COLVILLE INDIAN RESERVATION

INTEGRATED RESOURCE MANAGEMENT PLAN

DRAFT ENVIRONMENTAL IMPACT STATEMENT

COLVILLE CONFEDERATED TRIBES
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PURPOSE

CHAPTER I - PURPOSE OF AND NEED FOR ACTION

The Confederated Tribes of the Colville Indian Reservation have prepared an Integrated Resource Management Plan (IRMP) to provide guidance for management of approximately 1.4 million acres of Reservation lands for the next 15 years or more, or until replaced by a revised plan. The IRMP has been prepared in accordance with the Bureau of Indian Affairs planning regulations found in 43 CFR 1600. This Environmental Impact Statement (EIS) has been prepared to disclose action in the IRMP and evaluate the environmental consequences of such action in accordance with the Council of Environmental Quality's (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) of 1969, found in 40 CFR 1500. Federal laws and executive orders affecting management of the Colville Indian Reservation as they relate to preparation of an Integrated Resource Management Plan are reviewed by Hall (1991).

Chapter I contains a description of the planning area and the purpose and need for the plan and environmental analysis.

DESCRIPTION OF THE PLANNING AREA

The Colville Indian Reservation is located in northeastern Washington (Figure I-1). It is just under 1.4 million acres in size and is bounded on the east and south by the Columbia River, on the west by the Okanogan River and on the north by the line separating townships 34 and 35 of the Willamette Meridian. Elevations range from 790 feet to 6,774 feet and average about 3,000 feet across the Reservation. Precipitation averages from 10 to 25 inches annually and falls mostly in the winter. The major land uses and the extent of their area are shown in Table I-1.

Table I - 1. Major Land Use Categories of the Colville Indian Reservation.

LAND USE	ACRES	PERCENT OF RESERVATION
Agriculture	25,500	1.8
Forest – Commercial	673,025	48.3
Forest – Non-productive	128,348	9.2
Forest – Non-operable	92,852	6.7
Forest - Wilderness	8,397	0.6
Rangeland	455,276	32.7
Residential	1,195	0.1
Surface Waters	7,672	0.5
Total	1,392,265	100.0

The Colville Indian Reservation is home to the Lakes, Colville, San Poil, Nespelem, southern Okanogan, Moses/Columbia, Palus, Nez Perce, Methow, Chelan, Entiat and Wenatchi bands. A little less than one-half of the membership lives off-reservation. The Tribes currently have 8,538 members with the majority being under 10 year of age or between the ages of 30-39. The median age is 35 years. About 55 percent of the membership is of working age (21-69) and the unemployment is near 45 percent on the Reservation. Major employers on the Reservation are the Tribal, County, State and Federal governments, retail, forest industries and agriculture. Present median per capita income is about $7,561. Close to one-third of the members live below the poverty level (CCT 1999).

Timber revenues have historically contributed 80-90 percent of the Tribal budget. Gaming revenue first became a source of Tribal program funding in 1996.

The Reservation is comprised of lands in both fee (20%) and trust (80%) status. The east half of the Reservation lies within Ferry County, the west half within Okanogan County. Tribal members make up approximately 61 percent of the population (4,760 members of 7,826 on 4/1999) within the Reservation boundaries.

PURPOSE AND NEED

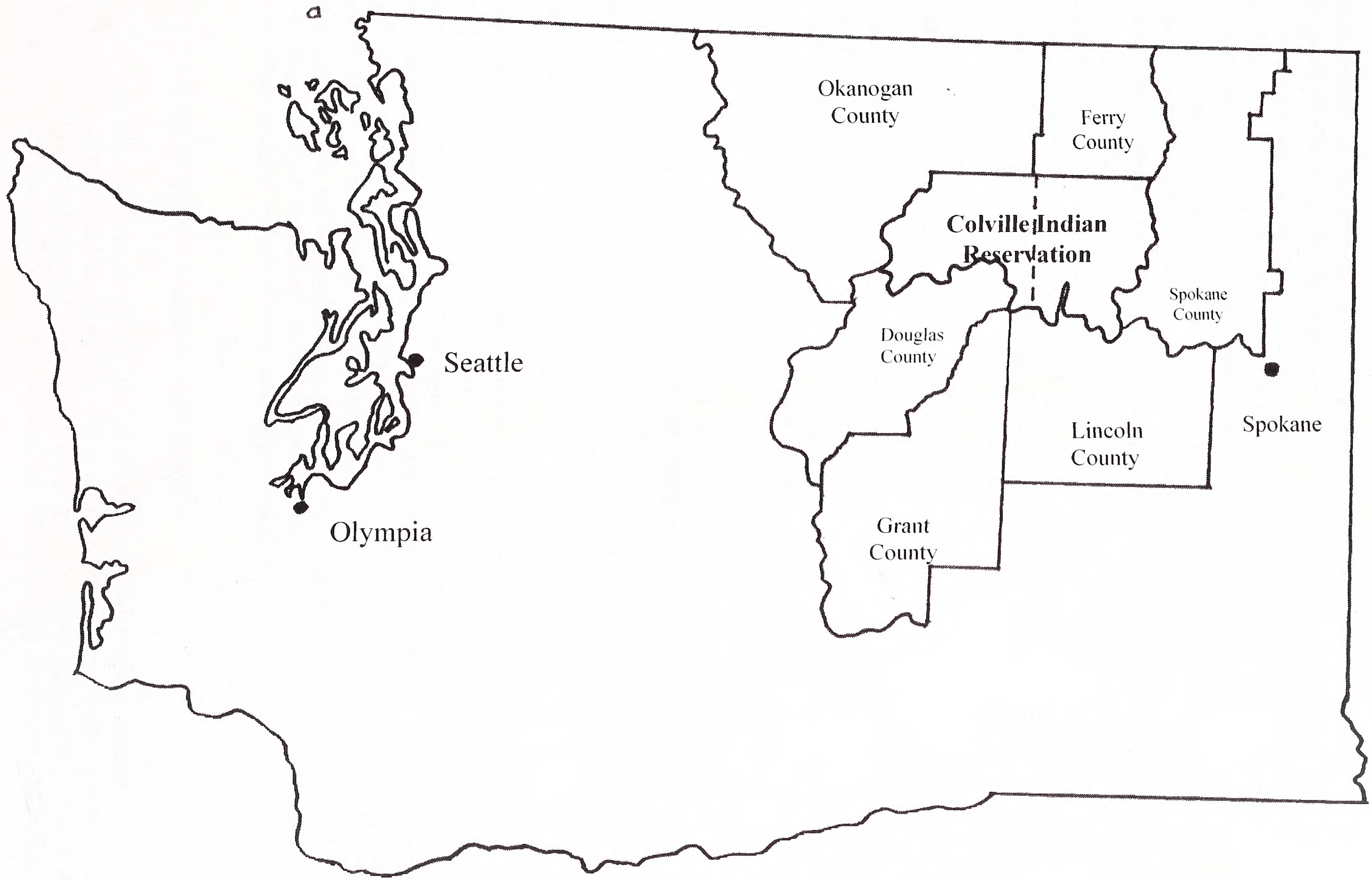
The purpose of this EIS is to determine the impacts that may be created by six alternative approaches to implementing the Integrated Resource Management Plan (IRMP) on the Colville Indian Reservation. If impacts are determined to be significant, mitigation measures will be developed applicable to all alternatives.

PROJECT DIRECTION

The Proposed Integrated Resource Management Plan (PIRMP) identified in this document was developed after consideration of the following:

- 53 BIAM. Guidelines for Integrated Resource Management Planning in Indian Country (CCT 1990).
- 30 BIAM Supplement 10. Integrated Resource Management Plan Structure and Procedures.
- Development of the Integrated Resource Management Plan Phase 1 (CCT 1997) and Phase 2 (CCT 1998a).
- Colville Tribal Code, Chapter 4.
- Public comments at scoping workshops and correspondence.
- Input from other government agencies.
- CCT staff analysis of the consequences of alternatives.
- Legal mandates of Federal laws and executive orders.
- Requirement of U.S. Department of Interior Bureau of Indian Affairs policy.

Figure I - 1. Location of the Colville Indian Reservation in the State of Washington.



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The management of the Reservation natural resources is governed by a variety of statutes, including Colville Tribal Code, the National Environmental Policy Act (NEPA), the Endangered Species Act, the Clean Air Act and the Clean Water Act. The National Indian Forest Resources Management Act (P.L. 101-630, Title III) requires the Secretary of Interior to manage Reservation lands for permanent forest production; however, such management must also be in accord with sustained-yield principles. Further, the Act requires that management of Reservation lands protect watersheds, regulate streamflow, provide for recreation facilities and contribute to the economic stability of local communities and industries. The Tribes, however, have discretion to determine how to manage the forest on a sustained-yield basis that provides for permanency of timber production over a long-term period. The Tribes must necessarily make judgments, informed by as much information as possible, about what kind of management will lead to permanent forest production that satisfies the principle of sustained yield.

THE IRMP PROCESS

Concepts of land planning and management continue to change. In the past, resource managers generally focused on the resources tied to their discipline, sometimes with little regard for the impacts their actions might have on other resources. As our understanding of the complex interrelationships in our natural world grows, management strategies, including those related to planning, are changing in an attempt to incorporate this new ecosystem approach.

Integrated resource management goes beyond the natural world and incorporates social, cultural, environmental, and economic aspects into the management scenario. It encourages active participation by those with a vested interest in the management of resources. Integrated resource management planning ties all decisions that affect a tract of land together so that each decision impact can be weighed against all others. It identifies conflicting and complementary management actions.

Direction for developing an Integrated Resource Management Plan for the Colville Indian Reservation is provided in Bureau of Indian Affairs Manual 53 (1990) as supplemented (1991). The manual developed with the participation of many Tribes points out that an Integrated Resource Management Plan (IRMP) is a Tribe's strategic plan for the comprehensive management of a reservation's resources. The process by which IRMP's are developed is a mechanism for the examination of the relationships among natural resources and their various uses, economic trends, cultural needs, and social forces. The ultimate goal of an IRMP is to create a balance within natural resource management actions, which reflects social, cultural, economic, and natural resource values of reservation residents.

THE COLVILLE INDIAN RESERVATION IRMP

The Bureau of Indian Affairs (BIA), as part of its trust responsibility, is required to have an approved forest management plan in place. The Colville Confederated Tribes operated under a 1962 Forest Management Plan until the adoption of an Interim Forest Management Plan in 1992. Prior to adopting the Interim Forest Management Plan, BIA Forestry developed and proposed an updated Forest Management Plan (1989). The Colville Business Council rejected the 1989 plan, and all of its alternatives, in 1992.

In response to BIAM 53 and the rejection of the Forest Management Plan, the Colville Confederated Tribes initiated the first steps to develop an IRMP for the Colville Indian Reservation. The Colville IRMP process, as shown below, was first described in an Interim Action Plan for Forest Management on the Colville Indian Reservation (1992).

THE IRMP PROCESS

A task group charged with outlining the process to be used on the Colville Reservation has developed the following process. The IRMP Process was designed as a guideline to assist in the sound management of Natural Resources on the Reservation. However, the planning principles involved could and eventually will be modified and applied to any project undertaken by Tribal Government to adequately address all planning issues.

The process, presently being developed, will be improved upon as problems are encountered. Steps, which work, will be retained. Steps or procedures, which do not, will be modified and methods, which accomplish goals, will be incorporated into the process. The time line, which accompanies the steps of the process, is for general direction only. Steps may be lengthened or shortened as the project demands. Each project will be unique and the IRMP Coordinator and IR Team will manipulate the process and schedule as required to achieve satisfactory results.

Due to staffing constraints and the expected schedule of IRMP Projects, specialists may be assigned to different projects and IR Team during concurrent time periods.

All goals developed through the IR Team should be consistent with Tribal policies.

The Colville Business Council initiated the IRMP to encompass not only forest vegetation, but also all of the resources that the Tribes used in the past and present, while ensuring that management of resources is based on Tribal values, desires and needs. In July of 1994, the Tribes hired a team to facilitate this planning effort. The team's responsibilities were to ensure that the membership's voices would be heard and would be the driving force of the plan. The planning team was later supplemented with specialists from various natural resource fields.

In 1996, the Colville Business Council enacted Resolution #1996-23 that provided the Holistic Goal for Management of the Reservation. Resolution #1996-23 provides the overall guidance for the development of the IRMP.

The process of developing the Colville IRMP began with getting input from the Tribal members and staff about their "vision" of the future of the Indian people, their Reservation, and its resources. Numerous "visioning sessions" were held utilizing a consensus building process for gathering input (Chadwick 1995). Over 400 individuals participated, resulting in about 3,200 comments. The results of these sessions were compiled in the Colville Vision (Clark 1996) and serves as the basis for the Tribe's Holistic Goal (CCT 1996) as well as a source of issue scoping input for this EIS.

Phase I of the IRMP describes the historical and current conditions of the natural resources on the Reservation and some of the processes that influence these resources. This component was published as Phase 1: Inventory and Analyses Reports (CCT 1997). These reports provide information necessary for the Tribes to make informed decisions regarding the management of the Reservation's natural resources.

The Draft Phase II report of the IRMP (CCT 1998a) is a compilation of the Tribes goals as they relate to management of the Reservation's natural resources. The Draft Phase II Plan defines a process for how the Tribes might begin to achieve the identified goals. The plan was written with the intent of supplying the Tribes with a functional document to guide management decision and activities as well as meet the BIA mandate for a Forest Management Plan. The plan describes the 15 goals that were developed from the "visioning" process and ranks them as to their relative priority. The ranking was conducted by the Colville Business Council, the Natural Resource Department managers, and the IRMP team and approved by Colville Business Council Resolution #1997-503 adopted September 4, 1997.

This IRMP focuses on the 15 key planning issues associated with the management goals for the natural resources of the Colville Indian Reservation. These issues were identified through Tribal and public scoping which started in October 1994 and internal analysis as described in Chapter II (Alternatives).

This IRMP establishes direction for the future management of the natural resources of the Colville Indian Reservation. It provide a comprehensive framework for allocating and managing Tribal administered resources on the Reservation for the life of the Plan that is expected to be 15 years, within the principles of multiple-use and sustained-yield. It will supersede and replace all previous natural resource management plans on the Colville Indian Reservation. It should be recognized that the adoption of the preferred alternative resulting from this EIS analysis is only a part of the Colville Confederated Tribes multiple-level decision-making framework. The Record of Decision for this EIS is, in essence, a programmatic statement of intent that establishes basic policies and sets forth the planning element that will be employed by the Natural Resources Department in future site-specific decisions.

DESIRED FUTURE CONDITIONS

Through the "vision" goal setting sessions as part of the IRMP development process and public and agency scoping for this analysis, 17 desired future conditions for the Colville Indian Reservation have been identified. The PIRMP would provide a process reflecting the Membership's desire to move the Reservation towards these desired future conditions.

1. Reservation and boundary surface and ground water are in sufficient quantity and distribution of high quality to meet existing and desired future needs.
2. Landscape hydrologic performance and processes sustain the water, soil and other resources.
3. Wetlands, riparian, and aquatic ecosystems continue to function as natural systems.
4. Culture, traditions and practices remain in the personal, social, economic, spiritual and political aspect of the lives of the Reservation's membership.
5. The long-term productivity and stability of the Reservation's soil resource is maintained.
6. Suitable habitat conditions for desirable native and non-native species (flora and fauna) exist to maintain Reservation biodiversity that includes the diversity of natural genes, species and ecosystems, as well as the evolutionary process that link them.

7. Managed landscapes more closely resemble those created by the activities of historic disturbance agents such as fire (natural and aboriginal ignitions), wind, insects, disease and animals.
8. Viable populations (numbers and distribution of reproductive individuals) of native and desired non-native species of wildlife, and their supporting habitats are maintained, while wildlife is provided in sufficient numbers to meet the cultural, subsistence and recreational needs of Colville Tribal Members.
9. An abundance of anadromous and non-anadromous salmonids and other species the Tribes desire continues in the waters of the Reservation.
10. Tribal Member's values are clearly stated and reflected in the management of their resources.
11. High air quality continues to exist on the Reservation.
12. A mosaic of desirable rangeland plant communities with diverse forbs, grasses and shrubs that optimize ecosystem processes exist across the Reservation.
13. The Reservation is in a clean, green, and healthy condition pleasing to Member's senses where man-made features and structures complement nature and meet the spiritual, cultural, social and economic needs of the Tribal Membership.
14. A Natural Resource Department capable of embracing the resource goals of the Colville Indian Reservation successfully functions by understanding the complexities of interpreting the Tribes Holistic Resources Goal and by formulating operational objectives (strategies) and action steps (tactics).
15. The landscape is producing a viable short-term and long-term economic stability for the Tribal Membership.
16. Non-Reservation sources of revenue continue from other government entities and private enterprises to assist in managing the landscape for producing short-term and long-term economic stability on the Colville Indian Reservation.
17. Diverse year-round recreational opportunities are provided for all age groups and ability levels with an emphasis on Tribal Member utilization as well as resource protection.

SCOPE OF THE PROPOSED ACTION

The scope of this Draft Environmental Impact Statement (DEIS) was determined through general public and Tribal membership scoping along with input from the staff of the Colville Confederated Tribes and private contract analysis, according to the requirements of 40 CFR 1508.25. The scope of the proposed action closely follows the direction and guidance provided by the USDI Bureau of Indian Affairs, the Colville Business Council and the Colville Natural Resources Department.

The time period for this analysis has been considered to be 15 years so as to coincide with the existing harvest cycle on the Reservation. Reasonable foreseeable future actions are included by resource in the cumulative effects analysis. For the Colville Indian Reservation, reasonably foreseeable actions within the next 15 years include the following:

- Consistency in management direction for all landowners on the Reservation.
- An increase in the use of prescribed fire to bring the Reservation vegetation more in line with natural conditions.
- An increase in demand for both ground water and surface water resources.
- An increase in demand for special forest products and dispersed recreation.
- An increase in Tribal population to support on the Reservation

This EIS recognizes that the natural resource planning and management activities on the Reservation would be divided into two tiers, a Reservation-wide landscape scale and a project scale. The Reservation-wide, landscape-planning process would concentrate on identifying and prioritizing projects and analyzing the relationship of each project to other projects and the overall goals of the Tribes. It is intended to provide direction to project level activities and ensure those project activities are coordinated in such a way that they work together to provide for Reservation-wide needs. The landscape planning process would provide direction to each project as to the specific needs that must be achieved in order to take the Tribes closer to their Desired Future Conditions on the Reservation. It is anticipated that this direction would assist in eliminating some of the conflicts that might occur in projects because of differing goals, viewpoints and agendas. The landscape level planning team would provide oversight to on-the-ground projects to ensure that they are in fact meeting the needs of the Reservation Membership.

Project level activities under the proposed alternatives would operate under a form of the project proposal process that is currently being used on the Reservation. This process would be modified to better reflect integrated resource management planning. Project planning as proposed here would have more clearly defined documentation to be used in analysis and formulation of direct on-the-ground applications. This level of planning would provide the management directions and requirements to be used on site-specific projects.

This programmatic DEIS documents the analysis of the first level of planning which when accepted would provide direction for all natural resource management programs, practices, uses and protection measures. If the Decision Officer selects an action alternative, implementation of the selected alternative would begin as soon as possible. This action would include the development of a Forest Management Plan reflecting management direction for the period 2000-2014 provided for by the selected alternative in the EIS.

As a result of this EIS process, monitoring will be recommended that describes mechanisms for determining progress of the Resource Management Departments in meeting the Tribes Holistic Goal as well as the desired future conditions of the Reservation.

ORGANIZATION OF THE DOCUMENT

This programmatic DEIS documents the environmental consequences of implementing the Integrated Resource Management Plan that would set forth direction for managing the natural resources of the Colville Indian Reservation. The Notice of Intent to prepare an EIS was published in the Federal Register, Volume 64, Number 104, June 1, 1999. In this Chapter, the Purpose and Need and Scope of Action have been provided.

Chapter II describes six alternatives (including no action) addressing the issues and resource management direction identified through the scoping and public involvement phases of the project.

Chapter III describes the affected environment of the Colville Indian Reservation and the existing conditions of the 14 specific resource items are discussed. Water resources and watersheds have been combined into one resource area for purposes of this analysis.

Chapter IV shows the expected effects on the 14 specific resource items for each alternative action, if implemented. The direct, indirect and cumulative effects of each alternative are predicted and the effectiveness of mitigation measures are discussed. Any expected, unavoidable adverse impacts are listed, including irreversible and irretrievable commitment of resources.

A List of Preparers identifies the individuals involved in the preparation of the document. The role and experience of Dr. Glen Klock, lead author of this document as well as other contributing authors is shown under List of Preparers. A List of Agencies, Organizations, and Other Persons identifies those who have been provided copies of this Draft EIS. A List of Acronyms used in the text is provided and the Glossary defines terms used in the text that may be unfamiliar or specialized. A References section provides the source description for published material referenced in the text.

The Appendices contain analytical reports and specific or supplementary information that further explain discussions in Chapters I through IV.

Many more reports and analysis documents have been referenced or developed during the course of this project. They were not included in this document because they either were technical in nature or were of excessive length. These items are referred to throughout the document as "part of the Project file." The original public and agency response letters are in the Project file. All project file records for the Colville PIRMP/EIS project are located at the Natural Resources Department Office in Nespelem, Washington and are available for inspection.

ALTERNATIVES

CHAPTER II – ALTERNATIVES

INTRODUCTION

Chapter II describes in detail a No-Action Alternative, a proposed alternative for implementing the Colville Reservation Integrated Resource Management Plan and four additional alternatives developed from project scoping that meet the Purpose and Need identified in Chapter I. Each alternative, if implemented, would provide a mix of uses and actions that could resolve the issues described in developing the alternatives. Each alternative provides a set of directions (standards and guidelines) for managing the resources and environment of the Colville Indian Reservation as well as offers different combinations and intensity of timber harvest for the years 2000-2014.

VISION

The Colville Confederated Tribes (CCT) will manage the natural resources under its jurisdiction on the Colville Indian Reservation to enhance and maintain the ecological health of the environment and the social well-being of Tribal Members and other human populations.

The basic principles supporting this vision are:

- Natural resources can be managed to provide for human use and a healthy environment.
- Resource management must be focused on ecological principles to reduce the need for single resource or single species management.
- Stewardship, the involvement of people working with natural processes, is essential for successful implementation.
- The Holistic approach provides the greatest opportunity to manage the Reservation's resources while enhancing and maintaining the desired quality of life.
- A carefully designed program of monitoring, research and adaptation will be the change mechanism for achieving this vision.

STRATEGY

Lands under the jurisdiction of the Colville Confederated Tribes will be managed to maintain or restore healthy, functioning ecosystems while providing a sustainable production of natural resources. This IRMP Holistic management strategy involves the use of ecological, economic, cultural, social and managerial principles to ensure the sustained condition of the whole. Holistic ecosystem management emphasizes the complete ecosystem instead of individual components and looks at sustainable systems and products that Tribal members want and need. It seeks a balance between maintenance and restoration of natural systems and sustainable yield of resources.

DEVELOPMENT OF ALTERNATIVES

The development of alternatives for the Colville Indian Reservation IRMP Environmental Impact Statement (EIS) began in April 1999. An Interdisciplinary Team, consisting of resource specialists from Western Resources Analysis, Inc and associated firms in cooperation with resource specialists from the Colville Confederated Tribes Natural Resources Department developed alternative strategies in response to issues identified through scoping and public participation activities. Using a process designed to address Colville Confederated Tribal Staff and Members as well as public concerns, the Interdisciplinary Team developed six action alternatives.

SCOPING

The scoping process is an early and open process for determining the issues to be addressed and for identifying the issues related to the proposed action. Steps used in the Colville IRMP EIS scoping process include the following:

- Identify the lands affected.
- Determine the combination of disciplines needed for interdisciplinary analysis of the resources.
- Assessing Tribal and public involvement needs and inviting public participation.
- Determining the issues to be analyzed in depth.
- Identifying and eliminating from further study those issues not significant or important to the proposed action.
- Reviewing the IRMP Phase I and Phase II documentation, Tribal Code and BIA directives as they relate to the proposed action.
- Identifying resource needs or management opportunities that contribute to achievement of the desired future conditions as defined in Chapter I.

From these elements, alternatives were developed to reflect public issues, Colville Confederated Tribe member and staff concerns, and resource needs. The public scoping summary for the Colville Indian Reservation EIS Project is in the project file at the CCT Natural Resources Department.

Public Involvement

Throughout the planning process Tribal members and the public have been kept informed through public meetings, mailings, meetings with members of the Colville Business Council, a project web site, news releases, individual contacts and telephone conversations.

EIS Scoping Meetings

A Notice of Intent (NOI) to prepare an Environmental Impact Statement for the Colville Indian Reservation IRMP was published June 1, 1999 in the Federal Register (64 FR 29332).

Three scoping open house sessions were held in April and May 1999. No public responses were received from the first two open house scoping sessions (April 7 at Nespelem and April 8 at Keller). Do to the small attendance, a third open house session was held in Nespelem on May 3, proceeded by a project introduction and information letter to 268 Tribal members, reservation residents, local agencies and governments. Twelve Tribal members and interested public attended the May 3 workshop at Nespelem. Comments were received from those attending the workshop on the following twelve issue areas.

1. Provide Tribes Revenue
2. Develop/Implement "HRV" Practices - in Forests and Ranges
3. Maintain Cultural Resources
4. Reduce Wildfire
5. Reduce Insects/Disease
6. Maintain Soil Productivity
7. Provide Wildlife Habitat Diversity
8. Protect ESA and Species of Concern - Plants, Animals, Fish
9. Maintain Watershed Health
10. Protect Watershed Management emphasis areas
11. Maintain High Air Quality.
12. Other Concerns/Opportunities - Aesthetics, Roads, Recreation, Livestock Grazing.

IRMP Scoping

Prior to initiating EIS Scoping, extensive applicable Tribal and public issue and concern input had been gathered (Clark 1996).

In recognition that the land and the people are interdependent, what affects one affects the other, and the conviction that the Tribal members and residents are the experts when it comes to their land, resources and lives, the Colville Integrated Resource Management Planners and Healthy Nations staff opted to coordinate their efforts to reach out to Tribal Members and the public by holding joint visioning sessions. A visioning schedule was developed which targeted resident Tribal elders, youth, communities and off-reservation members. Letters were mailed to all voting-age members within the Reservation and the State of Washington explaining program objectives, need for input, and an invitation to attend one or all of the scheduled Visioning Sessions. Notices of the Sessions were also given through the Tribal Tribune, flyers, inter-departmental memos and personal contacts.

Twenty visioning sessions were successfully held and five unsuccessfully held (no one showed up) across the Reservation between October 11, 1994 and January 26, 1995. A total of 411 participants' signatures were gathered. Participants reflected the targeted Tribal members as well as non-member residents and staff.

A consensus building process was used to conduct the Visioning Sessions. The levels of participation and inputs developed at these vision sessions have been documented by Clark (1996). Approximately 3,200 comments were recorded with 62 percent being directly related to natural resources and their management. This input is the basis for the Tribe's Temporary Holistic Goal as adopted by Tribal Resolution 1996-23 on January 18, 1996 as well as the basis for the IRMP Desired Future Conditions described in Chapter I of this EIS.

Tribal Scoping Direction

The scope of the IRMP document (and this EIS) and the Colville Confederated Tribes' position on jurisdiction as stated by Colville Business Council Chairman Joe Pakootas is as follows:

> *Lands Affected: The Integrated Resource Management Planning document shall apply to all lands within the exterior boundaries of the Confederated Tribes of the Colville Indian Reservation, whether held in trust by the United States for the benefit of the individual members or the Confederated Tribes of the Colville Indian Reservation as a whole, or held in fee by Indians or non-Indians.*
>
> *Purpose: Ecosystem management encompasses all lands within the exterior boundaries of the Colville Indian Reservation because the uncontrolled use and development of land within the Reservation poses a threat to the use of the Reservation as a homeland for the members of the Confederated Tribes of the Colville Indian Reservation for whom the Reservation was established and jeopardizes the value of the land and water, impairs the economic benefits of the natural resources and damages the environment. The explicit purpose of managing in an ecosystem manner is to protect the cultural, spiritual, and political integrity, economic security and the health and welfare of the members of the Confederated Tribes of the Colville Indian Reservation.*

The Bureau of Indian Affairs, as part of its trust responsibility, is required to have an approved forest management plan in place. The Tribes operated under a 1962 Forest Management Plan until 1989 when a new Forest Management Plan was prepared and analyzed in a NEPA Environmental Assessment (Cooper 1990). However, the Colville Business Council rejected the 1989 Forest Management Plan in 1992. In response an Interim Forest Management Plan was prepared and adopted by the Council in 1992. The Council adopted an Amendment to Final Assessment for 1989 Forest Management Plan in October 1998 (CCT 1998b). These documents have been extensively reviewed to determine applicable natural resources issues and concerns addressed in the IRMP and to be analyzed in this EIS document.

ISSUES

The issues to be addressed by this Environmental Impact Statement were developed through the scoping process. Issues key to the development of alternatives also served to aid in sharply defining the potential effects of the proposed actions. The proposed alternatives respond to these issues to the extent feasible within the physical, biological, and legal limits of forest management. For the Colville Indian Reservation, the issues generally relate to maintaining Tribal revenue, protecting cultural values, managing forest and range vegetation within the historic range of variability, reducing the risk of insect and disease on forest vegetation, protecting and maintaining watershed health, and providing wildlife habitat diversity.

A number of issues (Table II-1) in addition to those identified in the scoping process potentially affected by the proposed alternative actions are also important, and are considered in the effects analysis. The second set of issues differ from the key issues above in that these issues are generally protected by specific federal laws, Tribal Code and Best Management Practices. Net effects of these issues are limited and may be relatively the same for all alternatives. Mitigation and project design features necessary to maintain the levels and standards identified in the Integrated Resource Management Plan for these resources are included.

Discussion of the components of these issues throughout this EIS is arranged under specific environmental components so that the reader may more easily reference information. Each of the issues is discussed as they relate to 14 separate natural resource management components listed below.

- Aesthetics
- Agriculture
- Air Resources
- Cultural Resources
- Fish Resources
- Fire and Fuels
- Forest Vegetation
- Geology, Minerals and Soils
- Natural Resource Department Organization
- Range Resources
- Recreation Resources
- Socioeconomic
- Water Resources
- Wildlife Resources

Further information on the issues and concerns are described in the Project Scoping summary document (Arneson 1999) and the IRMP Visioning document by Clark (1996).

ISSUES KEY TO DEVELOPMENT OF ALTERNATIVES

A number of issues identified through scoping discussed below have been key to development of the EIS alternatives. The following issues formed the foundation of the EIS planning criteria and alternatives and are summarized in Table II-1. While responses to these issues are discussed later in the EIS, the first two issues below are briefly discussed for document clarification. Because of the nature of these two issues and their difficulty to analyze with respect to alternatives, the issues are not included in Table II-1. These issues, however, have been fully considered in alternative development.

Tribal Membership Values, Expectations and Awareness

How would the Integrated Resource Management Plan affect Tribal membership values, expectations and awareness?

> Tribal members expect a variety of values from the forest. Timber revenues have historically funded a large share of the Tribal government. Up until the early 1980s, various natural resource uses coexisted with a minimum of perceived conflict. Management before that period repeatedly advised the membership that under the style of management then in place multiple use could continue indefinitely, satisfying all of the various demands placed on the forest. Membership

perceptions of the forest itself have been largely shaped by the composition and structure of the forest as it has existed over the last thirty or forty years. Membership responses to management proposals and initiatives have often indicated various degrees of unawareness, denial or misinformation about forest health issues. Present expectations of a large part of the membership appear to be in conflict with recovering and maintaining long-term forest health. While this may be true, when questioned, individual Tribal members universally regard 'forest health' as a desirable state but have difficulty relating it to management goals.

Holistic Resource Management

How would the Tribes benefit from Holistic Resource Management using the Integrated Resource Management Planning process?

> The Integrated Resource Management Planning (IRMP) process replaces the single discipline and the multi-disciplinary team approach (ID Team) to achieve resource management goals. The IRMP concept "will evolve into a holistic management process which manages the "whole" from the whole's point of view versus from the individual or collective discipline's compromise. Evidence of this transition will be apparent when goals are generated considering desired future outcomes of human, economic, and ecological values instead of the current goal formation process typified by scoping. Under the old approach, problems become the goals resulting in crisis management. A more advanced approach would design for future desired conditions through planned change." (IFMP 1998)

Short-term and Long-term Value of Tribal Timber Resource

What is the economic return to the Tribes from the harvest of forest and range products and how might that return be affected by forest and watershed health concerns?

Timber Production Practice

What forestland should be available for intensive management for the extraction of timber products, what practices should be used on these lands, and what level of harvest should occur during the next planning period (15 years)?

Forest Health

What forestland management practices should be utilized to treat lands affected by insect and disease? How might forest health be addressed as a regional concern?

What past and current management practices have led to today’s existing forest health condition?

Late Successional Forest

To what extent and where should late successional and/or mature forest habitats be developed and retained to meet various resource objectives?

Habitat Diversity

To what extent and where should habitat be managed on the Reservation to support populations of native wildlife species?

Threatened and Endangered Species Habitat

What should be done to manage federally listed, threatened, or endangered plants and animals and to prevent future federal listing of plants and animals as threatened or endangered species?

Special Areas

What areas on the Reservation need special management to prevent irreparable damage to important historic, cultural, or scenic values, to protect traditional use areas and properties, and to protect botanical or fish and wildlife resources or other natural systems or processes?

Visual Resources (Aesthetics)

Which, if any, areas of the Reservation should be managed to reduce visual impacts or enhance (scenic) quality?

Watershed Health

Where and how should riparian management emphasis areas be managed to protect and improve water quality, fisheries, and wildlife habitat?

Recreation Resources

What areas or sites on the Reservation can be developed and/or managed to protect or enhance a variety of recreational opportunities?

Livestock Use of Rangeland

What affects does the present livestock-grazing program have on range vegetation condition and other resource values?

Natural Resource Department Organization

How might the Natural Resource Department be organized to most effectively use the Integrated Resource Management Planning process to reach the Tribes' Holistic goal?

Table II - 1. Issues Key to Alternatives Development and Related Issue Indicators.

RESOURCE	ISSUE	INDICATOR
Aesthetics	Protection of Visual Resource	Changes in Visual Resource Management Condition.
Agriculture	Protection of agriculture lands.	Acres in agriculture production.
Air Resources	Protection of Air Quality	Increased pollutants – tons/day PM_{10} $PM_{2.5}$ Total particulate matter Effects on Class I Airsheds. Changes in visibility and local air quality
Cultural Resources	Protection of cultural/heritage/historic/religious resources and uses	Ability to avoid and protect heritage resource materials/sites, most particularly traditional cultural properties (TCPs)
Fisheries	Effects on resident and Threatened and Endangered (T&E) fish species	Potential changes in fish habitat. Changes in stream temperatures.
Fuels/Fire	Risk of large wildfire	Relative risk rating Acres of prescribe fire/slash control
Forest Vegetation	Extent of forest vegetation altered. Effects on T&E plant species Effects on Unique and special habitat. Unwanted competing vegetation potential. Protecting Wilderness	Vegetation treatment area. Area of regeneration harvest Area of intermediate harvest Area of vegetation treated by PAG Effects on forest health Loss of T&E plant species Acres and location of unique and special habitat affected. Acres of disturbed oil surface. Acres of Wilderness
Geology/Soils	Potential geologic hazards – seismic and slope stability. Protection of soil productivity, stability and hydrologic function.	Potential geologic hazards. Acres of soil disturbance.
NRD Organization	Meeting Tribal Holistic Goal.	Effects of meeting Holistic Goal
Range Resource	AUMs provided. Extent of range vegetation altered. Range forage quality. Effects on T&E Species.	AUMs Reduction in area available for livestock use - acres. Range enhancement program
Rec. Resource	Protection and enhancement of resource	Effects on existing facilities and dispersed recreation.
Socioeconomic	Forest harvest viability NPV of proposed action Value returned to the Tribes Jobs Resource flow regulation	Net Present Value Estimated net Tribal revenue Return to Tribal treasure per MBF Jobs created or lost. Stable even flow of resource products and returns.
Water	Effects on aquatic resource Watershed health	Acres of riparian habitat disturbance Change in accelerated erosion affecting sediment yield and turbidity Direct Changes in Equiv. Open Area Cum. Change in Equiv. Open Area Changes in peak streamflow Changes in water quality Changes in channel stability Effects on wetland functionality

RESOURCE	ISSUE	INDICATOR
		Effects on groundwater Effects on Watershed Health
Wildlife	Effects on populations and habitat of T&E and other important wildlife species Protection of critical habitat Protection of big-game habitat. Protection of mature habitat and suitable habitat components. Protection of habitat diversity Protection of corridors and non-fragmented late successional forest.	Presence of additional human disturbance Presence of and changes to critical habitat Distr. of big-game summer habitat (%) Thermal Security Forage Distr. of big-game winter habitat (%) Thermal Security Forage Changes in acres of mature forest and suitable habitat components Impacts to habitat diversity Changes in corridors and late-successional fragmentation.

OTHER ISSUES ELIMINATED FROM DETAILED STUDY

The following issues, topics or effects were eliminated from consideration as primary factors in the formulation of alternatives for the reason cited.

- **Clearcut Regeneration Harvest**: Tribal Resolution 1998-207 directed that clearcut harvesting would not be used on the Colville Indian Reservation.
- **Use of Herbicides**: Tribal Resolution 1998-819 directed that herbicides would not be used for forest management activities on the Colville Indian Reservation.
- **Effects on Wilderness**: The effects of the proposed action are unlikely to affect the value and condition of the Moses Mountain and Grizzly Peak Wilderness areas.
- **Wild and Scenic Rivers**: No existing or proposed wild and scenic rivers would be affected by the proposed action.
- **Effects on Agriculture**: Action proposed by all alternatives is unlikely to have a measurable effect on agriculture on or off the Reservation.
- **Effects on Wind and Hydropower Resources**: There are no known wind power or hydropower proposals affecting the Colville Indian Reservation.
- **Effects on Prime and Unique farmlands and Paleontological Resources**: No discernible effects are anticipated.
- **Effects on Off-Reservation Indian Tribal Treaty Rights or Trust Resources**: No such treaty rights or trust resources would be affected by the proposed action.
- **Effects on Energy Use.** No discernible effects are anticipated.

ALTERNATIVE CONSIDERED BUT ELIMINATED FROM FURTHER STUDY

From the scoping data eight alternatives were originally developed. Two of the eight alternatives were considered, but eliminated from further study as they did not adequately meet the purpose and need, Colville Business Council direction or economic feasibility constraints appear to make them impractical. The two alternatives considered, but eliminated from further study, are briefly described below.

1. Postpone timber harvest on the Reservation during the next 15-year planning period.

While this alternative was developed to look at the environmental and economic consequences of not harvesting timber on the Reservation, resolutions passed by the Colville Business Council direct the continued harvest of timber. It is estimated that approximately 75 percent of the revenue supporting the economic viability of members of the Tribes comes from the sustained harvest of the Reservation's forest resource. This proposed alternative also does not address the serious forest health issue that needs to be addressed to protect the value of the existing forest resource. Therefore, this alternative was not developed because it is not considered economically feasible nor does it meet the present needs of the Colville Business Council.

2. Maximize the watershed health and wildlife habitat on the Reservation.

During scoping there was a segment of the public sector that expressed belief that forest practices on the Reservation have been seriously detrimental to watershed values including fish and wildlife habitat. It was expressed that fish and wildlife populations were less than expected on the Reservation and the cause was alleged to be from timber harvesting.

Studies documented in the Phase I and Phase II reports of the Integrated Resource Management Plan (CCT, 1997, CCT 1998a) indicate that improvements in watershed health along with fish and wildlife habitat could be made by modifying forest harvest activities. This alternative was developed to maximize beneficial support for enhancing watershed and habitat conditions. However, the Colville Business Council has contracted with Colville Indian Precision Pine, Inc. to provide 44 million board feet of timber annually to sustain the operation of the mill that employs many Tribal members. Thus, an alternative to maximize the future benefits to watershed health and wildlife habitat is not considered to be economically feasible nor does it meet the present needs of the Confederated Tribes of the Colville Indian Reservation.

ALTERNATIVES CONSIDERED IN DETAIL

This section of Chapter II describes the specific features of the six alternatives (including the No-Action Alternative) designed to respond to the issues. Alternative 1 will be the No Action Alternative and Alternative 2 is the Proposed Action to implement the Integrated Resource Management Plan on the Colville Indian Reservation. Alternatives 3, 4, 5 and 6 were developed by the ID Team from scoping data input and provide a range of levels of resource development, enhancement and protection to meet the Tribes' Holistic Goal through ecosystem management. Alternative 1 does not meet this need.

Alternative 1 which reflects the program action of the 1998 Amendment to the 1989 Forest Management Plan (CCT 1989, 1992, 1998b) is first described. Alternative 2 is the proposed Integrated Resource Management Plan (CCT 1998a) while Alternatives 3 through 6 are derivatives of the IRMP that focus with further detail on specific issues raised in scoping. As the goals, objectives and most management directions are common to Alternatives 2 through 6 they are first described before showing the specific management features attached to each alternative.

Under all alternatives, 569,522 acres of Tribal Trust commercial forestland would be managed for harvest in three forest districts, San Poil (147,361 acres), Inchelium (217,455 acres) and Omak/Nespelem (204,706 acres) under the direction of the Natural Resources Department. Two forested areas in addition to the forest districts would remain in Wilderness, the 3,417-acre Moses Mountain Wilderness and the 4,533-acre Grizzly Mountain Wilderness. The 21,492-acre Omak game reserve is within the Omak/Nespelem Forest District and the 100,503-acre Hellgate Game Reserve is within the Inchelium Forest District. Silviculture practices are permitted within these game reserves.

Alternatives 2 through 6 will assist the Interior Columbia Basin Ecosystem Management Plan (ICBEMP) (USDA/USDI 1998) in achieving regional goals for water quality as well as other resources.

Alternative 1 - No Action

Alternative 1 is the No Action Alternative. It provides no change in the existing management direction and represents Alternative CD presented in the Amendment to Final Assessment for 1989 Forest Management Plan, Colville Indian Reservation, October 16, 1998. Like the 1992 Interim Forest Plan, the 1998 Amendment is derived from the 1989 Forest Management Plan and Final Environmental Assessment that was not accepted by the Colville Business Council. The rejection of the 1989 Forest Management Plan and later amendments by the Colville Business Council led to the development of the Integrated Resource Management Plan presented under Alternatives 2 through 6.

The main objectives of Alternative 1 (Alternative CD, CCT 1998b) are:

1. To sustain all natural resources of the CCT through time and space.
2. Any marginal lands will be placed in the no harvest category
3. The standards of the 208 Water Quality Plan which deal with forest practices are written into Colville Tribal law and must be complied with.
4. Large areas of Wilderness Management emphasis areas and non-harvestable lanes (129,532 acres) with areas of aesthetic appeal, wildlife, and cultural concerns would be managed with no timber harvesting permitted.
5. This alternative incorporates the Colville Business Council directives for forest management under Tribal ownership on the Colville Indian Reservation to adopt a "No Clear Cutting Policy" to preserve, protect and enhance cultural and natural resources (Resolution #1998-207) and to preserve or protect, where possible, two large trees per acre for cultural and aesthetic reasons (Resolution #1992-096).
6. This alternative incorporates the Colville Business Council directive to reduce insect and disease vulnerability of forests under Tribal ownership on the Colville Indian Reservation (Resolution

1992-340) through the increase of timber harvest from the directed annual cut of 65 million board feet per year (Resolution #1990-469).

7. This alternative incorporates the Colville Business Council directive to increase economic benefits of timber harvest by waiver of the annual cut of 65 million board feet per year (Resolution #1990-469) to 30,000 acres treated (Resolution #1997-743 and #1998-647) and 75 million board feet per year of timber harvest (Natural Resources Department Directive, Timber Revenue Projection – FY 1998, December 5, 1997).
8. This alternative incorporates the Colville Business Council directive to allow for the conditional use of herbicides based upon review and recommendations of an appointed cultural resource advisory group (Resolution #1991-467).
9. This alternative continues the current level of fuels treatment, averaging about 2,000 acres per year on timber harvest areas

To compare Alternative 1 with the IRMP action alternatives, further analysis of the Interim harvest action (CCT 1998b) has been completed on an annual projection and is shown in Table II-3 for the period 2000 – 2014. This analysis shown in Table II-9 examines the total acreage to be treated as well as the expected harvest yield in million board feet by six plant association groups. The results of a more extensive analysis of Alternative 1 where also two methods of harvest, regeneration and intermediate, and the distribution of harvest by year is shown in Appendix E. The distribution of watersheds where harvest activities may occur between year 2000 and 2014 under Alternative 1 is shown in Figure II-1.

For the period year 2000 to 2014, 1,071.2 MMBF (million board feet) of timber would be harvested across 157,573 acres (See Table II-9 and Appendix E). About 675 MMBF would be harvested from 57,889 acres with a regeneration silvicultural treatment and 396.2 MMBF would be harvested from 99,684 acres with an intermediate silvicultural treatment. All forest area receiving a regeneration silvicultural treatment would have the down fuel load reduced to about 15 tons per acre followed by spot planting. Within regeneration harvest units in the ponderosa pine and Douglas-fir plant association groups, the predominant species planted would be ponderosa pine and western larch.

Over the 15-year planning period (2000-2014) the annual harvest rate would be about 71.4 MMBF on 10,505 acres. Using current timber value and interest rates the Net Present Value (NPV) for the harvest of forest products under Alternative 1 would be $101.3 million.

The fuels management objectives of 15 tons per acre would be accomplished by piling and burning, underburning, jackpot burning, or broadcast burning depending on the treatment and the amount of activity and natural fuels. Prescribed fire harvest fuels treatment would occur on about 2,000 acres. No non-harvest stocking control or prescribed burning would be done under Alternative 1.

The range management units and allotments on the Reservation would be managed under the current management direction. There would be no change in livestock use of the existing ranges.

The Natural Resources Department would remain in its current Management Structure.

Table II - 2. Summary of Some Key Features in Alternative 1.

No change in existing management direction
Management Objective – Improve forest health.
Average Annual Harvest – 71.4 MMBF on 10,505 acres.
Net Present Value - $101.3 million.
Stocking Control (thinning) – 0 acres.
Prescribed Fire – 2,000 acres harvest fuels annually.
No changes in livestock use on existing ranges.
No change in road management.

Alternative 2 – Integrated Resourced Management Plan (Proposed Action)

Alternative 2 would feature the implementation of the IRMP management directions described in the preceding section of this EIS.

For the period year 2000 to 2014, 953.1 MMBF (million board feet) of timber would be harvested across 156,989 acres (See Table II-9 and Appendix E). About 488.1 MMBF would be harvested from 41,488 acres with a regeneration silvicultural treatment and 465 MMBF would be harvested from 115,501 acres with an intermediate silvicultural treatment. All forest areas receiving regeneration silvicultural treatments would have the down fuel load reduced to about 15 tons per acre followed by spot planting. Within regeneration harvest units in the Douglas-fir plant association groups, the predominant species planted would be ponderosa pine and western larch. Not every regeneration harvest acre would be planted. However, to achieve the desired species composition, spot planting, at minimum, should be considered in every regeneration harvest unit.

The results of a more extensive analysis of Alternative 2 where also two methods of harvest, regeneration and intermediate, and the distribution of harvest by watershed is shown in Appendix E. The distribution of watersheds where forest harvest activities may occur between year 2000 and 2014 under Alternative 2 is shown in Figure II-1.

Over the 15-year planning period (2000-2014) the annual harvest rate would be about 63.5 MMBF on 10,466 acres. Using current timber value ($219/mbf mean return to Tribes on timber processed by Colville Indian Precision Pine) and interest rates (12% WACC), the Net Present Value (NPV) for the harvest of forest products under Alternative 2 would be $89.9 million.

The fuels management objectives of 15 tons per acre would be achieved by pile and burning, underburning, jackpot burning, or broadcast burning depending on the treatment and the amount of activity and natural fuels. Under Alternative 2, 3,100 acres of non-harvest stocking control (thinning) and 6,400 acres of prescribed burning for non-harvest fuels management would occur annually.

Under Alternative 2, there will be a 15 percent general reduction in range use, reducing the current 60,924 AUMs to 51,785 AUMs. No rangeland prescribed burning would occur.

The Natural Resources Department would continue in its current management structure allowing for the management directions specified for by Alternative 2.

Table II - 3. Summary of Some Key Features in Alternative 2.

Follows Direction Provided in IRMP Process
Management Objective – Meet IRMP Objectives
Annual Average Harvest – 63.5 MMBF on 10,466 acres
Net Present Value - $89.9 Million.
Stocking Control – 3,100 acres.
Prescribed Fire – 6,400 acres non-harvest fuels.
Range Use - Allotments Reduced 15 Percent.
Road Management – No Net Increase in Roads.

Alternative 3 – IRMP with Additional Watershed Health and Wildlife Habitat Emphasis

Alternative 3 would feature the implementation of the IRMP management directions described for Alternative 2, but modified as described below. Alternative 3 addresses concerns raised in scoping with regards to watershed health and wildlife habitat.

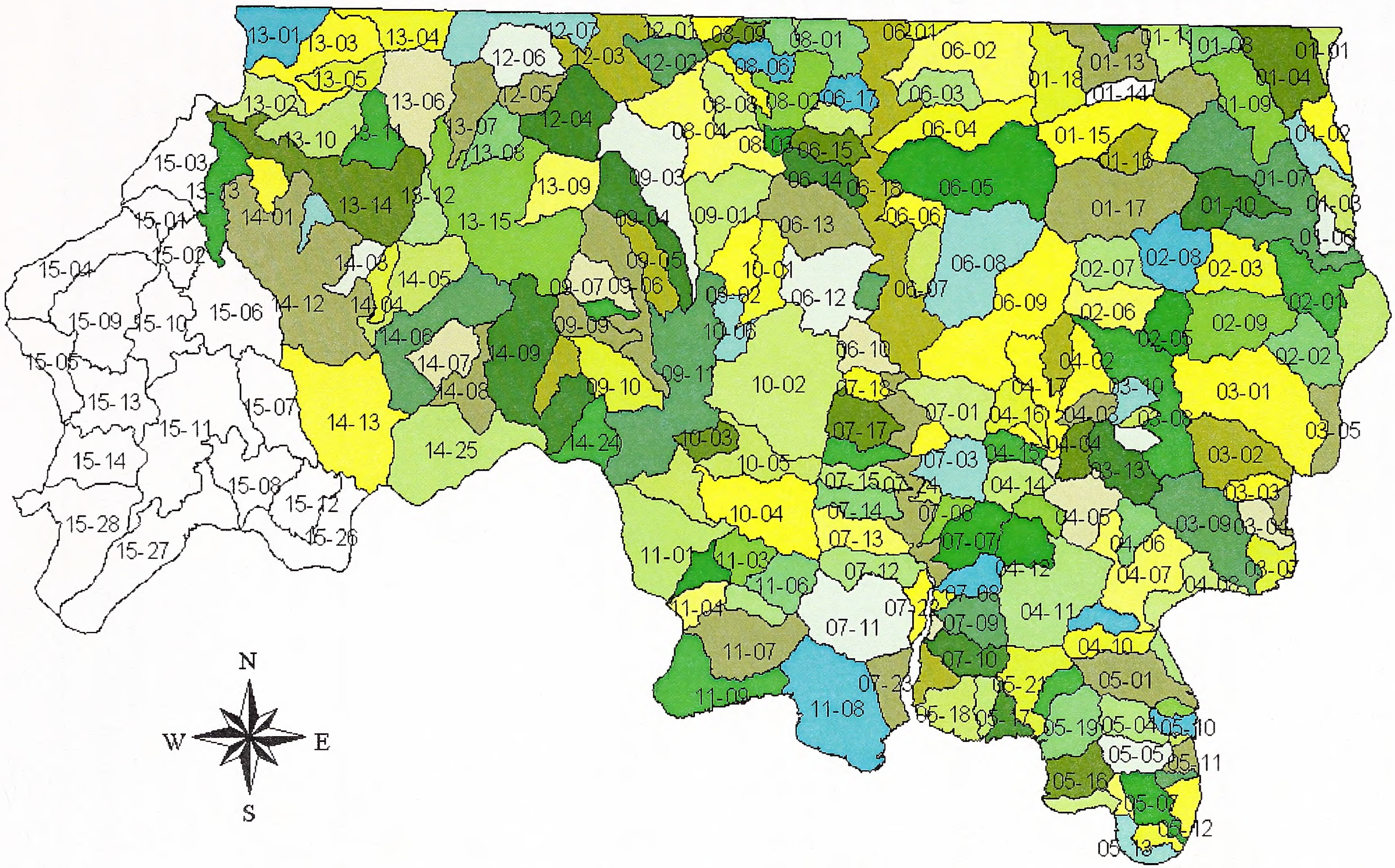
For the period year 2000 to 2014, 818.7 MMBF (million board feet) of timber would be harvested across 119,683 acres (See Table II-9 and Appendix E). About 512.1 MMBF would be harvested from 43,833 acres with a regeneration silvicultural treatment and 306.6 MMBF would be harvested from 75,849 acres with an intermediate silvicultural treatment. All forest areas receiving regeneration silvicultural treatments would have the down fuel load reduced to about 15 tons per acre followed by spot planting. Within regeneration harvest units in the Douglas-fir plant association groups, the predominant species planted would be ponderosa pine and western larch. Not every regeneration harvest acre would be planted. However, to achieve the desired species composition, spot planting, at minimum, should be considered in every regeneration harvest unit.

The results of a more extensive analysis of Alternative 3 where also two methods of harvest, regeneration and intermediate, and the distribution of harvest by watershed is shown in Appendix E. The distribution of watersheds where forest harvest activities may occur between year 2000 and 2014 under Alternative 3 is shown in Figure II-2.

Over the 15-year planning period (2000-2014) the annual harvest rate would be about 54.6 MMBF on 7,979 acres. Using current timber value ($194/mbf mean return to Tribes on timber processed by Colville Indian Precision Pine) and interest rates (12% WACC), the Net Present Value (NPV) for the harvest of forest products under Alternative 3 would be $79.4 million.

Fuels management objectives of 15 tons per acre would be achieved by piling and burning, underburning and jackpot burning treatments as well as being reached by more intensive utilization and yarding unmerchantable material (YUM). Under Alternative 3, 5,600 acres of non-harvest stocking control (thinning) and 6,400 acres of prescribed burning for non-harvest fuels management would occur annually.

Figure II - 1. Watershed Management Units (WMU's) Where Timber Harvest Would Occur Under on Commercial Forestland Under Alternatives 1, 2, 4 and 5.



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To enhance and protect resource values on watersheds impacted by earlier management activities, harvest will be postponed for 15 years on 16 Watershed Management Units (WMUs) determined to be in the "extreme" management sensitivity class (See *Chapter III, Geology, Minerals and Soils*) and ten years on 25 WMUs determined to be in the "high" management sensitivity class (Table II-5). Management sensitivity class determinations are based on Reservation watershed issues raised by soil and watershed sensitivity analysis (Hunner and Jones 1997). WMUs in the "extreme" and "high" management sensitivity classes have "extreme" and "high" current watershed sensitivity ratings (Appendix C, Table C-1), respectively. These WMUs have extreme and high susceptibility to soil disturbance and to surface runoff and erosion. Forestlands in these watersheds would not be removed from the harvestable land base and would be available for harvest with further review following the required harvest deferment period. It is also the intent under Alternative 3 to conduct all planned harvest and associated management activities within a watershed over the shortest practical period.

Harvest has been deferred for 15 years in the Upper and Lower San Poil River Watershed Management Units to reduce impacts on important wildlife corridor habitat.

In all deferred watersheds 20 percent or greater of the non-arterial road mileage would be closed to vehicle travel, preferably closing those roads that affect streamside and/or riparian management areas. The desired future condition is to reduce the total road density in all watersheds to less than 3.0 miles/per square mile, with the highest priority for closure action being in the 41 deferred watersheds. Closures would be enforced by physically blocking the roads to prevent vehicle travel.

Under Alternative 3, all range units will be withdrawn from commercial uses for a period of 15 years for WMUs as shown in Table II-5 with an "extreme" management condition and ten years for a "high" sensitivity condition. This would be a withdrawal of about 269,000 acres with a reduction of 12,609 AUMs per year for an annual livestock use of 48,290 AUMs. No rangeland prescribed burning would occur.

The Natural Resources Department would continue in its current management structure allowing for the management directions specified for by Alternative 3.

Table II - 4. Summary of Some Key Features in Alternative 3.

Follows Modified direction provided in IRMP process Management Objective – Meet IRMP objectives with emphasis on watershed Health and Wildlife Habitat. Harvest deferred in sensitive watersheds. Annual Average Harvest – 54.6 MMBF on 7,979 acres Net Present Value - $79.3 million Stocking Control (thinning) – 5,600 acres. Prescribed Fire – 6,400 acres non-harvest fuels annually. Range Use - Allotments reduced 21 Percent with deferment in sensitive watersheds Road Management – No net increase in roads. Reduce total road density to desired future condition of 3.0 miles per sq. mile in sensitive watersheds.

Table II - 5. Watersheds Deferred from Timber Harvest and Grazing under Alternatives 3 and 6.

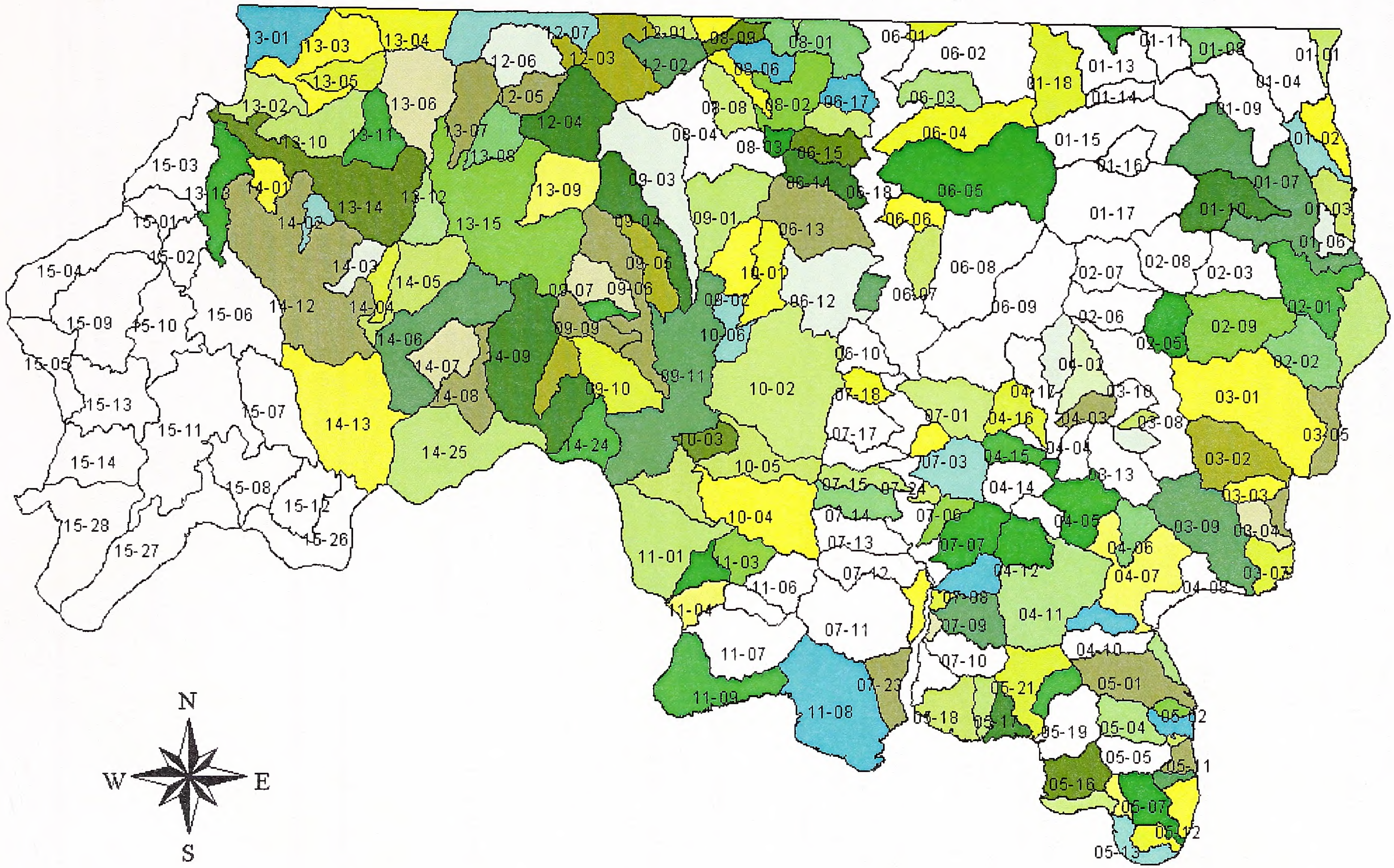
15-YEAR HARVEST DEFERMENT				10-YEAR HARVEST DEFERMENT			
RMU	WMU	Name	Acres	RMU	WMU	Name	Acres
1	01-15	Sitdown Creek	11,312	1	01-04	Barnaby Creek	9,339
1	01-16	John's Mtn. Creek	3,167	1	01-09	North Fork Hall Creek	8,552
1	01-17	Upper Lynx Creek	16,562	1	01-11	Stall Creek	3,184
2	02-06	Granite Creek	5,923	1	01-13	Upper Hall Creek	11,133
2	02-07	Beaver Dam Creek	1,482	2	02-03	Cornstalk Creek	7,086
3	03-08	Upper Wilmont Creek	12,629	2	02-08	North Twin Lake	6,468
3	03-10	Dry Creek	2,203	3	03-13	Little Wilmont Creek	5,936
4	04-01	Klondyke Creek	3,365	4	04-04	Faye Creek	2,854
4	04-02	Wells Creek	4,108	4	04-05	Middle Ninemile Cr.	6,663
4	04-09	Canteen Creek	2,410	4	04-14	Cook Creek	4,227
4	04-10	Little Ninemile Creek	3,693	4	04-17	Upper Ninemile Creek	5,952
4	04-13	Olds Creek	2,224	5	05-05	S. Fork Threemile Cr.	3,857
6	06-09	Bridge Creek	20,127	5	05-19	Redford Canyon	6,058
6	06-18	Upper San Poil River	23,711	6	06-02	Seventeenmile Creek	12,987
7	07-11	Manila Creek	13,700	6	06-08	Thirtymile Creek	15,815
7	07-24	Lower San Poil River	9,209	6	06-10	Capoose Creek	3,827
				7	07-10	Dick Creek	4,397
				7	07-12	Meadow Creek	5,116
				7	07-13	Jack Creek	5,427
				7	07-16	Lime Creek	2,909
				7	07-17	Cache Creek	5,031
				8	08-04	Upper Gold Creek	13,002
				11	11-05	McGinnis Lake	2,416
				11	11-06	Buffalo Lake	4,988
				11	11-07	Peter Dan Creek	10,202
Total			135,825	Total			167,426

Alternative 4 – IRMP with Stand Structural/Stage Correction Emphasis

Alternative 4 would feature the implementation of the IRMP management directions described for Alternative 2, but modified as described below. Alternative 4 addresses concerns raised in scoping with regards to the variance of forest structural age classes from the historical range of variability for the Colville Reservation. An emphasis on intermediate harvesting would be implemented to move the structural stage class of stands on the Reservation towards the desired future conditions.

Under Alternative 4 during the period year 2000 to 2014, 751.9 MMBF (million board feet) of timber would be harvested across 157,573 acres (See Table II-9 and Appendix E). About 178.4 MMBF would be harvested from 14,188 acres with a regeneration silvicultural treatment and 573.5 MMBF would be harvested from 143,330 acres with an intermediate silvicultural treatment. All forest area receiving a regeneration silvicultural treatment would have the down

Figure II - 2. Watershed Management Units (WMU's) Where Timber Harvest is Proposed on Commercial Forestland Under Alternatives 3 and 6.



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fuels load reduced to about 15 tons per acre by fuel treatments followed by planting. Within regeneration harvest units in the Douglas-fir plant association groups, the predominant species planted would be ponderosa pine and western larch. Not every regeneration harvest acre would be planted. However, to achieve the desired species composition, spot planting, at minimum, should be considered in every regeneration harvest unit.

The results of a more extensive analysis of Alternative 4 where also two methods of harvest, regeneration and intermediate, and the distribution of harvest by watershed is shown in Appendix E. The distribution of watersheds where forest harvest activities may occur between year 2000 and 2014 under Alternative 4 is shown in Figure II-1.

Over the 15-year planning period (2000-2014) the annual harvest rate would be about 50.1 MMBF on 10,505 acres. Using current timber value ($219/mbf mean return to Tribes on timber processed by Colville Indian Precision Pine) and interest rates (12% WACC), the Net Present Value (NPV) for the harvest of forest products under Alternative 4 would be $71.3 million.

The fuels management objectives of 15 tons per acre would be achieved by pile and burning, underburning, jackpot burning, or broadcast burning depending on the treatment and the amount of activity and natural fuels. Under Alternative 4, 6,000 acres of non-harvest stocking control (thinning) and 10,500 acres of prescribed burning for non-harvest fuels management would occur annually.

Under Alternative 4, the range objective would be to move shrub/steppe communities to desired ecological condition and to enhance the forage component of forested communities. The maximum possible sustainable livestock forage potential would be developed and allowable AUMs would be doubled to 121,800. To achieve this objective cross fencing with rotation grazing, out-of-riparian water developments, graveled stream watering and crossing points, riparian pastures, utilization monitoring and range reseeding techniques would be initiated. Under Alternative 4, 1,000 acres of rangeland prescribed burning would occur annually.

The Natural Resource Department management structure would be reorganized to more fully support the Holistic Goal of the Colville Business Council Resolution.

Table II - 6. Summary of Some Key Features in Alternative 4.

Follows modified direction provided in IRMP process.
Management Objective – Meet IRMP objectives with emphasis on stand structural/stage correction.
Higher proportion of selection harvest.
Annual Average Harvest – 50.1 MMBF on 10,505 acres.
Net Present Value - $71.3 million.
Stocking Control – 6,000 acres
Prescribed Fire – 10,500 acres non-harvest fuels and 1,000 acres rangeland annually.
Range Use - Allotment AUM's would be doubled.
Road Management – No net increase in roads.

Alternative 5 – IRMP with Forest Health Emphasis

Alternative 5 would feature the implementation of the IRMP management directions described for Alternative 2, but modified as described below. Alternative 5 addresses concerns raised in scoping with regards to the variance of forest structural age classes from the historical range of variability for the Colville Reservation as well as the significant loss of timber productivity from insect and disease. An emphasis on regeneration harvesting would be implemented to reduce the existing impacts of insect and disease in stands on the Reservation as well as moves the stands towards desired future conditions.

For the period year 2000 to 2014, 1,421.4 MMBF (million board feet) of timber would be harvested across 157,573 acres (See Table II-9 and Appendix E). About 1,183.7 MMBF would be harvested from 100,775 acres with a regeneration silvicultural treatment and 237.7 MMBF would be harvested from 56,798 acres with an intermediate silvicultural treatment. All forest areas receiving regeneration silvicultural treatments would have the down fuel load reduced to about 15 tons per acre followed by spot planting. Within regeneration harvest units in the Douglas-fir plant association groups, the predominant species planted would be ponderosa pine and western larch. Not every regeneration harvest acre would be planted. However, to achieve the desired species composition, spot planting, at minimum, should be considered in every regeneration harvest unit.

The results of a more extensive analysis of Alternative 5 where also two methods of harvest, regeneration and intermediate, and the distribution of harvest by watershed is shown in Appendix E. The distribution of watersheds where forest harvest activities may occur between year 2000 and 2014 under Alternative 5 is shown in Figure II-1.

Over the 15-year planning period (2000-2014) the annual harvest rate would be about 94.8 MMBF on 10,505 acres. Using current timber value ($219/mbf mean return to Tribes on timber processed by Colville Indian Precision Pine) and interest rates (12% WACC), the Net Present Value (NPV) for the harvest of forest products under Alternative 5 would be $132.6 million.

Table II - 7. Summary of Some Key Features of Alternative 5.

Follows modified direction provided in IRMP process
Management Objective – Meet IRMP objectives with emphasis on improving forest health. High proportion of regeneration harvest.
Annual Average Harvest – 94.8 MMBF on 10,505 acres
Net Present Value - $132.6 million
Stocking Control (thinning) – 3,100 acres.
Prescribed Fire – 6,400 acres non-harvest fuels and 1,000 acres rangeland.
Range Use - Allotment AUM's increased by 50%
Road Management – No net increase in roads.

The fuels management objectives of 15 tons per acre would be achieved by pile and burning, underburning, jackpot burning, or broadcast burning depending on the treatment and the amount of activity and natural fuels. Under Alternative 5, 3,100 acres of non-harvest stocking control (thinning) and 6,400 acres of prescribed burning for non-harvest fuels management would occur annually.

The range management objective under Alternative 5 is to move shrub/steppe communities to desired ecological condition and to enhance the forage component of the forest communities. The range objective in Alternative 5 is the same as in Alternative 4, except that range management activity will emphasize achievement of desired ecologic conditions to accommodate other non-livestock range uses and put less emphasis on maximizing livestock forage. A modest increase in allowable livestock forage would be developed and the allowable AUM's would be increased by 50 percent to 91,350. Under Alternative 5, 1,000 acres of rangeland prescribed burning would occur annually.

The Natural Resource Department management structure would be reorganized to more fully support the Holistic Goal of the Colville Business Council Resolution.

Alternative 6 – IRMP with Additional Forest Health, Watershed Health and Wildlife Habitat Emphasis

Alternative 6 would feature the implementation of the IRMP management directions described for Alternative 2, but modified as described below. Alternative 6 addresses concerns raised in scoping with regards to the variance of forest structural age classes from the historical range of variability for the Colville Reservation as well as the significant loss of timber productivity from insect and disease. An emphasis on regeneration harvesting would be implemented to reduce the existing impacts of insect and disease of stands on the Reservation and move the stands towards desired future conditions. In addition, Alternative 6 addresses concerns raised in scoping with regards to watershed health and wildlife habitat.

For the period year 2000 to 2014, 1,105.1 MMBF (million board feet) of timber would be harvest across 123,556 acres (See Table II-9 and Appendix E). About 913.8 MMBF would be harvested from 78,381 acres with a regeneration silvicultural treatment and 191.3 MMBF would be harvested from 45,174 acres with an intermediate silvicultural treatment. All forest areas receiving regeneration silvicultural treatments would have the down fuel load reduced to about 15 tons per acre followed by spot planting. Within regeneration harvest units in the Douglas-fir plant association groups, the predominant species planted would be ponderosa pine and western larch. Not every regeneration harvest acre would be planted. However, to achieve the desired species composition, spot planting, at minimum, should be considered in every regeneration harvest unit.

The results of a more extensive analysis of Alternative 6 where also two methods of harvest, regeneration and intermediate, and the distribution of harvest by watershed is shown in Appendix E. The distribution of watersheds where forest harvest activities may occur between year 2000 and 2014 under Alternative 6 is shown in Figure II-2.

Over the 15-year planning period (2000-2014) the annual harvest rate would be about 73.7 MMBF on 8,287 acres. Using current timber value ($219/mbf mean return to Tribes on timber processed by Colville Indian Precision Pine) and interest rates (12% WACC), the Net Present Value (NPV) for the harvest of forest products under Alternative 6 would be $104.4 million.

The fuels management objectives of 15 tons per acre would be achieved by pile and burning, underburning, jackpot burning, or broadcast burning depending on the treatment and the amount of activity and natural fuels. Under Alternative 6, 5,400 acres of non-harvest stocking control (thinning) and 6,400 acres of prescribed burning for non-harvest fuels management would occur annually.

To enhance and protect resource values on watersheds impacted by earlier management activities, harvest would be postponed for 15 years on 16 Watershed Management Units (WMUs) determined to be in the "extreme" management sensitivity class (See *Chapter III, Geology, Minerals and Soils*) and ten years on 25 WMUs determined to be in the "high" management sensitivity class (Table II-5). WMUs in the "extreme" and "high" management sensitivity classes have "extreme" and "high" current watershed sensitivity ratings (Appendix C, Table C-1), respectively. These WMUs have extreme and high susceptibility to soil disturbance and to surface runoff and erosion. Forestlands in these watersheds would not be removed from the harvestable land base and would be available for harvest with further review following the required harvest deferment period. It is also the intention under Alternative 6 to conduct all planned harvest and associated management activities within a watershed over the shortest practical period. Harvest has been deferred for 15 years in the Upper and Lower San Poil River Watershed Management Units to reduce impacts on important wildlife corridor habitat.

In all deferred watersheds 20 percent or greater of the non-arterial road mileage would be closed to vehicle travel, preferably closing those roads that affect streamside and/or riparian management areas. The desired future condition is to reduce the total road density in all watersheds to less than 3.0 miles/per square mile, with the highest priority for closure action being in the 41 deferred watersheds. Closures would be enforced by physically blocking the roads to prevent vehicle use.

Table II - 8. Summary of Some Key Features of Alternative 6.

Follows Modified Direction Provided in IRMP Process. Management Objective – Meet IRMP objectives with emphasis on forest health, watershed health and wildlife habitat. Harvest deferred in sensitive watersheds. Higher proportion of regeneration harvest. Annual Average Harvest – 73.7 MMBF on 8,237 acres Net Present Value - $104.4 million. Stocking Control (thinning) – 5,400 acres Prescribed Fire – 6,400 acres non-harvest fuels and 1,000 acres rangeland annually. Range use allotments reduced 50 Percent with deferment in sensitive watersheds. Road Management – No net increase in roads. Reduce total road density to desired future condition of 3.0 miles per sq. mile in sensitive watersheds.

The range management objective of Alternative 6 is to move shrub/steppe communities to desired ecological condition and to enhance the forage component of the forest community. This would be accomplished, in part, by a 50 percent reduction in allowable AUM's to 30,462. This reduction includes withdrawal from commercial livestock grazing all WMUs identified as "extreme" and "high" in Table II-5. The overall range management strategy for Alternative 6 is essentially the same as Alternative 5 with the exception of reduced allowable AUM's in Alternative 6. Under Alternative 6, 1,000 acres of rangeland prescribed burning would occur annually.

The Natural Resource Department management structure would be reorganized to more fully support the Holistic Goal of the Colville Business Council Resolution.

COMPARISON OF ALTERNATIVES

The harvest related features of the six alternatives are compared in Table II-9 and the effects of these alternatives on the resource management components are shown in Table II-10. All proposed action alternatives (Alternatives 2 through 6) are consistent with the Colville Integrated Resource Management Plan (CCT 1998a).

MITIGATION MEASURES AND MONITORING REQUIREMENTS

NEPA and CEQ regulations require identification of all relevant, reasonable mitigation measures that could reduce the impacts of the Integrated Resource Management Plan. Mitigation, as defined in the CEQ regulations (40CFR 1508.20), includes the following:

- Avoiding the impact altogether by not taking a certain action or parts of an action;
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation;
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action, and
- Compensating for the impact by replacing or providing substitute resources or environments.

Mitigation measures would be applied to the Colville Indian Reservation lands by implementation of Alternatives 2 through 6. Tribal Code and federal agencies may require additional mitigation measures as conditions for implementing the proposed alternative. Any such measures are automatically incorporated as required measures.

The management directions described in this Chapter will mitigate the effects of implementing the proposed action alternatives. Alternative 1 is mitigated by the direction incorporated in Alternative CD presented in the Amendment to Final Assessment for the 1989 Forest Management Plan, Colville Indian Reservation, October 16, 1998. Alternative 1 also includes the current Colville Business Council directives incorporated by reference. Alternatives 2 through 6 incorporate the IRMP Management Direction as described by each of the resource areas previously in this Chapter.

Table II - 9. Specific Harvest Planning Features by Alternative.

SPECIFIC FEATURES	ALTERNATIVES					
	1	2	3	4	5	6
Total Timber Harvest Levels						
Watersheds Treated (WMUs)	180 (21)	180 (21)	158 (5)	180 (21)	180 (21)	161 (5)
Acres Treated	157,573	156,989	119,683	157,573	157,573	123,556
Harvestable Volume (MMBF)	1,071.2	953.1	818.7	751.9	1,421.4	1,105.1
Regeneration Harvest Levels						
Acres Treated	57,889	41,488	43,833	14,243	100,775	78,381
Harvestable Volume (MMBF)	675.0	488.1	512.1	178.4	1,183.7	913.8
Intermediate Harvest Levels						
Acres Treated	99,684	115,501	75,849	143,330	56,798	45,174
Harvestable Volume (MMBF)	396.2	465.0	306.6	573.5	237.7	191.3
PAGS Treated (Acres)						
Regeneration						
P. Pine/Douglas-fir Warm Dry	0	0	0	0	0	0
Douglas-fir Warm Moist	16,573	11,175	14,066	0	24,668	21,006
Douglas-fir Cool Moist	21,971	15798	16,236	8,138	47,199	36,231
Douglas-fir Cool Dry	6,857	5,049	5,321	1,686	10,303	8,342
Grand Fir	5,514	4,137	3,737	3,906	7,811	5,542
Subalpine Fir Cold/Warm	6,975	5,328	4,473	514	10,795	7,260
Intermediate						
P. Pine/Douglas-fir Warm Dry	1,502	4,553	859	1,502	1,502	958
Douglas-fir Warm Moist	35,911	43,015	30,168	52484	27,817	23,688
Douglas-fir Cool Moist	32,280	35,325	23,767	46,114	7,053	5,414
Douglas-fir Cool Dry	11,877	12,625	9,205	17,047	8,430	6,825
Grand Fir	7,953	8,735	5,309	9,562	5,656	4,013
Subalpine Fir Cold/Warm	10,159	11,248	6,541	16,620	6,340	4,276
Prescribed Fire (Acres Treated Annually)						
Stocking Control	0	3,100	5,600	6,000	3,100	5,400
Non-harvest Fuels	2,000	6,400	6,400	10,500	6,400	6,400
Rangeland	0	0	0	1,000	1,000	1,000
Equivalent Open Area Created (A.)	94,064	87,240	71,390	75,594	109,712	86,952
Net Present Value ($ million)	101.3	89.9	79.4	71.3	132.6	104.4

Table II - 10. A Comparison of Effects Among Alternatives for Resource Management on the Colville Reservation. (Detailed effects of each alternative are shown in Chapter IV.)

RESOURCE	ISSUE INDICATOR	ALTERNATIVES					
		1	2	3	4	5	6
Aesthetics	Changes in Visual Resource Management condition.	Mod. (-)	Mod Low (-)	Mod Low (-)	Low (-)	High (-)	M. High (-)
Agriculture	Acres in agriculture production.	No Change	No Change	No Change	No Change	No Change	No Change
Air Resources	Increased pollutants – tons (over 15 yr)						
	PM_{10}	20,351	18,453	14,550	17,400	26,313	18,467
	$PM_{2.5}$	18,572	16,841	13,279	15,880	24,014	16,854
	Total particulate matter	26,278	23,828	18,788	22,468	33,977	23,846
	Carbon Monoxide	219,510	199,041	156,945	187,685	283,822	199,198
	Effects on Class I Airsheds.	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
	Changes in visibility and local air quality	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Cultural Resources	Ability to avoid and protect heritage resource materials/sites, most particularly traditional cultural properties (TCPs)	Yes	Yes	Yes	Yes	Yes	Yes
Fisheries	Potential changes in fish habitat.	Low (-)	Negligible	Low (+)	Negligible	M. Low (-)	V. Low (+)
	Changes in stream temperatures.	V. Low (-)	Negligible	V. Low (+)	Negligible	Low (-)	V. Low (+)
Fuels/Fire	Relative risk rating	Moderate	Moderate	Mod. High	Moderate	Mod. Low	Mod.
	Fuels Treatments – Acres						
	Regeneration Harvest Units	57,889	41,488	43,833	14,243	100,775	78,381
	Intermediate Harvest Units	99,684	115,501	75,850	143,330	56,798	45,174
	Stocking Control	0	46,500	84,000	90,000	46,500	81,000
	Prescribe Burn Restoration	0	16,674	16,674	16,674	16,674	16,674
	Prescribe Burn Maintenance	0	79,326	79,326	140,826	79,326	79,326
	Prescribe Burn Rangeland	0	0	0	1,000	1,000	1,000
Forest Vegetation	Vegetation treatment area.	157,573	156,989	119,683	157,573	157,573	123,576
	Area of regeneration harvest	57,889	41,488	43,833	14,118	100,775	78,381
	Area of intermediate harvest	99,684	115,501	75,849	141,320	56,798	45,174
	Area of vegetation treated by PAG						
	P. Pine/Douglas-fir Warm Dry	1,502	4,553	859	1,502	1,502	958
	Douglas-fir Warm Moist	52,484	54,191	44,234	52,484	52,484	44,693
	Douglass-fir Cool Moist	54,251	51,123	40,003	54,251	54,251	41,645
	Douglas-fir Cool Dry	18,733	17,674	14,526	18,733	18,733	15,167

RESOURCE	ISSUE INDICATOR	ALTERNATIVES					
		1	2	3	4	5	6
	Grand fir	13,468	12,872	9,046	13,468	13,468	9,555
	Subalpine fir	17,134	16,576	11,014	17,134	17,134	11,557
	Effects on Forest Health	M. Low (+)	M. Low (+)	Low (+)	M. Low (+)	Mod (+)	Mod Low (+)
	Loss of PETS plant species	None	None	None	None	None	None
	Unique and special habitat affected.	None	None	None	None	None	None
	Acres of Wilderness	7,970	7,970	7,970	7,970	7,970	7,970
Geology/Soils	Potential geologic hazards	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
	Surface soil disturbance						
	Acres	14,110	13,086	10,709	11,339	16,456	13,043
	Percent of forestland.	1.19	1.10	0.90	0.95	1.38	1.10
NRD Organization	Opportunity to meet Holistic Goal	Very Low	High	High	High	High	High
Range Resource	AUMs	60,924	51,765	48,290	121,800	91,350	30,462
	Reduction in area available for livestock use - acres.	0	0	269,000	0	0	269,000
	Range enhancement program	No	No	No	Yes	Yes	Yes
Recreation Resource	Effects on existing facilities and dispersed recreation.	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Socioeconomic	Estimated Net Revenue ($\$10^6$)	221.5	197.7	177.7	156.1	290.7	233.9
	Estimated Ave. Ann. Revenue ($\$10^6$)	14.8	13.2	11.8	10.4	19.4	15.6
	Return to Tribal treasure ($/MBF)	207	207	217	208	172	178
	Net Present Value ($\$10^6$)	101.3	89.9	79.4	71.3	132.6	104.4
	Jobs Years	4,285	3,812	3,275	3,008	5.686	4,420
Water	Acres of riparian habitat disturbance	None	None	None	None	None	None
	Change in accelerated erosion affecting sediment yield and turbidity	Low (+)	Low (+)	Low (-)	Negligible	Mod Low (+)	Negligible
	Direct Changes in Equiv. Open Area						
	Acres	66,401	63,663	51,913	60,020	72,422	55,410
	Percent	5.6	5.4	4.4	5.0	6.1	4.7
	Cum. Change in Equiv. Open Area						
	Acres	10,478	7740	-6,602	3,660	16,500	-513
	Percent	0.9	0.7	-0.6	0.3	1.4	0.0
	Changes in peak streamflow	Negligible	Negligible	Negligible	Negligible	V. Low (-)	Negligible
	Changes in water quality	Negligible	Negligible	V. Low (+)	Negligible	Low (-)	V. Low (+)
	Changes in channel stability	Negligible	Negligible	Low (+)	Negligible	V. Low (-)	V. Low (+)
	Effects on wetland functionality	None	None	None	None	None	None
	Effects on groundwater	None	None	None	None	V. Low (+)	None
	Effects on Watershed Health	Low (-)	V. Low (-)	Mod. (+)	V. Low (+)	Mod Low (-)	Low (+)

RESOURCE	ISSUE INDICATOR	ALTERNATIVES					
		1	2	3	4	5	6
Wildlife	Presence of additional human disturbance	Moderate	Moderate	Mod. Low	Moderate	Mod. High	Mod. Low
	Presence of and changes to critical habitat	None	None	None	None	None	None
	Distr. of big-game summer habitat (%)						
	Thermal	28	28	30	28	28	31
	Security	32	33	33	34	30	31
	Forage	40	39	37	38	43	39
	Distr. of big-game winter habitat (%)						
	Thermal	6	6	7	6	6	7
	Security	21	21	21	22	20	20
	Forage	73	73	72	72	74	73
	Changes in acres of mature forest and suitable habitat components	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
	Impacts to habitat diversity	Low (+)	Low (+)	V. Low (+)	Negligible	Mod. Low +	Low +
	Changes in corridors and late-successional fragmentation.	Negligible	Negligible	Negligible	Negligible	V. Low (-)	V. Low (-)

To implement integrated resources management techniques and ecosystem management concepts in an ecosystem prone to frequent disturbances, adaptive management measures are required and described below. These are recognized in the management objectives and management direction for the Colville Indian Reservation Natural Resources Department described in Appendix A of this document.

- Develop internal structure within resource programs for executing the four components of adaptive management: testing, monitoring, evaluation and incorporation of new knowledge into management approaches based on scientific findings and needs of society.
- Adaptive management techniques would be utilized to reevaluate the priority of the 15 resource goals every five years or more often at the direction of the Colville business Council.
- The four steps of adaptive management would be applied annually to the objectives and management directions defined by the Record of Decision of this IRMP EIS.
- The four steps of adaptive management would be applied on an operation plan basis to use best and management practices (BMPs), restorative measures, and other on-the-ground management practices.

To meet the Tribes' Holistic Goal and assure the IRMP Management Goals and Management Objectives are achieved monitoring requirements are needed. Organizationally the proposed Management Objectives and Management Direction for the Natural Resources Department (Appendix A) include:

- Ensure that the IRMP management direction for the 15 resource goals is implemented for all resource activities.
- Design a specific integrated monitoring and evaluation plan.
- The NRD Director along with the Program Manager would set the scope of or determine the need for interdisciplinary input in the Reservation-wide and operational plans.
- Each of the 15 resource goals would be reviewed annually for compliance towards meeting these goals.
- Specific reasons for monitoring, information to monitor, items to monitor and scale or appropriate level of monitoring would be established on all NRD projects.
- NRD will develop and maintain a common glossary of resource management terms to facilitate effective communication and data collection.

Monitoring is required on a Reservation-wide basis as well as on specific projects. The Reservation-wide monitoring will monitor IRMP implementation, the effectiveness of the management direction implemented under the IRMP and validate the assumptions and models used in planning. A Reservation-wide Monitoring and Evaluation Report will be prepared on an annual basis to document the results of this monitoring.

In addition to Reservation-wide monitoring, monitoring will be conducted of specific projects to ensure that implementation is consistent with the established management objectives and management direction. Monitoring is also conducted to determine the effectiveness of management activities and applied mitigation measures.

Three monitoring categories will be established for both Reservation-wide and project monitoring: baseline monitoring, implementation monitoring and effectiveness monitoring.

Baseline Monitoring - Characterizes the existing conditions and desired future conditions (DFC) and trends towards reaching these DFC's. It also provides a control for monitoring and assessing activities. Baseline monitoring sites need to be developed throughout the Reservation to sample current conditions.

Implementation Monitoring - Shows whether or not prescribed management direction was implemented as designed and in accordance with IRMP management goals and management direction. In addition to specific project monitoring, supplemental implementation monitoring will include internal field reviews by interdisciplinary teams using audit-like procedures.

Specific projects to be monitored will be selected based on local issues and management direction used. Projects involving each type of land management activity and a target of 10 percent of timber sales will be evaluated each year. The primary objective will be to determine if management direction identified in the IRMP were implemented and correctly applied in a timely fashion. During the review, visual observations will be made to see if IRMP management objectives and direction are both properly designed and implemented.

In the event of incorrect or inappropriate application of the management direction, causes will be identified along with corrective or preventative actions to be taken. Corrective measures will be incorporated into: (1) modification of and adjustment to contracts, (2) administrative procedures, (3) development of adaptive measures to improve future performance, and (4) long range plans as necessary to ensure management direction is both properly designed and implemented.

Effectiveness Monitoring - Demonstrates if management directions were effective in meeting planned levels and integrated resource management plan goals and objectives. The intent is to focus on cause and effect relationships between land management activities and achieving desired future conditions and management goals and objectives. Effectiveness monitoring will be done on a sample basis to characterize typical conditions so that results can be extrapolated.

AFFECTED ENVIRONMENT

CHAPTER III – AFFECTED ENVIRONMENT

INTRODUCTION

Chapter III describes the physical, biological, social and economic components of the Colville Indian Reservation's environment that would be affected by the proposed alternatives. Discussion of the affected environment is divided into the same environmental components listed in Chapter II. Most components are discussed from two viewpoints: the area that will be affected and the existing conditions of the area.

DESCRIPTION OF AFFECTED ENVIRONMENT

Location

The 1,392,265-acre Colville Indian Reservation is located in the north central portion of the State of Washington. The Reservation, the largest in the State of Washington measures approximately 35 miles north to south and 80 miles east to west. About 610,000 acres of the Reservation are in Okanogan County and 782,000 acres in Ferry County. More specifically, the Reservation is bounded on the east and south by the Columbia River, on the west by the Okanogan River and on the north by the township line common to Townships 34 and 35 north of the Willamette meridian. Much of the Reservation is mountainous covered by conifer forest, but lands bordering the Okanogan and Columbia Rivers are arid and naturally covered with vegetation of steppe environments. About 1,023,700 acres of the Reservation are in tribal trust and the remaining lands are in a non-trust status (owned by private individuals or corporations).

The principal towns on the Colville Reservation are Nespelem, Keller, Elmer City and Coulee Dam in the central portion, Inchelium in the eastern portion and East Omak on the western boundary. In additional to Reservation communities, a large number of Tribal members live in nearby communities of Omak, Okanogan, Grand Coulee, Brewster, Bridgeport and Colville-Kettle Falls. The major service centers for the Reservation are Spokane approximately 100 miles to the southeast and Wenatchee, 125 miles to the southwest of the Reservation. The Colville Confederated Tribes headquarters, USDI Bureau of Indian Affairs and other government and tribal services are located at the Colville Agency near Nespelem.

People

The dominant population on the Colville Indian Reservation is near 4,760 members of the Colville Confederated Tribes (1990 census). The total current enrolled Tribal membership is about 8,538 (CCT 1999). The Confederated Tribes of the Colville Reservation are comprised of people attributed to as many as twelve "distinct" historic groups (Wenatchee, Chelan, Entiat, Methow, Okanogan, Nespelem, San Poil, Lakes, Colville, Moses Columbia, Palus and Chief Joseph Band of the NezPerce). All of the Colville "tribes" have been described by Ray (1975:7) as "autonomous ethnic and political units of the Plateau Culture Area" and all traditionally lived in the central area of the Plateau, with the primary exception being the Wallowa NezPerce band.

Government

In 1937, the Confederated Tribes of the Colville Reservation government was organized under a Constitution and By-Laws, which directs overall responsibilities of the elected leadership. The Colville Business Council (CBC), the governing body, is elected to two-year terms from four districts. The Council develops policy and approves laws as described by the Administrative Procedure Act, Chapter 2-4 of the Tribal Code and regulations governing many phases of Reservation culture including natural resources management and environmental protection (Title 4 Natural Resource and Environment, Tribal Code).

The Tribes have an enterprise component, known as the Colville Tribal Enterprise Corporation (CTEC), which manages various for-profit businesses. At present there are 11 Tribal enterprises, with a total employment of about 450; including 353 Indians and 97 non-Indians (Passmore 1998). Tribal businesses include Trading Post stores in Keller, Inchelium and Nespelem; a wood treatment post and pole operation; a finished-pine product mill; a houseboat rental/marina business; casino and bingo ventures; a construction company; and a logging company. By Tribal Resolution, the Natural Resources Department is directed to provide the Tribal enterprise Colville Precision Pine a minimum 44 MMBF of sawlogs annually.

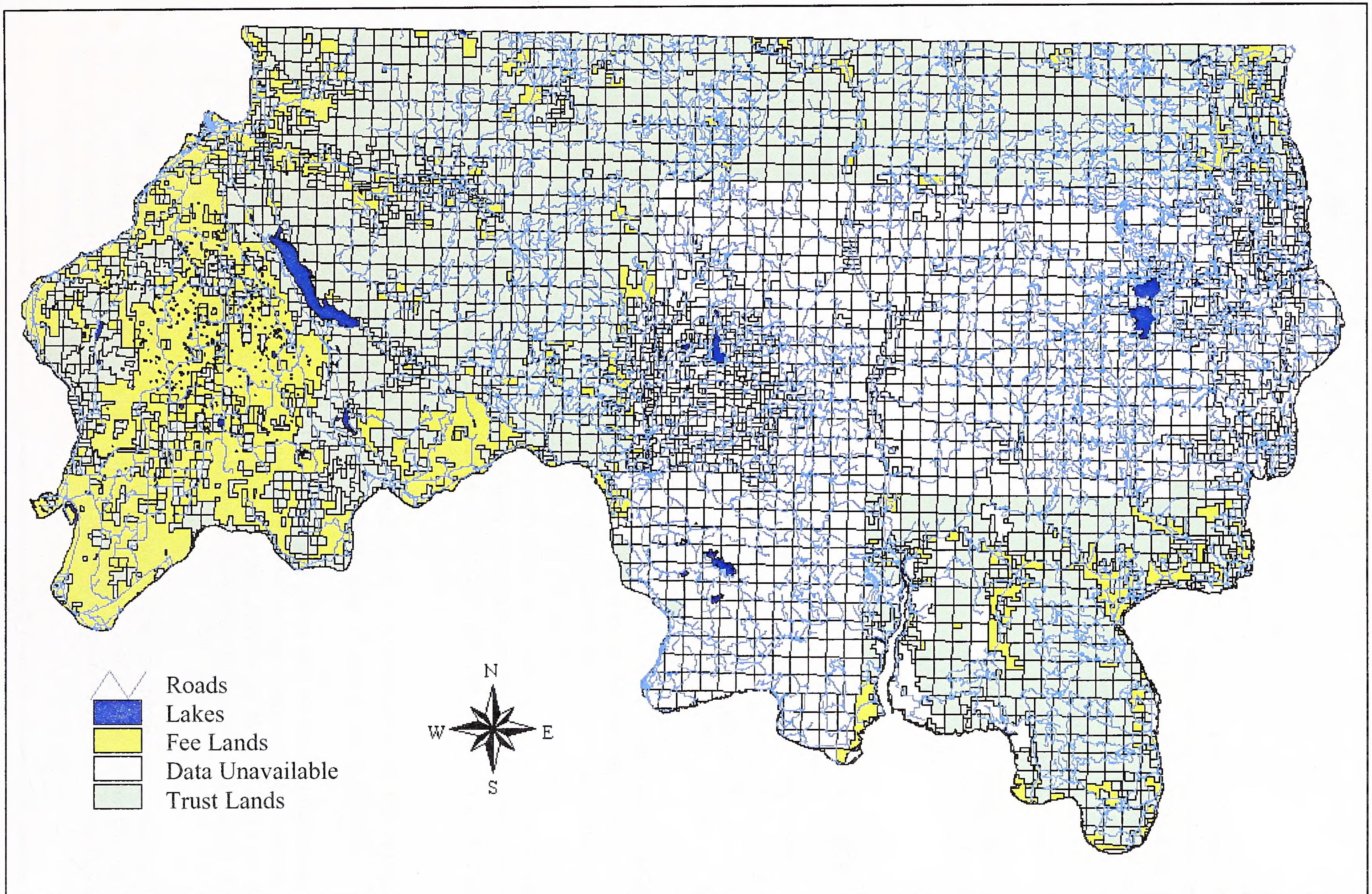
Land Ownership

The land ownership pattern on the Reservation is complex and dynamic. Two basic categories of ownership are present: trust lands, which are held in trust by the U.S. Government, and fee patent lands, which are on the county land records and are taxed. Trust lands include both tribal lands owned collectively by the Tribes and allotted lands owned by Tribal members. Joint ownership of an allotment by several heirs is common. The distribution of trust and fee patent lands on the Reservation are shown in Figure III – 1.

Most fee lands are owned by non-Indians, while some fee land are owned both by the tribes and individual Indians. Small amounts of land within the Reservation are owned by, or held in easement by, the U.S. Government, State of Washington, Ferry County or Okanogan County. These publicly owned lands are mostly rights-of-way associated with highway and road construction or dams and developments. The total trust land amounts to approximately 1,063,200 acres, of which 1,023,700 acres are tribal lands and 39,500 acres are allotted lands. Fee land acreage is approximately 321,886 acres. The amount of lands under tribal ownership is continuing to increase with the tribal policy of buying fee and allotted land whenever possible (U.S. Bureau of Reclamation 1979).

There are about 910,000 acres of forestland and 170,000 acres of rangeland on the Reservation, of which about 89 percent and 81 percent respectively, are in Indian ownership.

Figure III- 1. Distribution of Trust and Fee Patent Lands on the Colville Indian Reservation.



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Transportation and Roads

The Reservation is served by a network of 2,250 miles of federal, state, county, BIA and tribal highways and roads (Figure III-1). The major transportation routes on the Reservation are State Highway 21, which runs north-south through the central portion of the Reservation and US Highway 97, which parallels the western Reservation boundary between Omak and Brewster. State Highway 17 connects the Chief Joseph Dam area in the southwest part of the Reservation with US Highway 97 while State Highway 155 is the major link between Omak, Nespelem and the Grand Coulee Dam area. State Highway 21 joins the Keller Ferry area to West Fork and extends north to Republic. In addition to these roads, there are about 1,048 miles of Reservation roads of which about 51 miles are paved, 123 miles are gravel and 874 miles are natural surface.

There are no railroads or commercial airport facilities on the Reservation. Emergency landing fields for airplanes are located at 17-Mile and Twin Lakes.

Paleoenvironment

The post-glacial late and Holocene paleoenvironment on the Reservation has been reconstructed using pollen data derived from a number of depositional locations (lakes, marshes, bogs, and fens) throughout the Pacific Northwest and Northern Great Basin (Gough 1990). Carp Lake near Goldendale, Washington, contained a pollen record for the last 33,000 years indicating that temperate steppe vegetation prevailed until around 23,000 years before present (B.P.). From 23,000 to 10,000 years B.P. as the Reservation lands were undergoing the effects of the Cordilleran ice sheet (See *Geology, Minerals and Soils* section), the vegetation at Carp Lake was that of a periglacial steppe or tundra where it was too cold and arid at low elevations to support forests (Barnosky 1985). The cold began to moderate, but the area remained dry after 10,000 years B.P. and the area was covered with steppe vegetation similar to the natural vegetation seen today in the Columbia Basin. This phase was followed by a change to more humid conditions after 8,500 years B.P. prompting the growth of pine woodlands. A cooling trend is noted around 4,000 years before present and by which time the modern mixed forest vegetation dominated by ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*) had become established (Barnosky 1984).

Chatters (1984a) and also shown by Gough (1990) presented a construction of the regional climate for the area which includes the Reservation. A summary of Chatters' work follows.

- *Late Glacial, 13,000-10,000 Years B.P.* The climate was colder and wetter than that of today and the landscape was a nearly treeless sagebrush (*Artemisia* spp.) steppe/tundra. Although sparse, Haploxylon pine (probably either whitebark (*Pinus albicaulis*), limber (*Pinus flexilis*) or white (*Pinus monticola*), spruce, fir, birch, and willow arboreal pollens most likely were present in favorable locations.

- *Early Post Glacial, 10,000-9,000 Years B.P.* Lowlands and low mountains as far north as the town of Tonasket and east to the Colville Valley were covered with grasses. Open diploxylon pine (*Pinus ponderosa*) and/or lodgepole (*Pinus contorta*) forests most likely covered the Reservation area in favorable locations.

- *Warming and Drying Begin, 9,000-8,000 Years B.P.* The region began to warm and become drier as evidenced by the increase of sagebrush and other zerophytic plant pollen in grassland or steppe areas and the enlargement of opening in the forest.

- *Maximum Aridity, 8,000-7,000 to 4,700-4,900 Years B.P.* Sagebrush, saltbush and other zerophytic plants predominated and had extended into the Okanogan Highlands, the Colville Valley and eastward into the Rocky Mountain foothills. The vegetation of northeastern Washington largely supported open Douglas-fir and pine forests with sagebrush understory.

- *Returning Moisture, 4,700-4,000 to 2,700-2,500 Years B.P.* With increasing moisture and perhaps an accompanying reduction of temperatures, pines expanded into sagebrush steppe creating open pine forests perhaps similar to those of today and in the north and northeast, fir and spruce increased. Coniferous forests and/or deciduous shrub and tree woodlands occupied river floodplains.

- *Modern Climate ca. 2,500 Years B.P. to Euro-American Contact.* The climate became warmer and drier than that of the preceding period and conifers in the lowlands and riparian woodlands decreased. The forests of the Okanogan Highlands were predominately ponderosa pine and Douglas-fir while those of northeastern Washington were characterized by western hemlock and western red cedar.

- *Present Climate.* Reservation climate and ecotypes range from about 12 inches of precipitation in the southwest shrub-steppe areas to 35 inches of precipitation (See III-2) mostly in the form of snow in the central mountainous subalpine forest regions. Temperatures at Nespelem range from near -25^{0}F in the winter to near 100^{0}F in the summer. Existing vegetation types are described in the *Range* and *Forest Vegetation* sections.

Streams and Lakes

The Reservation has nearly 3,000 miles of streams and 420 lakes (Figure III-3). Stream density averages about 1.2 miles per square mile and ranges from areas with no perennial stream channels to watershed units with more than 2.5 miles per square mile. While the majority of the lakes southwest plateau area are saline or highly alkaline, and generally do not support a fishery, lake fishery is an important resource throughout the remainder of the Reservation.

Physiography and Topography

Most of the Colville Indian Reservation is located within the physiographic province known as the Okanogan Highlands. The Columbia River, where the Highlands province merges with the terrain of the Columbia Plateau, generally marks the southern boundary of the province. The southwest portion of the Reservation, however, lies within the Columbia Plateau known locally as the Okanogan Plateau or Timentwa Flats. The eastern boundary of the Highlands province is also marked by the Columbia River (where the river flows to the south), which separated the Highlands from the Kootenay Arc province. The Okanogan River forms the western boundary and separates the Highlands province (locally the Columbia Plateau Province) from the Okanogan Trench province. Elevations on the Reservation range from 790 feet at the mouth of the Okanogan River to 6,774 feet at the summit of Moses Mountain in the western central portion.

The portion of the Okanogan Highlands within the Reservation boundary is mainly composed of two major north-south trending mountain chains. They are the Kettle River Range and the Nespelem Range. Parts of both of these mountain chains were glaciated during the last major glacial advance. The topography in glaciated areas is characterized by smooth, rounded mountain summits with extensive bedrock exposed by glacial scouring. Relief is generally gently sloping to steep and the drainage patterns tend to be weakly developed. Non-glaciated areas in contrast, usually have narrow ridges, sloping to very steep relief, and well-developed drainage patterns with a high degree of slope dissection and are not found on the Reservation.

The Kettle River Range is located in the eastern part of the Reservation and forms the divide between the Columbia River to the east and south, and the San Poil River to the west. Grizzly Mountain, with an elevation of 6,397 feet is the highest peak on the Reservation in the Kettle River Range. Other prominent peaks include Cody Butte (4,764 feet). South Seventeen Mile Mountain (5,174 feet), Lynx Mountain (5,709 feet), Gold Mountain (4,686 feet), Whitestone Ridge (4,762 feet), and Johnny George Mountain (4,090 feet).

The Nespelem Range is in the central part of the Reservation and forms the divide between the San Poil River to the east and the Columbia and Okanogan Rivers to the south and west, respectively. The highest point in this range is Moses Mountain at 6,774-feet elevation. Other prominent peaks include Little Moses Mountain (5,963 feet), Omak Mountain (5,749 feet), Strawberry Mountain (5,855 feet), Keller Butte (4,831 feet), and Central Peak (4,781 feet).

The Okanogan Plateau in the southwest portion of the Reservation represents the most northern extension of the Columbia Plateau. Elevations range from 2,000 to 2,900 feet. This area is characterized by nearly level to gently sloping relief, and is dotted by many small lakes and ponds resulting from glaciation. Flood plains and terraces of recent alluvium with higher terraces of glacial outwash and glacial lake sediments flank the rivers and most of the major creeks.

Management Units

The Reservation for the purpose of managing its natural resources has been stratified into 15 Resource Management Units (RMU) (Figure III-4) and 209 Watershed Management Units (WMU) (Figure III-5). Each RMU is an eco-region containing Watershed Management Units (WMUs) with similar biological (including vegetation), geological (including soils), and Physical (including hydrologic) characteristics or attributes. RMUs are first tier land units dealing with planning and management issues while more specific environmental concerns are addressed within WMU units. The characteristics and features of the Reservation's WMUs are described in the Soils Existing Conditions Report in the Project Analysis File.

AESTHETICS

The visual character of the Reservation varies from rolling, agriculture land in its southwestern portion to heavily forested terrain in its central and eastern region. While the mountain groupings of the central region are dominant, Lake Roosevelt on the boundary is an important element of the visual landscape.

Two significant transportation corridors across the Reservation provide visitors and residents opportunities to enjoy the natural beauty of the existing landscape. These two routes are the Grand Coulee–Omak highway and the Keller Ferry Landing–Republic highway. Other important roads that provide broad views of the existing landscape are the Nespelem/Agency–Keller road and the Keller–Inchelium road. The highly visible effects of continental glaciation on the character of the land including the deposition of sediments associated with Lake Columbia often dominate the landscape along these highways.

The southwest region has its own particular visual character ranging from the stark ruggedness of Omak Lake to the "potholes" of the Cameron Lakes Region where its abundant wildlife and vegetation character is unique. From the Cameron Lakes Region, the opportunity for spectacular views of the Okanogan Valley and the rugged North Cascade Range to the west, prevail. The residual remnants of glacial ice rafted rocks scattered across the southwest plateau provide unique character to the Reservation's landscape unmatched elsewhere.

No visual quality objective zoning (example, VQOs -USDA Forest Service 1984) or planning exists for the protection of the aesthetics and/or visual character of the Reservation. Development of such planning is suggested for protection of this valuable resource on the Reservation.

AGRICULTURE

Agriculture on the Colville Indian Reservation is managed under the Land Operations Branch (Land Ops) of the Bureau of Indian Affairs (BIA) that provides management services under the Departments of Range, Weed Control and Soils. This section of the EIS will only address management activities as they directly affect dryland and irrigation farming.

Agricultural data for the Reservation is limited. The Bureau of Indian Affairs (BIA) stopped requiring that written records be kept locally during the 1960s and then in 1982 began making annual inventory and production reports. This resulted in a 20-year period with little agricultural data. Therefore, this analysis will mainly reflect agriculture information gathered since 1982.

The Colville Confederated Tribes, individual members, and non-Indians all own agricultural fee land within the Reservation boundaries.

Figure III- 2. Precipitation Zones on the Colville Indian Reservation.

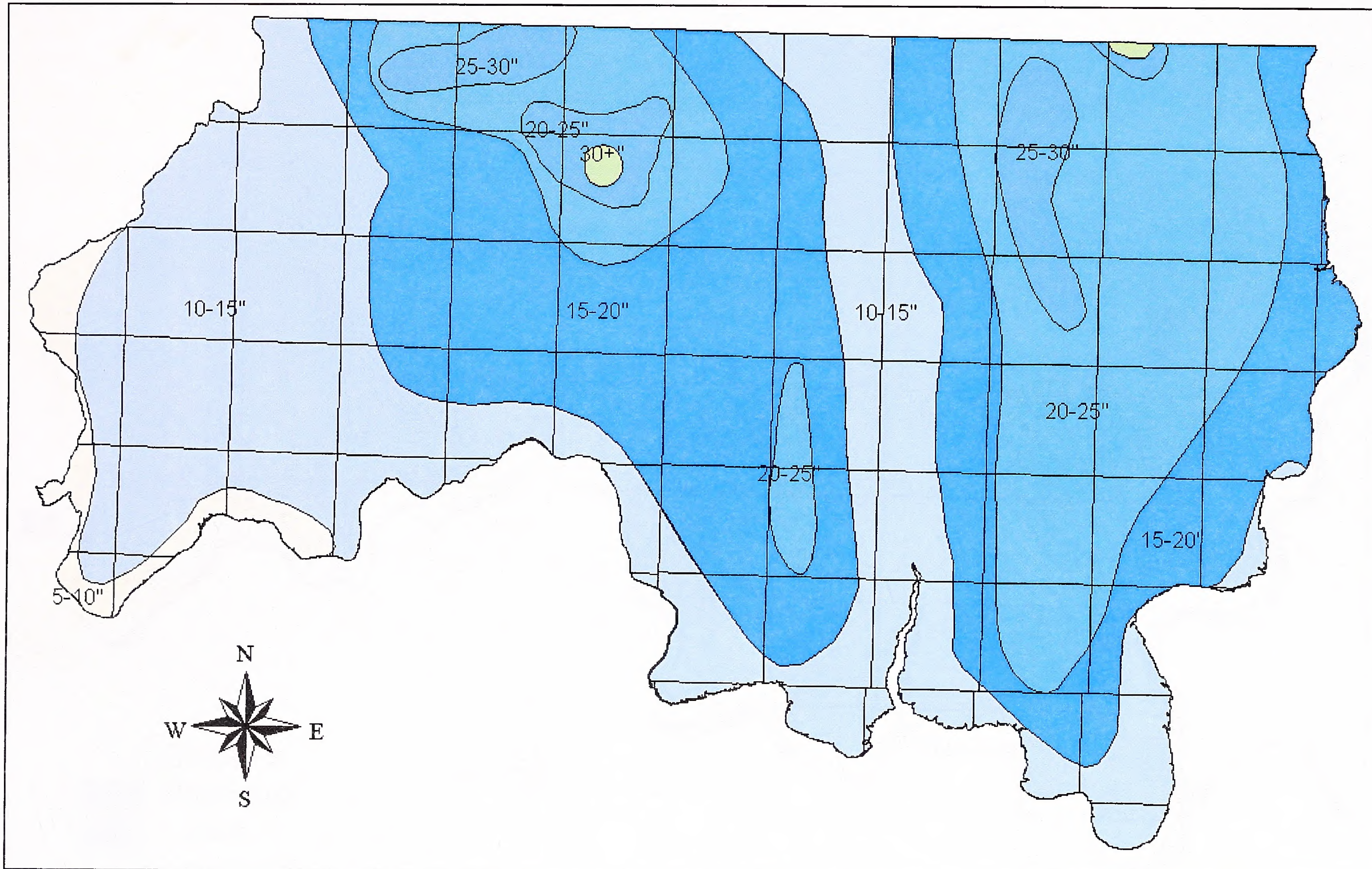

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Figure III- 3. Streams, Lakes and Boundary Waters on the Colville Indian Reservation.

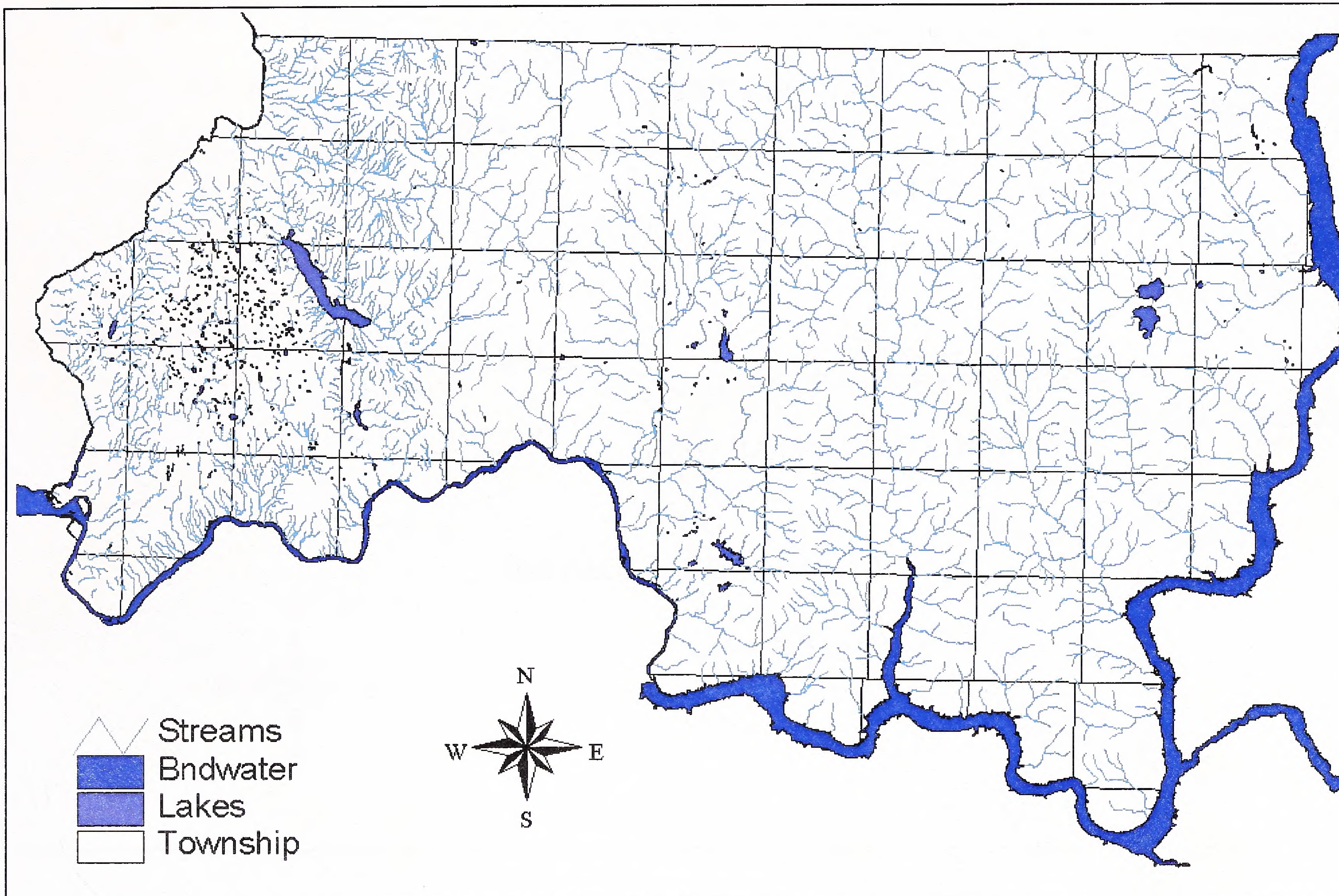

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Figure III- 4. Resource Management Units on the Colville Indian Reservation.

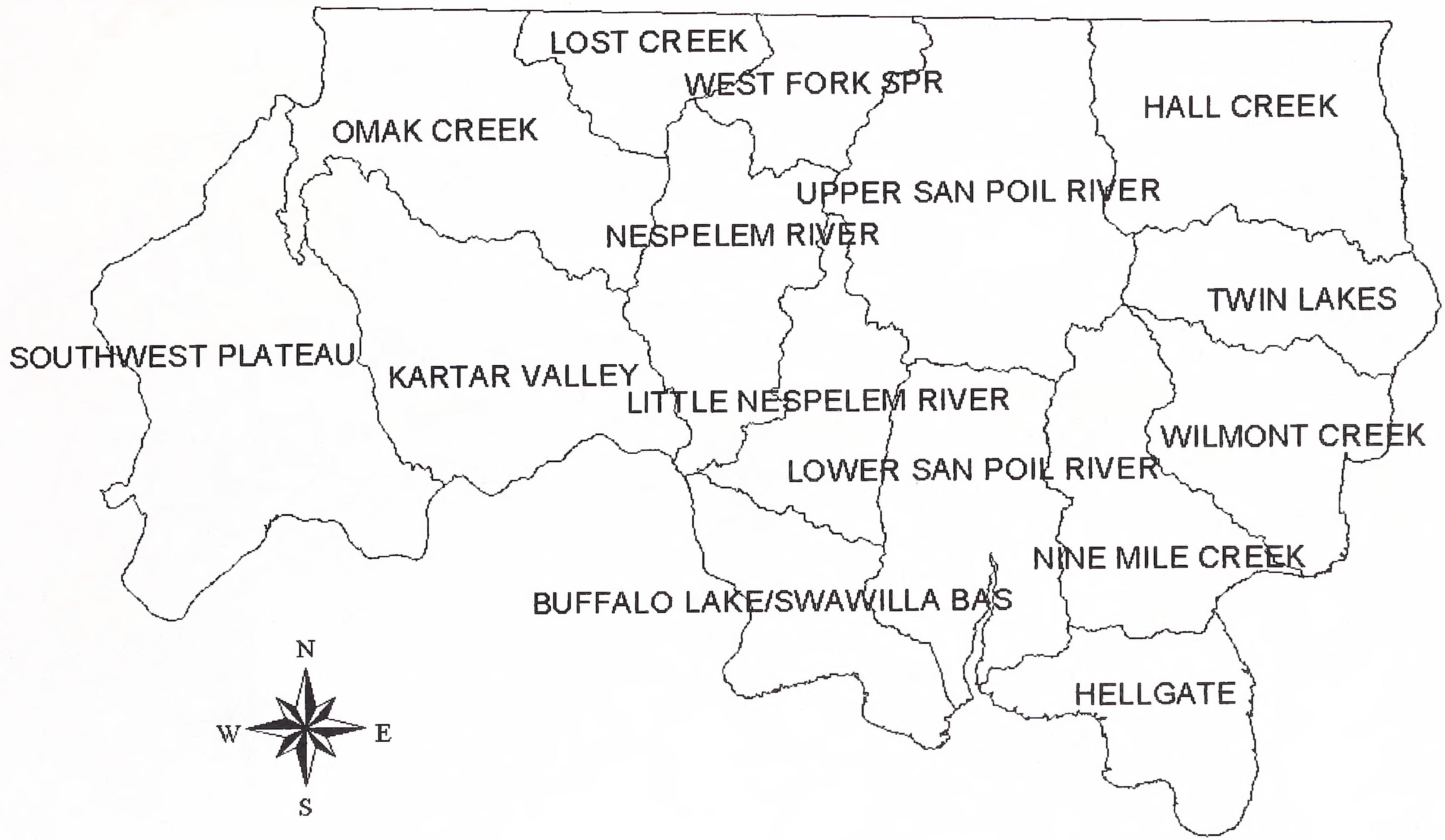

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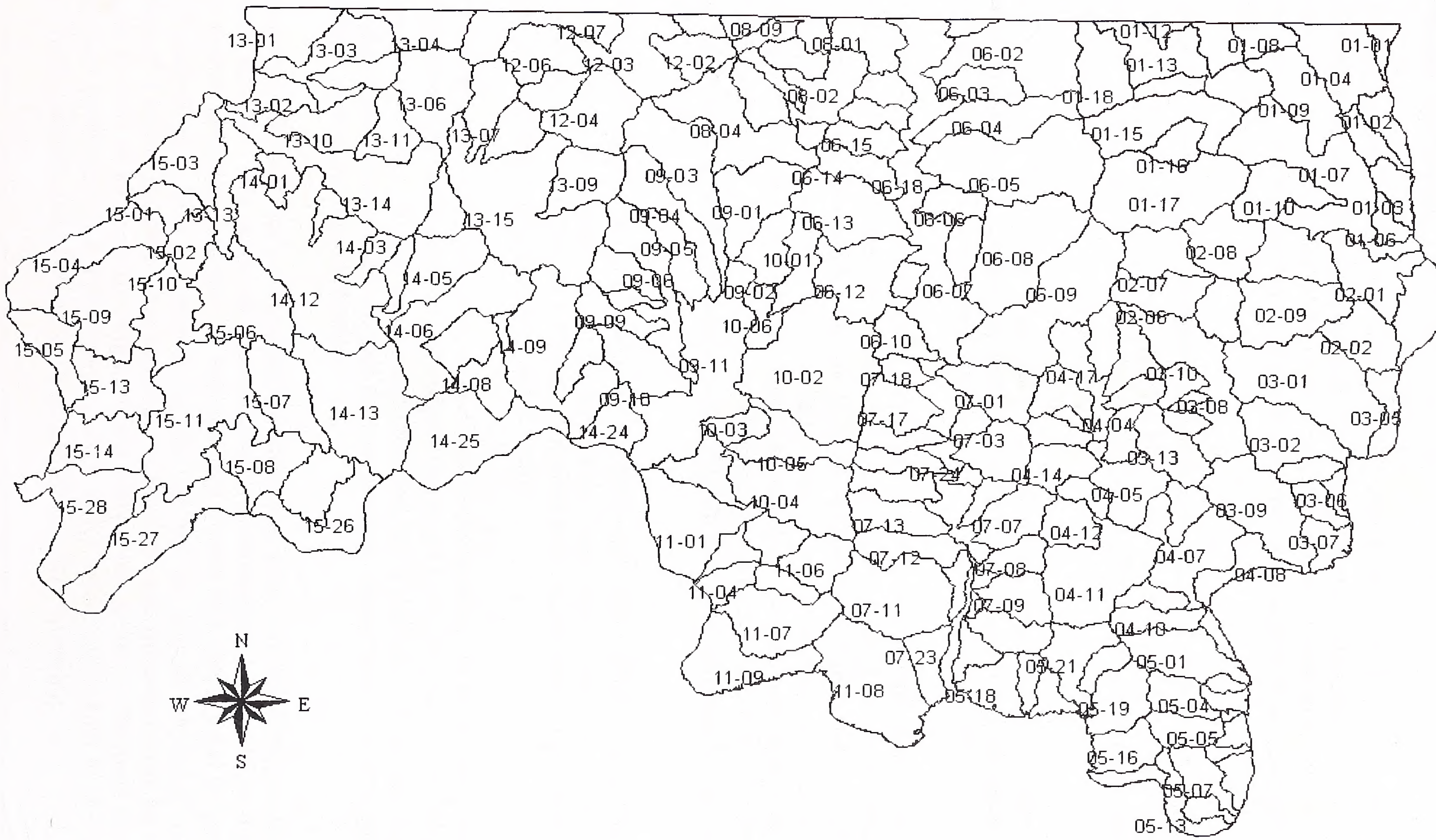
Figure III- 5. Watershed Management Units on the Colville Indian Reservation.



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Pre-European Agriculture

Prior to European contact in the late 1700's, the Colville Tribes were nomadic. They hunted large and small game, caught anadromous and resident fish and gathered roots, berries and medicines as the season dictated (Dahl 1990, Ray 1933). There is little to no evidence of plant culture or animal husbandry within the present "Plateau" region prior to pre-European contact Post-European Agriculture

Social, economic, and cultural disruption and their subsequent challenges for the Indian people to survive mark the post European period. Early in these period European traders brought agricultural technology as well as diseases to the Plateau. Miners, loggers, missionaries, settlers, and the military followed these early traders.

From 1872 through the 1940s cropland was considered more valuable than timber thus considerable forestland was cleared for this use. With markets distant and limited transportation, most crops were grown for home consumption or for feeding livestock.

A 1914 report cited that many agriculture tracts were abandoned as crops were stunted by drought. Irrigation was limited at that time to small diversion ditches where construction was easy or in some valley lands that were partially sub-irrigated. Jennie Pierre was the first to file for irrigation water approximately one half mile from the mouth of Stanger Creek in 1908 (USDI 1914, 1915). From 1911 to 1936, at least 18 feasibility studies were completed for power reservoirs and irrigation projects on Reservation lands with seven projects completed between 1915 and 1939 resulting in the irrigation of over 11,000 acres and draining 420 acres of wetlands (USDI BIA 1961b).

A 1939-40 study stated, "80 acres was the smallest unit upon which it could be reasonably expected an owner or operator could be successful" and that farms with fewer acres would require off-farm income (USDI BIA 1961a). Irrigated tracts at the time ranged from less than 10 to 73 acres with none meeting the minimum 80 acres.

Later a 1953 report (USDI BIA 1953) stated that better farming methods along with irrigation could compensate for the scarcity of agricultural land, and lands that were undeveloped, as well as, of low productivity. It was further reported that the installation of sprinkler systems had increased the yield many-fold and opened the possibility to place more land into agricultural use and to further expand the cattle industry.

In response to Tribal member's preference for developing their own small irrigation systems, and due to both farm size and scattered locations, the BIA during the 1960s designed and installed privately owned irrigation systems. It was reported (USDI BIA 1961c) that irrigation systems increased production to 8-12 animal unit months (AUMs) per acre as compared with rangeland production of 1 AUM per acre, thus reducing winter feed and irrigation costs by a third to an annual cost in 1961 of $30/acre for irrigation and $20 per ton for hay. The trend towards private irrigation was confirmed in a 1969 report (USDI BIA) where only three of the seven public irrigation works constructed between 1915 and 1939 were still operating.

During the 1970s limited irrigation development caused agriculture to be a minor contributor to the Reservation's economy (USDI Bur Rec. 1979). During this period about 26,000 acres of the Reservation was in agricultural crops with about 5,500 acres irrigated. Studies during this period indicated that the greatest net return and employment for the Tribes would come from developing and irrigating orchard lands along the Columbia and Okanogan Rivers.

Existing Agriculture

Currently, approximately 6 percent (about 20,000 acres) of the Reservation is farmed with approximately 5,500 acres continuing to be irrigated. The greatest agriculture benefits continue to be irrigated orchards along the Columbia and Okanogan Rivers. In general, both the interest and economic feasibility of traditional agricultural farming on the Reservation appears to be on the decline. This supports the direction of Tribal management to emphasize protection and enhancement of the natural resource base, i.e., water quality and quantity; soil productivity and health; diverse and abundant wildlife habitats, sustainable ecosystems, etc., in lieu of promoting agriculture as an industry among Tribal members (Clark 1997).

The recent gross value and levels of various agriculture commodities grown on the Colville Reservation as well as distribution of agriculture land use has been described by Clark (1997).

No direct, indirect or cumulative effects of the proposed action in Chapter II are anticipated to affect agriculture on the Colville Indian Reservation. Thus, there will be no further discussion of agriculture in this document.

AIR RESOURCES

Regulations and Standards

The 1963 National Clean Air Act, as amended in 1966, 1970, 1977, and 1990, regulates air quality concerns on the Colville Indian Reservation. The 1977 amendment provided for the Prevention of Significant Deterioration (PSD) program. The intent of the PSD program is to limit degradation in those areas of the country where the air quality is much better than standards as exists on the Reservation. Under this provision, certain national parks and wilderness areas were designated as Class I Airsheds whereas the remainder of the country was designated Class II. Although the PSD permit provisions of the Clean Air Act apply only to major stationary sources of air pollution, the Environmental Protection Agency (EPA) uses them to determine the degree of potential impacts of other sources on air quality. Facilities and uses of the Colville Indian Reservation do not require a PSD permit.

The Colville Reservation is more than 100 air miles from any wilderness area where air quality is protected by designation as a Class I Airshed. The Grizzly and Moses Mountain wilderness areas on the Reservation are not Class I Airsheds.

Two agencies have air quality responsibility in Okanogan and Ferry counties that includes the Colville Reservation: the EPA and the Washington State Department of Ecology (WDOE). The

WDOE have adopted the National Ambient Air Quality Standards (NAAQS) established by the EPA. The NAAQS's of concern on the Reservation is inhalable particulate matter (PM_{10} and $PM_{2.5}$). While WDOE is concerned with air quality in the region, it has no jurisdiction over air resources on the Reservation.

The Clean Air Act Amendment (CAAA) of 1977 defines two types of NAAQS's, a primary standard and a secondary standard. Primary NAAQS's are designed to protect public health, allowing for an adequate margin of safety. The primary NAAQS's have been set at levels low enough to protect people with preexisting illnesses, children, or people with conditions that might be aggravated by such pollutants. Secondary standards are designed to protect human welfare from any known or anticipated adverse effects of the criteria pollutants on the soil, crops, animals, structure, or other property. The NAAQS's applicable to the Reservation are shown in Table III-1.

The 1977 amendment to the Clean Air Act contained provisions for a special program – the Prevention of Significant Deterioration (PSD) Program – to prevent the growth of stationary industrial sources from causing a significant deterioration of air quality in areas that meet the NAAQS (attainment area). The PSD requirements call for careful monitoring of annual air quality conditions and placement of limits on the "increment" of clean air that can be used by industrial projects. Allowable increments have been established for both Class I and Class II Airsheds. However, according to the WDOE, the implementation of resource management activities on the Colville Reservation does not require a PSD permit.

Table III - 1. National and State of Washington Ambient Particulate Air Quality Standards (USDA Forest Service 1995).

POLLUTANT	AVERAGING PERIOD	PRIMARY NAAQS	SECONDARY NAAQS	WASHINGTON STANDARDS
Inhalable Particulate Matter PM10	Annual Arithmetic Mean	50 ug/m3	50 ug/m3	--
	24-hour	150 ug/m3	150 ub/m3	--
Inhalable Particulate Matter PM2.5	Annual Arithmetic Mean	15 ug/m3	15 u5/m3	--
	24-hour	65 ug/m3	65 ug/m3	--
Total Suspended Particles (TSP)	Annual Arithmetic Mean	--	--	60 ug/m3
	24-hour	--	--	150 ug/m3

Note: ug/m^3 – Micrograms of pollutant per cubic meter of air
Arithmetic mean = the sum of a set of n terms, divided by n.

The federal Clean Air Act requires protection of air quality related values including visibility in mandatory Class I Airsheds – public lands where the view is an important part of their value and includes certain parks and wilderness areas. The federal strategy for visibility calls for a two-phased effort. Thus far, visibility program efforts have focused on large sources, referred to as Phase I sources that have obvious negative impacts on visibility. Obvious impacts mean visual plumes extending from a large source in the area of visibility impairment. The only visual plume areas seen on the Reservation is at the Omak mill site and prescribed burns in forested areas.

Phase II, regional haze, is more complex. While scientific and technical limitations to understanding regional haze has long prevented the EPA from proceeding with the development of a Phase II program, these issues have largely been overcome and the EPA is in the process of developing regulations.

Monitoring

Particulate Matter

Particulate matter consists of fine particles of smoke, dust, pollen or other materials that remain suspended in the atmosphere for a substantial period of time. Particulate matter is measured in three forms: Total Suspended Particulate (TSP) and PM_{10} as well as $PM_{2.5}$, both subsets of TSP. PM_{10} is respirable or fine particulate matter, defined as smaller than 10 micrometers in diameter while $PM_{2.5}$ is the same material smaller than 2.5 micrometers in diameter.

While monitoring is now being planned, neither the Colville Confederated Tribes nor any other organization has conducted air quality monitoring on the Colville Indian Reservation in recent years. No baseline data has been established for the Reservation. Visual observations on the Reservation indicate the largest source of suspended fine particles $PM_{10/2.5}$ appears to be road dust from automobiles and trucks, particularly on non-asphalt surfaced roads. Prescribed fire for forestry improvement periodically provides large quantities of particulate matter, although no studies have been done on the quantity and composition of this source. Additional known sources of Total Suspended Particles (TSP) on the Reservation include the East Omak sawmills, residential fireplaces and woodstoves and occasional wildfires on forest and rangelands.

Best estimates of background concentrations of PM_{10} and $PM_{2.5}$ for the Colville Reservation can be determined by using the average fine mass (roughly $PM_{2.5}$) values measured at the two high elevation Interagency Monitoring of Protected Visual Environments (IMPROVE) sites in the State of Washington. These sites are located in Tahoma Woods in Mt. Rainier National Park and at the Snoqualmie Summit Ski Area and have 3-month average values of 2.01 and 1.49 ug/m3 respectively. Because both of these sites are closer to major suspended particle sources, they probably receive more particulate pollution than the Reservation and would be considered a "worst case" estimate.

Other Pollutants

As there are no major air resource pollutant sources on or near the Reservation it is assumed that ambient levels of carbon monoxide, lead, ozone, nitrogen oxide and sulfur dioxide (all pollutants of air quality concern) are typical of the levels found in other remote rural settings in the State of Washington. No monitoring of these pollutants has occurred nor has a base line been established for the Colville Reservation.

Visibility

The clarity of the air, or visibility, is another way to judge air quality. Visibility is affected by natural and human-caused materials in the air such as fine particles of soot or dust, sulfates and nitrates. These materials alter visibility by changing the way light is transmitted through the atmosphere. Distant objects appear veiled by a haze that reduces both color and brightness. Even the gases that make up the air we breathe can affect visibility by scattering light. In the State of Washington, concerns about visibility range from views in urban areas to views in parks and wilderness areas and at scenic vistas.

Visibility is another value in Class I Airsheds that must be protected. The US Forest Service that manages many wilderness airsheds considers loss of more than one-half deciview from haze from a single source or one deciview from multiple sources to be an unacceptable impact. Class I Airsheds are also to be protected from plume blight, or visible plumes of pollutants.

Ten recording sites distributed throughout the State of Washington provide visibility-monitoring data. The site closest to the Reservation is in Spokane. Major air pollutants detected at the monitoring site receptors include sulfate, organic carbon, nitrates and dust. Washington DOE, however, points out that further study is needed to accurately apportion the contribution of the various source categories to the major pollutant components (WDOE 1997).

Monitoring data and published reports single out sulfur emissions as the single most significant source of visibility impairment (WDOE 1997). The largest source of sulfur emissions on the Reservation is most likely from vehicle operation that is unlikely to affect visibility. Currently no stationary air pollution source or construction activities have been identified in the State of Washington that contribute to air quality/visibility impairments in mandatory Class I Airsheds (WDOE 1997).

Existing Conditions

Generally, the location, terrain, and wind patterns produce optimum conditions for maintaining high air quality across the Reservation. However, recent monitoring of air quality on or near the Reservation is non-existent and no baseline values have been established. Okanogan and Ferry Counties have, on occasion, been included in air forecast advisories issued by WDOE for air stagnation due to atmospheric temperature inversions. There are, on an average, 10 to 15 days during the winter months when the advisories are issued. When they are issued, they are generally for the entire State east of the Cascade Range and do not specifically single out the Reservation area.

As noted, Washington Department of Ecology does not have jurisdiction over air resources on the Reservation. Until the Reservation develops a Tribal air resource management program, the EPA serves as the monitoring and enforcement agency.
Air quality studies about 20 years ago on Mt. Tolman near the Reservation reported visibilities that ranged from less than 0.6 miles to greater than 50 miles depending on meteorological factors. Poorest visibility occurs in the fall and winter and the best during the spring and summer. Occasionally during the late summer region-wide dust storms contribute to poor

visibility on the Reservation. Prescribed fire used on forest and rangelands as well as occasional wildfire sometimes contributes to periods of reduced air quality and visibility on the Reservation.

CULTURAL RESOURCES

Definitions and Standards

The National Historic Preservation Act (NHPA) of 1966 established the federal government's policy and programs on historic preservation. Section 106 of the Act requires Federal agencies having direct or indirect jurisdiction over a proposed Federal or federally assisted or permitted undertaking to take into account the effects an undertaking may have on historic properties listed on or eligible for the National Register of Historic Places and it affords the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on such undertakings (16 U.S.C. 470f). The Washington State Office of Archaeology and Historic Preservation (OAHP) and the ACHP are the state and federal agencies, respectively, responsible for overseeing the management and protection of historic properties in compliance with the NHPA.

Historic resources are districts, sites, buildings, structures, and objects that contain evidence of past human activities. They include historic and prehistoric sites and properties of traditional religious and cultural importance (TCPs).

Prehistoric cultural resources may include, but are not limited to the following, all of which predate the entry of Euro-American trade goods and people into the region (roughly 9500 BC to 1800 AD).

- Isolated artifacts;
- Campsites related to hunting and gathering forages; and
- Rock shelters/rock features used for shelter and/or for foraging.

Ethnographic archaeological sites are defined as properties that contain artifacts and features related to Native American lifeways which post-date the entry of Euro American trade wares and people into the region, and pre-date contemporary Native American uses of the landscape (roughly 1800A.D. to 1945 AD). Ethnographic period archaeological resources include items made from trade metals such as steel digging tools, clothes or implements decorated with trade beads.

Historic period cultural resources are defined as artifacts and features that relate directly to Euro American entry into, and utilization of, the landscape (roughly 1800 to 1945 AD). Historic properties may include forts, homesteads, cabins, irrigation ditches, telecommunication lines, blazed trees, wagon roads, early Forest Service administrative improvements (including developments made by members of the Civilian Conservation Corps during the 1930s), and trash dumps. Archaeological sites that contain features and/or artifacts indicative of more than one temporal/cultural affiliation (e.g., an area that contains lithics and the remains of a 1902 homestead) are identified as multi-component properties.

National Register Bulletin 38 states that a traditional heritage property is defined generally as a property that is eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community (USDI, u.d: 1).

To be considered eligible for the national Register of Historic Places, heritage resources must meet one or more of the following criteria (NHPA 1966):

> *The quality of significance in American History, architecture, archaeology, engineering and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, workmanship, feeling and association and*

a) That are associated with events that may have made a significant contribution to the broad patterns of our history; or
b) That are associated with the lives of persons significant in our past; or
c) That embody the distinctive characteristics of a type, period, or method of construction that represent the work of a master, or that posses high artistic values, or that represent a significant and distinguishable entity whose component may lack individual distinction; or
d) That have yielded, or may be likely to yield, information important in prehistory and history (36 CFR 60)

A property with traditional heritage value must meet the following eligibility criteria considerations (USDI, Bulletin 38):

1. The property must be tangible and discrete. "[It] should be clearly recognized at the outset that the National Register does not include intangible resources themselves. The entity evaluated must be a tangible property – that is, a district, site, building, structure, or object." (USDI u.d: 9).
2. The property must have clearly definable physical references that can be documented historically. "The National Register discourages nomination of natural features with sound documentation of their historical or heritage significance." (USDI u.d: 9). Furthermore, National Register designation of large land areas is warranted only when such areas contain multiple properties definable as a historic district by theme group or heritage significance.
3. The traditional values attributed to the property must have a document able history of at least 50 years (USDI u.d: 15).
4. The property must be traditional and of integral importance to the ethnic group or Indian tribe (USDI u.d: 10).
5. The property's significance must be established through multiple lines of documentation (e.g. archaeology, history, oral tradition, ethnography, or ethnohistory or a preponderance of evidence in any one of these fields.

Past Human Uses

Archaeological evidence from sites on the Reservation suggests that initial human use of the area began around 7,000 years ago. Early residents of the area likely employed foraging subsistence strategies that required frequent shifts in residence and a broad-based economy.

Field Studies

Numerous archaeological field investigations have been conducted across the Reservation since 1941. A brief summary of each of these investigations has been made by Gough (1990).

Traditional Cultural Properties

Gough (1990) recorded four locations on the Reservation that meet the requirements of "Traditional Cultural Properties" (n.d. USDI Bulletin 38). The four sites identified by Gough (1990) are associated with traditional Native American beliefs and cultural practices important in maintaining the historical identity of the people themselves. Three of the sites are non-structural geographic locations, with visible natural features to which tribal members attach religious or cultural significance. It is not known how long these three places have been regarded as significant, or by which specific bands of Indian peoples. The fourth site is structural, a sweat lodge frame.

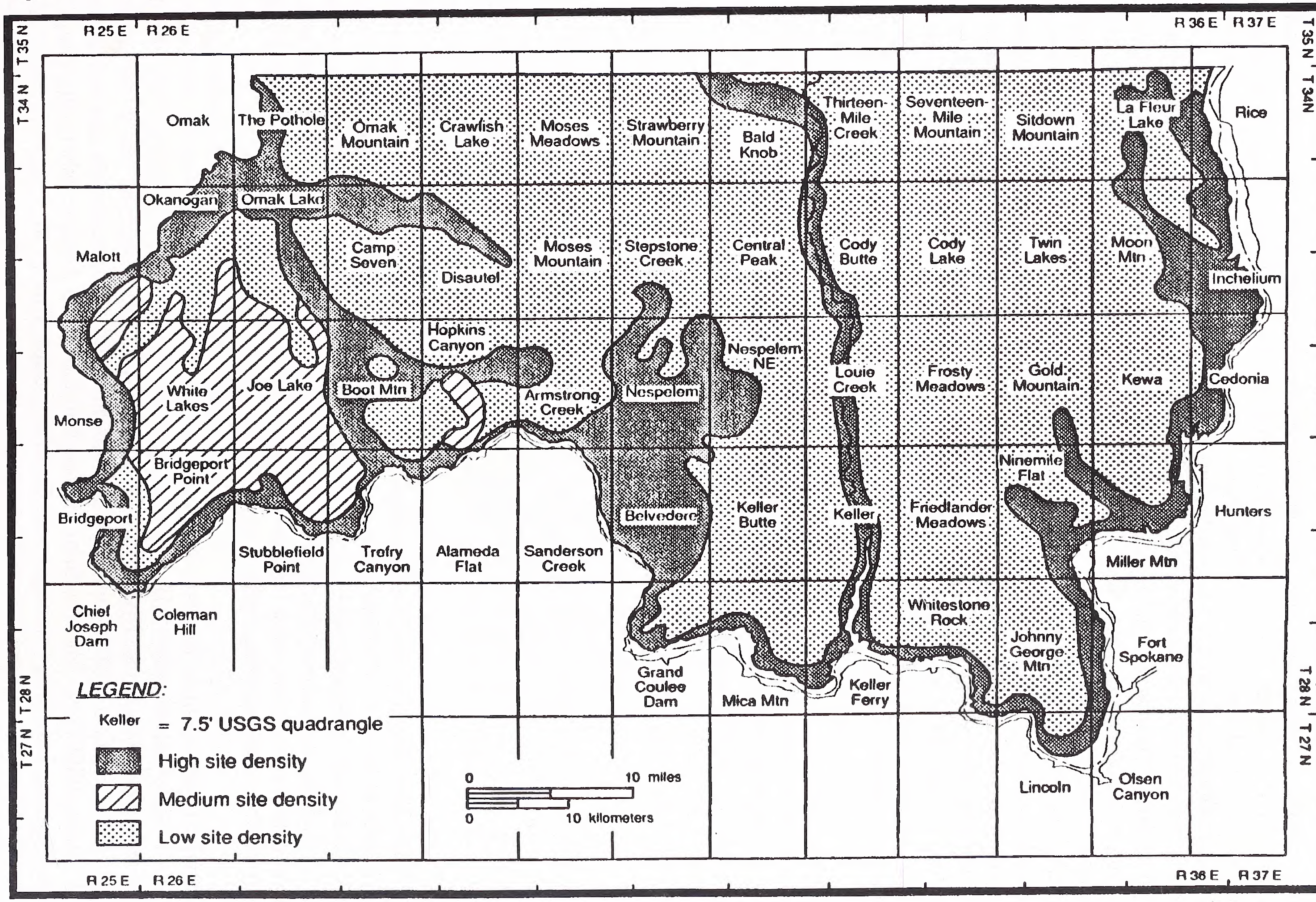
One recorded sites Creation site, has sacred value. The significance attached to the mountain, cliffs, and ground along lower Bridge Creek in the San Poil Valley reflect traditional beliefs of the area's native peoples about their origins and the nature of their world. Coyote Rock represents a slightly different traditional value. Perched on the hillside above the confluence of Hall and Buckskin Creeks, it symbolizes the wisdom and cunning of Coyote, a figure prominent in numerous Plateau Indian legends. Ghosty Bluffs abruptly rising above Hall Creek north of Inchelium, represents a more whimsical side of traditional beliefs. According to legend, ghosts of Indian ancestors inhabit the bluffs and appear only at night to sing, dance and drum.

Prehistoric Sites

In a sampling survey of the Reservation in 1989, the forested portion was extensively surveyed for completion of cultural resources compliance requirements of the tribal/BIA five-year timber sale (Gough 1990). Part of the requirements of this project was to facilitate development of a management plan for cultural resources, both known and undiscovered, on the forested portion of the Reservation where future harvest activities are anticipated.

The latest available information indicates there are 328 sites (historic and archaeological) recorded on the Reservation. These site samples do not include the large numbers of sites recorded along the Columbia River. In the 1989 survey of the forested portion, 69 sites were identified. The proposed action in conjunction with these cultural resource sites was maintenance of a 100-foot riparian buffer zone and avoidance (Gough 1990). A management plan for protection of the historic resources of the Reservation was proposed by Gough (1990).
The 1989 study reported by Gough (1990) provides extensive information on the distribution of prehistoric sites across the Reservation, as well as, a re-mapping of high-moderate-low probabilities on the Reservation. Figure III-6 portrays, in a generalized manner, a relative ranking of site densities on Reservation lands. More detailed mapping of site potential are on file with the Colville Confederated Tribes and provide the detail necessary for long-range planning of future cultural resource surveys

Figure III- 6. Generalized Prehistoric Site Density Ranking Across the Colville Reservation (Gough 1990).



Ethnohistory and Ethnography (Hanes 1995)

The Confederated Tribes of the Colville Reservation are comprised of people attributed to as many as twelve "distinct" historic groups (Wenatchee, Chelan, Entiat, Methow, Okanogan, Nespelem, San Poil, Lakes, Colville, Moses Columbia, Palus and Chief Joseph Wallowa Band of the NezPerce). All of the Colville "tribes" have been described by Ray (1975:7) as "autonomous ethnic and political units of the Plateau Culture Area" and all traditionally lived in the central area of the Plateau, with the primary exception being the Wallowa NezPerce band. No treaties were developed with many of the northern interior Columbia basin groups, including Methow, Okanogan, Kutenai, Pend d'Oreille, Colville, Spokane and other Salish groups in central Washington. The United States Government simply took possession and later established Reservations by executive order. The Colville Reservation was established by executive order in 1872 for all non-treaty peoples of northeastern Washington (Royce 1899:856). The Reservation was initially created in the fertile Colville Valley east of the Columbia River, but later that same year, under pressure of non-Indians in the region, it was moved west of the river onto more arid lands (Royce 1899:858). A number of people from across northern Washington and Idaho originally moved onto the Reservation (Ray 1932, Ross 1968). In this manner the Colville Reservation is exemplary of the fluidness of population movement prior to invasion still evident today. The Reservation originally consisted of San Poil-Nespelem, Sinkaietks (Southern Okanogan), and Colville bands, but later added Chief Moses' Columbia Salish (Wenatchee, Senijextees, Sinkiuses, Entiats, and Methows) and Chief Joseph's NezPerce and Palus followers, both treaty-signing bands (Hunn 1990: 269). Palus themselves are scattered on Colville, Yakama and NezPerce Reservations (Hunn 1990: 271).

As in most other cases of confederated tribes situations, there has been considerable assimilation of the various tribes on the Reservation. Tribal membership for the Colville Confederated Tribes in 1995 was 7,992. The Colville Confederated Tribes experienced the usual history of steady reduction of the initial Reservation through the allotment era at the beginning of the 20th century. Further information concerning each of the historic groups is provided below. The ethnographically described seasonal round of these people described by Gough (1990) is one possible way of adapting to and deriving a living of from the Reservation environment.

Living nearest the Canadian border on the Columbia River were the Colville's and Senijextee (Ray 1936: 120). The Colville's originally lived at Kettle Falls on the Columbia River, south along the river to Hunters, Washington, and eastward a short distance in the Colville River valley (Ray 1932: 14). The Senijextee lived along the Columbia River from Kettle Falls north into Canada and along the lower Kettle River. It has been estimated that up to 3,000 salmon were netted daily at Kettle Falls. Like Celilo Falls lower on the Columbia River, Kettle Falls served as a major fishery and a trading center.

The Colville Reservation as it exists today was created on the homelands of the Nespelem and San Poil Tribes. The Nespelem's lived primarily along the Nespelem River and Columbia River to the mouth of the Okanogan River (Ray 1932: 15; 1935:137). The San Poil's lived along the San Poil River and fished at the mouth of the San Poil and Spokane Rivers and at Kettle Falls (Ray 1932:23; 1936: 139). The mouth of the San Poil River was a major fishery attracting Coeur d'Alene, Yakama, Umatilla, Okanogan and Colville groups (Ray 1936: 138). The San Poil used root grounds south of the Columbia River through Grand Coulee country as far southwest as Soap Lake and Ephrata and as far east as Davenport (Ray 1932: 27). The Nespelem and San Poil hunted east of the Columbia River at Huckleberry Mountain. They both remained aloof from government contract and refused assistance, but ultimately resided on the Reservation created around them.

Obviously, owing to the 19th century non-Indian impulse to "lump" independent traditional Indian communities into larger supposed political or ethnic entities, considerable confusion exists, particularly in the literature concerning the nature of Salish groupings often labeled Wenatchee, Entiat, Chelan and Methow, with homelands all along the west side of the Columbia River from the Yakama homeland upstream to the Okanogan River (Chalfant 1974d: 333). Each group was culturally related but have geographically distinct settlements. They are considered distinct from other Salish groups across the Columbia River to the east, though share common cultures. These groupings had settlements at the Lake Chelan outlet, Entiat River, on the Columbia River between the Entiat River and the Wenatchee River, at the mouth of the Wenatchee River, upstream on the Wenatchee River, at the forks of the Wenatchee and Icicle River and on the Columbia River several miles below the mouth of the Wenatchee (Chalfant 1974d: 323).

The Okanogan (or Sinkaietks), perhaps maintained the largest degree of distinctiveness (Ray 1936: 122; 1974b: 391). With their homeland naturally focused along the Okanogan River from its mouth at the Columbia River upstream, they also made use of resources south of the Columbia River in the Waterville area (Ray 1936: 410; Cline et. al 1938). Apparently not pleased with the creation of the Chief Moses (Columbia) Reservation on their homelands, they remained on their homelands after termination of that Reservation and eventually joined the nearby Colville Reservation (Ruby and Brown 1992: 202).

The Methow's also kept a relatively large degree of separateness from other Salish groups downstream (Ray 1936: 141). The Methow's lived primarily along the Methow River with primary fisheries on the Columbia River at the mouth of the Methow River. Some of the Methow group moved onto the Colville Reservation while others remained in the Methow Valley (Ruby and Brown 1992: 129).

The Chelan group originally resided at the southern end of Lake Chelan (Ray 1936: 141). Because of the significant drop in elevation from Lake Chelan to the Columbia River, salmon fishing focused on the Wenatchee River. People from the area attended the Yakama treaty council in 1855, and were signatories to the treaty (Ray u.d.). Under terms of the Chief Moses Agreement of 1883, some Chelan's received allotments in their own territory and southern portions of the short-lived Chief Moses Reservation while others moved to the Colville Reservation (Boyce 1899: 910; Kappler 1904: 1040).

The Entiat peoples originally lived mainly along the Entiat River (Ray 1936: 141). The Entiats were signatory to the 1855 Yakama Treaty. Some Entiats subsequently took allotments on Lake Chelan, while others moved to the Colville Reservation (Ruby and Brown 1992: 75).

The Wenatchee country was a popular trade center for many of the groups. Considerable trade and communication occurred with the several west bank Salish groups, with people west of the Cascades, and others up and down the Columbia River. Typically shared at this trade center were fisheries, root grounds, small game, waterfowl hunting, trading, gambling, horse racing and summer ceremonies. People from the area traditionally traveled as far south as The Dalles and west to Puget Sound for trade, often serving as merchants, reselling items gained in trade at The Dalles to San Poil and Okanogan peoples (Chelfant 1974d: 365). The Leavenworth locality served as a key fishery at the mouth of the Icicle River (Ray 1936: 142). Those Salish groups south of the Wenatchee Mountains such as the Wenatchee's in the Ellensburg area, had naturally forged closer ties with the Yakama and Kittitas Tribes and had become signers of the Yakama Treaty along with the Leavenworth area group.

Though the first direct contact between these west bank Salish and non-Indians occurred by 1811 with the David Thompson and Alexander Ross fur trapping parties, there is a remarkable lack of information about these groups for the next 30 years (Chalfant 1974d: 342). The fur traders and explorers apparently paid little attention to this area as exemplified by the lack of trading posts established between Fort Okanogan and the Walla Walla River. The few-recorded observations consistently remark about the relatively poor resource conditions along this stretch of the Columbia River. Similarly, there is little information concerning relocation of these groups to Reservations though most refused removal to the Yakama Reservation because of its location outside their homeland and residence of difference linguistic groups. This area is described as the last in central Washington to be affected by non-Indian settlement. It was not until the 1890s that there were very many non-Indian settlers (Ray 1974d: 379). Most early non-Indian intrusions therefore derived from military and other government activities rather than settlement. Most of the Wenatchee group took allotments in their homeland (homesteads), though some moved to the Colville Reservation.

The Sinkiuses (also called the Columbia) group had a relatively large homeland centered on the east bank of the Columbia River in the Rock Island area below Wenatchee. Their subsistence range extended across the semi-arid plateau country east of the river within the great bend of the Columbia River, approximately west of Moses Lake, north of Vantage and south of Badger Mountain (Ray 1936: 143; Relander 1986: 33). Much of this region east of the Columbia and north of the Snake River is little known in historical written records, but was frequently considered resource poor including the paucity of wood and water to support settlements when compared with surrounding areas. Though the mid-Columbia region is well know historically for large stream courses and coulees, source areas for these historic stream is from outside the area. Thus, most streams in the area are small and some intermittent. The lifting of waters from behind Grand Coulee Dam, the extensive enlargement of Banks Lake and the development of the Columbia Basin Irrigation Project have dramatically changed the current hydrology of the area. Because of limited resource the semi-arid plateau groups living on its periphery primarily used area: Okanogan, San Poil, Nespelem, Colville and Spokane from the north along with Wanapum and possibly Palus from the south.

None of the eastside Columbia bands signed the Yakama Treaty; though the treaty served ceded their lands. A charismatic leader in the late 1800s, Chief Moses assumed leadership of the non-treaty peoples of the mid-Columbia, beginning with the Rock Island Rapids settlement opposite the mouth of Moses Coulee and near the mouth of the Wenatchee River (Relander 1986: 32; Chalfant 1974f: 242). Chief Moses attracted many "disaffected" groups from the region resulting from disease epidemics, war and dislocation. Called the Columbia Confederacy, the union includes the Sinkiuses, Chelan, Entiat, Methow and Wenatchi groups (Ray 1951; Ruby and Brown 1965). Under the leadership of Chief Moses, the peoples of these groups avoided war with the United States during the Yakima War of 1855.

In 1879, the Columbia (Moses) Reservation was established by executive order adjacent to the 1872 Colville Reservation for the Sinkiuse, Columbia, Chelan, Entiat and Wenatchi groups (Royce 1899: 898). The Columbia Reservation extended from the Okanogan and Columbia River west to the crest of the Cascades and north from Lake Chelan to the Canadian border and included the homelands of the Methow, Chelan and Okanogan groups (Ray 1974b: 403). Some of the Entiat group moved to the Columbia Reservation, but Columbia and Wenatchee peoples chose to remain in their homelands. As a consequence, those who did move to the Reservation were forced to relocate again to the Colville Reservation under an 1883 Executive Order (Kappler 1904: 1073) restoring the Columbia Reservation to public domain, later formalized by an 1886 executive order (Royce 1899: 920). By 1884, most Columbia Salish relocated to the Colville Reservation with Chief Moses settling near Nespelem. The 1883 agreement also encouraged the Chelan, Entiat, and Wenatchee people to take one square mile homesteads for the various Salish people in the area. This form of settlement preceded the 1884 Indian Homestead Act that allowed for the same action on a broader basis. However, the Chelan group not only refused relocation to a Reservation, but also would not permit their lands to be surveyed for homestead purposes. They were subsequently forcibly relocated to the Colville Reservation allowing some of the Entiat group to take homesteads in the vacated Chelan territory.

The Palus are Sahaptin-speakers rather than Salish whose homeland was the lower Snake River from just above the mouth of the Palouse River to the Columbia River and up the Palouse drainage at least as far as Colfax, Washington (Ray et al 1938: 388). The principal settlement was located at the mouth of the Palouse River with no substantial settlements located further up the Palouse apparently due to the occurrence of a falls that posed an obstacle to anadromous fish just a few miles upstream from the mouth. The western-most settlement was a well-used fishing site at the mouth of the Snake River, and has at times been attributed to Wanapum's, though several groups perhaps shared it. The upper Palouse River country where they apparently gained much of their subsistence was shared with Coeur d'Alene and NezPerce. The subsistence area extended eastward to the camas fields near Desmet and Moscow, Idaho.

The Joseph Band is also known as the Wallowa-Imnaha Band of NezPerce (Ray 1975: 11). Like the Palus, they are a Sahaptian-speaking group in contrast to the numerous Salish-speaking Colville Reservation Tribes. With a traditional homeland in present-day northeastern Oregon, the band apparently always maintained a large degree of independence from other NezPerce bands, even prior to the 19th century (Ray 1975: 12). After extensive conflict and deportation to Oklahoma in the 1870s, many of the bands returned to the Northwest in 1885, primarily to the Colville Reservation.

FIRE/FUELS

Historical Perspective

In 1904 a forester named Franklin Reed (1904) described two forest types on the Reservation:

> "... a pure, open stand of bull pine (ponderosa) with a ground cover of bunch grass. The stand consists of 10 to 15 trees, 12 inches and over diameter breast high, per acre...", and
> "... a dense stand of red fir (Douglas-fir) and larch with a varying intermixture of yellow (ponderosa) and lodgepole pine. The stand is often so dense as to prevent the growth of grass, but where it is open the ground cover is usually pinegrass. The proportion of timber under 12 inches in diameter breast high is so high that the yield per acre is not heavy..."

He describes fire on the Reservation as follows:

> "Fires have occurred in the timbered portion of the Reservation every summer since anything was known about the country. At one time or another the whole area has been burned over. Once a forest fire gets burning no attempt is ever made to put it out unless it gets so near to threaten destruction to buildings or fences."

He goes on to describe how fire behaved in the two types of forest he described:

> "In the bull pine type, which was open with an understory of grass, fires were typical ground fires carried by the grass. The mature trees survived but much of the regeneration was killed. Fire in the mixed type forest was much more destructive. The higher fuel loads resulted in hotter fires that often killed all standing timber over several hundred acres. Lodgepole pine often regenerated in pure stands to the exclusion of other species."

Boyce and Dumas (1997) pointed out that fires have burned through Reservation forests for thousands of years, most likely since the recession of the ice age 10,000 to 15,000 years before present. The Reservation is subject to considerable summer thunderstorm activity. Additionally, the indigenous people had a tradition of igniting fires for various reasons. These factors, in conjunction with rainfall patterns, created a historic pattern of frequent fires across the Reservation. At the dryer low elevations, fire resistant ponderosa pine predominated in mosaics of even-aged, relatively open stands. At the highest elevations or in very moist areas, seral species were periodically replaced by cataclysmic fire events.

Between 1910 and 1930 there were several large stand-replacing fires in the higher elevations characterized by sub-alpine fir and lodgepole pine. By 1930, though, fire suppression had begun to change the forest. The transition between forest and rangeland appears to have expanded into areas that did not support trees in the past. The density of trees throughout all alterations of the forest has increased as well, primarily from the suppression of fires. Further discussion on the changing forest in response to fire control is shown in the *Forest Vegetation* section.
Historically the frequency, intensity, and extent of fires differed considerably across the Reservation. These differences can be categorized by the concept of the fire regimes as described by Agee (1981). They are a function of growing environment (temperature and moisture patterns),

ignition pattern (lightning, human), and plant species characteristics (fuel accumulation, adaptations to fire):

- *High-severity regimes:* Fires are very infrequent (more than 100 years); they are usually high intensity, stand replacement fires. They are typically moist and cool areas where fire occurs under unusual conditions, such as during long drought and with dry, hot winds (Pickford, et. al. 1980). Fires are often of short duration (days to weeks) but of high intensity and severity. Historically this regime would be characterized by the sub-alpine zone and covers about 80,500 acres.

- *Moderate-severity regimes:* Fires are infrequent (25-100 years); they are partial stand replacement fires, including significant areas of high and low severity. They occur in areas with typically long summer dry periods and fires will last weeks to months. Periods of intense fire behavior are mixed with periods of moderate- and low-intensity fire behavior; variable weather is associated with variable fire effects. Historically this regime would be characteristic of the Douglas-fir and grand fir zones and covers about 328,500 acres.

- *Low-severity regimes:* Fires are frequent (1-25 years); they are low intensity fires with few overstory effects. Frequent fires limit the time for fuel to accumulate, so typical fire intensity is moderate to low. Historically this regime would be characteristic of the ponderosa pine zone and covers about 242,300 acres. The grass and shrub lands would also be included in this regime.

Existing Conditions

The fire regimes as shown above have formed the structure of natural forests on the Reservation. There are, however, few places on the Reservation where forestlands have been managed for natural conditions such as those created by fires of the past. Fire is less prevalent on today's landscape than in historic times, due to effective fire control policies. Success in fire suppression has allowed more uniform and increasing fuel loads across the Reservation, shifting forest fire effects that were typically of low and moderate severity in historic fires to severe fires today. Ironically the increased risk of valuable timber loss has forced the use of more intensive and often mechanized forms of suppression actions. This in turn has added to fire costs with greater impacts on other resource values (CCT 1992).

Fire exclusion, and past selective cutting, has changed the structure, composition and density of the today's existing forest. Fire suppression removed the primary source of natural thinning in forest stands. It also removed a powerful force that selected in favor of seral species by favoring thick-barked fire resistant trees and shade intolerant pioneer species. Additionally, suppression of naturally recurring fires has allowed the accumulation of fuels.

Selective harvest methods have advanced the successional character by disproportionately removing seral species while opening up the forest canopies enough to favor the establishment of either brush or shade tolerant climax species. Favoring the creation of understory plant communities changed the structure, or multiple canopy stands. What now exists after eighty years of management are many multi-level stands that support more trees per acre than they did historically. The upper canopy levels are often made up of the remnants of the pre-management forest, largely ponderosa pine and western larch. The lower levels are frequently made up of over-dense stands of shade tolerant, climax species. Accumulated fuel levels are high. Historical photographs and narratives illustrate a change in understory vegetation with brush becoming a more dominant component.

Historically, stands having the current structure, composition and density were rare or temporary in nature. In 1960, Harold Weaver reported that nearly the entire forest had been burned at least once since 1910. The intensity of these fires had varied from light surface burns to stand replacement crown fires. Particularly extreme fire years occurred between 1910 and 1931 (Table III-2). These fires appear to correspond to a very large area now occupied by 60 to 80 year-old trees (Boyce and Dumas 1997). Records show that 631,772 acres or nearly 50 percent of the Reservation has been affected by wildfire in the past 90 years (Table III-2).

Table III - 2. Extent of Wildfire Occurrence on the Colville Reservation between 1911 and 1998 (CCT GIS Database).

PERIOD	ACRES
1911-1944	404,052
1945-1959	36,309
1960-1969	59,716
1970-1979	16,098
1980-1989	54,957
1990-1998	42,571
Unknown	18,069
Total	631,772

FISHERIES RESOURCE

Historical Use

From a historical perspective Ray (1933:28) reported that the fishing season on the Reservation began around the first of May, overlapping with root digging activities, and that sturgeon and small fish were taken first. The salmon would not start appearing until a month or so later, and the salmon fishing season would last until mid-August with some fish continuing to be taken in September and October. Many of the people chose to use fishing spots near their winter village sites while others traveled some distance to preferred locations such as the mouth of the San Poil or Spokane rivers or Kettle Falls (Ray 1933:28).

Characteristics

An in-depth review of historical fish population and habitat conditions on the Colville Indian Reservation was provided by Hunner and Jones (1997) in the Phase I Hydrology report for the Integrated Resource Management Plan. This report will summarize major conclusions of that document for the purposes of evaluating alternatives presented in this programmatic EIS.

Fish species composition on the Reservation has changed from historical conditions (See Appendix B). Formerly dominated by anadromous fish and resident species of native brook trout (bull trout), rainbow trout and cutthroat trout, fish populations are currently dominated (>70%) by eastern brook trout, with some native rainbow and cutthroat trout present. Bull trout are not known to presently occur on the Reservation. Lakes contain mostly warm water and trout species. Over 31 lakes on the Reservation are non-fish bearing because of natural water quality alkalinity levels.

Hunner and Jones (1997) attributed the decline of Reservation fisheries to three activities: over-harvest (off Reservation), water diversions, and habitat degradation. Habitat degradation has occurred from timber harvest, urbanization, conversion of land to agricultural uses, livestock grazing, fire suppression and road building activities.

Estimates of historically (pre-European influence) available anadromous salmonid spawning habitat were used by Hunner and Jones to speculate on historical population density of salmonids on the Reservation. Their calculations estimated an annual run of 20,009 spring chinook, 13,341 summer and fall chinook, 22,918 coho and 67,033 steelhead. Currently the Reservation does not have habitat suitable to support populations of that size (see Fig. 26 and 27, Hunner and Jones 1997).

Hunner and Jones also reported past presence of chinook in Barnaby Creek, Bridge Creek, Gold Creek, Nineteen Mile Creek, the San Poil River, Spring Creek, Thirtymile Creek, Twenty-one Mile Creek and Round Lake. Chinook are not presently known to inhabit any of these areas.

Existing Conditions of the Fisheries Resource

Riparian Habitat

Hunner and Jones (1997) concluded that virtually all streams on the Reservation have been altered from their natural state as a result of logging, road building activities, grazing, mining, dams and agricultural use. Approximately 50% of stream and riparian areas on the Reservation are defined as severely impacted (less than 50% of potential riparian vegetation exists and greater than 50% fines in stream substrate), and 25 percent are moderately impacted (75% potential vegetation, 40% fines in stream). Agriculture activities impact five to 10% of streams, causing nutrient and sediment loading of streams from runoff and erosion, contamination from pesticide applications and loss of riparian vegetation.

Nearly 90 percent of the Reservation's streams in the forest zone have suffered impacts from 90 to 100 years of timber harvest activities. Road building with improper drainage structures and sloping have caused high sediment loading into streams. Improperly functioning or constructed culverts prevent fish passage through streams. Large woody debris is lacking due to harvest activities in riparian areas, and pool/riffle ratios are low in approximately 60% of the streams.

The loss of streambank vegetation, LWD, and stream complexity render instream populations of fish more vulnerable to effects of temperature extremes (summer and winter). Lack of shade and reduced flow conditions raise water temperatures above fish tolerance levels, and freezing water temperatures in streams with low winter flows jeopardizes overwintering survival. Lack of pools and backwater areas in streams creating refuge habitat for resident species during high and low flows results in a decline of instream fish populations.

Hunner and Jones (1997) compiled data on Habitat Quality Indexes for selected streams on the Reservation that are shown in Table III-3.

Fisheries Populations

At the present time there appears to be no current quantitative information on current fish species and populations in streams and lakes on the Colville Reservation. Current information, however, does indicate that fish populations in Reservation streams are dominated by introduced eastern brook trout with a few native rainbow and cutthroat trout also present. Lakes contain both warm water fishes and trout species.

Eastern brook trout *(Salvelinus fontinalis)* have been stocked in Washington state since the late 1890's and are found in most flowing waters of the Reservation (Table III-3). Owhi Lake provides brood stock for eastern brook trout egg collection. Brook trout prefer cool headwater ponds and spring-fed streams, however populations on the Reservation appear to have adapted well to severely degraded habitat, including warm water temperatures (>20°C) and high levels of sedimentation (>60%).

Table III - 3. Fish Habitat Quality Index Ratings of Selected Streams on the Reservation. Data from Hunner and Jones (1997).

RESOURCE MANAGEMENT UNIT	STREAM	FISH HABITAT QUALITY INDEX RATING (Range) #1	CONSTRAINING ATTRIBUTE	FISH HABITAT QUALITY INDEX RATING (Range) #2
Hall Creek	Hall Creek	Moderate		
Lower San Poil	San Poil @ Keller	Fair/moderate		
	San Poil near Keller	Moderate (fair to good)	NO_3; temp.	Moderate (mod - fair)
	Lower Manila Cr.	Fair/moderate (poor to mod)	NO_3	Moderate
	Upper Manila Cr.	Fair/moderate (poor to mod)	NO_3; temp.	Moderate;(mod-fair)
	John Tom Cr.		NO_3	Moderate
	Meadow Cr.		NO_3	Moderate
	Jack Cr.	Fair/moderate (poor to mod)	NO_3	Moderate
Upper San Poil	San Poil R. (above Thirteenmile Cr.)	Moderate (fair - good)	Temperature	Moderate (mod - fair)
	Bridge Cr	Fair/moderate	Temperate	Moderate
	Thirteen Mile Creek		Temperature	Fair-poor
	San Poil River (just below West Fork		Temperature	Moderate
	Granite Cr (near Republic)	Fair/moderate		
West Fork SPR	W. Fork San Poil R.	Fair/good	Temperature	Moderate
	Gold Creek		Temperature	Moderate
Nespelem River	Nespelem River (below Millpond)	Fair/moderate		
	Nespelem R. (by rodeo grounds)		Temperature	Moderate
	Kincaid Creek		Temperature	Moderate
Little Nespelem R.	Little Nespelem River		Temperature	Moderate
Buffalo/Swawilla	Poker Joe Cr.		Temperature	Moderate
Kartar Creek	Coyote Cr.		Temperature	Fair
	Kartar Cr.		No_3	Moderate
	Nason Cr.		No_3	Fair
	No Name Cr.		No_3; temp	Moderate
Omak Cr.	Omak Cr (Mill Site)		Temperature	Moderate - poor
	Omak Cr. (below Mission Falls)		Temperature	Moderate-fair
	Omak Cr. (near French Valley)		Temperature	Moderate
	Mission Cr.		Temperature	Moderate - fair
	Wanacut Cr.		Temperature	Poor
Wilmont Creek	Nez Perce Creek		NO_3	Fair
Hellgate	Sixmile Creek		NO_3	Moderate

#1 - Ratings based on a) late summer mean daily discharge to annual mean daily discharge ratio and b) annual stream flow variation.

#2 - Based on warm temperature and Excessive Nitrate-N Constraint.

Other fish species currently found on the Reservation include rainbow trout, cutthroat trout (Lahotan, Westslope and Cascade), brown trout, kokanee, sockeye salmon, largemouth bass and redside shiners. Most of these (except for sockeye) have been stocked on the Reservation since the 1930's. Sockeye pass through Reservation waters during migrations, but may spawn in select slack water areas.

Bull trout and Chinook salmon are not found in streams on the Reservation but may occur in boundary waters of the Reservation.

Current Fisheries Research and Management Activities

Tribal Trout Hatchery Program

Tribal hatchery production operates to enhance subsistence and recreational fisheries and to contribute to natural fishery production on the Reservation. During the 1950's most fish stocked were fry and fingerlings from state hatcheries. Current tribal stocking activities include sub-catchable, and catchable sized fish. Annual production goals for the hatchery are:

- 160,000 fingerling rainbow trout
- 330,000 subcatchable rainbow trout
- 80,000 legal sized rainbow trout
- 196,000 fingerling eastern brook trout
- 330,000 subcatchable eastern brook trout
- 100,000 Lahotan cutthroat trout

Lake Roosevelt Rainbow Trout/Passage Improvement Project

The Lake Roosevelt Rainbow Trout/Passage Improvement Project's goal is to improve rearing habitat and passage conditions for native adfluvial rainbow trout utilizing Lake Roosevelt tributaries. Principal areas of focus are tributaries of the San Poil River. Program elements include removal of passage barriers, improvement of flow duration, riparian vegetation and habitat complexity. This project receives funding from the Northwest Power Planning Council's Fish and Wildlife Program.

Chief Joseph Dam Kokanee Enhancement Project

The goal of the Chief Joseph Dam Kokanee Enhancement Project is to protect and enhance natural production of kokanee *(Oncorhynchus nerka)* in streams above Chief Joseph and Grand Coulee Dams. Streams targeted for evaluation include the San Poil River, Nespelem River, Big Sheep Creek, Deep Creek, Onion Creek, Alder Creek, and Ora-pa-ken Creek.

Lake Roosevelt Fishery Management

Lake Roosevelt Fishery Management programs have four goals. First, create and maintain a high quality kokanee and rainbow trout fishery above Chief Joseph and Grand Coulee Dams. Second, maintain and enhance natural populations of wild kokanee and rainbow trout. Third, create and maintain a balanced ecosystem able to withstand unfavorable lake operations, and fourth, develop a fisheries management plan incorporating lake improvements to benefit kokanee and rainbow trout fisheries.

Omak Creek Watershed Restoration Project

The Omak Creek Watershed Restoration Project seeks to restore stream and ecosystem processes so that an anadromous fishery can be reintroduced into Omak Creek. This effort is a cooperative one between the Natural Resources Conservation Service of Okanogan County, and the Colville Tribes' Environmental Trust, Range, and Fish and Wildlife Departments.

Other Monitoring Programs

Confederated Tribes Surface Waters Monitoring Program

A program of limnological data collection on Bourgeau, Buffalo, Elbow, Gold, Goose, Little Goose, McGinnis, Nicholas, North and South Twin, Omak, Owhi, Round, and Sugar Lakes was undertaken to provide baseline limnological information for select Colville Reservation lakes. This data is available on the World Wide Web at http://www.wsu.edu:8080/Lake/.

Creel surveys

Annual creel surveys are made on Buffalo, Omak, North and South Twin Lakes, and Owhi Lake provide CPUE, public use trends, and hatchery success rates. This data, however, was not available for this analysis.

Proposed, Endangered, and Threatened Fish Species

Bull Trout

Bull trout are native salmonids found in the upper Columbia River Basin drainages. They have been the object of much attention and discussion since their populations and range of distribution have been declining. Currently bull trout are listed as "Threatened" species by the USFWS on June 10, 1998 (63 FR 31647).

Bull trout closely resemble Dolly Varden *(Salvelinus malma*) and were long considered an inland form of that coastal anadromous trout until Cavender (1978) identified them as a distinct species. The American Fisheries Society officially recognized them as *Salvelinus confluentus* in 1980.

Most salmonids have specific habitat requirements for successful life histories, however bull trout are considered habitat specialists (Rieman and McIntyre 1993). Channel stability, high winter flows, low summer flows, substrate, cover, cool water temperatures in summer, and the presence of migration corridors appear to influence distribution or abundance of bull trout (Allen 1980; Fraley and Graham 1981; Leathe and Enk 1985; Oliver 1979; Thurow 1987; Ziller 1992 - all as cited in Rieman and McIntyre 1993).

As of fall 1995, bull trout had not been observed in waters of the Reservation for five years, with the exception of one specimen found in Lake Roosevelt in 1990 (Hunner and Jones, 1997). It is believed that bull trout were common on the Reservation, however elder tribal members referred to them as 'native brook trout', and some reports of bull trout may have been cutthroat trout. Habitat degradation, loss of prey species (salmon and steelhead fry and fingerlings) and the introduction of brook trout beginning in the 1890's have all contributed to the loss of bull trout on the Reservation (Hunner and Jones 1997).

Bull trout are thought to have been extirpated in the Okanogan River, Nespelem, San Poil, and Kettle rivers; Barnaby, Hall, Stranger, and Wilmont creeks according to the NMFS ESA listing for bull trout.

Chinook Salmon

All Chinook salmon in the Okanogan River are apparently anadromous and are considered part of the Upper Columbia River Summer- and Fall-Run ESU. After careful review NMFS ruled that this ESU did not require protection under the Endangered Species Act provisions.

GEOLOGY, MINERALS AND SOILS

Hunner and Jones (1997) prepared an extensive IRMP Phases I Inventory and Analysis Report on the hydrology of the Colville Reservation. In this document significant attention was paid to the geology and soils found on the Reservation including their historic and present conditions. It is not the intent of this affected environment section to repeat that information, but rather to briefly describe those geologic, minerals, soil and watershed features that affect resource management on the Reservation and where management action would most likely be affected by the proposed action in this EIS.

Geology

The Colville Indian Reservation is located at the southern extreme of the Okanogan Highlands physiographic province, which encompasses the southern end of a unique and distinctive geologic feature (See geology map in Analysis file) referred to as the Okanogan subcontinent (Alt and Hyndman 1984). This land unit is considered to have originated as a micro-continent composed of old geologic materials and was estimated to have been approximately the size of California. The subcontinent existed at some unknown distance off the western coastline of North America and was rafted against the western coastline of North America approximately 100 million years ago as part of a plate tectonic process. Deformation of the original Okanogan subcontinent, subsequent igneous intrusions and associated metamorphism, and later volcanic activity has acted to produce the rock types found on the Reservation.

The oldest known rocks exposed on the Colville Reservation generally consist of metamorphosed sedimentary rock units known collectively as the Covada Group (Pardee 1918). The metasediments of the Covada Group are primarily derived from the metamorphism of preexisting sedimentary rocks of the Okanogan subcontinent. Covada rocks date to the Paleozoic Era (possibly to the Ordovician Age), although an exact age has not been confirmed. The rocks present in the Covada Group consist primarily of shale, slate, argillite, schist, and quartzite with localized conglomerate, limestone, and greenstone (Pardee 1918). These rocks are complexly interbedded. Although no reliable estimate of thickness has been given for the group, the thickness is likely a few thousand feet (Pardee 1918). Exposed rocks of the Covada Group are located primarily at the eastern portion of the Reservation, although isolated outcroppings of the rocks occur in the central and south-central portions of the Reservation.

The principal rock types present on the Reservation include intrusive and volcanic igneous materials that invaded the older rock masses around the time that the Okanogan subcontinent rafted against the Pacific Coast of the North American continent. These rocks are generally of granitic composition and are of Cretaceous and early Tertiary age. Collectively, these rocks form the Colville Batholith that occupies about half (western) of the Reservation (Rinehart et al. 1975). The batholith likely makes up the entire plutonic basement beneath the Reservation, and areas of metamorphic and later igneous rocks are probably underlain by the batholith. The batholith consists of individual plutons that are of similar composition and age. The rocks of the Colville Batholith include mainly granite, granodiorite, quartz diorite and diorite.

Younger volcanic rocks form an extensive area in the central part of the Reservation. These rocks are known collectively as the San Poil Volcanic Sequence (Cooper and Beak Consultants 1990). The San Poil Sequence includes largely rhyodacite and andesite lava flows with associated volcanic tuffs and breccias. Water-laid volcaniclastic sedimentary strata (for example, the O'Brien Creek Formation) are also present within the San Poil Sequence. Numerous dikes, generally associated with the San Poil Volcanic Sequence, have been intruded into the rocks of the Reservation. The dikes are mostly of diorite and granitic composition. The dikes generally trend to the northeast, although some northwest trending dikes occur.

The Okanogan Plateau in the southwest part of the Reservation is underlain by flows of Miocene Columbia River Basalt. The basalt is a northern extension of the great flood basalt that covers much of the central Washington Columbia Basin. The basalt ranges up to about 1,000 feet in thickness at the southwest margin of the Reservation.

The landscape surface of the Reservation has been highly influenced by glaciation in the Pleistocene Epoch and in more recent times (Atwater 1985). During the Pleistocene Epoch, approximately three-fourths of the Reservation was covered by glacial ice of the Cordilleran ice sheet (Richmond et al. 1965). Glaciation took place on what is now identified as the Colville Reservation during two glacial periods. The Pinedale glaciation occurred between 8,000 and 25,000 years before present, while the Bull Lake Glaciation took place approximately 32,000 years before present. During both glacial periods, three primary lobes of glacial ice advanced and receded over the Reservation land (Clausnitzer and Zamora 1987). The three lobes were (1) the Okanogan Lobe which covered almost the entire western half of the Reservation except for the upper elevations of Moses and Armstrong Mountains; (2) the San Poil Lobe, which was mainly confined within the valley walls of the San Poil valley in the central part of the Reservation and terminated just nor of the confluence of the San Poil River with the Columbia River; and (3) the Columbia River Lobe which covered the entire eastern part of the Reservation.

A large area of non-glaciated terrain exists in the southeastern part of the Reservation. Most of this area, however, was inundated by Glacial Lake Columbia, which resulted in the deposition of glaciolacustrine sediment. Consequently, glacial deposits in the form of glacial till, outwash and lacustrine sediment cover most of the Reservation. Significant remnants of terraces formed by glacial outwash and alluvium can be seen at the near 2,400-foot elevation along the present Columbia River Channel. Lake Columbia was formed by blockage of the present Columbia River Channel near the mouth of the Okanogan River by glacial ice.

As the glacier melted it left deposits of glacial till, glacial outwash and glaciofluvial materials consisting mainly as sequences of silt, sand, gravel and cobble with some localized inner beds of clay. These unconsolidated materials are generally present as valley fill and terraces, and in some areas streams have reworked and re-deposited the materials as additional sand and gravel terraces. Lower valley fill and terrace deposits may be as much as 300 to 700 feet thick in the larger valleys. Conversely, some of the upper valleys are scoured into bedrock, with only a thin mantle of soil on valley sides and only several feet of sediment underlying the valley floors. Glaciolacustrine sediments underlie some low elevation drainage areas in the southernmost and eastern regions, such as in the San Poil River Valley, Ninemile Flat, and Lower Hall Creek valley. These deposits, dense and high in clay content, restrict water percolation and create elevated or perched groundwater tables. This situation enhances riparian and wetland plant community development.

Because of the removal of surface materials by glacial scour and the semi-arid climate, soil development on the southwest portion of the Reservation is minimal. Only in scattered locations are stands of conifer trees possible, most often the result of wind blown volcanic ash deposits, which provides sufficient soil water storage for tree survival during the dry summer months.

Minerals

Economic deposits of various minerals occur within the rocks of the Colville Indian Reservation and include both metallic and non-metallic resources (See minerals map in analysis file)). Metallic deposits include gold, silver, copper, zinc and lead. Antimony, molybdenum, tungsten, iron, nickel, manganese, chromium, and uranium are also present in some areas. An extensive deposit of molybdenum and tungsten is known to exist in the Mt. Tolman area in the southeast portion of the Reservation. Non-metallic deposits of potential economic value also occur on the Reservation. These include limestone, sand, gravel, silica and saline deposits (Rinehart et al. 1975).

The Covada, Nespelem, Park City, and Keller (also termed San Poil) mining districts are the primary mining areas for metallic ore deposits. The metallic ore deposits were likely emplaced and concentrated by hydrothermal activity associated with intrusions of granitic rocks and are believed to be of Tertiary age (Rinehart et al. 1975). Based on the number of occurrences and the quality of deposits, silver and lead are the metals of greatest importance on the Reservation, with gold and copper being of secondary importance. Concentrations of other ore types are less common on the Reservation or have lower quality.

The most common non-metallic mineral resources on the Reservation consist of sand and gravel deposits that could be used for concrete or construction materials. The sand and gravel deposits are the result of glacial activity and exist over much of the Reservation. Glacial lake clays are also common, and may by useful in the production of bricks or ceramics. A massive silica quartz deposit also occurs on the Reservation. Limestone suitable for building stone is present locally on the Reservation; however, most of this limestone is too fractured for this use and may be used more effectively as a source of lime. Saline minerals are present in lakes on the southwest plateau of the Reservation. However, economic deposits of evaporites have not been identified, and this mineral source is viewed mainly as a potential source (Cooper 1990).

Soils

Across the Colville Reservation soil survey has identified 178 soil series that have been further stratified into 530 series and phases (Appendix I, Hunner and Jones 1997). As recorded in the soil survey, soils across the Reservation vary widely in texture, depth, rock fragment content, and natural drainage. In general, soils on the uplands are generally suited for timber production, livestock grazing, wildlife habitat and recreation while soils on terraces and plateaus are also suited for these uses as well as for cropland and building site development.

The complexity of the soil mapping makes it very difficult to show map units at the scale used in this document. Thus, the Reservation soils map as well as the geology map and minerals map are available for inspection in the Analysis file at the Natural Resources Department. Map units referred to below can be found in the Analysis file soil map.

The soils of the Colville Reservation due to their significant heterogeneity vary widely in their potential for major land uses. Less than one-half of the Reservation is suited for commercial timber production. Map units 7, 10, 11, 15 and 17 are the warmest and driest forest soils with ponderosa pine the dominant conifer tree species and Douglas-fir subdominant where conditions are more mesic. Shrub and grass competition as well as high seedling mortality due to low precipitation and high summer temperatures are the major forest management concerns on these soils.

Map units 8, 9, 12, 13, 14, 16, 18, and 19 include forest soils that are cool and moist compared to those described above. Conifer tree species include Douglas-fir, western larch, grand fir, ponderosa pine and lodgepole pine. Many soils in these units have a mantle of volcanic ash that may be susceptible to compaction, puddling and displacement by timber harvesting equipment. Proper timing and planning of silvicultural treatments are important to minimize these impacts. Plant competition from shrubs and pinegrass can be severe; however forest productivity is generally moderate to high. Forest grazing potential is moderate to low depending on the successional stage of the stand.

Map unit 20 consists of the coldest and most mesic forest soils on the Reservation. Conifer tree species include subalpine fir, Douglas-fir, western larch, lodgepole pine, and Engelmann spruce, with whitebark pine at the highest elevations. The soils in this unit also have a mantle of volcanic ash that is susceptible to damage by timber harvesting equipment. Proper timing and planning of silvicultural treatments will assist in reducing compaction, puddling, and displacement of the volcanic ash mantle. Shrub and pinegrass invasion following logging can interfere with regeneration. Forest productivity is generally moderate to high. Forest grazing potential is low.

About 30.4 percent of the Reservation is classified as open or forested rangeland and is comprised of map units 1 through 6. Map units 1 and 3 are in the 9- to 12-inch annual precipitation zone. Forage production is generally low in these units because of low precipitation and limited available water capacity in many of the coarse textured soils. The hazard of wind erosion can be severe in areas that have been overgrazed and highly disturbed. Map units 2, 4, 5 and 6 are in the 12- to 15-inch annual precipitation zone. Forage production is correspondingly higher than in map units 1 and 3. Steepness of slope limits livestock distribution and range improvements in some area of all these map units.

Approximately 1.2 percent (15,000-20,000 acres) of Reservation lands are used for dryland crops. The main crops are winter wheat, spring wheat and barley. Non-irrigated cropland is concentrated in map units 2 and 4 with minor acreage in map units 3, 6 and 7. The main limitations for non-irrigated crops are the low annual precipitation and the hazard of water erosion. Wind erosion can be a problem especially on soils with sandy loam surface layers. Most crops are grown in rotation that includes fallow periods to enhance soil moisture conditions. An unknown quantity of these lands has gone into the federal CRP program in recent years and was seeded to native grass species.

Irrigated cropland comprises about 0.4 percent (5,500 acres) of the Reservation. Map unit 1 contains the largest acreage and is used mainly for fruit orchards, small grains, hay and pasture. The main limitations for irrigated crops are the hazards of wind and water erosion and the low moisture holding capacity of the coarse textured soils. Map units 2 and 7 are generally suited to orchards in areas below 1,800 feet elevation remembering that other factors such as aspect and air drainage are also important considerations for orchard site selection. Some soils, such as the Nespelem and Cedonia series, have limited water intake rates and permeability's that require special consideration in irrigation system design to prevent misuse of the land. Map units 8 and 9 are generally suited to irrigated hay and pasture.

The potential for recreational use varies considerable and is dependent on the intensity of use and properties of the soil. Map units 1, 2, 7, 8 and 9 have the highest potential for campground uses and water sports, such as boating, fishing, and swimming, because of their proximity to the major rivers and lakes as well as generally moderate slopes. Map units 10 through 20 have good potential for hiking, backpacking, and horseback riding trails because of mountainous topography with high aesthetic value. These units also are well suited for cross-country skiing because of a reliable snowpack in most years and an extensive road network.

Watershed Sensitivity Analysis

Landscape Features

Landscape features vary widely across different areas of the Reservation. Distinct differences exist in physiography, geology, soil characteristics, erosion processes, vegetation and drainage patterns and features. As a result of these differences a wide range of soils types have developed across the Reservation. These soils are quite variable in terms of parent material, depth to restricting layer, landscape position, slope, and drainage class. Soils have developed in glacial deposits and material weathered from different bedrock types. Rangeland soils have a component of loess, warm forest soils have a component of loess and volcanic ash, and cool forest soils have a mantle or component of volcanic ash with some loess. The volcanic ash mantle commonly occurs on all aspects at the highest elevations, but generally only on northeastern aspects at lower elevations.

Soil depths vary from very shallow (less than 10 inches) to over deep (greater than 60 inches) in material weathered from bedrock and are usually very deep in glacial, alluvial and eolian deposits. Areas of extensive rock outcrop occur in the San Poil Valley and on the northeast side of Omak Lake. Less extensive, but significant outcroppings occur elsewhere, especially in the Buffalo Lake/Swawilla, Omak Creek and Southwest Plateau Resource Management Units (RMU). Hillslope gradients range from gently sloping (about 5 percent) to very steep (greater than 60 percent) in uplands and on terrace escarpments, and are nearly level on terraces and bottomlands. Most upland soils are well drained and bottomland soils along streams are moderately well to very poorly drained (water table is high). Soil formed in sandy glacial outwash and eolian deposits are excessively drained and soils formed in clayey glacial lake sediments commonly are moderately well-drained to poorly drained.

Sensitive Soils

Because of these differences in soil development, landscapes across the Reservation are not equally susceptible to adverse impacts that may lead to compaction, loss of productivity, and accelerated surface erosion and mass wasting. All soils will compact to a certain degree, but wet soils and highly porous soils are particularly sensitive to natural and man-induced disturbances. Notably, volcanic ash and loess of low bulk density and high porosity is easily compacted particularly under optimum soil moisture conditions. Composed largely of silt and fine sand particles, ash and loess are easily eroded. In some soils on the Reservation, the ash mantle with a mix of organic matter constitutes the major nutrient and water retention component of the soil base. These soils are highly susceptible to significant loss in productivity through displacement and compaction (Klock 1975). Compaction impedes root development as well as retards soil moisture recharge and induces accelerated runoff and erosion of the fertile topsoil. Soils containing an admixture of ash in the soil surface rather than a relatively pure ash cap are somewhat less sensitive to disturbance and less erosive.

Inherent Watershed Rating

Hunner and Jones (1997) developed an Inherent Watershed Rating for the soil types and phases found on the Reservation. These sensitivity ratings are an index for defining a soil's susceptibility to disturbance (displacement and compaction) as well as sensitivity to surface runoff and consequent erosion. In the development of this rating, sensitivity-rating classes of low, moderate and high were assigned to each soil type and phase map unit based on its specific attributes creating a numerical rating. The results of this summary evaluation by Resource

Management unit is shown in Table III-4. Specific inherent factors that influenced the analysis are also described for each Reservation's RMUs by Hunner and Jones (1997), but are not included in this affected environment report. The Inherent Watershed Rating on a Watershed Management Unit basis is shown in Appendix C, Table C-1 and summarized in Appendix C, Table C-2.

Watershed Sensitivity

Watershed sensitivity can be defined as the inherent capacity of a watershed to regulate or modify flow regimes and exhibit stable erosion patterns or tendencies. It is a measure of resiliency or physical stability of a watershed system in balance and the capacity of a watershed to adsorb impacts brought about by natural and man-induced events up to a certain threshold and return to a stable former state. Beyond this threshold, a series of long-term changes may take place as the system adjusts to a new set of conditions, i.e., changes in peak flow and sediment load.

Table III - 4. Inherent Watershed Sensitivity Ratings for the Colville Reservation Resource Management Units (Hunner and Jones 1997).

RESOURCE MANAGEMENT UNIT	INHERENT WATERSHED SENSITIVITY
Hall Creek	Moderately High
Twin Lakes	Moderate
Wilmont Creek	Moderate
Ninemile Creek	High
Lower San Poil River	High
Upper San Poil River	Moderately High
Hellgate	Moderate
West Fork San Poil River	Moderately Low
Nespelem River	Moderately Low
Buffalo Lake/Swawilla	Moderate
Omak Creek	Low
Little Nespelem River	Moderately Low
Kartar Valley	Low
Lost Creek	Low
Southwest Plateau	Very Low

Because of differences in landscape features, the sensitivity of watersheds and sub-areas within them to certain resource management practices varies from place to place. While one location may generate no likelihood of local or cumulative effects from an activity, the same activity conducted in a similar way in another location with higher sensitivity could have both site specific and cumulative impacts.

Soil characteristics have a large influence on the sensitivity of watersheds. Parameters that influence (1) surface runoff volume and erosion, such as soil infiltration rate, vegetation type, and ground surface conditions, and (2) surface runoff rate (time of concentration and peak discharge) such as topography and watershed size and shape, were considered for use in the analysis. These factors affect the infiltration, storage, routing, and release of water to channels and, thus, regulate runoff timing and flow regimes.

Inherent Watershed Sensitivity

All watersheds have an inherent hydrologic sensitivity or stability that translates into its capacity to regulate or modify its hydrologic response and exhibit stable erosion patterns. It is the capacity of a watershed to absorb impacts brought about by natural and human-induced events up to a certain threshold, beyond which a series of long-term negative changes may occur to the soil and water resource base. Parameters linked to this sensitivity include watershed size, shape and aspect, hillslope gradient, elevation, geology, soil and vegetation types, and precipitation patterns. The health and quality of the soil and water resource base in a highly sensitive watershed is quite vulnerable to man's activities.

Hunner and Jones (1997) described the methodology used to develop Inherent Watershed Sensitivity ratings for the 209 Watershed Management Units on the Colville Reservation. The analysis methodology used to develop the indexed sensitivity ratings was based on the following parameters.

1. Soil erosion index
2. Soil surface and substratum type
3. Hydrologic soil group
4. Soil depth to restricting layer
5. Hillslope gradient
6. Precipitation type/elevation zone

The Inherent Watershed Sensitivity for the 209 Watershed Management Units are shown in Appendix C, Table C-1 and summarized in Table C-2. It appears that about ten percent of the WMUs comprising about 10 percent of the Reservation area have "extreme" or "high" inherent watershed sensitivity. The relative difference between inherent soil and watershed sensitivity is basically the potential for rain-on-snow events in the Reservation's watersheds.

Current Managed Watershed Sensitivity

Land-based disturbances induced by man may result in a watershed that has greater runoff efficiency and hydrologic sensitivity; that is, it has suffered a loss in its ability to detain and slowly release water and to moderate peak flows along with surface and channel erosion. Conversely, many watersheds are stable and have illustrated their resilience to withstand both natural and man-induced changes. Scientific results (Grier and Klock 1985) indicate that while forest practices can significantly alter hydrologic systems in some instances, in others they have little or no effect. Part of the variability in response can be attributed to the wide range of practices associated with road development (location, construction, drainage systems, maintenance), harvesting (silvicultural treatments and logging systems), site preparation and riparian management practices. The magnitude of hydrologic response may be contingent upon an array of watershed variables including geology, climate, topography, landforms, stream density, vegetative cover and patterns, and natural disturbance regimes (Reiter and Beschta

1995). Current managed watershed sensitivity as used is this document is the same as Current Watershed Sensitivity Analysis (Rating) developed by Hunner and Jones (1997).

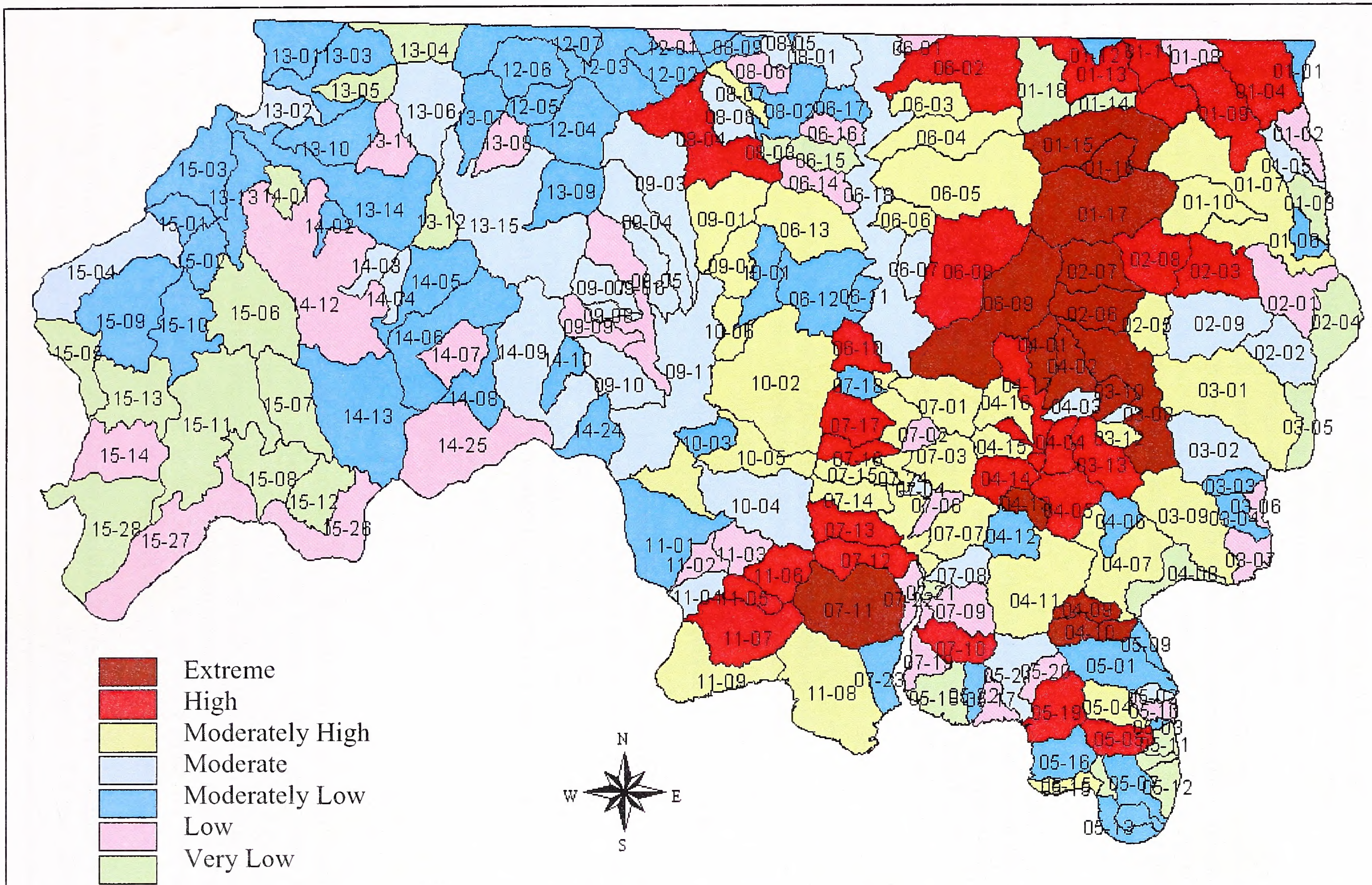
The current Managed Watershed Sensitivity Rating developed by Hunner and Jones (1997) is an index to ground-based disturbances. It is a function of the inherent watershed sensitivity as shown for the Reservation in Appendix C, Table C-1 and the spatial extent of ground impacts such as soil compaction and displacement. Vegetation management, grazing, road building and other activities on hillslopes and in riparian areas may induce adverse impacts. These impacts and concurrent loss of vegetation are irreversible unless mitigation is pursued. Hunner and Jones (1997) also considered road density as an indicator to the amount and extent of ground disturbance for other activities and to soil and water-related resource degradation. Road density is a parameter component factored into the Inherent Watershed Sensitivity rating for each Watershed Management Unit to determine a current Managed Watershed Sensitivity rating (Appendix C, Table C-1).

Hunner and Jones (1997) have also described methodology used in developing an index for their current Managed Watershed Sensitivity ratings. Again, note that the Inherent Soil Sensitivity is also a key component in the current Managed Watershed Sensitivity analysis. The analysis has been based on the following parameters:

1. Vegetation components of crown closure, species composition and size structure.
2. Road density by watershed management unit.
3. Sediment source zone road miles/stream miles by WMU.
4. Number of road stream crossings by WMU.
5. Soil sensitivity that includes erosion index, depth to bedrock, slope, parent surface material, substratum material, and hydrologic soil group.
6. Water retention capacity, which includes depth to bedrock, slope, and hydrologic soil group, and weighted by size of watershed (1,600-5,000, 5,000 to 8,200, and greater than 8,200 acres)
7. An analysis of potential stream impacts based on roads within 100 meters and overstory vegetation classes.
8. Precipitation/elevation zone

The current Managed Watershed Sensitivity Ratings for the 209 Watershed Management Units are also shown in Appendix C, Table C-1 and summarized in Table C-2. This analysis indicates that management activities have increased the extreme level of watershed sensitivity about four percent (from 4% to 8%) of the Reservation or on about 50,000 acres. Watershed restoration efforts should be considered on these watersheds and future timber harvest activities should be deferred if deemed necessary to improve the existing conditions.

Figure III- 7. Distribution of Watershed Management Units by Managed Sensitivity Level on the Colville Indian Reservation.



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Watershed cumulative effects are the impacts resulting from a series of management activities occurring within a defined watershed over a span of time. The summation of watershed practices and management over time and space may create a risk to lower elevation streams different from what might be expected from natural hydrologic events. Watersheds of low current sensitivity indicate a low cumulative-effects risk with a potential risk no greater than expected from natural hydrologic events. In watersheds of a moderate or high cumulative-effects risk, the rate or frequency, extent, and magnitude of geomorphic processes or events have been accelerated and intensified. In a sense, the sensitivity or fragility of these watershed systems has been enhanced and future management direction should be towards minimizing further impacts.

Wetlands

Hunner and Jones (1997) have noted that wetlands across the Reservation are quite variable because of precipitation patterns, but in general their area has been shrinking over time. To determine the extent of wetlands on the Reservation two methods were used: (1) the USDI Fish and Wildlife Service National Wetlands Inventory and (2) the Reservation soil inventory.

Areas identified as wetlands from the Reservation soil inventory include:

1. Hydric soils that were also in hydrologic group D (primary wetlands).
2. Hydric soil inclusions that were also in hydrologic group D (secondary wetlands)
3. Intermittent lakes.
4. Perennial lakes.
5. Known wet areas, springs, marshes or swamps or depressions ranging from 1-5 acres in size.

In the analysis it was recognized that many of the wetland soil type locations did not match the National Wetlands Inventory location data. Hunner and Jones (1997) point out a number of known discrepancies. These discrepancies apparently account for the difference in acreage values of 28,482 acres for the National Wetlands Inventory and the 39,590 acres for the wetlands identified from the Reservation soil inventory (Appendix L, Hunner and Jones 1997).

RANGE RESOURCE

Historic Conditions

Indian and non-Indian cattlemen alike capitalized on the Reservation's grazing lands in successful open range stock raising ventures, particularly in the Kartar Valley and Duley Lake region years before the allotment and white settlement era (Gough 1990). When the Reservation was opened to homestead entry in 1916, the area's abundance of rich grazing lands continued to be the primary attraction for would-be settlers. The Spokesman-Review (26 May 1916:12) reported that the chief value of the Reservation in the 350,000 acres to be open for settlement would be its grazing land where bunchgrass can be found that measures to the waist.

In addition to luring cattlemen, the Reservation's vast grasslands also attracted sheepmen. The country around Nespelem was particularly valued as sheep range. In the space of a few weeks in the spring of 1916, over 20,000 head of sheep were ferried across the Columbia (at a cost of one cent per head) to the Nespelem Valley and elsewhere (Spokesman-Review, 26 May 1916:12). Eventually, sheepmen established semi-permanent sheep stations at various grazing locations on the Reservation.

Horses shared and competed for rangelands with cattle and sheep on the Reservation. From the late 1800s through the 1930s, herds of wild horses roamed the Reservation (and a few still remain today). It was reported that by the 1920s, as many as 10,000 head of wild horses roamed between Inchelium and Keller alone (Louie 1990) while 2,000-3,000 occupied the Duley plain. Wild horses provided an important source of income for both Indians and white settlers on the Reservation. In the 1920s horses sold for an average of $5-7 per head, while horses that were broken to saddle or harness brought as much as $15 per head (1990). In addition, in the spring, homesteaders who were struggling to make a living farming on the Reservation routinely skinned the carcasses of wild horses that had fallen victim to "poisonous vegetation" and other natural causes and hauled the hides to Spokane, where the hides were traded for wheat seed (Wells 1973:31).

In addition to being a source of income, wild horses also provided entertainment for both Indians and whites living on the Reservation. The phenomenal popularity of rodeo and Western shows (both organized and spontaneous) was undoubtedly influenced by the sheer number and availability of wild horses on the Reservation (Gough 1990). A few elusive wild horses still run free on the Reservation (Condon 1990) and their management is directed under Tribal Code 4-14.

Existing Conditions

Geographically, the Colville Reservation is situated such that it includes a range of elevation, topography, soil types, precipitation, and climatic influences. Consequently, the Reservation supports diverse plant community types. Many of these plant communities have value for livestock grazing. Of the total 1,392,265 acres within the Reservation, 918,606 acres (66%) are within range units (1996 range unit summary). In broad terms, the allotments include 287,825 acres of shrub-steppe, 135,105 acres of savannah-like open forest, and 495,676 acres of denser forest plant communities.

The non-forested range has been classified into 56 range sites using the Soil Conservation Service (SCS), now Natural Resources Conservation Service (NRCS), site classification system. These 56 range sites have been grouped into 15 plant associations, potential natural communities (PNC's). However, three plant associations occupy most of the non-forested range acreage. These associations are: bluebunch wheatgrass/Sandberg bluegrass, bluebunch wheatgrass/ Sandberg bluegrass-needle and thread, and antelope bitterbrush/bluebunch wheatgrass. These associations occupy well-drained upland rangeland sites.

Hard use of the Reservation range has resulted in severe deterioration of many plant communities. Go-back land from failed farming attempts, now being grazed, is included as rangeland. Data developed from the SCS range survey in the 1980's indicates that approximately 57% of the shrub-steppe rangeland is in a poor condition. Poor condition is defined as less than

25% of the site occupied by native, late successional plants (PNC). Twenty percent of the range is rated fair or fair to poor. Fair condition indicates 24-50% of the site in PNC. Fourteen percent of the range is in a good condition (51-75% PNC). Only 9% of rangeland is rated as excellent (greater than 76% PNC). The Tribal Range Department recognizes that many seral stage range communities on the Reservation are productive and palatable producers of livestock forage, even though they do not meet criteria for good to excellent PNC. Further, they recognize that many of these seral stage sites are limited by biology, economics, or technology from being returned to PNC within the foreseeable future. It should be noted that the present condition of most range sites is due, in large part, to heavy use for long periods of time in the past. Present stocking rates and levels of utilization on most range units more accurately reflect actual range carrying capacity.

Little information is available regarding the forage resource on the forest sites. However, it is understood by most that adjustments to management must be made on forested range units to correct the existing heavy use in riparian systems (both lakeside and streams) and meadow complexes. The Tribal Range Department is in the process of developing Integrated Range Management plans using the Tribes' Holistic Goal to address these issues. The June 1992, Tribal Fish and Wildlife Department, Riparian Management Guidelines contain direction for range management in riparian areas to protect and enhance fish and wildlife habitat.

Poor condition range sites are the sites most vulnerable to weed invasion, to soil erosion, and to further reduction of their potential to provide forage, wildlife habitat or quality water. Because poor condition range is often an incomplete ecosystem, unfilled niches in the system are available for noxious weeds to invade and to establish. Roads and vehicle traffic are the principle vectors for weeds. The present weed program cannot treat enough acres to stay ahead of the spread of weeds.

Range Units

As of 1996, 60,924 livestock AUMs were used from the 56 range units on the Reservation. The AUMs are allocated to approximately 9,700 cattle and 175 horses. The grazing season begins in May in the low elevations and in June and July in the mountains. The season ends in October and November. Sixty-four Tribal members and 24 non-members hold grazing permits. Tribal members have preference for grazing permits. The fee rate for Tribal members is a base rate of \$0.66 per AUM, adjusted for fluctuations in live-weight steer prices. For non-members residing within the Reservation boundaries, the fee rate is \$6.00 per AUM. Grazing fee revenue goes to the Tribal fund. The usual term of a range permit is 5 years. Range permits are administered in accordance with Chapter 4-11 of the Tribal Code and the Code of Federal Regulations. The Tribal Code recognizes the importance of stewardship of the range resource, the need for integration of multiple uses on rangelands, and the opportunity for Tribal members to create new wealth from the range resource. Decision making for range management is vested in the Tribal Business Council, based on recommendations from the Tribal Range Department.

Chapter 4-11 of the Tribal Code contains most of the regulation needed to effectively administer the rangeland resource. However, funding is lacking to accomplish many of the on-the-ground activities required to monitor range compliance, to improve grazing efficiency, and to enhance rangeland sustainability. Grants from outside sources are relied on heavily to fund range activities. It should be noted that grazing permit revenues alone are not and most probably never will be adequate to fund a fully functional range management program for the Reservation.

Livestock carrying capacity for grazing units is based on a range survey done in 1957. However, on many range units, range condition may have changed significantly since 1957. Range units are being re-inventoried at the present time at the rate of approximately 3 units per year. The present thinking by the Tribal Range Department is that changes in stocking rate should be made on a range unit basis, giving consideration to: existing and potential species composition, condition and trend, potential for the site to recover, and existing and potential forage production. The Tribal Range Department recognizes that with better range management livestock carrying capacity can be increased while at the same time improving the condition of the rangeland to accommodate other Tribal objectives. These objectives might include: fish and wildlife habitat, culturally significant plants and animals, quality water, and open space.

Range improvements such as fencing, water developments, salt placement, cattle guards, access trails, and range reseeding are in place on the Reservation. However, many more such improvements are needed. The Tribal Range Department lacks funds to put in improvements and the permittees generally lack long-term tenure security sufficient for them to want to install improvements from their personal funds. Range improvements are considered affixed to the land and cannot be removed by the lessee upon termination of a permit unless it is specifically allowed in the terms of the permit (section 4-11-35, Tribal Code).

In recent years, efforts at livestock operator education have been increased. This has come about as the result of a US Dept. Of Agriculture EQIP grant to the Colville Confederated Tribes, part of which includes funding for an education program. The education effort has included field days, seminars, and range management information publications. The effort has expanded to assisting operators to develop holistic management goals for their operations that include their grazing permits.

Wild Horses

Chapter 4-14 of the Tribal Code contains the directives for managing wild horses on the Reservation. Free roaming wild horses are under the jurisdiction of the Colville Confederated Tribes and are managed as a part of the natural resources of the Reservation (section 4-14-1, Tribal Code). The Director of the Tribal Fish & Wildlife Department has been given broad management authority to insure proper maintenance and perpetuation of the wild horse herd, within the bounds of integrated resource use and of sustainability of the habitat. Chapter 4-14 regulates not only free roaming wild horses, but also owned horses under permit to graze on Tribal land. Section 4-14-10 specifies that any person who has a permit to graze horses on Tribal land shall manage their horses consistent with the Tribal Code.

Holistic Aspects

The range resource has many values to the people of the Colville Confederated Tribes. In addition to the livestock forage value these lands provide water, fish and wildlife habitat, culturally significant plants and animals, and a place suitable for cultural and spiritual renewal.

The rangeland communities include plants and animals unique to rangeland environments. Some of these require careful stewardship if they are to persist in rangeland communities.

The attitudes of Tribal members concerning how rangeland should be managed are as diverse as the products from rangeland. Opinions vary from using rangeland primarily for livestock production to livestock should be removed from the rangelands. A process to help the Tribal membership resolve these conflicting desires is not yet in place on the Reservation. The result is a high degree of frustration among many Tribal members toward Tribal resource management and what lays ahead for the rangeland resources on the Colville Reservation. The purpose of this Integrated Resource Management Plan is to give to the Colville Confederated information and methodology to resolve these resource allocation conflicts. Better stewardship of Tribal rangelands presents opportunities to increase productivity, diversity, and sustainability of rangeland environments.

RECREATION RESOURCE

Setting

Recreation may be defined as any activity pursued by an individual in which that individual seeks physical, mental, cultural and/or emotional replenishment. Within this perspective recreational activities could occur anywhere on the Reservation. (CCT 1999)

The 1.4 million acre Colville Indian Reservation contains a wide variety of physical settings from the dry semi-arid areas in the western portion, to the moist cooler forests of the eastern half, to scattered lakes throughout, and to reservoirs along the southern and eastern boundaries. The Reservation is primarily rural in nature with relatively few developed facilities.

Fishing and hunting are popular activities for Tribal Members as well as others. These activities are described and addressed in the *Wildlife* Section.

Cultural and traditional uses are also very important to the Tribes. Recreation planning and management must recognize these uses as well as protect the natural environment. The culture, traditions and practices are described in the Culture Section. Management direction is described in the Integrated Resources Management Plan (CCT 1998a) and the draft Parks and Recreation Program Recreation Plan (CCT 1999).

The Reservation's Parks and Recreation administration program reports to the Natural Resource Committee of the Colville Business Council. Currently the Parks and Recreation Program have a program director that manages three divisions within the program: Administration, Maintenance and Enforcement. (CCT 1999)

The Parks and Recreation Program receives Federal funding and funds from the Colville Tribes; for FY 1999 $591,000 Tribal and $331,375 Federal. The budget reflects expected expenses to the program with minimal upgrades and/or new projects. Approximately $90,000 is collected in camping and fishing fees.

Regional Existing Conditions

Regional recreation use was summarized for 1995 as follows (CCT 1999):

Visitor Arrival Centers - Coulee Dam	467,347 visitors
Omak Visitor Center	9,630 visitors
Okanogan National Forest	1,208,000 visitors
Wenatchee National Forest	5,300,000 visitors
Colville National Forest	1,983,200 visitors
State Parks on Lake Roosevelt	1,462,820 visitors

Visitors spent approximately $14,190,000 in Ferry County and $99,610,000 in Okanogan County. (CCT 1999)

The Colville Confederated Tribes are participants in the development of the Upper Columbia Tourism Network that includes the rural areas in Okanogan County and parts of Ferry, Douglas, Chelan and Grant Counties. The mission of the Network is:

> *To enhance tourism in the Upper Columbia region through cooperative planning and marketing by public and private partners, public education, and the promotion of the diverse natural, cultural, and recreational resources of the region.*

It is an area having well over 3,000,000 annual visitors but tourism-marketing efforts have been generally limited to promoting specific towns, resorts, or events. A broader based regional tourism strategy and organization has the potential to supplement current marketing efforts and to reach larger and more sophisticated audiences (Tourism 1999).

Reservation Existing Conditions

The Colville Tribes' Campground Permits in 1997 totaled 945,699 campground permits, 256 random camping permits, and 1 seasonal camping permit. These permits have been increasing yearly. In June and July 1999 the Parks and Recreation program requested current users to comment on what they currently enjoy, types of upgrades they need and general information about the users. A total of 133 surveys were completed. Boating and tent camping were the major use when camping, and trailer use was the next most popular. The order of amenities/facilities identified as needed were: 1-boat launch, 2-showers, 3-outhouse/restrooms, 4-swimming docks, 5-boat docks, 6-playground equipment, and 7-interpretive displays (CCT 1999).

Recreation facilities of the Lake Roosevelt Reservoir are operated by the Roosevelt Recreation Enterprises, a subsidiary of the Colville Tribal Enterprises (CCT 1999)

The reservoir and shoreline area behind Grand Coulee Dam is designated the Lake Roosevelt National Recreation Area, jointly administered by the National Park Service and the Colville Confederated Tribes. The Tribes are concerned with the protection of its portion of the 150-mile shoreline, adjoining uplands, and wildlife habitat. The Colville Tribal Park and Recreation Program was created in 1988 for the expressed purpose of protecting the Colville Indian Reservation's resources in this area. In 1990, when the Parks and Recreation Program became established, it took over the responsibilities of campground maintenance from the Fish and Wildlife Program.

Congress, in 1940, authorized acquisition of Indian Lands for the Columbia Basin Project and recognized that the Colville Confederated Tribes and the Spokane Tribe have the paramount right to hunt, fish and boat within an area of Lake Roosevelt equal to one quarter of the entire reservoir. By 1946 a formal agreement (the Tri-Party Agreement) was signed by the Bureau of Reclamation, the Bureau of Indian affairs and the National Park Service (but excluding the Colville Confederated Tribes and the Spokane Tribe) for management of Lake Roosevelt. This agreement created the "Indian Zone", one quarter of the entire reservoir, as a band of water within the Colville and Spokane Reservations extending to the mid-point of Lake Roosevelt.
About 1970 the NPS had ceased management and enforcement activities within the "Indian Zones". The tribes had taken over whatever park and campground maintenance they could afford. In 1974 the Solicitor for the Program of Interior confirmed the Indians' rights to manage within their respective Reservations, including the "Indian Zones". During the 1980's the Tri-Party Agreement was negotiated to include the Colville Confederated Tribes and the Spokane Tribe. A new agreement was signed and approved by all on April 20, 1990. This agreement recognized certain sovereign and governmental powers of an Indian tribe within their respective Reservations, including fish and wildlife harvest, recreation, environmental protection, protection and management of cultural, historical and archaeological resources and the development and utilization of resources on the Reservation including economic development and management thereof.

In a Draft Recreation Plan by the Colville Confederated Tribes Parks and Recreational Department (CCT 1999) it was pointed out that the Reservation has much potential regarding future recreation use sites. The Reservation provides the opportunities for a wide diversification of physical locations that could be developed by providing roads, picnic tables, outdoor restrooms, camp/park areas, watercraft access, etc. The Parks and Recreation Department has suggested that the recreational and tourism market could be used to increase Tribal revenues if recreational sites and activities were enhanced and/or increased have suggested it. However, because of the sensitivity of the Tribes' culture, traditions, and way of life, expanding recreational opportunities are taken cautiously with careful examination.

The major emphasis as requested by Tribal Members is to concentrate on adding and improving existing facilities. Future recreational opportunities have been identified and listed as short-term investments (could be implemented within a two year span) and long-term investments (will take additional time to research and develop). These opportunities are listed in Table III-5.

Table III - 5. Recreational Facilities on the Colville Indian Reservation (CCT 1999).

RECREATION SITE	CCT REC.	FEE	NONCCT REC.	DEVELOP OPPOR	RECREATION SITE	CCT REC	FEE	NONCCT REC	DEVELOP OPPOR
Omak Stampede Park			X		Owhi Lake West				
Omak Community Center			X		Apex Lake				
Inchelium Ferry (AA Camp)	UR	F	X	ST	Summit Wayside (Bridge Cr. Summit)	UR		X	
Elbow Lake Campground					Borgeau Lake				
Elbow Lake Shore					Bridge Creek Park		F		
Hideaway Campsite					Frosty Meadow A				
Barnaby Creek Picnic	UR	F	X	LT	Rogers Bar Campground	UR	F	X	ST
Barnaby Isle	UR	F	X		Buffalo L. Resort (Reynolds)	BL			LT
Barnaby Island Campsite	UR	F	X		Wilmont Ck. Campsite	UR	F	X	LT
13-Mile Ck. Campground	SP	F	X		Keller Park (San Poil Park)	F	F	X	ST
Okanogan River Mouth					McGinnis Lake	BL			
Buckskin Cr. Campground					Little Goose Lake	OM			
CCC Campground					Omak Lake-Kartar Rock	OM			LT
Hall Creek Camp	UR				Omak Lake-Baines Beach	OM			LT
Lafleur Lake. Campground					Big Goose Lake	OM			
Hall Creek Park					Sandy Beach				
Sitdown Creek Camp					Sam's Place (not maintained)				
Simpson Lake Campsite					Rebecca Lake				
21.Mile Ck. Campground	SP	F		LT	Rogers Bar 3	F	F		

RECREATION SITE	CCT REC.	FEE	NONCCT REC.	DEVELOP OPPOR	RECREATION SITE	CCT REC	FEE	NONCCT REC	DEVELOP OPPOR
Gold Lake Campground					Barney's Junction	UR			LT
23-Mile Campground					Swawilla Basin	LR			LT
Bear Creek Campground		F		LT	Quarry Falls	LR			ST
Omak Lake-Mission End	OM	F	X		Crescent Bay (NRA)	LR	F	X	ST
Omak Lake-Nicholson B.	OM			ST	Twin Lake. Youth Camp	TW			LT
Northstar Campground	BL				Old North Twin Lake. Resort	TW			LT
Carson Beach					South Twin Lakes	TW			LT
Summit Lake. Campground					San Poil Arm Boat Launch	SP			ST
Rocky Point	TW	F		ST	Buffalo Lake. Public Access	BL	F	X	LT
Round Lake Area					Moses Meadows Area	OM			
Round Lake Shore					Chief Joseph Dam	RW			
Hidden Beach					Washburn island	RW			
Coyote Cr. Campground	BL	F			Rufus Woods Net Pens	RW	F		LT
Owhi Lake East					Moon Beam Bay				LT

CCT Recreation Areas – UR. Upper Lake Roosevelt: LR. Lower Lake Roosevelt: TW. Twin Lakes: SP. San Poil Arm: BY. Buffalo Lake: OM. Omak Lake: RW. Lake Rufus Wood.
Development Opportunities: ST. Short-term: LT. Long-term.

SOCIOECONOMICS

The Colville Business Council is one of the largest economic factors in north central Washington. Most importantly, the management of the natural resources on the Colville Reservation has a major socioeconomic influence on and off the Reservation within Ferry and Okanogan Counties. While tourism and recreation are increasing in value to the people of this region, these counties are sparsely populated and their economies are heavily dependent upon the production and processing forest products. Agriculture and mining are also important.

Regional Population

The estimated 1999 populations for Ferry and Okanogan Counties are 7,100 and 36,900 respectively (CCT 1996). The total population of both counties is markedly less than one percent of the State of Washington's total.

The largest city and county seat in Ferry County is Republic with a population of about 1,100 residents. Okanogan, Omak and Tonasket are the largest cities in Okanogan County on or near the Reservation with estimated populations of 2,410, 4,365 and 1,025 respectively (CCT 1996). Okanogan is the county seat. The Colville Reservation population in Ferry County is 1,653, about 23 percent of the current population and it is 7,692 or 21 percent in Okanogan County.

Reservation Population

Of the 7,692 people who live on the Reservation in April 1999, approximately 4,760 or 62 percent are enrolled Tribal members. The total enrolled Tribal Membership is 8,538 and the remaining 3,778 Tribal members live off the Reservation. Members living off the Reservation still have an interest in the Reservation as they receive capita income from timber sales, land settlements, and grazing fees and may also own parcels of allotted land.

Employment and Income

Data published by the Confederated Tribes of the Colville Reservation (CCT 1999) indicates that 55 percent of the Reservation's population is age 21-69 with only 2,332 employed out of a total working force of 4,848. The median annual household income within the Reservation is $19,759 plus the majority of the employed persons are female. The median per capita income in Ferry and Okanogan Counties is $14,627 and $17,648 respectively, with the Native American median per capita income on the Reservation at $7,561. There is a 45 percent unemployment level within the Native American population located on or adjacent to the Colville Reservation. Out of the 4,760 tribal members, there are approximately 2,919 (ages 18-64 years) in the work force and approximately 63 percent are in need of employment. This employment and income data has changed little since 1996 (CCT 1996). . It is estimated that close to one-third of the Colville Tribal members do not have the necessary financial resources to meet minimum economic day-to-day needs.

Major employers that are within the Colville Reservation are Colville Confederated Tribes, Colville Tribes Enterprise Corporation (CTEC), Bureau of Indian Affairs (BIA) and Indian

Health Service (HIS). These four identified employers provide a total of 2,040 individual jobs as of April 1996 (CCT 1996) of which about 25 percent are involved in forest product harvesting and manufacturing. Because of the Colville Tribal Employment Rights Ordinance, Indian preference is given in hiring and contracting for all work done on the Reservation.

Forest Product Revenues

Forest product revenues are the result of those activities of the forest products industry under the direction of the Colville Business Council.

During the 1978-1987 period, the average annual forest product revenue ranged from $6.4 million to $25.0 million with an average of $12.7 million. With an annual harvest range from 44.6 to 143.9 million board feet (mmbf) with an average of 86.9 mmbf, unit values average from 1978-87 about $146 per thousand board feet. For the period 1995-1999, the average unit value to the Tribes for timber processed at Colville Indian Precision Pine (CIPP) was $194 per thousand board feet and $137 per thousand board feet on non-CIPP processing.

FOREST VEGETATION

Resource Setting

The Colville Indian Reservation is situated along the southern edge of the forested region in northeastern Washington. Of the Reservation's 1,392,265 acres 1,189,233 acres (85%) are within forest Plant Association Groups. However, the Reservation is considered to be approximately 68 percent forested of which nearly 53 percent (738,000 acres) is classified as commercial forestland. The remaining forestland is classified as either biologically or economically marginal, or as inoperable under current or contemplated harvest methods. Of the total commercial forestland base, approximately 86 percent is owned by the Colville Confederated Tribes. Forest industry, private individuals, or individual tribal members own the remainder. (Boyce and Dumas 1996)

Because of the location of the Reservation and its elongated east-west shape, the Reservation encompasses the interface of three climatic regimes. Vegetation of the southern portion of the Reservation along the Columbia River reflects the strong influence of the arid and semi-arid climates and steppe region (shrub and grass dominated vegetation) of the north central Columbia Basin. The western half of the Reservation displays the strong influence of the rain shadow cast by the Cascade Mountain range that produces a warmer and drier climate than the ponderosa pine and Douglas-fir forestlands to the east. The eastern half of the Reservation (in particular the northeast corner) is influenced by the maritime weather patterns that produce the cooler and moister climates that add grand fir and western redcedar to the forest composition in the extreme northeastern Washington.

Climax dominated coniferous tree species distinguish the forest vegetation zones of the Reservation (Clausnitzer and Zamora 1987). These include the subalpine fir (*Abies lasiocarpa)*, grand fir (*Abies grandis*) Douglas-fir (*Pseudotsuga menziesii*) and ponderosa pine (*Pinus ponderosa*) zones.

Composition of the Reservation flora is strongly influenced by the degree of disturbance from logging, wildfire, grazing and cultivation as well as by the Reservation's geographic location. The highest degree of disturbance occurs in the ponderosa pine and Douglas-fir zones, which account for approximately 85 percent of the total land base (Boyce and Dumas 1996)

Current Management Goals

The Vegetation Resource Goals on the Colville Indian Reservation are to (1) provide suitable habitat conditions for desirable native and non-native species (flora and fauna) and (2) to maintain biodiversity, which includes the diversity of genes, species and ecosystems, as well as the evolutionary processes that link them. Managed landscapes would more closely resemble those created by the activities of historic disturbance agents, such as fire (natural and aboriginal ignitions), wind, insects, disease and animals, than now exist. The Forest Vegetation Management Objectives are to:

- Restore ecosystem processes by managing vegetation structure, stand density, species composition, patch size, pattern and fuel loading and distribution so ecosystems are resilient to endemic levels of fire, insects and disease. Land use emphasis may vary by zone or administrative boundary. The categories of land use will include timber production, wildlife, water, fisheries and recreation. Those areas not specifically delineated with a primary land use for wildlife, water, fisheries or recreation will have timber production as the emphasis.

- Manage production activities and their levels on available and suitable lands to produce commodities that create or maintain the Desired Range of Future Conditions. At the same time, maintain ecosystem processes, including disturbance intensities and frequencies.

- Restore fire as a natural process by developing and implementing prescribed fire plans on a landscape scale.

- Rehabilitate wildfire disturbed areas to restore native species, maintain productivity and prevent undue soil loss.

Biodiversity has been defined as the natural variability of life forms, genetic make-ups, biological processes and ecological niches that occur in any specified location or region through recent adaptive evolutionary time. The Colville Confederated Tribes objectives for biological diversity are to provide for all seral stages of terrestrial and aquatic plant associations existing and/or desirable for the Reservation, with a distribution that is ecologically sound and ensures continued reproduction of the species.

The factors for assessing biodiversity are highly dependent on the existing conditions and the scale or size of area being evaluated. Biodiversity on the Reservation is best described by the variety of environmental conditions available for maintenance of plant and animal populations. The diversity of plant associations and successional communities, the kind and distribution of seral/structural stage habitats, and the prevalence of habitat fragmentation and availability of corridors will be used as the base indicators of Reservation biodiversity.

In an ecosystem approach to natural resource management it is assumed that the current vegetation conditions have been modified by man's actions. This could be as either direct impacts, such as, logging and livestock grazing, or it could be through the indirect changes to natural fire regimes due to wildfire suppression. Naturally functioning ecosystems are considered to be more resilient to disturbances than are ecosystems that man has simplified through management. Ecosystem management assumes that vegetative structural conditions and species composition that were present prior to the early 1900's are more desirable than current conditions.

In order to develop meaningful ecosystem management prescriptions we need to have some idea of what the past was like (Historic Range of Variability), what we would like the future to be like (Desired Future Conditions), and where we are now (Current Existing Conditions). The Historic Range of Variability (HRV) is determined through old records, photographs, diaries and surveys. The Desired Future Condition (DFC) is determined by merging the biological potential for an area to return to the HRV with the current and future social concerns and desires of the Colville Confederated Tribes. The Current Existing Conditions (CEC) has been complied from forest surveys, stand exams and recent satellite imagery mapping project of the entire Colville Indian Reservation.

Plant Associations

Clausnitzer and Zamora (1987) developed the classification system used on the Colville Indian Reservation to describe 28 plant associations found on forested areas. This ecological classification provides for the identification of biological site potential by means of vegetation characteristics and involves the recognition of land units based on potential climax vegetation or plant associations (Daubenmire 1968).

The Plant Association Group (PAG) is the environmental unit used by the Colville Reservation forest resource management teams. Plant Association Groups provide a means to organize many forest stands into a more manageable number of identifiable units having relatively similar biotic and abiotic environments. The PAG vegetation, soils and other physical characteristics on a site serve as indicators of future species composition, productivity potential and probable responses to management actions.

The 28 forest plant associations identified on the Reservation were combined into nine plant association groups (PAG's) based on similar environmental conditions, disturbance regimes, response to disturbance and productivity. Table III-6 provides a list of these forest plant associations and acreage on the Reservation for each PAG.

Compared to lands in the Cascade Mountains to the west and Selkirk Mountains to the east, the Reservation supports a limited diversity of plant associations. Based on information in the plant association database the major climax tree species on the Reservation (Table III-6) is Douglas-fir. Four relatively similar Douglas-fir PAG's occupy over 70 percent of the Reservation. Ponderosa pine PAG's occur at the lowest elevations and constitute about 15 percent of the forested landscape. Grand fir occurs at higher elevations east of the San Poil River, with volcanic ash modified soils generally being the only environmental factor differing between the

Douglas-fir and grand fir associations. Subalpine fir PAG's dominate the highest elevations, making up the remaining 8 percent of the potential natural vegetation.

Table III - 6. Plant Association Groups Identified on the Colville Indian Reservation.

PLANT ASSOCIATION GROUPS	PLANT ASSOCIATIONS	CROWN* DENSITY	AREA ACRES
Ponderosa Pine – Grass	Ponderosa Pine/bluebunch wheatgrass *(PIPO/AGSP)* Ponderosa Pine/Idaho fescue *(PIPO/FEID)*	45% 40%	68,175
Ponderosa Pine – Bitterbrush	Ponderosa Pine/bitterbrush (*PIPO/PUTR*) Ponderosa Pine/ricegrass (*PIPO/ORHY*) Ponderosa Pine/bitterbrush/bluebunch wheatgrass (*PIPO/PUTR/AGSP*) Ponderosa Pine/bitterbrush/Idaho Fescue *(PIPO/PUTR/FEID)*	45% 50% 45% 45%	64,838
Douglas-fir – Warm, Dry	Douglas-fir/Idaho fescue *(PSME/FEID)*	90%	22,960
Douglas-fir – Cool, Dry	Douglas-fir/pinegrass (PSME/CARU) Douglas-fir/pinegrass/bearberry *(PSME/CARU/ARUV)* Douglas-fir/spirea *(PSME/SPBEL)*	95% 85% 90%	86,332
Douglas-fir – Warm, Moist	Douglas-fir/snowberry *(PSME/SYAL)* Ponderosa Pine/snowberry *(PIPO/SYAL)*	100% 90%	253,666
Douglas-fir – Cool, Moist	Douglas-fir/oceanspray *(PSME/HODI)* Douglas-fir/ninebark/heartleaf arnica (*PSME/PHMA/ARCO)* Douglas-fir/ninebark-pachistima (PSME/PHMA-PAMY)	95% 95% 100%	257,385
Grand Fir	Grand fir/twinflower *(ABGR/LIBOL)* Grand-fir/twinflower/Pacific Yew *(ABGR/LIBOL-TABR)* Grand-fir/fairy bells *(ABGR/DIHO)* Western Redcedar/twinflower *(THPL/LIBOL)*** Western Redcedar/wild sarsaparilla *(THPL/ARNU3)*	100% 100% 100% 100% 100%	51,450
Subalpine Fir – Warm	Subalpine fir/twinflower *(ABLA2/LIBOL)*	100%	18,015
Subalpine Fir – Cold	Subalpine fir/huckleberry *(ABLA2/VACCI)* Subalpine fir/pine grass *(ABLA2/CARU)* Subalpine fir/pachistima *(ABLA2/PAMY)*	100% 100% 100%	62,469
TOTAL			886,810

* Existing crown closure density (tentative – needs adjustment for Reservation)
** The western redcedar plant associations have been included in the grand fir PAG because of their limited area and distribution.

Riparian communities, found along most of the perennial and some of the intermittent streams, differ slightly from the surrounding forest due to higher levels of soil moisture. Douglas-fir remains the dominant coniferous species, while willows, aspens and cottonwoods are the predominant hardwood species in these areas. Wildlife of all forms is attracted to the riparian zones due to the presence of water, generally cooler temperatures, and the presence of higher quality browse. Hardwood shrubs are important browse for many species and enhance wildlife richness by attracting animals that are otherwise scarce in coniferous forest habitats. Riparian plant communities have not been formally classified on the Reservation.

Hardwood tree species such as black cottonwood and trembling aspen exist as components of mixed riparian stands or near seeps or springs as small, scattered understory components of predominantly conifer stands in the Reservation. Other than as riparian zone or disjunctive wetland components, there are no pure stands of hardwood species on the Colville Indian Reservation.

Several other non-forest community types are interspersed within the coniferous forest landscape. These areas include unvegetated rocky outcrops and ridgetops, and low shrub/grassland openings on very shallow soil, south exposure slopes and plateaus. Minor amounts of cliff faces and talus slopes on the Reservation generally support little to no vegetation, but do provide a unique habitat for some reptile, amphibian, small mammal and bird species.

Existing Condition of Plant Association Groups

Ponderosa Pine PAG's

The forested area of the Reservation classified into the ponderosa pine PAG's is dominated by ponderosa pine with only minor amounts of Douglas-fir. Quaking aspen may occur on wetter soils. These PAG's include a large part of the deer and elk winter range. Ponderosa pine forests present at the turn of the century were the result of frequent low intensity fires, caused by both lightning and aboriginal ignitions. The result was a forest mosaic of small to moderate sized even-aged patches. Stocking levels were low, creating very open stands.

At the present time, stands in the ponderosa pine PAG's are often choked with understory regeneration as the result of an extended period of fire exclusion. The extensive stocking has encouraged a proliferation of a number of bark beetle species. Whereas fire formerly thinned the stands from below, the bark beetles are now thinning them from above, killing the most valuable trees first. This is occurring despite repeated entries that have removed high-risk trees and reduced the amount of old-growth to low levels. Mistletoe, which was formerly a localized problem, is now widespread with understory trees being rapidly infected by residual overstory. The large stumps created by several cycles of previous logging are increasingly the focus of annosum root rot centers. Plentiful ladder fuels, mistletoe brooms and dead and down material makes the threat of catastrophic fire a greatly increased possibility in the area identified in the ponderosa pine PAG's. Under existing conditions tree mortality appears to be increasing and site productivity declining in these PAG's.

Douglas-fir PAG's

Tree species occurring on lands in the Douglas-fir PAG's include Douglas-fir, ponderosa pine, western larch, lodgepole pine, and quaking aspen. The lower elevation area in these PAG's provides deer and elk winter range. Fire history indicates slightly less frequent fires of slightly higher intensity than in the drier ponderosa pine PAG's and has created a large mosaic of patches burned by surface fires or crowning fires. Fire resistant and seral species were favored, with regeneration occurring in the fire created openings and fire induced thinning occurring elsewhere. Individual stands within the complex mosaic were largely even-aged. All the common forest pests, while present, were usually at endemic levels.

With fire control starting in the early 1900s, the natural thinning and stand replacement function in these PAG's no longer occurred to any level of significance. The introduction of selection logging along with fire control no longer opened up stands sufficiently to favor the establishment of shade intolerant seral species. Additionally, the fire functions of duff reduction for site preparation and continual culling of the more fire sensitive climax species was eliminated. The result has been a massive conversion to a condition of overstocked Douglas-fir understories. The seral species overstories diminished as successive stand entries continue.

Armillaria and laminated root disease, which formerly were endemic, have exploded in the presence of their preferred host, Douglas-fir. Bark beetles in epidemic proportions are serious pests related to the overstocked conditions while mistletoe has spread under the multi-canopy conditions.

Grand Fir PAG

The grand fir PAG has the greatest diversity of tree and understory plant species. Tree species include grand fir, Douglas-fir, western larch, ponderosa pine, lodgepole pine, Engelmann spruce, western redcedar (moister soils), Sitka alder, paper birch, and quaking aspen. Lands in this PAG provide deer and elk summer range, hiding and thermal cover. This PAG, located on soils more moist than occupied by Douglas-fir PAG's, sometimes occupies favorable aspects or sheltered positions in a complex matrix within the Douglas-fir zone. The natural fire frequency within lands classified in the grand fir PAG varies from somewhat longer than the Douglas-fir PAG's to nearly rotation length in the wettest locations. In most cases recurring fires precluded the development of thin barked, shallow rooted climax grand fir while favoring fire resistant western larch. Douglas-fir in older age classes also has a thick bark and might be classified as moderately fire resistant. In many cases the natural stands prior to wildfire suppression were nearly indistinguishable from the Douglas-fir zone stands except for a more lush understory vegetation and an increased component of Douglas-fir allowed by the longer fire frequency. Historically, grand fir was well represented only in the most humid or protected locations.

Here, as in the Douglas-fir zone, fire exclusion and selection logging have allowed the development of understories of the most shade tolerant species (grand fir and Douglas-fir), resulting in chronic overstocking, multi-level stands, and large numbers of host trees for a variety of forest pests and diseases. Annosum root rot in grand fir is a serious problem along with various heart rot fungi. Armillaria and laminated root rots attack both grand fir and Douglas-fir. Dwarf mistletoe in Douglas-fir and western larch reacts dramatically when closed stands are opened up, and the understories are soon infected in multi-story stands. The spruce budworm and tussock moth are expected to soon become epidemic and the combination of all of the above plus the chronic overstocking can be expected to create future bark beetle problems. Fuel buildup and large quantities of ladder fuels, combined with the fire sensitive grand firs, insures that any fire in the future will cause serious damage or stand replacement.

Subalpine Fir PAG's

Tree species located on lands within the subalpine fir PAG's include subalpine fir, Douglas-fir, western larch, lodgepole pine, Engelmann spruce, Sitka alder, quaking aspen, and paper birch. The area provides cover for deer and elk during the summer season along with forage in disturbed areas. Being at the highest elevations or in the coldest areas, lands in these PAG's have the lowest fire frequency. The longer period between fires, plus generally favorable climatic conditions, allowed for higher fuel accumulations than in most forest areas of the Reservation. Fires, when they occurred, were more likely to be catastrophic in nature and resulted in stand replacement with seral, fire related lodgepole pine or lodgepole pine-western larch mixtures. In some areas even-aged fire-resistant old-growth western larch stands developed. Climax subalpine fir is found only in limited areas on the Reservation.

Fire suppression and selection logging have allowed many old-growth western larch stands to develop understories of shade tolerant subalpine fir, Engelmann spruce or Douglas-fir, with each successive selection harvest decreasing the amount of western larch remaining in the overstory. Armillaria, laminated, and annosum root rots are damaging the shade tolerant species. Douglas-fir and western larch mistletoe infections have become serious in the partially harvested overstories, and understories are becoming infected. Spruce budworm and tussock moth are now present in the host species (Douglas-fir and subalpine fir) and are expected to cause future significant losses.

Lodgepole stands have not, for the most part, been selectively logged but for many years were bypassed because of low product values. This has resulted in a large inventory of lodgepole at or near rotation age, most of which is in an overstocked condition. Mountain pine beetle activity is increasing and will continue for many years into the future. Lodgepole mistletoe, while present, is usually not serious due to the extensive even-aged structures and younger age of the stands.

Forested Seral/Structural Stage Diversity

The Colville Confederated Tribes have adopted a system for managing forested vegetation on a landscape or ecosystem basis similar to the Viable Ecosystem Management Guide developed by the Ochoco National Forest (USDA Forest Service 1994a). Ecosystem management sets establishment and maintenance of ecosystems and their processes as a first priority and places forest commodities as a secondary goal. The objectives of management through a viable ecosystem approach are:

1. To identify plant community conditions necessary to maintain or reestablish a viable ecosystem through future planning;
2. To make informed management decisions involving biodiversity and ecosystem viability; and
3. To effectively assess the cumulative effects of management activities on communities of plants and animal species.

The viable ecosystems' approach compares existing relationships between combinations of vegetation structure and species composition with site potential and an historic range of seral/structural stage variability. The historic condition assumes that the complement of native species was viable in the conditions that existed prior to European settlement (pre-1900). Groupings of plant associations having similar levels of productivity provide the baseline for comparisons. Nine Plant Association Groups (PAG's) are found on the Reservation (see Table III-6). The historic range of seral/structural stages (discussed in the Wildlife: Phase I: Inventory and Project Reports, Colville Confederated Tribes 1997) for each of these PAG's are presented in Table IV-14 through IV-20. (This data is shown in Chapter IV for easier interpretation.)

Historic Conditions

The availability of diverse habitat seral/structural features is one of the primary factors used to evaluate habitat diversity for a wide variety of plant and animal species. The major natural disaster events that provide structural stage variation of a stand-replacing nature are wildfires, major insect/disease outbreaks, large windstorms, and in specific mountainous locations avalanche. In the ponderosa pine-dominated forest of the Reservation, frequent (every 6 to 12 years), medium to large, cool underburn wildfires would have been the primary disturbance factor prior to 1900 (Arno 1980, Arno and Petersen 1983, Gruell et al. 1982, Gruell 1986). As a result of these cool, underburn wildfires, a series of relatively old stands with single-layer canopies, interspersed with small natural openings and occasional small, early to mid-seral stands, would be the natural seral/structural stage variability expected in the ponderosa pine and dry Douglas-fir PAG's across the Reservation.

Existing Conditions

The topography and natural and man-caused disturbance factors across the Reservation have combined to create moderate levels of habitat diversity in an area that traditionally had relatively low diversity. As shown in Table IV-16 to IV-22, only four very similar forested plant association groups occupy more than 70 percent of the Reservation. A major factor contributing to current diversity has been the reduction in wildfires. Frequent natural and aboriginal-caused fires maintained single-layered canopies of single species ponderosa pine and Douglas-fir forests across large areas of the Reservation. Since the 1920's, these plant communities have been subjected to an altered fire disturbance regime. Maintenance of fire-free forests over the past 50 to 75 years has allowed a number of atypical stand conditions to develop. Examples are:

- Two-and-three storied canopies with pure ponderosa pine composition;
- Two-and-three storied canopies with ponderosa pine and/or Douglas-fir over fire-sensitive tall shrubs;

- Two-storied canopies with ponderosa pine and/or Douglas-fir over sapling/pole ponderosa pine, Douglas-fir and grand fir.

Man-caused disturbance has also played a major role in restructuring stand characteristics of the area. In the late-1970's to mid-1980's, logging removed much of the large-diameter ponderosa pine and Douglas-fir overstory from easily accessible areas of the Reservation and adjacent lands. More recently, logging activity has taken place in a number of higher elevation stands in the northern half of the Reservation. These activities resulted in providing increased seral/structural stage diversity in the form of pole and immature timber stands having a very open, widely-spaced canopy structure of young trees, ranging from 20 feet to 75 feet in height with a shrub/seedling understory.

Based on the analysis of current ecosystem conditions, the Desired Range of Future Conditions are not met for 70 of the 117 successional/structural stages of the nine PAG's. There is an excess above the desired distribution of high range of variability for 31 of the successional/structural stages of the area and a deficiency relative to the low range values for 39 stages.

Tables IV – 16 to 22. Displays the Historic Range of Variability (HRV), Desired Future Conditions (DFC) and Current Existing Conditions (CEC) for seven PAG's, five forest structural stages and six successional stage classes for all forested lands on the Reservation. (Note this table is placed in Chapter IV so as to compare existing conditions with potential impacts) The successional stages used are a combination of species composition and canopy layering features. From the data in Tables IV – 16 to 22, the amount of forestland outside the Desired Future Condition range can be summarized by PAG and size class (Table III-7).

Table III - 7. Summary of Acres of Forestland Outside the Desired Future Condition Range by Plant Association Group and Structural Class - Colville Reservation.

PLANT ASSOCIATION GROUP	AREA OUTSIDE DESIRED FUTURE CONDITIONS - ACRES					
	Total	Size 1	Size 2	Size 3	Size 4	Size 5
Ponderosa Pine - Grass	68,175	+5,931	-2,454	+2,182	+11,726	-16,703
Ponderosa Pine – Shrub	64,838	+8,883	-2,983	+1,945	+8,559	-16,080
Douglas-fir Warm Dry	22,960	+321	-1,056	+184	+3,214	-3,146
Douglas-fir Warm Moist	235,666	+28,411	-9,893	-	+35,513	-44,138
Douglas-fir Cool Dry	86,332	+2,331	-691	-	+13,554	-15,885
Douglas-fir Cool Moist	237,394	-	-4,510	-	+55,075	-27,538
Grand Fir	51,450	-	-515	+617	+12,862	-7,820
Subalpine Fir Warm	18,015	-	-	+1,117	+2,666	-1,549
Subalpine Fir Cool	62,469	-187	-	+5,122	+7,496	-3,061
Total	865,299	+45,690	-22,102	+11,167	+150,665	-135,920
		+5.3%	-2.6%	+1.3%	+17.4%	-15.7%

This summary shows a 15.7 percent deficit in size class 5 (21"+) stands. The deficit is distributed throughout all plant association groups. Where possible the surplus size class 4 stands could be manipulated to develop size class 5 characteristics over time. The surplus non-stocked areas (size class S1) need to be examined to determine if they are commercial forestland in nature and if they need reforestation to bring into a stocked (S2) condition.

The stages of succession and stand development are also out of balance. The acres of forestland outside the Desired Future Condition range by seral stage and stand development is summarized in Table III-8.

Table III - 8. Summary of Acres of Forestland Outside the Desired Future Condition Range by Plant Association Group and Seral and Stand Development Stage for the Colville Reservation.

PLANT ASSOCIATION GROUP	AREA OUTSIDE DESIRED FUTURE CONDITIONS - ACRES					
	ES	EM	MS	MM	LS	LM
Ponderosa Pine - Grass	-11,044	+11,726	-	-	-	-
Ponderosa Pine – Shrub	-8,234	+8,559	-	-	-	-
Douglas-fir Warm Dry	-7,141	+4,569	-	-	+1,033	+1,056
Douglas-fir Warm Moist	-21,388	+12,683	-	-	+10,400	+8,117
Douglas-fir Cool Dry	-22,533	+4,403	-	-	+5,180	+12.259
Douglas-fir Cool Moist	-59,111	-	-	-	+25,164	+56,975
Grand Fir	-6,225	-	-3,036	+4,425	+1,904	+8,078
Subalpine Fir Warm	+270	-216	-631	+793	+649	+1,369
Subalpine Fir Cool	-2,061	+125	-4,373	+5,747	+4,748	+5,185
Total	-137,387	+41,849	-8,040	+10,965	+49,078	+93,039
	-15.9%	+4.8%	-0.9%	+1.3%	+5.7%	+10.8%

There is a surplus of late-successional acres in all plant association groups - both single-storied and multi-storied conditions and a deficit of early successional, single storied stands. To adjust these conditions management would include intermediate harvests that would favor retention of seral species and stocking control to remove excess trees. However to achieve the Desired Future Condition balance of early successional stages would require 2-3 entries at 15+ year intervals.

The Integrated Resources Management Plan (CCT 1998a) stipulates that if the successional/structural stages are above or below the Desired Future Condition (DFC) value, the proposed management activities should attempt to create stand conditions that will provide the desired conditions in the reasonable future. Analysis of available size class/successional/structural stage data for existing conditions on the Colville Indian Reservation indicates that of the potential 97 different PAG/size class/successional stage/structural stage combinations 45 percent are below the DFC and 31 percent exceed the DFC. Only 24 percent of the desired future conditions are presently being met.

There is no pattern to the excess and deficit stages except that size class 5 for nearly all successional/structural stages and PAG's is below DFC, whereas 67 percent of size class 4 is above DFC.

Table III - 9. Summary of Acres Needing Silviculture Treatments to Achieve Successional Stage Balance by Plant Association Group on the Colville Reservation.

PLANT ASSOCIATION GROUP	AREA NEEDING SILVICULTURE TREATMENTS		
	Priority 1 (Acres)	Priority 2 (Acres)	TOTAL (Acres)
Ponderosa Pine – Grass	17,046	8,178	25,224
Ponderosa Pine – Bitterbrush	9,727	17,501	27,228
Douglas-fir – Warm, Dry	2,066	5,751	7,817
Douglas-fir – Warm, Moist	20,295	53,270	73,565
Douglas-fir – Cool, Dry	6,905	19,855	26,760
Douglas-fir – Cool, Moist	7,120	59,350	66,470
Grand fir	4,115	12,355	16,470
Subalpine Fir – Warm	180	1,980	2,160
Subalpine Fir – Cold	625	11,875	12,500
TOTAL	68,079	190,115	258,194

Risk to ecosystem health increases as the current conditions increase above or decrease below the Desired Future Condition. A risk priority analysis was made with the following criteria:

Priority #1 - Current condition >10% above or below DFC
Priority #2 - Current condition 0-10% outside DFC

Based on existing conditions and the above priority rating a summary has been developed of area needing silviculture treatments to move the Reservation towards the Desired Future Conditions. This analysis is shown in Table III-9

Priority stands needing silviculture treatment are primarily S4 (small/medium size) to be extended to the S5 (large size) characteristics. The treatments should primarily be intermediate harvests designed to remove infested and diseased trees, to increase composition of seral species and to reduce overstocking. Unstocked areas should be planted. Average volumes removed would be 2-4 MBF/Ac. With the current level of treatment activity, 30,000 acres per year, it would take at least 10-15 years to make the initial entry to adjust size classes and 2-3 entries would be necessary to achieve the desired balance for successional stages.

Forest Health Trends

Altering stand species composition, density and canopy structure (singly or in combination) have profound effects on pathogen and insect population responses and associated ecosystem effects. As discussed previously, the Reservation landscapes have been dramatically altered by timber harvest and fire exclusion. Insects and diseases were part of the pre-settlement forests, but as

Wickman (1992) pointed out, the extent of their influences were typically small disturbance events of shorter duration, and the severity of effects were less than we observe today.

There is evidence of this extension to larger areas. For example, bark beetles have been a major source of damage to merchantable timber stands. Losses were estimated at nearly 18 million board feet annually during the 1930s and were nearly twice as high by the late 1950s (Interim Forest Management Plan 1992). The Douglas-fir tussock moth was recognized as a serious pest in the early 1930s, when 300 million board feet were killed on the Colville National Forest north of the Reservation. In 1972 to 1974 an outbreak of this insect occurred on the Reservation. Aerial spraying on 150,000 acres and salvage of 45-50 million board feet (Interim Forest Management Plan 1992) controlled the outbreak. Another tussock moth epidemic has been building, but has apparently temporarily crashed in 1999. A similar insect, the western (spruce) budworm, greatly expanded its population by infesting over 200,000 acres in 1991 (Boyce and Dumas 1997).

In the long run, the reduction of losses depends on silvicultural techniques that encourage more pest resistant stands, stand diversity by age and species, and methods of control that rely on the pest's own biological enemies and biological quirks.

Dwarf Mistletoe

Mistletoe infection has been recognized as a serious problem for a long time. With the exception of the Douglas-fir beetle, it was the only other problem deemed worthy of direct measures in the 1961 Forest Management Plan (McAvoy 1961). It stated that "mistletoe infection in ponderosa pine, Douglas-fir and western larch can be lessened through marking practices to eliminate mistletoe from the overstory". This strategy did not address stocking control or species composition and, therefore, appears to have failed.

Root Rots

Root rots are a pathogen problem gaining increased recognition on the Reservation's forestlands. Root diseases were a subordinate part of most pre-settlement, mixed-conifer landscapes (Hessburg, Mitchell and Filip 1994). These diseases are expanding their influence from historical infection centers that colonized burgeoning populations of Douglas-fir and grand fir (Hessburg, Mitchell and Filip 1994). These diseases cause death of both large and small trees. Selective harvest methods provide increased food sources for these fungi and periodic stand entries maintain these increased levels. These conditions are evident in many of the stands on the Reservation. Douglas-fir and true firs are the most susceptible and the influence of these pathogens is building in response to increasing availability of these preferred hosts. Therefore, a large portion of the Reservation has the potential for significant losses. Data on root rot was documented at each forest inventory plot and reported by Leadingham (1995).

While root rot losses are not as widespread as dwarf mistletoe they do cause damage and do impede achieving the Desired Future Conditions. Their presence will be even more important as host stands are perpetuated for added years to provide the large tree (21"+ dbh) structures.

Indicators of insect and disease hazards have been developed by the Forest Service (Lehmkuhl et. al. 1994). Appendix A of this publication summarizes the hazard analysis used in the terrestrial landscape assessments to evaluate historical and current susceptibility of vegetation to insects and diseases. This assessment methodology has been used in this analysis for the Colville Reservation.

The hazard associated with each insect or pathogen (or group) identified on the Reservation was rated for 4-6 hazard variables, including:

- Site Quality (plant association group).
- Host Abundance (% of hast species).
- Canopy Structure (number of canopy layers and composition).
- Stand Density (total canopy cover - %).
- Crown Differentiation (difference in crown diameters) - used for some beetle species as an additional variable for stand density.
- Host Age (host size class).
- Continuity of Host Species (host-host transition at cell edges).

This hazard rating system was used to evaluate the insect and disease hazards. Forest inventory analysis summary data (Leadingham 1999) was used in making this analysis for the Colville Indian Reservation. The evaluation was made for each plant association group (PAG) and size/structure stage (S/S). Insect and disease hazards were summarized into four groups: defoliators, bark beetles, dwarf mistletoes, and root diseases.

A total of 289 PAG's and S/S combinations present on the Reservation were rated. About 65 percent of these evaluations were rated as "high" hazard. These evaluations were further stratified and those with two or more points above "high" were rated as "very high" hazard. This includes the 64 evaluations that are summarized in Table III-10. Table III-11 summarizes the acres of "very high" insect and disease hazard.

Some PAG's and S/S combinations are at a "very high" hazard for multiple attacks from insects and pathogens. Where more than two "very high" ratings are identified, these were rated as "extremely high" hazard. This includes ten PAG's and S/S combinations as shown in Tables III-10 and III-11.

Table III - 10. Very High Insect and Disease Hazard Ratings Stratified by Type of Infestation, Plant Association Group and Size/Structural Stage for Forestlands on the Colville Indian Reservation.

PAG/SS [1]	PATHOGEN [2]				COMPOSITE HAZARD RATING
	Defoliators	Bark Beetles	Dwarf Mistletoe	Root Rot	Extremely High
Pond. Pine – Warm Dry					
E3		X			
ES4		X			
LM4		X			
LM5			X		
Douglas-fir – Warm Dry					
EM4		X			
Douglas-fir – Warm Moist					
E3	X				
EM4	X		X		
EM5	X		X	X	X
LS4	X		X		
LM4	X		X	X	X
LM5	X	X	X	X	X
Douglas-fir – Cool Dry					
EM4	X		X		
EM5			X	X	
LM5			X		
Douglas-fir – Cool Moist					
E3	X				
EM4	X		X	X	X
EM5	X	X	X	X	X
L3	X				
LS4	X		X		
LM4	X	X	X	X	X
LM5	X	X	X	X	X
Grand Fir					
E3		X			
ES4	X				
EM4	X	X			
MM3	X				
MM4	X	X	X	X	X
LS4	X	X		X	
LM4	X	X		X	X
LM5	X	X			X
Subalpine Fir					
EM4	X				
MM4	X				

1 PAG /SS is the Plant Association Group and Structural Stage Class.
2 Pathogen w/ Very High Hazard Rating (X) by PAG/SS

Table III - 11. Area of Plant Association Groups on the Colville Reservation with Very High Insect and Disease Hazard by Type of Infestation.

PAG/SS [1]	PATHOGEN (ACRES)				COMPOSITE HAZARD RATING
	Defoliators	Bark Beetles	Dwarf Mistletoe	Root Rot	Extremely High
Pond. Pine – Warm Dry		96,334	3,296		
Douglas-fir – Warm Dry		6,865			
Douglas-fir – Warm Moist	158,343	4,495	131,386	46,745	46,745
Douglas-fir – Cool Dry	15,916		19,832	1,707	
Douglas-fir – Cool Moist	204,932	95,224	177,498	140,279	140,279
Grand Fir	47,333	49,317	16,754	30,684	30,684
Subalpine Fir	26,045				
Total	452,569	252,235	348,766	219,415	217,708

1 PAG /SS is the Plant Association Group and Structural Stage Class.
2 Absence or presence (X) of very high pathogens in the PAG/SS

Late and Old Structural Stage Habitat Fragmentation and Corridors

Forest fragmentation occurs when a contiguous block of mature (M5) and late or old (L5) structural stage forest habitat is broken into smaller, isolated patches of forest surrounded by early (E1) to young (E2/M3) successional stage vegetation. In addition to a direct loss of mature forest structural stage habitat, disturbance of M5 and L5 forest reduces the availability of interior mature forest habitat through edge effect. Also, the size of individual late and old structural stage patches may be reduced below the optimum for the species of concern. Suitable interior forest habitat patches may become isolated from each other if corridors having M5 and L5 characteristics or other acceptable security habitat are not retained.

Across the Reservation, late and old structural stage forest has had heavy overstory removal harvests over the past 30 years. A relatively large amount of interior, late and old structural stage habitat values were lost when these timber harvests occurred in stands adjacent to retained late and old structural stage stands. The effects of timber harvest on M5/L5 habitat fragmentation are generally viewed as being negative, but, when viewed from the biodiversity standpoint, this may not always be the case. In some instances, these activities have provided high-quality, open foraging habitat for large ungulates and additional edge habitat for smaller mammal and bird species that prefer the proximity of early successional stage feeding and mid- to late successional stage security habitats. Although isolation of late and old structural stage forest patches is detrimental to late and old structural stage dependent species, these openings have provided a diversity of habitats that may approximate an historic mosaic of fire-created openings in the area.

There is limited research available that documents the use or value of corridors (Noss 1987, Simberloff and Cox 1987, USDA Forest Service 1991). Nevertheless, there is strong support for the assumption that corridors between late and old structural stage forest stands maintain biodiversity and mitigate for part of the effects of habitat fragmentation. Four general characteristics of effective corridors are: the wider the corridor, the better; the shorter the corridor, the better; corridors that provide habitat suitable to the species of concern are the best; and ridges and riparian drainages provide traditional, natural travelways. Minimum width for suitable corridor habitat on the Reservation is considered to be 400 feet.

Threatened and Endangered Species

Endangered species are defined by the Endangered Species Act (PL 97-304) as species of plants and animals in danger of extinction throughout all or significant portions of their ranges. Threatened species are defined as plants and animals likely to become endangered in the foreseeable future. Candidate species are those that could become threatened or endangered with a reduction in their populations or critical habitat, or about which not enough is known to assure their long-term viability as a species. Endangered and threatened species receive federal protection through species recovery plans, biological assessments of project impacts, and consultation with U.S. Fish and Wildlife Service (USFWS).

Existing Conditions

No federally listed threatened or endangered plant species are known to occur in the Reservation. Only one federally listed plant species is known to occur in a location adjacent to the Colville Indian Reservation (Table III-12). All other plant species considered as threatened or endangered that are known to occur on the Reservation or in suitable habitats in adjacent counties are Washington State listed species.

Ute's ladies-tresses (*Spiranthes diluvialis*)
Federal Status - Threatened
State Status - Threatened

Habitat - Until recently, this species was only known to occur in northern and eastern Utah and central Colorado. Subsequently this species is not found in many botanical keys commonly used for identifying plants in the Pacific Northwest. Another very similar orchid species also occurs in Washington, making it impossible to positively identify Ute's ladies-tresses by vegetative characteristics alone, it must be flowering.

This orchid is known to inhabit wetland and riparian areas, including springs and wet meadows, river meanders and floodplains. Ute's ladies-tresses are generally found above 1,500 feet elevation and below the lower margin of montane forests. The wet habitats for this species are generally associated with open shrublands, grasslands or in forest/non-forest transitional zones.

Existing Situation - In 1997 a small population of Ute's ladies-tresses, less than 20 individuals, was discovered in Okanogan County, Washington. Suitable habitat for this species does occur on the Reservation, but there are no known occurrences at this time.
Candidate, sensitive and plant species of concern will not be considered further in this EIS. But environmental assessments prepared for project level work will evaluate potential management

activity impacts and provide mitigation for those activities found to be potentially harmful to listed species.

Table III - 12. Known Occurrences of Endangered or Threatened Plant Species in Counties within or Adjacent to the Colville Indian Reservation.

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS[1]	STATE STATUS[1]	KNOWN COUNTY OCCURRENCE[2]
Camissonai pygmaea	Dwarf evening-primrose	-	T	D
Cypripedium parviflorum	Yellow lady's-slipper	-	E	F/O/S
Delphinium viridescens	Wenatchee Larkspur	-	T	D
Ophioglossum pusillum	Adder's-tongue	-	T	D/S
Oxytropis campestris var. *columbiana*	Columbia crazyweed	-	T	F/S
Petrophyton cinerascens	Chelan rockmat	-	T	D
Phacelia lenta	Sticky phacelia	-	T	D
Polemonium pectinatum	Washington polemonium	-	T	L
Silene spaldingii	Spalding's silene	-	T	L
Spiranthes diluvialis	Ute's ladies-tresses	-	T	D
Trifolium thompsonii	Thompson's clover	-	T	D

[1] Status - E = Endangered; T = Threatened; C = Candidate; SC = Species of Concern.
[2] County - D = Douglas, F = Ferry, L = Lincoln, O = Okanogan, S = Stevens.

Wilderness Areas

Two wilderness areas on the Reservation have been set aside for the primary use of the Reservation's population for spiritual, educational, historic, and limited recreational use. They are the 4,553-acre Grizzly Mountain Wilderness Area (T34N, R34E) and the 3,417-acre Moses Mountain Wilderness Area (T33N, R30E).

Commercial timber harvest is strictly prohibited in the Wilderness Areas. Harvest would only be allowed if it were determined to be the only means to control catastrophic events or to salvage substantial resources impacted by an event and otherwise lost. The Wilderness Areas are also protected against man-made developments such as commercial enterprises, structures and roads.

TIMBER RESOURCE

Historic Harvest Activities

Prior to 1911 only small logging operations with little commercial value beyond the immediate community occurred on the Colville Indian Reservation. By then railroads had opened the West, but the nearest railroads were to far to the east and west of the Reservation. The Columbia River offered little assistance in transporting logs because of its steep canyons and swift currents (Hudson et al. 1981:184)

From 1911 to 1918 logging was mostly confined to supplying three government-owned sawmills at Nespelem, Hall Creek and Omak. The logs were delivered to these mills by the local Indians, who in return, received a share in the lumber (Rellergert-Taylor 1988).

It is of interest to note that between 1873 and 1919 the total cut from the Colville Indian Reservation probably did not exceed 20 million board feet. Whereas, the annual cut of sawtimber on the Reservation from 1919 to 1942 was 22 million board feet.

In 1910, the sale of timber from the Reservation was legally permitted for the first time and the first timber sale on the western side of the Reservation was made on April 21, 1919. The Omak Creek Logging Unit (25MMBF) was originally contracted by the Omak Manufacturing Company, which built a sawmill known as Cougarville on the western slopes of Omak Mountain. Primitive logging methods and lack of experience soon led to financial disaster (Lewis 1980:11). On February 4, 1991, J.C. Biles and Nate Coleman bought the mill and the rights to the timber contract changing the name of the mill to Biles-Coleman Lumber Company.

On January 9, 1993, Biles-Coleman bought the Moses Mountain Unit (435MMBF) that was to be harvested at a rate of 25 MMBF over a 25-year period. The Bureau of Indian Affairs was to receive payment for the actual amount cut but no less than the specified minimum quantity (Lewis 1980:21).

In 1924 Biles-Coleman constructed a sawmill on the present mill site in Omak and initiated railroad logging up Omak Creek from the mill eastward toward Disautel. In 1925 Biles Coleman bought the Mission Creek Unit (6 MMBF) providing the company with all the timber between Omak and Disautel. The Omak mill of Biles-Coleman was destroyed by fire on September 23, 1928 and later rebuilt.

The village of Disautel had its own prospering lumber industry before the Biles-Coleman takeover in 1929. In 1927, the Wall Lumber and Box Company had an annual payroll of $150,000 and employed 80 men in Disautel.

The Great Depression struck the timber industry hard. For years logging units were put up for sale on the Reservation, but no bids were received (Lewis 1980:58). As the economy improved timber began to sell and the Tunk Creek Unit was sold to Biles-Coleman in 1939. In 1941, the Kartar Unit (224 MMBF) was also sold to Biles-Coleman although it was first put up for sale in 1930 without a bid.

Biles-Coleman began using trucks to haul logs in the 1940s with the railroad logging phased out after a major flood on May 30, 1948 destroyed much of the rail system. By 1951 Biles Coleman was operating trucks over a network of 90 miles of permanent road and nearly 100 miles of temporary road (Lewis 1980:70).

In 1962 the financial interest in Biles-Coleman was sold to Eclipse Lumber Company and again sold in 1970 to the Crown Zellerback Corporation. Later in the 1980's Crown Zellerback sold the mill to its employees and in 1997 Quality Veneer purchased the mill.

Development in the eastern part of the Reservation started with the sale of the Twin Lakes Unit (240MMBF) to the Helund Box and Lumber Company of Spokane in 1924. Logging began with a 16-mile branch railroad from the Great Northern Railroad from Kettle Falls in 1928, but quickly ended with the Great Depression in 1929. Large-scale logging started in the San Poil Valley with the sale of the West Fork Unit (80MMBF) in 1926. A sawmill was built at West Fork where approximately 20 MBF was cut before the operation failed (Rellergert-Taylor 1988).

Today by Colville Tribal Business Council resolution, the Tribes provide a minimum of 44 MMBF of timber annually under contract to the Colville Precision Pine mill in Omak, a Tribal owned company. Most of the harvesting activities on the Reservation are by a Tribal owned logging company.

Historic Forest Conditions

Many tribal elders say the forest is different today than it used to be. They picture the forest as having been open and park-like with big ponderosa pine trees and very little brush. They describe riding horseback through a forest unimpeded by thick vegetation. In 1904 a forester named Franklin Reed described two forest types on the Reservation (Reed 1904):

> "...a pure, open stand of bull pine (ponderosa) with a ground cover of bunch grass. The stand consists of 10 to 15 trees, 12 inches and over diameter breast-height, per acre..."

He describes this pine type as occurring on predominately southern exposures up to 3,500 feet elevation. The second type, which he called mixed forest, occurred above 3,500 feet elevation, on all north exposures below that, and in the bottom of deep, narrow, sheltered valleys, such as the San Poil River, and Hall and Barnaby Creeks. He describes this mixed stand as follows:

> "...a dense stand of red fir (Douglas-fir) and larch with a varying intermixture of yellow (ponderosa) and lodgepole pine. The stand is often so dense as to prevent the growth of grass, but where it is open enough the ground cover is usually pinegrass. (The proportion of timber under 12 inches in diameter breast height is so high that the yield per acre is not heavy..."

Historical range of variability represents a quantitative description of forest conditions prior to Euro-American resource management. Several sources provide information on historical conditions, including documented accounts by indigenous peoples and European explorers, settlers and officials, old photographs, discussions with tribal elders and more. Two quantitative sources of data were used in determining the amount and variation of forest types: the Public Land Survey of 1908 and the Civilian Conservation Corp. (CCC) forest stand type mapping done in the 1930's.

The CCC's mapped forest types across much of the Reservation's forest that had not been harvested, which was still a significant amount. This data was digitized into the GIS for the Twin Lakes Unit, approximately 190,000 acres, located in the moist northeast part of the Reservation. The data was then stratified by plant association groups (PAG's). A description of the historical range of variability (HRV) for each PAG appears later in this report.

The result of this analysis, summarized in Table III-13, tends to confirm the historical and generally accepted view of what the forest in that area used to be like. Ponderosa pine-dominated stands accounted for about 47 percent of the area. Stands composed of a mix of Douglas-fir and western larch made up 26 percent of the area. Stands of large trees with a diameter at breast height over 20 inches made up 37 percent of the forested area (Table III-14).

Table III - 13. Stand Composition for Twin Lakes Unit (CCC Survey circa 1930's).

STAND TYPE	PERCENT OF AREA
Ponderosa pine	47.3
Lodgepole pine	3.1
Western larch	2.5
Hardwoods	6.4
Douglas-fir	0.9
Douglas-fir/Larch	25.7
Mixed conifer	6.4
Burned area	4.1
Logged area	0.5
Cultivated/Swamp	9.0

Table III - 14. Tree Size Class Distribution - Twin Lakes Unit (CCC Survey circa 1930's).

SIZE CLASS	AREA (ACRES)	PERCENT OF AREA
Less than 12 inches	7,532	4
12 to 20 inches	102,761	59
Greater than 20 inches	63,058	37

The Public Land Survey, completed on the Reservation in 1908, used bearing trees to identify corner locations. Tree type, size and distance from the corner were described for each bearing tree. This gives an extensive sample of trees across the Reservation. Using survey records to reconstruct historical forest conditions has been well documented (Habeck 1994). The data for the entire Reservation based on the 1908 Public Land Survey also illustrates similar historic conditions (Table III-15). Ponderosa pine accounted for approximately 41 percent, western larch made up about 13.5 percent and other conifers (mainly Douglas-fir) made up approximately 43.1 percent. Larger trees, i.e., those greater than 20 inches DBH were dominated by ponderosa pine and western larch (Table III-16).

Table III - 15. Reservation Forest Historic Distribution Based on Trees per Acre (Land Survey Notes circa 1908).

TREE SPECIES	PERCENT
Ponderosa Pine - Lodgepole pine	41.0
Western Larch	13.5
Douglas- fir/ grand and subalpine firs/spruce & cedar	43.1
Hardwoods	2.4

The results from the bearing trees and the Twin Lake Unit stand typing compare well, except for the higher elevation, cold forest characterized by subalpine fir and lodgepole pine. The stands described in the 1930's had fewer large trees than the bearing tree data indicated. This was due to several large stand-replacing fires in these areas between 1910 and 1930.

Table III - 16. Reservation Forest Historic Size Distribution Based on Trees per Acre (Land Survey Notes circa 1908).

TREE SPECIES	DBH SIZE CLASS			
	4-8 Inches	9-20 Inches	>20 Inches	Total
Ponderosa and Lodgepole Pine	11.5	20.5	15.0	47.0
Douglas-fir/Grand and Subalpine Fir and Western Redcedar	14.5	25.5	11.0	51.0
Western Larch	3.25	6.5	4.5	14.25
Total	31.5	54.5	30.5	116.5

These data sets were used to develop an estimate of the historic range of each PAG occupied by one of five tree size classes and six seral structural stages. Even though the data sources were pre-management, they may not reflect true historical conditions. Grazing had been occurring for over 100 years, first by horses and later cattle and sheep. Fire suppression had likely begun to change the forest, especially by the 1930s. Adjustments were made to the historic range of variability (HRV) to compensate for these effects. They are considered "ballpark" figures and were used as a reference or starting point for gauging the development of a set of desired future conditions (DFC) for the forested landscape.

These early descriptions indicate that forest conditions in the historical past may have been different that they are today. Historical conditions are likely to represent the forest as influenced by natural processes and thus may be indicative of the pre-Euro-American forest. It is not that is was better or worse than today's forest but that it may be more reflective of the forest and wildlife dynamics as they evolved naturally. The influence of indigenous peoples may have been significant, and some would argue that humans had altered natural processes. Indigenous peoples, however, may have been in this area since the last ice age 10,000 to 15,000 years before present. It therefore, can be assumed that the historic forest evolved and changed with native peoples being a part of this natural process within.

Early Forest Management

Forest management on the Colville Reservation, began in the early 1900s and involved the application of a fire control policy. The underlying philosophy was that fire was a destructive force endangering the natural resources of the Reservation. It was thought that if resources were to be available for human consumption they would have to be protected from consumption by fire. Therefore, fire control was equated with sustained yield management of forest products.

Commercial harvest of timber products also began in the early 1900s. Prior to the 1940s harvest had been relatively insignificant. Harvest after that time, however gathered momentum peaking in the 1970s when in excess of 120 million board feet were removed annually. During most of this time, volume was removed in a selective manner. Care was exercised in an effort not to "high grade" the most valuable or desirable species from the forest. However, all operations were commercially driven so tree selection was confined to only trees with commercial value. Therefore, stems below commercial size were not harvested or managed. The predominately even-aged structures were opened up largely by removal of seral species. Significant forest development money for treatment of noncommercial portions of the stands was not available until the late 1970s.

A major shift in timber management practices began in the late 1970s. Before 1970 commercial harvest of every acre within an area delineated as a timber sale was the norm, with the anticipation that these areas would be on 20-year cutting cycles. Blanket timber marking guidelines were implemented which were designed specifically to remove a certain percentage of the commercial volume. There was no provision for any other types of timber management other than fire protection.

In the 1970s this was altered to the following:

- Individual stand prescriptions would be prepared.
- Regeneration cuts would be prescribed on areas with extensive entomological or pathological problems, or supporting over rotation age timber.
- Maximum impact areas, i.e., regeneration cuts, were limited to 1/3 of a sale area and were not to exceed 40 acres in extent.

- Regeneration of conifer species would no longer be left simply to chance.
- Site preparation and regeneration of seral species would be planned for with artificial regeneration measures utilized where deemed necessary.
- Rehabilitation activities would be prescribed in areas capable of, but not currently supporting, enough immature stems to produce a commercial crop and which had insufficient volume per acre to make logging profitable.
- Intermediate cuts (including pre-commercial thinning) would be prescribed for overstocked but otherwise relatively healthy stands.

The actual prescription strategy would vary by the land classification for each stand within a sale area. As these plans began to be implemented, the Natural Resources Department organizational structure was altered to begin to accommodate some of these activities including prescribed burning, herbicide application, nursery operations and tree planting.

During the 41 years from 1919 through 1960 a total of 1.8 billion board feet of timber was harvested from the Colville Reservation for an average annual harvest of 43 million board feet. Nearly 80 percent of this volume was ponderosa pine. The total value (not adjusted for inflation) of this timber was 17 million dollars. (Boyce and Dumas 1996)

Timber sale records show that a total of 3.3 billion board feet was harvested during the 35 years from 1961 through 1995 (average 93.7 million board feet per year). Approximately 48 percent of this volume was ponderosa pine. The total income from this timber was more than $330 million.

During the fifteen years, 1984-1998, about 500 million board feet of timber were sold. The annual harvest volumes by silvicultural treatment type for the 15-year period are summarized in Table III-17 and the distribution of harvest areas shown in 11. The annual dollar value of timber harvested and acreage pre-commercially thinned during this period is also shown in Table III-17.

Current timber management is directed by the October 16, 1998 Amendment of the 1989 Forest Management Plan as approved by the Colville Business Council (Resolution 1998-431). The objectives are to:

1. Sustain all natural resources of the CCT through time and space.
2. All marginal lands will be placed in the no harvest category.
3. Must meet the standards set by the 208 Plan (water quality plan).
4. Large areas of Wilderness Zones and non-harvestable lands with areas of aesthetic appeal, wildlife, and cultural concerns would be managed with no timber harvesting permitted.
5. Adopt a "No Clearcut Policy" for forests under Tribal ownership.
   - to preserve, protect, and enhance cultural and natural resources.
   - to preserve or protect, where possible, 2 large trees/Ac. for cultural and aesthetic reasons.
6. Reduce insect and disease vulnerability of forests under Tribal ownership.
7. Increase economic benefits of timber harvest by waiver of the annual cut of 65 MMBF/Yr. to 30,000 acres treated and 75 MMBF/Yr. of timber harvest. Note: Resolution 1998-431 also requires Colville Timber Resources Company to pay for all volume harvested over 65 million board feet per year.
8. Allow for conditional use herbicides based upon review and recommendations of an appointed cultural resource advisory group.

Table III - 17. Level and Type of Forest Harvest Activities by Acres on the Colville Reservation During the Period 1984-1998 (15 years).

TREATMENT TYPE	YEAR							
	1984	1985	1986	1987	1988	1989	1990	1991
Clearcut		168	529	1,832	1,737	2,174	1,725	550
Commercial Thin			18	787	337	452	228	243
Improvement Cut			111	2,967	4,955	3,919	3,825	6,160
Overstory Removal	319		602	1281	2,158	613	695	646
Regeneration Reserve Tree								
Sanitation/Salvage			152	897	1,142	880	279	209
Seed Tree	260	113	635	2,551	2,215	575	405	448
Shelterwood			60	227	120	37		
Unevenaged Cut*			24	71	792	440	238	374
Total Treatment Acres	579	281	2,131	10,613	13,456	9,090	7,395	8,630
Timber Volume MMBF	44,567	54,786	70,177	94,481				
Gross Dollar Value ($million)	6.46	6.19	8.44	11.60				
Pre-commercial Thin, Acres						18		256

TREATMENT TYPE	YEAR							TOTAL
	1992	1993	1994	1995	1996	1997	1998	
Clearcut	1,035	760	1,027	1,171	1,345	744	606	15,403
Commercial Thin	353	1,575	642	828	454	751	1,318	7,986
Improvement Cut	3,857	4,806	7,646	5,422	8,935	4,795	2,812	60,210
Overstory Removal	363	880	74	278	158	83	468	8,618
Regeneration Reserve Tree[1]				60	76	226	919	1,281
Sanitation/Salvage		75	23	592	126	244		4,619
Seed Tree	352	917	1,894	1,406	2,304	2116	2,020	18,211
Shelterwood	31	152	321	338	127	589	187	2,189
Unevenaged Cut*	22	1,307	676	821	648	415	521	6,349
Total Treatment Acres	6,013	10,472	12,303	10,916	14,173	9,963	8,951	124,866
Harvest Volume MMBF				39,129	40,319	42,367	36,650	39,811
Gross Dollar Value				19.9	20.0	17.2	14.5	16.8
Pre-commercial Thin, Acres	137	193	99	115	198	15		1,031

[1] Miscellaneous units where treatment was not defined were lumped in the unevenaged cut category.
Data source – Colville Indian Reservation GIS files. (Omissions may exist, personal communications T. Leadingham 1999)

Table III - 18. Current Forest Management Statistics (CCT 1998a).

FEATURE	AREA (ACRES)	VOLUME (MMBF/YR)	VALUE ($ MILLION)
Forest Lands			
Total Forest	888,500		
Permanent Withdrawal	252,109		
Commercial and Limited Harvest	636,391		
Annual Harvest			
Selection Harvest	1,746		
Clearcut	0		
Shelterwood/Seed Tree	2,794		
Regeneration with Reserves	2,383		
Intermediate Cut	14,375		
Total	21,238	39,655	17.7
Allowable Annual Harvest		75	
Ponderosa Pine Harvest		29.1	
Annual Revenue to Tribes			11.5
Long-term Sustained Yield		138.1	

Resolution #1998-431 also directs harvest activities until adoption of the Forest Management Plan being prepared as part of the Integrated Resource Management Plan Environmental Impact Statement.

Forest Inventory

The Colville Reservation has a continuous forest inventory in place since 1958. The inventory contains 1,110 plots on a 1.7-mile grid across the entire Tribal Trust forestland. At each grid location three 1/5-acre plots are located 400 feet apart. Tree measurements include: diameter, height, mistletoe infection, other insects and diseases, and volume defect. Both live and dead trees are inventoried, including those on the ground. Observations are made on the one acre area surrounding the plot, including: general forest cover type (species, size, density), timber harvest type and date, root rot disease occurrence and extent, stand mistletoe rating, non-tree vegetative cover, and soil erosion.

The sixth measurement of these plots was completed in 1995 and the results published by Leadingham (1995). In addition to summaries of basic forest statistics (growth and volume by species for the entire forest and forestry districts), the data was also stratified and analyzed by plant association groups. These summaries are utilized in this report to describe existing stand and forest health conditions.

General Forest Trends

The inventory data indicates that the two forest management strategies used on the Reservation since the 1900s (fire exclusion and selective cutting) have changed the structure, composition and density of the forest. The summaries provided in Table III-19 show differences between historic and current species composition and Table III-20 show differences in size classes.

Table III - 19. Current Versus Historic Species Composition (Trees/Ac.) from Land Survey Notes (1908) and Leadingham (1995).

TREE SPECIES	INVENTORY YEAR (TREES/ACRE)	
	1908	1995
Ponderosa Pine and Lodgepole Pine	47	35
Douglas-fir and Other	52.5	63
Western Larch	14	12
Subalpine fir/Western Redcedar	1	3
Hardwoods	2	1
TOTAL	116.5	114

Table III - 20. Current Size Distribution of Trees >5" DBH from Continuous Forest Inventory Data (Leadingham 1995).

DBH SIZE CLASS	PERCENT
5-8 Inches	55.5%
9-15 Inches	33.5%
16-20 Inches	6.5%
21+ Inches	4.5%

Fire suppression on the Reservation has removed the primary force in natural thinning of forest stands. Fire also affected species composition favoring the presence of either thick barked fire resistant trees or shade intolerant pioneer species. Selective harvest methods have advanced composition change by disproportionately removing seral species while opening up the forest canopies only sufficiently to favor the establishment of either brush or shade tolerant climax species. Favoring the creation of understories has changed the stand structure, or multiple canopy stands. Existing conditions remaining after near 100 years of forest management on the Reservation are many multi-level stands that support more trees than they did historically. The composition of the upper canopy levels are often remnants of the pre-management forest, largely ponderosa pine and western larch while the lower canopy levels are frequently over-dense stands of shade tolerant, climax species. Historical photographs and narratives appear to illustrate a marked change in other vegetation with brush becoming a more dominant component of the forest.

The continuous forest inventory shows the average volume per acre has increased between 1958 and 1995. (Table III-21). The volume of Douglas-fir and true firs has increased while western larch has steadily declined. Ponderosa pine volumes appear to have remained stable.

Table III - 21. Total Conifer Volume/Acre from Continuous Inventory Plots (Leadingham 1995)

INVENTORY YEAR	VOLUME MBF /Acre
1958	8.2
1972	8.6
1979	8.5
1985	8.9
1995	9.2

The first comprehensive forest inventory of the Reservation, completed in 1958, estimated an average annual net growth of 75 board feet per acre. The 1995 inventory measured growth at 172 board feet per acre annually. (Table III-22). Even considering today's merchantability standards including smaller trees, it is clear that estimated growth has more than doubled since 1958.

Table III - 22. Average Annual Net Volume Growth per Acre from Continuous Forest Inventory Plots (Board Feet/Acre/Year) on the Colville Reservation (Leadingham 1995).

INVENTORY YEAR	VOLUME (Board Feet/Acre/Year)
1958	75
1979	126
1985	170
1995	172

As noted previously, there is a large percentage of the growing stock in the 60-80 year old age class, which would be predominately poles (5-8" DBH) to small sawtimber (9-15" DBH). This is also the age at which trees are accelerating in board feet volume growth. This would tend to illustrate that the growth increase experienced over the last four decades was not so much the result of direct management during the time but resulted from the in-growth of previously unmerchantable stems that originated during earlier fire exclusion.

It can be concluded from these general forest trends that timber growth would most likely decline in the near future because of this growing stock age distribution and as stress induced entomological and pathological agents cause additional mortality due to higher than natural tree density and susceptible species composition. From a long-term timber management standpoint, the current age/size class structure is imbalanced relative to natural conditions. Under existing conditions without management action, many of the Reservation's forest stands are susceptible to high mortality in the near future.

Historic Harvest Practices

In the 1961 Forest Plan, it was reported (McAvoy 1961) that during the 41 years from 1919 through 1960, a total of 278,378 acres had been commercially harvested on the Colville Reservation forest. McAvoy (1961) further stated that "The development and construction of forest utilization roads into timbered areas has been accomplished largely by the timber operators who logged the various cutover units. Many of these roads have seriously deteriorated due to lack of sufficient drainage facilities or the failure of such facilities to function properly." There was obvious concern by the forestry staff as illustrated by the comments and guidelines contained in the 1961 plan. In the "Water and Watersheds" section, it was noted that during the planning period through 1971 "logging will progress into more rugged terrain with steeper and sometimes unstable slopes. Excessive logging road and spur road grades would be avoided. Roads should be properly drained and maintained." There was also reference made to specific standards to be followed during construction. However well intended, construction practices changed very little. That is, roads continued to be low cost avenues for timber extraction constructed solely for facilitating tractor skidding. They were constructed up the drainage bottoms, very near the streams with little or minimal drainage devices, and no maintenance after the logging sale was completed. Eventually, except for a few small watersheds, the entire forest was accessed in this manner.

Commercial timber harvest has impacted almost the entire forest. Initially, harvest was accomplished with a combination of horses and railroad transportation (Rellergert-Taylor and O'Dea 1988). Tractor skidding became the primary means of moving the logs from the stump to either the railroad or the logging roads in the early 1930s. Skid trails on sustained slopes of greater than 50 percent were not uncommon, with some skid trails exceeding 60 percent. The number and location of skid trails was left solely up to the operator. Although undocumented, these activities most likely had serious adverse impacts on the areas forest soils and water resource.

Concurrent with adoption of individual stand prescriptions in the 1970s, was a change in logging practices. Instead of logging contractors determining road locations, logging road plans have been initiated for the timber sales. They were designed so that new roads would not be running up all the drainage bottoms. Many existing roads were slated for abandonment, although in many cases, logging contractors are still reopening these roads. Plans that include tractor skidding were limited by slope and soil conditions. Seasonal shut downs due to wet soil conditions have become common practice. Cable yarding systems have been initiated on the Reservation on sustained slopes greater than 35 percent. The standard practice of machine piling and burning all logging slash has been abandoned. Logging contractors now utilize smaller skidding equipment due to the utilization of smaller material and better road locations.

Current Harvest Practices

In 1985, the Colville Tribal Business Council passed the Colville Forest Practices Act. The Forest Practices Act establishes the minimum standards for forest practices affecting Reservation resources. The Act is applicable to all lands within the Reservation boundaries

On Reservation lands, tractor skidding is still primarily used. The number of skid trails continues to be a problem. Although designated skid trails are called for in the contracts, more than 20 percent of an area is often adversely affected by disturbance during harvest activities.

Smaller diameter trees have begun to be utilized commercially. To accommodate the harvest of this material, mechanized harvesting has become common. Initial attempts at mechanical harvesting illustrated the need for establishing some additional Best Management Practices. At this time, only processors that fell and delimb the stems at the stump are allowed. Forwarders are then utilized to get the material from stump to truck, walking on top of the slash as much as possible to reduce soil compaction.

Current Plant Association Group Prescription Strategies

The Plant Association Group (PAG) classification system for the Colville Reservation was previously described in the *Forest Vegetation* Section. Forest management prescription strategies for the Reservation have been developed for grouping of these PAG's.

Ponderosa Pine PAG's

Management of the ponderosa pine PAG's is greatly influenced by the driest and warmest conditions of any forested area on the Reservation. Brush and grass competition is a regeneration concern along with high seedling mortality due to low precipitation and high summer temperatures. Natural regeneration through seed tree or shelterwood regeneration harvests is favored in these PAG's. Group selection technique may also be used to secure natural regeneration in the driest areas whereas limited small clearcuts with artificial regeneration may be used in areas of disease or insect infestation. Most importantly, maintenance of vigorous ponderosa pine and stocking control are essential to the long-term health of forests in these PAG's. Control of undesirable vegetation using low intensity prescribed fire is needed. Planned rotation ages are usually 120 years, but may exceed 140 years in the driest areas.

Douglas-fir PAG'S

The Douglas-fir PAG's encompasses the bulk of commercial forestland on the Reservation. Brush and grass competition is a regeneration concern in these PAG's, along with high seedling mortality due to low precipitation and late summer drought. Seed tree, shelterwood or clearcut harvesting methods are most commonly used for regeneration. Group selection is sometimes used in warmer, drier areas to secure natural regeneration. Ponderosa pine is favored for natural or artificial regeneration followed by western larch (cooler, moist areas), Douglas-fir, and lodgepole pine. Species control entailing a shift to the more disease resistant seral species (ponderosa pine and western larch) plus stocking control are being utilized in the recovery and maintenance of forest health in this series. Control of undesirable vegetation using low intensity prescribed fire is needed on those areas not supporting lodgepole pine. Rotation ages vary from 80 years for lodgepole pine to 120 years for ponderosa pine and western larch.

Grand Fir PAG

The grand fir PAG encompasses some of the most productive timberland on the Reservation. Brush invasion can be severe in former selectively logged areas and require control treatments during regeneration. Seed tree, shelterwood, or clearcut methods are commonly used for regeneration harvests. Management for seral species, plus stocking control, are the primary treatments and are utilized in the recovery and maintenance of forest health. Western larch and ponderosa pine (warmer areas) are favored for natural or artificial regeneration, followed by Douglas-fir, lodgepole pine, and grand fir on cooler sites. Prescribed fire for stocking control is not used in this PAG. Rotation ages vary from 80 years for lodgepole pine to 120 years for larch and ponderosa pine.

Subalpine Fir PAG's

These are the coolest PAG's with productivity variable due to temperature regimes and soil differences. Brush and pinegrass invasion can delay or prevent regeneration on previously harvested areas. The control of unwanted competing vegetation is often needed during the regeneration phase. Current silvicultural treatments include seed tree, shelterwood, or clearcut regeneration harvests. Creation or maintenance of seral species stands and stocking control are utilized to recapture and maintain a high state of forest health. Western larch is favored for natural or artificial regeneration, followed by Douglas-fir, Engelmann spruce (wetter soils), and lodgepole pine. Planned rotation ages are generally 80 to 120 years.

Lodgepole Pine

In the predominant lodgepole pine areas of the subalpine fir PAG's dominance of lodgepole pine and western larch in mature and old single-layer forests shall be maintained. The Desired Future Condition is ES1 - 5%-15%, ES2 - 20%-30%, ES3 - 50%-60%, and ES4 - 0-10% (CCT 1998a).

More harvest pressure is expected in these stands in the future as the demand for lodgepole products increases. Presently, extensive acreage of subalpine PAG equivalent lands in nearby Canada is being converted to the production of lodgepole pine.

WATER RESOURCE

Historic Setting

Water has played a very important role in the history of the Colville Confederated Tribes. The Columbia and Okanogan Rivers that make up the boundary waters on three sides of the Reservation were major transportation routes for the Tribes as well as an important source of food, namely salmon and sturgeon. The earliest recorded trade in the region was among tribes encamped along these rivers. It was by these waterways that the first Euro-Americans entered the region in the late 1700s and early 1800s.

More recently, the development of irrigation systems on the Reservation led to agriculture production on Reservation lands. Gough (1990) noted two significant irrigation ditches, the Twin Lakes and Nespelem ditches, constructed on the Reservation in the early 1900s. Both are overgrown with vegetation. Although reportedly only the lower portion of the ditch below Cornstalk Lake actually functioned, the Twin Lakes Ditch delivered water to the Seyler Valley west of Inchelium. The Nespelem Ditch was supposedly built in the 1920s to irrigate fields east of the Nespelem River and the Agency grounds.

In 1939, work was proceeding on installing or improving irrigation ditches included in the Nespelem, Little Nespelem, San Poil and Hall Creek irrigation projects. In 1941 the Monse Irrigation Project was started. Further discussion of irrigation projects is included in the *Agriculture* section.

Dam building on the Columbia River has had a major impact on boundary waters of the Reservation. The U.S. Bureau of Reclamation completed Grand Coulee Dam in 1942. The reservoir, Franklin Roosevelt Lake, forms the entire eastern half of the Reservation's southern border and the entire eastern border. Rufus Woods Lake, the reservoir formed behind Chief Joseph Dam completed by the U.S. Army Corp of Engineers in 1955 forms the remainder of the southern boundary. Wells Dam completed by the Douglas County Public Utility District in 1968, impounds the Columbia River along the southwestern boundary and the lower part of the Okanogan River to about the town of Monse.

Physical Setting

Across the Reservation there are 26 primary streams including the Columbia, Okanogan, San Poil and Nespelem Rivers along with ten major lakes and hundreds of minor lakes, ponds and bogs (Table III-23). With the exception of the eastern Kartar Valley RMU (Omak Lake and Big Goose Lake areas) and much of the Southwest Plateau RMU including Soap Lake that do not have external drainage, drainage from the Reservation is ultimately to the Columbia River through two different basins. The western one-third of the Reservation drains to the Okanogan River Basin whereas the remaining two-thirds of the Reservation drains east and south to the main Columbia River Basin through predominately the Nespelem and San Poil Rivers.

As discussed above, three major reservoirs border the Reservation. Lake Roosevelt is over 100 miles long and contains ten million acre-feet of storage. Lake Rufus Woods stores more than

590,000 acre-feet behind Chief Joseph Dam and Wells Dam impounds about 9,100 acre-feet of storage (Douglas PUD).

Table III - 23. Important Natural Reservation Streams and Lakes along with Drainage Area and Size.

STREAMS	DRAINAGE (ACRES)	LAKES	SIZE (ACRES)
Omak Creek	87,315	Apex	2
Wanacut Creek	24,815	Big Goose	220
Lost Creek	41,595	Bourgeau	20
Nespelem River	84,045	Buffalo	563
Coyote Creek	24,055	Camille	20
Peter Dan Creek	10,475	Cody	7
Manila Creek	15,110	Crawfish	40
Swawilla Basin	29,080	Elbow	40
San Poil river	188,775	Fish	2
Columbia River	121,880	Gold	20
Okanogan River	39,035	Great Western	52
Whitestone Creek	43,910	Johnson	54
Ninemile Creek	73,910	LaFluer	22
Sixmile Creek	9,080	Little Goose	7
Threemile Creek	11,300	Little Owhi	37
Wilmont Creek	36,445	McGinnis	116
Hall Creek	92,615	Nicholas	2
Barnaby Creek	18,275	Omak	3,300
Stranger Creek	63,250	Owhi	501
NezPerce Creek	17,720	Penley	
Falls Creek	18,945	Rebecca	49
Gold Creek/West Fork San Poil River	41,055	Round	49
Little Nespelem River.	56,590	Simpson	37
		Soap	150
		Sugar	5
		Summit	10
		North Twin	746
		South Twin	948

The Reservation has been stratified into 15 Resource Management Units (RMU). Across these RMUs the Reservation has been further stratified by 209 Watershed Management Units (WMU). Key watershed features and characteristics of these WMUs are shown in Appendix D, Tables D-1 and D-2.

Water Quantity

As shown in Appendix D, Table D -2, Precipitation ranges from 12 to 28 inches annually across the Reservation. In a water budget analysis, the USGS (1974) estimated that the annual water input by precipitation to the Reservation averages is about 1,885,000 acre-feet annually or about 16.2 inches. Of this input it is estimated that 1,530,000 acre-feet or 13.2 inches is lost to evapotranspiration. The remaining 335,000 acre-feet or 3.0 inches is available for streamflow and groundwater recharge. This is about 82,000 acre-feet or 0.7 inches less than estimated by the Bureau of Reclamation (1979) of 3.7 inches. If it assumed that about 8 percent of the water runoff is available for groundwater recharge, then 308,000 acre-feet (2.65 inches) would be available to streamflow and 27,000 acre-feet (0.35 inches) for groundwater recharge, that if not utilized would eventually become streamflow. (Additional groundwater is provided to the Reservation through seepage from the Columbia and Okanogan Rivers.) While highly variable with elevation and topography the annual water production on the Reservation averages about 160 acre-feet per square mile. With an average annual streamflow of 14 cubic feet per second for Omak Creek during the 1972-1979 period, this amounts to about 74.3 acre-feet per square mile or about 1.4 inches, less than one-half the streamflow projected for the entire Reservation by the USGS (1974).

The San Poil River, the largest interior stream on the Reservation has an average flow of 230 cubic feet per second, but flows drop substantially during August and September. For the 880 square mile San Poil Basin with the highest precipitation zone on the Reservation, the annual flow is about 189.2 acre-feet per square mile or about 3.5 inches This is slightly less (0.2 inches) than the 3.7 inches estimated for the entire Reservation by the US Bureau of Reclamation (1979).

Since nearly 81 percent of the precipitation reaching the Reservation is estimated to be lost as evapotranspiration (the use of water by plants and evaporation), the largest opportunity to modify streamflow is by vegetation management. Reduction of forest vegetation cover or species conversion (Klock 1981, Lopushinsky 1981, Hunner and Jones 1997) provides the largest opportunity to increase streamflow on the Reservation. Management action that increases overstory canopy closure or converts ponderosa pine to Douglas-fir or grand fir stands is most likely to reduce streamflow. This possible streamflow reduction generally appears during the late summer low-flow period when flows are most critical for fish habitat and other beneficial water uses. The overstory vegetation cover for the watersheds across the Reservation is shown in Appendix D Table D-1. The effects of forest management on the Reservation's streamflow existing conditions is discussed in the *Water Quality* section below.

Water Use

Water is used on the Reservation for many purposes, including domestic supplies, irrigation, livestock watering, fish and wildlife, and recreation. Within the Colville Reservation, irrigation is the single largest consumer of water.

Total water use on the Reservation is estimated at about 60,000 acre-feet with about 60 percent being used from groundwater sources. Streams provide about 60 percent of the 16,000 acre-feet of water used annually for irrigation (Harkness 1974). The Columbia and Okanogan Rivers are the principal sources of surface irrigation water. Other sources include the Nespelem River, and Hall, Kartar and Stranger Creeks. The remaining 40 percent of the irrigation water is from groundwater wells located throughout the Reservation.

Water quality

An extensive assessment of the water quality conditions and management needs of the Colville Reservation was completed in 1998 (Passmore 1998). An overview of the beneficial uses of water and impacts that exist for Reservation streams and lakes is shown in Tables III-24 and III-25.

Passmore's (1998) assessment showed that in general, many Reservation streams and lakes including the boundary waters meet water quality standards set forth in Chapter 4-8 Water Quality Standards of the Colville Tribal Code. The assessment showed that many smaller streams could probably be upgraded to higher standards, Class IV to Class II or III (Table C-2). However, overall, the existing water quality conditions of streams and lakes on the Reservation do not adequately protect resident fish or salmonid spawning and migration (Passmore 1998).

The assessment showed that human fish consumption (from a human heath standpoint), secondary contact recreation and aesthetics are the most frequently and universally supported water uses on the Reservation. In turn, fish rearing along with salmonid spawning and migration are the most frequently and universally impaired water uses on the Reservation (Table III-24 and III-25).

Livestock grazing and logging roads are the most frequent and universal causes of water pollution (and riparian habitat destruction) on the Reservation (Table III-25). Another universal source of water quality impairment has been the changing of streamflow regimes over time through various land use practices. Hunner and Jones (1997) showed that 31 of 77 currently intermittent streams probably had perennial flow patterns in their historic condition. These streams are not being diverted into irrigation or some other use.

Passmore (1998) suggested these streams are drying up due to the cumulative effects of various activities taking place in the watershed including forest practices, grazing practices, road building, riparian "modifications" and urbanization. While all of these practices may be affecting streamflow, most likely the departure from the historic range of variability in the forest vegetation community is having a much greater effect (This is the viewpoint of author Dr. Klock; Also see *Forest Vegetation* section).

Table III - 24. Beneficial uses of streams and Lakes on the Colville Reservation and Percent of Those Streams and Lakes Where the Beneficial Use is Impacted (See Appendix C, Passmore 1998).

BENEFICIAL USES	PERCENT SUPPORTING USE		PERCENT WHERE USE IS IMPACTED	
	Streams	Lakes	Streams	Lakes
General Use	0.7	0.0	0.0	7.1
Fish Consumption	84.3	47.6	1.4	0.0
Primary Contact Recreation	10.7	11.9	9.3	16.7
Secondary Contact Rec.	68.6	47.6	2.1	0.0
Aesthetic Enjoyment	87.9	61.9	10.0	7.1
Fisheries Production	22.9	40.5	48.6	21.4
Salmon Spawning	12.1	14.3	50.0	9.5
Salmon and Other Fish Mitigation.	6.4	0.0	46.4	0.0
Aquatic Life	5.7	42.9	7.1	7.1
Wildlife Habitat	75.0	54.8	29.3	21.4
Cultural and Traditional	12.9	26.2	4.3	0.0
Sample Size: Streams 143, Lakes 38.				

Silviculture practices and the exclusion of fire have created a forest on the Reservation much different than existed in historic times. This existing forest condition is one that has a much higher demand for water use through evapotranspiration because of stocking and species present than during historic times. Therefore, water available for streamflow is markedly less and perennial streams of the past now have become intermittent.

Table III - 25. Causes and Sources of Water Quality Impairment on Streams and Lakes on the Colville Reservation (See Appendix C, Passmore 1998).

CAUSE OF IMPAIRMENT	STREAMS	LAKES	SOURCE OF IMPAIRMENT	STREAMS	LAKES
Alkalinity (pH)	5.0	0.0	Urban Development	17.9	6.4
Siltation and Sediment	2.9	0.0	Non-irrigated Agricul.	47.1	7.1
Organic Enrichment	1.4	0.0	Irrigated Crop Prod.	12.9	0.7
Thermal Modification	45.7	9.5	Grazing Livestock	60.0	5.0
Flow Alteration	3.5	0.0	Feedlots	55.0	9.3
Habitat Alteration	0.7	1.4	Aquaculture	15.7	2.1
Forest Management	14.3	1.4	Forest Harvest/Roads	35.0	0.0
Harvest Roads	43.6	6.4	Other	2.8	1.4
Land Development	6.4	1.4			
Riparian Removal.	5.0	0.7			
Highway Maintenance	10.7	0.7			
Natural	7.9	2.9			
Non-point	5.0	0.7			
Beaver	10.0	1.4			

A permanent stream-monitoring network of approximately 150 potential stations (about 75 currently active or active at a given time) has been established as part of the Tribes' ongoing water quality management program. This system is serving as the Tribes permanent water quality monitoring and stream condition reference database. Data from this monitoring is on file at the Colville Natural Resources Department.

While this water quality-monitoring data indicates that most streams and lakes are of good quality, there is concern across the Reservation that the overall water quality is not good enough to adequately support aquatic needs. Further review of this concern is needed. Water acidity values range from pH 7 to pH 8 (neutral to slightly alkaline) with the exception of several lakes on the southwest plateau including Omak and Soap Lakes that have high salinity and alkalinity. Most streams and lakes have a low to medium electrical conductivity and an adequate dissolved oxygen level. Total dissolved solids generally range between 124 and 161 mg/l and suspended solids range from 1 to 17 mg/l. The range of suspended solids does not reflect the higher sediment loads that often occur during high flows. High bacterial counts are often found in small streams where livestock graze with the highest concentrations occurring during low flow periods in the late summer or fall. During spring runoff and summer storm events suspended sediment loads higher than normal levels have been measured and observed in forest streams across the Reservation. Forest management practices particularly associated with forest road construction and maintenance have been identified as the primary source of this sediment.

The Colville Confederated Tribes have established a set of Codes to protect water use, rights and quality for the Reservation. These Codes that have been designed as a framework for managing and protecting the Reservation's water resource include:

- Chapter 4-5 – On site Wastewater Treatment and Disposal
- Chapter 4-6 – Mining Practices Water Quality
- Chapter 4-7 – Forest Practices Water Quality
- Chapter 4-8 – Water Quality Standards
- Chapter 4-9 – Hydraulic Project Permitting
- Chapter 4-10 – Water Use and Permitting
- Chapter 4-15 – Shoreline Management

Groundwater

As noted the USGS (1974) estimated that the recharge to groundwater from precipitation is estimated at 30,000 acre-feet annually. However, this recharge is modified by inputs from both the Columbia and Okanogan River. Other than the Columbia and Okanogan Valleys groundwater supplies on the Reservation are limited in most areas. Larger aquifers exist in the Nespelem River Valley and the Hall Creek drainage.

The Okanogan River Valley is underlain by a large body of water-bearing sand and gravel (aquifer) with an average thickness of 120 feet. Much of this aquifer is off the Reservation, however, an estimated 75,000 acre-feet of ground water is stored beneath this part of the Reservation (Cooper 1990). Kartar Valley, a tributary to the Omak Lake drainage basin, is underlain by water bearing sands and gravels up to 150 feet thick.

Along the Columbia River there is an estimated 300,000 acre-feet of groundwater storage in sand and gravels. However, this aquifer is highly dependent upon the water level in reservoirs behind Grand Coulee, Chief Joseph and Wells Dams.

The upper reaches of the Nespelem Valley contain aquifers fed partly by the Nespelem River and small streams that seep into the ground before reaching the river. The aquifer beneath the Nespelem River Valley is estimated to store approximately 300,000 acre-feet (Cooper 1990). In addition, the aquifer beneath the San Poil River Valley is estimated to store approximately 50,000 acre-feet of water.

The Inchelium area contains both high and low yield groundwater aquifers that can range with pumping capacity from less than four gallons per minute (gpm) to over 400 gpm. These aquifers are estimated to store approximately 750,000 acre-feet of water. Approximately half of this storage is believed to be underlying the Hall Creek drainage.

An analysis of the Reservation's groundwater quality has been reported by the US Geological Survey (USGS 1974). This analysis along with recently collected data on file in the Colville Natural Resources Department indicates that the quality of the groundwater is generally good and the water can be used for most purposes without treatment. Dissolved mineral concentrations range from 92 mg/l to 383 mg/l. Hardness of the groundwater ranges from moderately hard to very hard (150 to more than 300mg/l hardness).

Some groundwater quality problems have been associated with naturally occurring iron and manganese. Spring box wells and shallow wells in proximity to surface water may be prone to color and turbidity problems associated with spring run off and snowmelt. Most bacteria problems associated with groundwater on the Reservation have been associated with faulty or damaged well construction that has allowed surface contamination to enter the well. Other bacteria and nutrient (nitrate, ammonia) problems are a result of influences from faulty septic drain fields, agricultural practices and feedlots. Shallow and improperly placed or constructed wells are particularly susceptible to impacts from these activities on the Reservation.

A groundwater-monitoring network of about 35 stations is currently being established as part of the Tribe's ongoing water quality management program. The network includes public supply wells and other wells where groundwater contamination from land use activities and identified potential pollution sources is a concern.

Wild and Scenic Rivers

No stream on the Reservation or along its boundary has been determined to be eligible as components of the National Wild and Scenic River System.

Floodplain and Wetlands

As noted above, the Okanogan River borders the Reservation on the west and the Columbia River acts as the southern and the western boundary. Flooding along the Okanogan River normally occurs in May or June as a result of the melting of snowpack from the local mountainous area as well as the vast headwater area in Canada. Following the disastrous flood of 1948, levees were constructed in cities along the Okanogan River. The flood of 1972 ran about one foot higher than in 1948 and overtopped levees along the river. It is estimated a 100-year flood would run about one foot higher than that of 1972. It would overtop all existing levees and would flood about one-third of the City of Omak.

Along the Columbia River above Grand Coulee Dam, the 1,310-foot elevation mark is recognized as the 100-year flood line. The U. S. Bureau of Reclamation allows no permanent structures to be built below this line. Also the Bureau of Reclamation, Corps of Engineers and Douglas County Public Utility District control the river level with a series of hydroelectric and flood control dams.

Flood plains are managed on the Reservation under direction of Colville Tribal Code, Chapter 4-15, Shoreline Management. While floodplains and wetlands exist across the Reservation (Also see *Geology, Minerals and Soils* Section), outside of the City of Omak no known Federal Emergency Management Agency (FEMA) floodplains or wetlands exist within the boundaries of the Reservation.

Watershed Improvement Needs

Watersheds required for restoration and current project needs to meet water resource management goals and objectives on the Reservation have been identified and discussed by Passmore (1998) and Hunner and Jones (1997).

WILDLIFE

The Wildlife Resource Goal is to: maintain viable populations (numbers and distribution of reproductive individuals) of native and desired non-native species of wildlife and their supporting habitats, while providing wildlife in sufficient numbers to meet the cultural, subsistence and recreational needs of Colville Tribal Members. Wildlife management objectives are to:

- Restore and/or maintain habitat conditions at or above a level capable of supporting healthy, sustainable, viable and productive populations and communities of diverse plant and animal species to meet spiritual, cultural and subsistence needs of the membership.

- Contribute to the recovery and management of listed species (Federal or State: Endangered, Threatened, Candidate or Sensitive) populations and/or habitats by restoring or protecting habitat quality, quantity and effectiveness for listed species. And to manage habitat to prevent future listing of species.

- Manage rangelands and Range Units to maintain or enhance habitat requirements (including breeding, feeding, protection, dispersal and travel) of species closely associated with or dependent on native rangeland, forested uplands, meadows and riparian areas.

- Institute wildlife population management practices, which maintain sufficient wildlife numbers to meet cultural, subsistence, recreation and economic needs of Colville Tribal Members.

- Wild free roaming horses and their habitat shall be managed and controlled in a manner that maintains a wild horse herd on the Colville Indian Reservation, while insuring that populations do not reach levels that damage the habitat or are adversely competing with native wildlife species

Approximately 333 species of wildlife are known to exist or have in the past been supported by habitats within the Reservation boundaries (Hruska 1997). The IRMP, Wildlife, Phase I: Inventory and Project Report (Hruska 1997) provides descriptions of past and current conditions for wildlife and their habitats; defines relationships between habitat, wildlife and resource use; describes current monitoring; and provides desired future conditions and management recommendations for wildlife.

Threatened and Endangered Species

The Colville Indian Reservation provides suitable habitat for a number of federal and state-listed threatened or endangered wildlife species (Table III-26). The Endangered Species Act, as amended, requires that all resource management actions planned for the Reservation evaluate potential impacts to federally listed species through biological assessment reports. The U.S. Fish and Wildlife Service provides a species list of threatened, endangered, candidate and proposed plants and animals that might be present within the Reservation for consideration in environmental assessments. Table III-26 indicates which of these species has been confirmed as present by a qualified biologist (Class I Sighting). For discussion of bull trout see the Fisheries Resource section of this Chapter.

Table III - 26. Endangered or Threatened Species Occurring in north central Washington and Considered for the Colville Indian Reservation IRMP Project.

Species	Federal Status[1]	State Status[1]	Habitat Present	Class I Sightings	Potential Occurrence
Canis lupus Gray wolf	E	E	Breeding Foraging	Yes	Transient
Ursus arctos horribilis Grizzly bear	T	E	Spring/Fall Foraging	Yes	Transient
Grus canadensis Sandhill crane	-	E	Resting Foraging	Yes	Migrant
Haliaeetus leucocephalus Northern bald eagle	T	T	Breeding Foraging	Yes	Resident
Lynx canadensis Lynx	C	T	Breeding Foraging	Yes	Resident
Buteo regalis Ferruginous hawk	SC	T	Breeding Foraging	None	Accidental
Centrocereus urophasianus Sage grouse	SC	T	Breeding Foraging	Yes	Accidental
Tympanuchus phasianellus Sharp-tailed grouse	SC	T	Breeding Foraging	Yes	Resident
Salvelinus confluentus Bull trout[2]	T	C	Breeding Foraging	Yes	Resident

[1] Status - E = Endangered; T = Threatened; C = Candidate; SC = Species of Concern.
[2] See Fisheries section of this EIS.

The findings of biological assessment reports are forwarded to the United States Fish and Wildlife Service for concurrence or consultation. All future resource planning will also consider the potential impacts to federally listed candidate species and to all categories of state listed species (Table III-27). Resource management projects that may negatively affect habitat for these species will consider modifying the practices and procedures utilized so that populations of candidate, sensitive and species of concern do not decline further.

Gray Wolf (*Canis lupus*)
Federal Status - Endangered
State Status - Endangered

Habitat - Past sightings of gray wolves in the Cascade and Selkirk Mountains of northern Washington suggest that suitable habitat is present and populations of this species are beginning to recover in the state. Although field studies have not been conducted locally, investigations in other geographic regions indicate that wolf social groups occupy individual territories from tens to hundreds of square miles. Fritts and Mech (1981), for example, estimated territory sizes of 8 wolf packs in northwestern Minnesota ranging from 75-214 square miles. Preferred habitat is dense conifer forests interspersed with large meadows. Wolves follow migrating big-game herds between upper elevation summer range and lower elevation winter range areas. The most critical factors defining gray wolf habitat are the availability of large ungulate prey and isolation from human disturbance.

Existing Condition - Class I (verified by biologist) sightings of gray wolves in the North Cascades in the early 1990's suggest that populations of this species are beginning to recover in parts of Washington State. One of these sightings was northwest of Winthrop in the Okanogan National Forest near the Pasayten Wilderness. Gray wolves have also been reported in the mountains east of Tonasket (Jon Almack, 1992 personal communication, Washington Department of Wildlife). There has been Class I sightings on the Reservation.

The U.S. Forest Service conducted calling surveys for gray wolves on the Okanogan and Colville National Forests north of the Reservation up until three or four years ago. No wolf responses were heard (Jim McCowan, personal communication, Colville NF). All further surveys, limited to checking reported sightings, have proved negative. Although there are very few verifiable occurrences of gray wolves on or near the Reservation, it is assumed that since suitable habitat and prey are available gray wolves may utilize the area as infrequent, transient visitors.

Grizzly Bear (*Ursus arctos horribilis*)
Federal Status - Threatened
State Status - Endangered

Habitat - Grizzly bears utilize a wide variety of habitats from mature coniferous forest to open alpine meadows. They occupy home ranges that can be over 1,000 square miles in area. Grizzly bears, males in particular, prefer low to mid-elevation riparian areas in the spring and late fall, but move up to higher elevation alpine and subalpine meadow habitats at other times of year. Denning/hibernation sites are often at elevations above 6,500 feet. Food varies seasonally, and includes anything from forbs, grasses, and berries to rodents, large ungulates, and carrion.

Existing Condition - The U.S. Forest Service, in cooperation with the Washington Department of Wildlife, the Idaho Department of Fish and Game, U.S. National Park Service, U.S. Fish and Wildlife Service, and British Columbia (Canada) Wildlife Branch recently completed a study to assess the population and habitat potential for grizzly bears within northern Washington and Idaho. The study concluded that a small population of grizzly bears, numbering perhaps 10-20 individuals, inhabits the 3,400 square miles of forestland north of Interstate Highway 90 and west of the Okanogan and Columbia Rivers in Washington State. The study also concluded that a small population of grizzly bears, numbering perhaps 10-30 individuals, inhabits the 4,000 square miles of forestland north of Interstate Highway 90 and east of the Columbia River. There have been a few Class I sightings (confirmed by a biologist) and several unconfirmed sightings of grizzly bears or their signs within the Okanogan and Colville National Forests. No confirmed sightings have been reported within the past ten years for the Colville Indian Reservation.

Since some suitable habitat may be present, grizzly bears are assumed to be present as infrequent transients through the Reservation. Current conditions within the Reservation provide limited seclusion habitat, poor quality and limited variety of spring and fall range, and very few, if any, potential denning sites for grizzly bears. The current open road density within the Reservation averages more than 5 miles per square mile, exceeding the recommended maximum road density of not more than 1 mile per square mile in grizzly bear habitat (Ruediger and Mealey 1978). The high level of human use for logging, firewood gathering, and hunting greatly reduces the seclusion value of habitat for grizzly bears. The nearest suitable denning habitat may occur on the Colville National Forest in the chain of peaks from White Mountain to Mount Leona to the north of the Reservation.

Sandhill crane (*Grus canadensis*)
Federal Status - None
State Status - Endangered

Habitat - Sandhill cranes generally use only large tracts of open habitat where visibility is good in all directions. Grain fields, grasslands, meadows, marshes dominated by emergent vegetation and large shallow ponds are favored as resting and feeding sites. Nesting occurs in extensive shallow-water marshes with dense emergent plant cover, especially bull rushes.

Existing Condition - Migrants can be found throughout the state of Washington, especially in the spring, with the largest concentrations being found in the central Columbia Basin. Sandhill cranes may be found resting and foraging on the Reservation for short periods during their spring and fall migration between breeding territories in northern Canada and wintering grounds in southern California and Mexico. There are no known cases of Sandhill cranes nesting in north central Washington.

Northern Bald Eagle (*Haliaeetus leucocephalus*)
Federal Status - Threatened
State Status - Threatened

The northern bald eagle is currently being considered for delisting as threatened by the USFWS.

Habitat - Bald eagles inhabit most of the major rivers and reservoirs in the interior northwest, primarily as migrants and winter residents. Seven years ago, fewer than 12 active bald eagle nesting territories were known to exist east of the Cascades in Washington (Taylor 1992, personal communication). Bald eagle populations in eastern Washington are assumed to be highest during February and March, with the highest wintering concentrations being in northeastern Washington and along the Columbia River corridor.

Bald eagles nest in large, dominant trees located overlooking an associated body of open water (Stalmaster 1987, MBEWG 1991). Bald eagles generally use traditional communal roost sites in winter, especially during periods of severe weather. These roosts are often located in a stand of large trees at the head of sheltered draws. Winter roosts are generally no more than a few miles from open water, but in regions such as north central Washington where suitable roost trees and open water may be widely separated there may be many miles between the two habitats. Bald eagles are opportunistic foragers whose food includes primarily fish and waterfowl during the summer. Important food sources for bald eagles wintering in eastern Washington are carrion, fish, and waterfowl (Fielder 1982).

Existing Condition - Bald eagles visit many of the major rivers, lakes and reservoirs in eastern Washington, primarily as migrants and winter residents. Midwinter bald eagle surveys (no longer being conducted) reported an average of four bald eagles in the lower Methow River Valley and eight bald eagles in the Okanogan River Valley (Taylor 1986-1990). Much larger wintering populations have been reported in the Kettle Falls/Colville valley region of northeastern Washington.

At least ten bald eagle nesting territories are known to exist on Lake Roosevelt in the region bordered by the Colville Indian Reservation. Winter roost sites are known to exist above Lake Roosevelt on the Reservation. Bald eagles will occasionally venture over the Reservation as migrants or while foraging in the summer at various lakes, but generally bald eagles spend little time in the interior of the Reservation boundaries. Most of the upland lakes provide no open water from November to March. The nearest potentially open water to suitable winter roosting habitat occurs along the perimeter of Lake Roosevelt.

North American Lynx (*Lynx canadensis*)
Federal Status - Candidate
State Status - Threatened

Habitat - Lynx occupy the boreal regions of North America and Eurasia, including Alaska, Canada, and the northern edge of the contiguous United States. Although never a very common species in the contiguous United States, the lynx remains widespread in many of its haunts north of our border. Although actual documentation is unavailable, lynx populations appear to have decreased over portions of their former range in the U.S. In Washington, the lynx is found in the North Cascades, Okanogan and Selkirk Mountains where it inhabits Engelmann spruce, subalpine fir and lodgepole pine forests generally above 4,500 feet elevation (Rodrick and Milner 1991). Here, as elsewhere, its presence depends on the snowshoe hare as its primary year-round food source (Koehler 1990).

Because of the close association of lynx with snowshoe hares, habitat that is good for hares is assumed to benefit lynx (Rodrick and Milner 1991). A number of studies have shown that snowshoe hares prefer successional stages of forested habitats with dense stands of shrubs and saplings that provide hiding and thermal cover and winter food (Grange 1932, Pietz and Tester 1983, Lievaitis *et al.* 1985, Monthey 1986). Snowshoe hares browse primarily on stems of hardwoods or conifers during winter (Pease et al. 1979), and shift to a diet of forbs, grasses, and leaves in the summer (de Vos 1964, Wolff 1978). Small twigs and new growth of less than one centimeter diameter are the preferred winter browse, though hares eat larger stems when food is limited (Wolf 1980). In north central Washington, stems and bark of sapling lodgepole pine protruding above the snowpack were found to be the principal winter foods of snowshoe hares (Koehler 1990).

Denning/breeding habitat shifts to more mature forest conditions. Typically this habitat has spruce and subalpine fir stands over 200 years old on north and northeast aspects, supports moist habitat associations and has a relatively high density of downed large woody debris. Denning areas must also have corridors of relatively closed vegetative cover connecting to prey habitats, since lynx often avoid open habitat (Brittell *et al.* 1989).

Existing Condition - Lynx presence on the Reservation has been confirmed by Class I sightings, but no denning activity or sites have been located. Mixtures of suitable lodgepole pine and subalpine fir habitat are available near the summits of Moses and Grizzly Mountains.

The US Forest Service has adopted a target of maintaining 30% foraging/hiding/ thermal habitat, 30% travel cover and 10% denning habitat. Created or natural openings within this landscape should not exceed 30% of the total, and created openings should avoid being contiguous with existing openings. Within habitat above 4,500 ft elevation, the Reservation provides a few stands that partially meet the assumed criteria for denning habitat and could be expected to be used now or will develop into acceptable denning habitat over time. No winter surveys have been conducted to confirm year round presence and no sightings of lynx with kittens have been reported.

To protect habitat effectiveness open road density in habitat managed to benefit lynx should not exceed one mile per square mile and all motorized traffic should be discouraged or eliminated after post sale activities. Although open road densities at lower elevations are quite high, in suitable lynx habitat on Grizzly and Moses Mountains open road densities are less than 0.1 mile per square mile.

Given the average density of lynx and the types and sizes of habitat, one to three resident lynx (not including kittens) could be expected to be resident on the Reservation.

Ferruginous hawk (*Buteo regalis*)
Federal Status - Species of Concern
State Status - Threatened

Habitat - Ferruginous hawks prefer brushy open country, prairies, plains and badlands. They are known to breed in the Columbia Basin of Washington and Oregon. Nesting occurs in isolated trees, cliffs, cutbanks, man-made structures, on the ground, and in trees along the forest-sagebrush ecotone.

Ferruginous hawks feed primarily on small mammals, especially prairie dogs, ground squirrels and jackrabbits, but they also take grasshoppers, birds and reptiles. They forage in non-forested, non-mountainous areas. The hawk forages by flying a few feet above the ground over low-shrub or open fields.

Existing Condition - There have been no confirmed sightings of ferruginous hawks on the Colville Indian Reservation. Preferred habitats for foraging do occur on the Reservation. Existing potential nesting habitat occurs adjacent to the ponderosa pine forest-sagebrush ecotone. It is assumed that ferruginous hawks may fly over the region as they move between suitable foraging and breeding territories on lands adjacent to the Reservation.

Sage grouse (*Centrocercus urophasianus*)
Federal Status - Species of Concern
State Status - Threatened

Habitat - In Washington, sage grouse historically ranged from the Columbia River, north to Oroville, west to the foothills of the Cascades and east to the Spokane River. Their preferred habitat contains medium to dense sagebrush stands with tall and short sagebrush overstory and a variety of shrub/steppe forbs and grasses. Sage grouse are dependent on sagebrush from October through April for both browse and winter cover habitat. From May through September they forage on succulent forbs and grasses found in the sagebrush dominated habitat, moving to free water sites only in late summer-early fall.

Sage grouse establish traditional breeding grounds (leks) that are passed from one generation to the next. Nests are constructed in the vicinity of the lek, as are brooding/rearing areas. Brooding requires well-sheltered areas that provide protection from adverse weather and predation. Contiguous sagebrush habitat that covers hundreds of acres is essential for support of a viable local sage grouse population.

Existing Condition - Only two isolated populations of sage grouse remain in Washington. One population exists in Douglas and Grant counties and the second on the Yakima Firing Range in Kittitas and Yakima counties. A few individual birds or a small non-breeding population of sage grouse still occur on the southwest region of the Reservation. An occasional individual bird may immigrate across the Columbia River from the Douglas/Grant County population. With the proper management of suitable habitat, it may be possible that a breeding population of sage grouse could be developed on the Reservation.

Sharp-tailed grouse (*Tympanuchus phasianellus*)
Federal Status - Species of Concern
State Status - Threatened

Habitat - The Columbian subspecies of sharp-tailed grouse historically occurred throughout eastern Washington. Sharp-tails were plentiful in eastern Washington when early explorers arrived and became important game birds that were harvested in abundance, but their numbers have drastically declined in Washington over the past 100 years (Hays *et al.* 1998). Conversion of grassland and sagebrush habitats to agriculture is the primary reason this species was nearly extirpated from the state.

The preferred habitat is the shrub/steppe plant community, dominated by sagebrush and bunchgrass. Spring breeding habitat centers on big sagebrush, summer shifts more to bitterbrush dominated sites and winter habitat is more dependent on riparian areas. The sharp-tailed grouse decline in Washington is primarily attributed to loss and degradation of habitat. Excessive livestock grazing, agriculture, and brush control using herbicides and fire are primarily responsible for loss of habitat. Remaining sharptail shrub-steppe habitat is severely fragmented and in poor condition, especially in Okanogan County where winter habitat has been removed. Loss of nesting, brood rearing, and wintering habitat are important factors limiting population growth.

Existing Condition - The Colville Indian Reservation has the largest, most stable sharp-tailed grouse population remaining in the state. There are 17 leks being monitored on the Reservation, having 169 birds counted in the most recent surveys (Hays *et al.* 1998). The actual population is estimated at 352 birds and is currently considered to be self-sustaining. Any increases in livestock grazing or other agricultural use or clearing of preferred habitat could result in reduced breeding success and eventual loss of the species from the Reservation lands.

ENVIRONMENTAL CONSEQUENCES

CHAPTER IV – ENVIRONMENTAL CONSEQUENCES

The purpose of Chapter IV is to show the environmental consequences of carrying out the alternatives described in Chapter II. Each alternative potentially affects various components of the environment depending upon the existing conditions and affected environment described in Chapter III. Those potential environmental effects are presented in Chapter IV and form the scientific basis for the systematic comparison of alternatives.

Environmental impacts are discussed in terms of their direct, indirect and cumulative effects. *Direct effects* are caused by the action and occur at the same time and place as the action. *Indirect Effects* are caused by the action and occur later than the action or are farther removed in distance (40CFR 1408.8). *Cumulative effects* are those that affect the environment as a result of the incremental impacts of this action and other past, present, and reasonably foreseeable future actions (40CFR 1508.7). These potential effects resulting from proposed actions are described in Chapter IV.

All environmental effects shown in Chapter IV assume complete compliance with the Management Directions summarized in Appendix A and to be incorporated in the forthcoming Forest Plan (CCT 2000). This Forest Plan (CCT 2000) will implement the Record of Decision for this EIS. These Management Directions along with the Chapter II mitigation propose action that avoid, minimize, restore, replace, reduce, or eliminate probable or potential environmental impacts.

It is extremely important that mitigation specific to the Reservation as described in Chapter II of this document be included in the design of the alternatives and during implementation of the preferred alternative. Overall, *mitigation* is a measure taken to cause an action to become less harsh or less severe. From the CFQ Regulation (40CFR 1508.20), mitigation includes:

Avoiding the impact altogether by not taking a certain action or parts of an action;
Minimizing impacts by limiting the degree or magnitude of the action and its implementation;
Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and
Compensating for the impact by replacing or providing substitute resources or environment.

In the design of alternatives in Chapter II and throughout the discussion of environmental consequences in Chapter IV, appropriate mitigation measures have been incorporated and evaluated. Please refer to Chapter II for additional discussion of specific mitigation measures.

The environmental consequence for each environmental component follows.

AESTHETICS

Timber harvest and road construction can affect the aesthetics of the Reservation because of contrasts created between natural forest landscapes and those modified by management activities. These contrasts consist of changes in line, form, color and texture of the vegetation and landform as well as extension of view distances. The effects these alterations have on aesthetics are dependent upon individual human values. The ability to control how disturbances appear depends upon the harvest system used, landform, soil type, silvicultural system employed and fuels disposal.

The aesthetics issue of concern is loss in scenic quality and the issue indicator is the change in Visual Resource Management condition. For the Reservation, each alternative was examined for the overall effect on the existing visual conditions.

Management Direction Impacts

The eight proposed aesthetics management directions shown in Appendix A would assist in enhancing the scenery and general appearance of the Reservation. Most particularly, the management directions to meet desired future conditions and reduce road densities would be most important. Under Alternatives 3 through 6, the proposed management direction to map the visual resource character would be extremely useful for protecting the Reservation aesthetic values during planning for future activities. All of the management directions shown in Appendix A for air resources would be beneficial to the resource and would not result in any known adverse impacts.

Operational Impacts

Effects Common to All Alternatives

Several major primary roads and numerous secondary routes cross the Reservation. While aesthetics are not a major concern on the secondary roads, the scenery as seen from the primary routes is of concern. Timber harvest activities and road building over the past 50 years have affected nearly all the forested areas of the Reservation and evidence of that activity is widely spread along primary view routes. Road construction and timber harvest as proposed under all alternatives would continue to contrast with natural forest landscapes. Views of the natural forest landscape condition can have a major effect on the enjoyment of the area for recreational and other forest users. Retention of the scenic resource in a natural-appearing, undisturbed state can be in direct conflict with intensive timber management.

The landscape and aesthetics of the Reservation will not remain static. The incidence of current and future pathogens or wildfire will determine the extent of the long-term effects of any treatments imposed. Any of these factors, acting independently or in concert, has the potential to alter the landscape to a greater extent than the proposed activities. In addition, there is much variability in the forest overstory where the stand density averages about 55 percent. Thus, there are many openings and other features that affect contrast in line, form, color and texture of the vegetation and landform. This variability ameliorates contrast that may be created by harvest units under all alternatives.

Road construction would create the longest-lasting visual disturbance because of soil disturbance. Roads constructed through or along openings are highly visible when viewed in the foreground and middleground. Low standards roads built through undisturbed timber stands would be well hidden to middleground view, unnoticed from the background, and noticed in the foreground only by those traveling or intersecting the road. Closing and revegetation of roads following harvest would partially mitigate visual impacts. Seeding of cut and fills slopes, as part of normal road stabilization would mitigate impacts by eliminating the color contrasts of exposed soils and vegetation.

Both intermediate and regeneration silvicultural systems would be used in all alternatives. While difficult under regeneration systems, in intermediate systems an opportunity exists to blend the proposed action into the natural landscape and provide retention and partial retention visual quality.

With the proposed implementation of treatments to meet and restore the historic range of natural variability and natural vegetation conditions, substantial opportunity exists to improve the scenic quality of the Reservation. On much of the Reservation the historic natural vegetation characteristics have been open ponderosa pine and Douglas-fir stands. While historic natural vegetation included thickets of dense understory as well as the effects of damage by pathogens, these visual detractors are much more prevalent under the existing conditions. Treatments proposed under all alternatives would provide enhanced scenery in many parts of the Reservation.

Direct and Indirect Effects

Alternative 5 followed by Alternative 6 with extensive regeneration harvest would have the largest short-term negative direct effects on aesthetics of the Reservation with Alternative 4 having the least short-term direct effects. For the long-term the aesthetic values of the Reservation will be the greatest with Alternatives 5 and 6 where new vigorous healthy stands will replace the present overstocked stands damaged by pathogens. While the forest health will be improved under Alternative 4, it will be difficult to observe from a general visual perspective. Alternatives 1, 2 and 3 will have a moderate short-term direct negative impact on the Reservation's aesthetics.

Alternatives 3 and 6 would provide an indirect positive benefit to the Reservation's aesthetics by renovating and/or removing many unnecessary forest roads, particularly in the streamside management emphasis areas.

Cumulative Effects

The direct effects of the proposed alternatives would be additive to the past harvest activities that have modified the landscape over the past 25 years. These visual effects would be observable from existing secondary forest roads on the Reservation. The extent of the visual impacts along primary roads is unknown, as the visual quality characteristics and identification of viewpoints of aesthetic concern have not been identified. All alternatives would continue modification of the present landscape character and would lead to a further departure in aesthetic value from the modified natural conditions that now exist. The opportunity does exist, however, to partially return the forestlands on the Reservation toward a historic range of vegetation conditions and improve the overall aesthetics that is expected in ponderosa pine and Douglas-fir dominated stands. The visual impacts of the proposed action under all alternatives would continue into the foreseeable future or until the new stands grow to provide forest cover that approaches the historic natural appearance.

AIR QUALITY

Current air quality within the Colville Indian Reservation is excellent. Few sources of pollutants exist within the area and the ones that do are minor. Air pollution records have not been consistently kept across the Reservation, but observations indicate Washington Veneer sawmill and plywood plant at Omak on the western edge of the Reservation is the largest point source. Colville Indian Precision Pine at Omak is also a point source.

The key issue is the protection of air quality across the Reservation and surrounding lands as well as the protection of Class I Airsheds. The issue indicators identified in Table II-1 are increased pollutants in tons/day of total particulate matter, PM_{10} and $PM_{2.5}$, effects on Class I Airsheds, and changes in visibility and local air quality.

To arrive at these emission estimates certain assumptions as guided by the Desk Reference for NEPA Air Quality Analysis (USDA Forest Service 1995) have been used for analyzing the air quality effects of Alternatives 1 through 6. The fuels created and the tons of fuel that would be consumed by prescribed fire have been estimated for the silvicultural treatments of intermediate harvest, regeneration harvest, and restoration prescribed fire. These fuels value for each forest plant association group (PAG) are shown in Table IV-1 and are referenced to the "Photo Series" by Maxwell and Ward (1980). The fuels created by silviculture treatment and those estimated to be consumed by prescribed fire by alternative over the period 2000-2014 is shown in Table IV-2. Further information on the effects of fuels treatments is shown in the *Fire/Fuels* section of this Chapter.

Management Direction Impacts

In Appendix A, eight management directions were developed for the restoration and enhancement of the air resource under the Integrated Resources Management Plan. These management directions would provide guidance for the Tribes to move towards the air resources desired future condition on the Reservation. All of the management directions shown in Appendix A for air resources would be beneficial to the resource and would not result in any known adverse impacts.

Operational Impacts

Effects Common to All Alternatives

All management activities proposed under the alternatives would comply with air quality standards and rules administrated by the United States Environmental Protection Agency. Pollutants of concern are total particulate matter (PM), inhalable particulate matter (PM_{10} and $PM_{2.5}$) and carbon monoxide (CO). Nitrous oxide, sulfur dioxide and ozone are pollutants of concern, but are at such low levels in the forest environment of north central Washington that changes in levels are not further considered in this analysis.

Short-term adverse effects to air quality, primarily from smoke, cannot be avoided in the range of alternatives. Prescribed fire is a useful tool in the management of healthy vigorous stands on the Colville Reservation. Under all alternatives, stands would remain at risk for wildfire. Wildfires generally occur at times and under conditions that impact local and regional air quality to a greater extent than do prescribed fires.

Table IV - 1. Fuels Created by Silvicultural Treatments and Estimates of Fuels Consumed by Prescribed Fire within each PAG.

PAG	SILVICULTURAL TREATMENT	PHOTO [1]	FUELS CREATED TONS/ACRE	FUELS CONSUMED TONS/ACRE
Ponderosa Pine Doug.-fir Warm Dry	Intermediate Harvest	6-PP-3	20.1	5
	Restoration Pre. Fire	6-PP-3	20.1	5
D.-fir Warm Moist D.-fir Cool Dry D.-fir Cool Moist	Intermediate Harvest	2-MC-3	20.4	5
	Regeneration Harvest	3-PP-1, wo/20"+	29.7	15
	Restoration Pre. Fire	2-MC-3	20.4	5
Grand Fir Subalpine Fir	Intermediate Harvest	2-MC-4, wo/50% 9"-20"	18.0	20
	Regeneration Harvest	3-MC-3	43.5	30
	Restoration Pre. Fire	2-MC-4, wo/50% 9"-20"	18.0	10
Grass and Shrub	Restoration Pre. Fire			2

Using regional averages, it has been assumed in this analysis that 13.3 grams total particulate matter (PM), 10.3 grams PM10, 9.4 grams PM2.5, and 111.1 grams carbon monoxide (CO) are emitted per kilogram of fuels consumed. The estimated total particle matter (PM), particle matter PM10, particle matter PM2.5 and carbon monoxide emissions by year and alternatives are shown in Table IV-3, IV-4, IV-5 and IV-6, respectively.

Road construction/maintenance, vehicle emissions and dust along with silvicultural practices also contribute slightly to the temporary degradation of air quality on the Reservation. Prescribed burning and dust from roads and machinery would temporarily affect local air quality, but would not constitute an irretrievable or irreversible commitment of resources.

Table IV - 2. Fuels Created by Silviculture Treatments and Estimated Consumption by Prescribed Fire under Six Alternatives.

TREATMENT YEAR	ALTERNATIVES (TONS x 1,000)											
	1		2		3		4		5		6	
	Treated	Burned	Treated	Burned	Treated	Burned	Treated	Burned	Treated	Burned	Treated	Burned
2000	240.4	107.6	229.7	96.3	186.9	79.3	212.6	89.8	269.6	146.7	208.4	101.0
2001	357.5	171.9	338.5	154.7	179.6	83.1	307.9	139.9	399.6	219.2	203.6	102.7
2002	189.8	94.9	179.3	85.6	180.5	86.5	164.0	82.7	214.1	127.1	203.6	107.5
2003	214.9	103.4	202.9	92.7	160.6	70.5	190.8	90.1	242.4	139.7	196.2	97.3
2004	234.8	116.3	222.7	105.0	221.2	97.2	204.4	99.9	265.4	154.3	244.6	119.2
2005	316.8	152.1	289.5	132.2	2196	109.6	273.1	124.6	353.6	195.0	229.7	124.1
2006	371.4	187.6	352.1	170.1	237.8	133.5	322.1	156.1	415.0	234.6	239.2	137.1
2007	238.1	118.6	227.5	107.8	160.7	70.8	201.7	99.3	266.6	153.3	250.2	135.8
2008	195.1	91.4	183.3	81.1	147.1	67.9	170.4	78.0	216.4	121.7	219.1	106.1
2009	250.9	152.3	232.3	138.9	152.7	78.2	200.6	131.6	285.3	185.6	250.2	141.5
2010	2265	120.3	215.7	109.8	151.3	78.3	193.8	104.3	253.7	152.7	215.7	111.9
2011	172.5	101.6	160.7	91.9	213.4	113.1	148.9	93.6	193.6	127.6	238.9	133.5
2012	244.6	147.3	230.1	135.5	299.7	132.0	199.0	128.8	279.5	182.3	240.8	121.2
2013	246.3	131.6	230.6	117.0	204.8	105.7	212.8	114.7	277.1	167.2	229.7	126.1
2014	381.7	178.9	374.7	172.8	217.9	107.0	342.5	155.9	447.2	247.5	236.1	127.8
Total	3,881.3	1,975.8	3,669.7	1,791.6	2,933.8	1,412.6	3,344.7	1,689.3	4,379.2	2,554.7	3,406.0	1,793.0
Mean	258.8	131.7	244.6	119.4	195.6	94176	223.0	112.6	291.9	170.3	227.1	119.5

Table IV - 3. Particle Matter Emissions Estimated for the Proposed Alternatives.

YEAR	ALTERNATIVES - TONS					
	1	2	3	4	5	6
2000	1,432	1,281	1,054	1,194	1,952	1,344
2001	2,286	2,058	1,105	1,861	2,916	1,366
2002	1,262	1,139	1,756	1,100	1,690	1,430
2003	1,375	1,233	938	1,198	1,858	1,295
2004	1,547	1,397	1,293	1,329	2,053	1,586
2005	2,023	1,759	1,458	1,657	2,593	1,650
2006	2,496	2,262	1,775	2,077	3,120	1,824
2007	1,577	1,433	942	1,321	2,039	1,807
2009	1,216	1,078	904	1,037	1,619	1,411
2009	2,026	1,847	1,041	1,750	2,469	1,882
2010	1,599	1,460	1,041	1,387	2,031	1,489
2011	1,351	1,223	1,504	1,244	1,698	1,775
2012	1,960	1,802	1,756	1,714	2,424	1,613
2013	1,750	1,557	1,405	1,526	2,224	1,677
2014	2,379	2,298	1,423	2,074	3,292	1,700
Total	26,278	23,828	18,788	22,468	33,977	23,846
Mean Ann.	1,752	1,589	1,253	1,498	2,265	1,590

Table IV - 4. Particle Matter PM_{10} Emissions Estimated for the Proposed Alternatives.

YEAR	ALTERNATIVES - TONS					
	1	2	3	4	5	6
2000	1,109	992	817	925	1,511	1,041
2001	1,770	1,594	856	1,441	2,258	1,058
2002	978	882	891	852	1,309	1,107
2003	1,065	955	726	928	1,439	1,003
2004	1,198	1,082	1,001	1,029	1,590	1,228
2005	1,569	1,362	1,129	1,283	2,008	1,278
2006	1,933	1,752	1,375	1,608	2,416	1,413
2007	1,221	1,110	729	1,023	1,579	1,399
2008	941	835	700	803	1,254	1,093
2009	1,569	1,431	806	1,356	1,912	1,457
2010	1,239	1,130	806	1,074	1,573	1,153
2011	1,046	947	1,165	964	1,315	1,375
2012	1,518	1,396	1,360	1,327	1,877	1,249
2013	1,355	1,205	1,088	1,182	1,722	1,299
2014	1,842	1,780	1,102	1,606	2,549	1,316
Total	20,351	18,453	14,550	17,400	26,313	18,467
Mean Ann.	1,357	1,230	970	1,160	1,754	1,231

Table IV - 5. Particle Matter $PM_{2.5}$ Emissions Estimated for the Proposed Alternatives.

YEAR	ALTERNATIVES - TONS					
	1	2	3	4	5	6
2000	1,012	905	745	844	1,379	950
2001	1,616	1,454	781	1,315	2,061	966
2002	892	805	813	777	1,195	1,011
2003	972	872	663	847	1,313	915
2004	1,093	987	914	939	1,451	1,121
2005	1,430	1,243	1,031	1,171	1,833	1,166
2006	1,764	1,599	1,254	1,468	2,205	1,289
2007	1,115	1,013	666	933	1,441	1,277
2008	859	762	639	733	1,144	998
2009	1,432	1,306	736	1,237	1,745	1,330
2010	1,130	1,032	736	980	1,435	1,052
2011	955	864	1,063	879	1,200	1,254
2012	1,385	1,274	1,241	1,211	1,713	1,140
2013	1,237	1,100	993	1,079	1,572	1,185
2014	1,681	1,624	1,006	1,466	2,326	1,201
Total	18,572	16,841	13,279	15,880	24,014	16,854
Mean Ann.	1,238	1,123	885	1,059	1,601	1,124

Table IV - 6. Carbon Monoxide (CO) Emissions Estimated for the Proposed Alternatives.

YEAR	ALTERNATIVES - TONS					
	1	2	3	4	5	6
2000	11,960	10,699	8,808	9,975	16,303	11,225
2001	19,096	17,190	9,231	15,543	24,355	11,412
2002	10,544	9,515	9,608	9,189	14,119	11,944
2003	11,486	10,302	7,836	10,011	15,523	10,816
2004	12,923	11,670	10,801	11,102	17,146	13,246
2005	16,897	14,692	12,180	13,838	21,662	13,783
2006	20,846	18,899	14,826	17,346	26,061	15,237
2007	13,173	11,972	7,867	11,031	17,036	15,091
2008	10,154	9,008	7,548	8,663	13,525	11,790
2009	16,926	15,432	8,693	14,622	20,624	15,718
2010	13,360	12,194	8,695	11,584	16,962	12,436
2011	11,285	10,212	12,561	10,395	14,181	14,827
2012	16,369	15,056	14,666	14,314	20,250	13,470
2013	14,619	13,003	11,740	12,747	18,579	14,007
2014	19,872	19,200	11,884	17,325	27,496	14,197
Total	219,510	199,041	156,945	187,685	283,822	199,198
Mean Ann.	14,634	13,269	10,463	12,512	18,921	13,280

The use of prescribed fire to reduce flammability and excess levels of fuels would affect long-term forest productivity by reducing the risks and consequences of a major wildfire. The temporary impacts of smoke from prescribed fire would have minor effects on the use of forest resources, such as recreation sites, scenic resources and the collection of cultural plants.

Direct and Indirect Effects

Proposed action under all alternatives would affect air quality by the addition of particulate matter and carbon monoxide (Tables IV –3, IV-4, IV-5 and IV-6). Among alternatives the amount of emission vary according to the comparative level of silvicultural treatments and plant association groups in which treatments are proposed (Table IV-1). However, estimated emission levels are quite low when considered that they are generated on treatments across the 1.4 million acre Reservation. These emissions would have a very low effect at the local level and would have a short-term temporary, but overall negligible long-term effect on regional air quality and visibility. No action proposed under any alternative would have an adverse effect on the air quality in a Class I Airshed.

From a comparative viewpoint, Alternative 5 followed by Alternative 1 would have the largest impacts on air quality from the emission of particulate matter and carbon monoxide as a result of the larger amounts of fuel consumed by prescribed fire (Tables IV –2, IV-3, IV-4, IV-5, and IV-6). Alternative 3 would have the smallest impact with Alternative 4 having a slightly larger impact. Alternatives 2 and 6 would have a near equal moderate impact on the Reservation's air quality.

Cumulative Effects

The negligible direct and indirect impacts on air quality and visibility would be additive to existing conditions that appear to be excellent. Thus, there would be a negligible effect on air quality including visibility under all alternatives. The burning of fuels would be done in accordance with smoke management clearance requirements where cumulative effects of smoke would be minimized.

CULTURAL RESOURCES

In conformance with the National Historic Preservation Act of 1966, revised: 36CFR800 Federal Regulations and Tribal Requirements a cultural resources overview, sampling survey and cultural resources management plan were completed by Gough (1990). All alternatives proposed in this EIS would meet the requirements of the Colville Reservation Cultural Resource Management Plan prepared by Galm, Hoistine and Gough (Chapter 9, Gough 1990)

As pointed out by Gough (1990), the identification of a diverse sample of cultural resources on trust lands of the Colville Reservation makes it possible to maintain at least some of these resources through what are termed passive preservation measures. Sites subject to passive preservation are those that can be protected from land-altering activities including forest harvest and other resource management activities, through avoidance and the maintenance of existing conditions. In some cases, it may prove advisable to include in the list of passively preserved sites those properties warranting evaluation for the National Register of Historic Places (NRHP). In this way a priority list can be developed for site evaluation that initially focuses on sites threatened by imminent destruction. Those sites not in immediate jeopardy can be assigned a lower priority and testing plans extended into the future.

Certain site types, such as rock features (cairns, talus pits, talus burials) occur most often in positions on the landscape that can often be avoided with little difficulty. Thus, an initial list of sites included for passive preservation would be developed and the details of the sites on this list would be available to those individuals in resource management positions to insure that communications are maintained among departments. The list should include consideration of all sites recorded on the Reservation, previously recorded as well as new sites, so that decisions affecting passive preservation take into account the full complement of resources present. In addition, this list would become a part of the Integrated Resource Management Plan to ensure necessary site protection.

Management Direction Impacts

Under the Integrated Resource Management Plan, 31 management directions were developed as shown in Appendix A. The management directions are to strengthen existing programs, regulations, and guidelines for preserving and protecting the cultural resources of the Confederated Tribes of the Colville Indian Reservation. All of the management directions shown in Appendix A for cultural resources would be beneficial and would not result in any known adverse impacts.

Operational Impacts

Direct and Indirect Effects

While avoidance would be used to protect cultural resource sites, cultural plants would be vulnerable to forest harvest practices including road construction and regeneration harvest activities. In some cases, forest practices such as regeneration harvest would have a very positive impact by creating vigorous new fields of huckleberry and blackberry plants. Alternatives 5 followed by Alternative 1 would create the largest amount of lands affected by regeneration harvest and have the largest positive impact on stimulating desired cultural plants. Alternative 4 with large amounts of intermediate harvest would have the lowest positive impact on desired cultural plants. Alternatives 2, 3 and 6 would have intermediate positive impacts.

All proposed forest management alternatives would move stands closer to the historic range of variability with Alternative 5 creating the largest movement during the next cutting cycle. As these alternatives move forest and range conditions closer to their historic range of variability, the environment for the reintroduction and enhancement of desired cultural plants on the Colville Reservation would be improved in the long-term. Short-term impacts on cultural plants can be expected at site-specific locations. Coordination between the Reservation's cultural plant specialists and harvest planners would insure the protection of desired cultural plants in the same manner that protection is provided to threatened and endangered plant species.

Cumulative Effects

As noted above, moving forest conditions on the Reservation towards the historic range of variability by defining and planning for desired future conditions (See *Forest Vegetation* in this Chapter), there would be a long-term positive benefit to cultural plants. Cultural sites would continue to be protected under all alternatives.

FIRE/ FUELS

Fires have burned through the Colville Reservation forests for thousands of years, ignited naturally by lightning and also by the indigenous people for various reasons. Fire exclusion and past selective cutting have changed the structure, composition and density of the forest. Success in fire suppression has allowed more uniform and increasing fuel loads across the Reservation, shifting fire effects that were typically of low and moderate severity in historic fires to severe fires today.

Management Direction Impacts

The alternatives will be implemented in accordance with the goals, objectives and management direction as shown in Appendix A. Actions are proposed to restore fire back into the ecosystem. Current forest conditions vary from the historical conditions when fires were frequent but low to moderate in severity. With the increased fuel loading and the denser stands, thinning and/or mechanical fuel reduction may be necessary in combination with prescribed fire to achieve desired future conditions. Management options are presented and evaluated. Alternatives 3 and 6 achieve only the priority restoration actions and Alternatives 1, 2, 4 and 5 also maintain (conserve) some previously treated areas already in a desired condition. Management directions for managing fire and fuels shown in Appendix A would unlikely create an unmitigated adverse impact to resources on the Reservation

Operational Impacts

Effects Common to All Alternatives

Natural fire will continue to occur. The frequency and severity of these fires will be dependent of the environment (temperature, wind and moisture patterns) and plant species characteristics (fuel accumulation, forest structure and adaptations to fire). Effective suppression actions can control the majority of these fires but some will become major events during severe weather periods and during multiple fire situations.

Direct and Indirect Effects

Implementation of any of the six action alternatives will have direct and indirect effects of the fire/fuel conditions. A true "no action" alternative, one with no harvest, no treatment and no natural disturbance, was not analyzed, but this situation would only accelerate the trend towards larger and more severe dire occurrences.

The fire/fuel effects vary by alternative and are described by high hazard areas treated, timber sale areas treated and prescribed fire treatments.

The draft Wildfire Prevention Analysis and Plan analyzes three distinct elements relating to wildfire:

Risks:	Uses or human activities that have the potential to result in wildfire ignition or areas of historical lightning concentrations.
Hazards:	Analysis of fuels and topography to determine the potential for a "large" fire to result from an ignition.
Values:	Natural or developed areas where fire loss or destruction would be unacceptable.

The risk element and the value element would only be affected be the alternatives in indirect ways:

- Closing roads and reducing human activity may reduce fire risk while extending or adding roads could increase this risk.

- Value assessments involve consideration of 25 elements. Any effects would depend on where or when a wildfire would occur. Treatment of high hazard fuels would have a general beneficial effect.

Timber harvest activities and resulting fuels treatment would have a beneficial effect on the fire hazard component. The overstocked and multi-layered canopy situations would be addressed and seral residual stands would be more tolerant to fire. The highest treatment priority would be given to addressing the high hazard compartments.

Staff review of existing conditions on the Reservation is estimated (CCT 1998a) that prescribed fire is needed on 37,000 acres annually to achieve desired future condition stocking control. This estimate was calculated from the acres in each PAG and the historic fire frequency within each PAG. Most likely it would be difficult to achieve the historic role of fire in vegetation stocking control. However, using a combination of prescribed fire and vegetative treatments, the historic patterns can be emulated and the desired future conditions achieved.

The IRMP (See Standard RL-S2.1and RL-S13.1, CCT 1998a) addressed the existing condition and the need for stocking control by recommending the following level of vegetation treatment activities on the Reservation.

Vegetation Treatment Method	Treatment Area (Acres/Year)
Commercial Timber Harvest	11,700 - 15,900
Stocking Control (Thinning))	6,125 - 8,400
Prescribed Burning of Non-activity Fuels	9,200 - 12,500
Prescribed Burning of Rangeland	1,000 - 3,820
Total Treatment Area	28,025 - 40,620

Commercial timber harvest proposed under Alternatives 1 through 6 ranges from about 7,979 to 10,505 acres annually which is about 65 percent of the range necessary to achieved desired future conditions for the Reservation. It is recognized that the desired future condition would not be fully achieved in the 2000-2014 planning cycle.

Harvest Area Fuel Treatments

Reducing natural, logging and thinning residue is presumed to be an effective means of limiting the damage potential of any subsequent wildfire, or at least making the wildfire easier to control.

Removal of the fine and intermediate size classes (elements less than one inch in diameter) from the fuel complex effectively eliminates any hazard. Fires start in the fine (less than 1/4 inch in diameter) fuels; the rate of which a fire spreads is determined by the amount, continuity, and moisture contents of fine and intermediate-sized fuels. A general guideline is to reduce the fuel loading to 15 tons/acre to meet this objective.

Fuel loading varies by PAG and type of treatment activity performed. Using photographs in the "Photo Series for Quantifying Natural Forest Residues in Common Vegetation Types of the Pacific Northwest, Wayne G. Maxwell and Franklin R Ward, USDA Forest Service, GTR PNW-105, May 1980", the average fuel loading for the PAG's and treatment was estimated and summarized in Table IV-1 shown in the *Air Quality* Section of this Chapter. The quantities burned by alternative and the effects on air quality also are summarized in the *Air Quality* Section.

Potential fuel treatments for all alternatives include:

1. Indirect Methods - Those treatments that leave downed fuels to decompose naturally. Indirect control lines have to be strategically located to assist suppression efforts and break fuel concentrations into manageable units. Methods and considerations include:

   a. Fuel Break - A technique that reduces or eliminates hazardous fuels and interrupts fuel bed continuity.
      Fuel breaks do not necessarily stop not or fast moving fires, but are designed to assist fire suppression tactics and provide access where resistance to control is high.
   b. Fire Break - A firebreak is a natural or artificial obstruction where all vegetation is removed to stop uncontrolled fires.
      Firebreaks may require annual maintenance to control fine fuel buildup, e.g., grasses. A fuel break should be planned next to a firebreak when located in heavy fuels and timber.

2. Direct Methods - Those treatments that reduce the potential of destructive fires by removing hazards while providing for long-term productivity of the site (e.g., not removing all large woody material). These include:

   a. Broadcast Burning - Applying fire to a designated unit of land where the fuel has not been piled or windrowed.
      Broadcast burning is used for fuel reduction, site preparation, and vegetation manipulation. Proper unit layout (size and shape), firing methods, and safety considerations are requirements of this kind of burning.

b. Underburning (or Understory Burning) - Prescribe burning with a low fireline intensity fire under a timber canopy.
   Underburning is used primarily for fuel reduction, less so for site preparation, and vegetation manipulation where these objectives can be met with a low intensity fire. Proper firing methods and a very good knowledge of weather and fire behavior are requirements to prevent damage to the overstory.

c. Jackpot Burning - Prescribed burning to dispose of fuel concentrations where discontinuous fuels prevent a broadcast burn.
   This is typically in spring or fall when fine fuels will burn but large fuels will not. Although risk of fire escape is low, managers must continue to consider ignition and holding problems.

d. Pile and Burn - Fuels are piled by mechanical means or by hand and then usually burned in the fall when fine fuels outside the piles are too moist to burn or covered with snow.

e. Yarding Unmerchantable Material (YUM) - Unmerchantable woody material is yarded to landings for further treatment or use as firewood by the public.
   Specifications usually refer to the minimum piece size to be yarded, e.g., 4x6, (4 inch small end diameter and 6 feet long).

3. Rearrangement - The alteration of the fuel bed without removing any of the forest residues from the site.

   The objective is to hasten the natural decomposition by increasing the bulk density of the fuel bed. This does not immediately reduce the fuel loading but does alter the packing ratio of the fuel bed.

   a. Lopping - Branches are cut from felled trees and left in place or scattered.
      Reducing vertical fuel continuity is the main objective. This is most effective with light fuel loadings. Lopping branch wood to within 1 foot of the ground effectively reduces flame heights to one half if left untreated.

   b. Chopping - A machine mounted chopper (e.g., a rotary disc) is used to chop slash.
      This treatment basically breaks slash into smaller pieces and gets it closer to the ground to hasten decomposition and is most effective in light to medium fuel loading.

   c. Crushing or Trampling - Debris is crushed or trampled using heavy equipment.
      Terrain, reserve tree density, and fuel loading limit these methods. Crushing is best done when slash has cured for at least one season. Note: Crushing or trampling is deemed unacceptable on the Colville Reservation due to soil compaction. (5)

The selection of the fuel treatment methods will be determined on a project basis in order to meet the overall IRMP objectives. Areas treated by silvicultural practices will be treated to meet IRMP goals, objectives and directions to meet the fuel management objectives. Acres treated by alternative are summarized in Table IV-7.

For the majority of conditions the following fuels treatment guidelines are proposed:

Alternatives 1, 2, 4 and 5

Regeneration Harvest - Underburn, pile and burn, jackpot burn or broadcast burn
Intermediate Harvest - Underburn, pile and burn, or jackpot burn

Alternatives 3 and 6

Regeneration Harvest - Including utilization, YUM yarding, lopping or jackpot burning
Intermediate Harvest – Including utilization, YUM yarding, lopping or jackpot burning

Stocking Control (non-timber harvest activity)

The stocking control treatment is primarily pre-commercial thinning and thinning of forest vegetation in areas not managed for timber production. By this treatment tree stocking levels are reduced to the desired levels. Fuels would be treated following the stocking control treatment to achieve the desired objective of 15 tons per acre. The fuels treatment would be primarily by piling and burning or jackpot burning.

Prescribed Fire

An IRMP management objective is to "Restore fire as a natural process by developing and implementing prescribed fire plans on a landscape basis." Additional guidelines include: "Use both managed and natural prescribed fire to promote or maintain desired future conditions..."(FV-G1.33), and "Prescribed fire may be used to promote or maintain desired future stand conditions with one or a series of prescribed fire treatments. Where necessary, use thinning and/or mechanical fuel reduction in combination with prescribed fire."(FV-G1.32)

The first priority for prescribed fire will be to restore the desired future conditions. In the timber section prescribed fire is recommended to restore the following PAG's to the desired future condition:

PAG	Prescribed Burn Acres
PP	3,989
DFWM	12,685
Total	16,674

The second priority will be to maintain (conserve) the desired condition. Maintenance prescribed fires during this 15-year period will be primarily in the previously treated commercially thinned stands or to accomplish other identified resource objectives. The area in acres to be treated by the proposed alternatives are summarized in Table IV-7

The current annual level of fuels treatment on the Reservation averages about 2,000 acres (Alternative 1) and only treats timber harvest fuels. Alternatives 2 through 6, however would treat both timber harvest fuels and stocking control fuels as well as use prescribed burn restoration treatments. In addition in Alternatives 4, 5 and 6, prescribed fire would be used to treat rangelands.

Alternatives 3 through 6 achieve the priority 1 burning and moves into maintenance burning with Alternative 4 treating the most area. Alternatives 2, 3, 5 and 6 achieve about 75 percent of the minimum area of vegetation requiring treatment to achieve the desired future condition while Alternative 1 only achieves about 30 percent of the minimum requirement. The vegetation treatment proposed under Alternative 4 achieves coverage on about the minimum area necessary to meet desired future conditions.

Table IV - 7. Summary of Vegetation Treatments Proposed by Alternatives for the Colville Reservation.

FUEL TREATMENTS	ALTERNATIVES (ACRES)					
	1	2	3	4	5	6
Regeneration Harvest	57,889	41,488	43,833	14,243	100,775	78,381
Intermediate Harvest	99,684	115,501	75,850	143,330	56,798	45,174
Total Harvest Area	157,573	156,989	119,683	157,573	157,573	123,555
Stocking Control – (Non-Timber Harvest Activity)	0	46,500	84,000	90,000	46,500	81,000
Prescribed Burn – Restoration						
CFL Acres	0	14,639	14,639	14,639	14,639	14,639
Non-CFL Acres	0	2,035	2,035	2,035	2,035	2,035
Prescribed Burn – Maintenance	0	79,326	79,326	140,826	79,326	79,326
Prescribed Burn - Rangeland	0	0	0	15,000	15,000	15,000
Total Non-harvest Treatment	0	96,000	96,000	172,500	111,000	111,000
TOTAL AREA TREATED	157,573	299,489	299,683	420,073	315,073	315,555
Average per Year	10,505	19,965	19,980	28,005	21,005	21,035

Cumulative Effects

The actions analyzed in this document are for the next fifteen years - the next harvest cycle. With Alternatives 2 through 6, stocking control and prescribed fire will be used to move the forest towards the desired future conditions. During this period, however, the forest will not fully reach the desired future condition. It is anticipated that these actions will continue in the future to achieve the Holistic goals and the desired future conditions. Conservation actions will necessary on an on-going basis to maintain these conditions. Fire was a tool used to achieve the historic conditions and prescribed fire will be a valuable tool for maintaining the desired conditions and viable ecosystems.

FISHERIES RESOURCES

The Colville Reservation lies within the Columbia River watershed and the largest internal drainage is the San Poil River. The hydrologic condition and fish habitat of the Colville Reservation portion of the Columbia River watershed has been markedly affected by past management activities. As pointed out in *Chapter III* of this EIS, the decline of Reservation fisheries has been attributed to three activities: over-harvest (off Reservation), water diversions, and habitat degradation. Habitat degradation has occurred from timber harvest, urbanization, conversion of land to agricultural uses, livestock grazing, fire suppression and road building activities. High summer water temperatures, low summer flows, and a lack of rearing habitat have likely impacted potential levels of resident fish populations.

Along with the presence of coarse woody debris, bedload sediment production, deposition and movement are considered to be key factors affecting current and future fish habitat conditions. There has been no long-term monitoring of sedimentation activities within streams on the Reservation. In addition, there appears to be no satisfactory short-term method to accurately quantify existing or future bedload movements in a forested watershed. The *Chapter III Geology, Minerals and Soils* Section of this EIS discusses erosion potential, sediment production and sensitivity ratings for Watershed Management Units on the Reservation.

The following factors were considered as additional key indicators for fish habitat on the Colville Reservation

The number of road crossing of streams - While the current road planning for the Reservation strongly emphasizes area access via existing roads and ridgetop roads, rather than via stream bottoms, many apparently unnecessary stream crossing exist from past activities. Road crossings of streams areas widely recognized as having the potential to indirectly affect the condition of streams by accelerating sediment delivery to the stream channel. While road planning is not part of this document, all alternatives call for no net increase in roads on the Reservation, thus decreasing the probability of additional stream crossings. In addition, Alternatives 3 and 6 plans for a marked reduction in road density on high and extreme sensitivity WMUs, thereby reducing the impact of stream crossings.

Changes in food abundance and availability – General riparian conditions can markedly influence the abundance of terrestrial insects available to fish as well as the abundance of leaves, organic detritus and other debris used by aquatic organisms as food. No direct management actions would occur in streams or riparian management emphasis areas under any alternative. Changes in food abundance for fish are not expected to substantially increase or decrease under any alternative.

Changes in fish access – No decrease in fish access to any streams on the Reservation would occur as a result of the proposed action alternatives.

Presence of coarse woody debris – On streams such as those found on the Reservation, coarse woody debris is needed to develop pool habitat as well s to reduce bedload sedimentation. All alternatives would continue to support the natural delivery of coarse woody debris, as no future source in the riparian management emphasis area would be disturbed. No reduction of future coarse woody debris delivery to stream channels would occur under any alternative, as underburning is not planned in the riparian management emphasis areas.

Presence of dry channels – Many portions of the streams on the Reservation have intermittent flows, drying up during the summer and fall months. This natural condition appears to have a small adverse impact on fish numbers and production and is unlikely to change into the foreseeable future (5-10 years) under any alternative.

Management Direction Impacts

In Appendix A, 27 management directions were developed for the restoration and enhancement of the fisheries resource under the Integrated Resources Management Plan. These management directions would provide guidance for the Tribes to move towards the fisheries resources desired future condition on the Reservation. All of the management directions shown in Appendix A would be beneficial to the resource and would not result in any known adverse impacts.

Operational Impacts

Effects Common to All Alternatives

All alternatives have a varying potential to modify peak flow, suspended sediment and bedload movement in streams throughout forestlands on the Reservation. It does not appear from the data analyzed, however, that any alternative would adversely modify hydrologic response of any watershed such that fish habitat would be significantly different in the short term than expected under the present conditions. The *Water* section of this Chapter discusses the effects of alternatives to the stream channels.

In the foreseeable future, the lack of summer/fall rearing habitat (notably high quality pools) would continue to limit natural fish production across the Reservation. The proposed action under all alternatives would have no short-term effect on the existing shortage of rearing habitat. Over the long-term as the vegetation structure ages and more coarse woody debris becomes available for natural replacement into the stream channel, rearing habitat may increase under all proposed alternatives.

An increase in stream temperatures is unlikely during the summer months under all alternatives. Any possible stream temperature increase would result from stand deterioration and timber harvesting adjacent to stream buffers through the WMUs. The use of stream management emphasis areas as provide in the Management Directions, Appendix A, for Alternatives 2 through 6 are expected to keep timber management-related stream temperature increases to a minimum.

Direct and Indirect Effects by Alternative

Table IV - 8 shows the factors affecting fish habitat and populations, their indicators and how each of the six proposed alternatives would affect these factors. As none of the alternatives are projected to have significant adverse impacts on streams and lakes, they are unlikely to directly affect fish habitat and populations. Alternatives 3 and 6, however, may have significant positive impacts on fish habitats as timber harvest has been deferred from 10 to 15 years on all WMUs that are currently in a high or extreme watershed sensitivity class (See *Water, Chapter III*). In addition, in both alternatives road management plans are for reducing road densities from the present near 5 miles per square mile to 3.0 miles per square mile. Both the reduction of road densities and the deferral of harvest will have a major positive impact on improving fish habitat and populations on the Colville Reservation.

The plans of no net increase in roads under Alternatives 2, 4 and 5 would prevent further deterioration of watershed conditions, thereby providing protection to fish habitat. Alternative 1 would not provide additional fish habitat protection other than exist currently.

The movement of stands towards desired future conditions and/or historic range of variability would be a positive benefit to fish habitat on the reservation. From this action, instream quantities of organic debris including coarse woody debris would likely increase as stand move towards larger structural stage classes, thereby increasing the quantity and quality of rearing habitat for juvenile fish. Without timber harvest and the correction of structural stage classes, the potential for catastrophic wildfire would continue to increase, thereby raising the risk of major watershed impacts if any sizeable portion of individual watersheds burn. While the reader is referred to the Forest Vegetation and Timber Resource sections of this Chapter for discussion on treatment effects by alternatives, Alternatives 5 and 6 would provide the largest reduction in risk for future wildfire while Alternative 3 would provide the least.

Cumulative Effects

The cumulative effects of all proposed alternatives with proposed activities to maintain current or reduce road densities and to defer harvest on sensitive watersheds would provide beneficial effects to the fish resources on the Colville Reservation. None of the proposed alternatives would markedly alter the current availability of productive fisheries habitat on the Reservation or in adjacent downstream reaches and tributaries. The no-harvest riparian management emphasis areas placed on lakes and streams will allow for development of more natural conditions over time in previously impacted areas. All water resource and fisheries resource Management Directions shown in Appendix A would support a positive cumulative effect to the fish habitat and populations on the Reservation under Alternatives 2 through 6.

Additional foreseeable timber harvest activities are expected to occur after the year 2014. The effects of these future activities on the resource would be analyzed at that time.

Table IV - 8. Effects of Proposed Action by Alternatives on Watershed Factors that Affect Fish Habitat and Populations.

FACTORS AFFECT FISH HABITAT	INDICATOR	RISK BY ALTERNATIVE					
		1	2	3	4	5	6
Water Quality	Stream Temperature	Low (-)	Very Low (-)	Negligible (-)	Negligible (-)	Low (-)	Very Low (-)
	Hazardous Materials	None	None	None	None	None	None
Habitat Access	Physical Barriers	None	None	None	None	None	None
Habitat Elements	Sediment	Low (-)	Very Low (-)	Very Low (-)	Negligible (-)	Low (-)	Very Low (-)
	Coarse Woody Material	Negligible (-)	None	Negligible (-)	None	Negligible (-)	Negligible (-)
	Pool Character and Quality	Negligible (-)	Negligible (-)	Negligible (-)	None	Negligible (-)	Negligible (-)
	Off-Channel Habitat	None	None	None	None	None	None
Channel Conditions and Dynamics	Width Depth Ratio	Negligible (-)	Negligible (-)	Negligible (-)	None	Negligible (-)	Negligible (-)
	Streambank Condition	None	None	None	None	Negligible (-)	None
	Floodplain Connectivity	None	None	None	None	Negligible (-)	None
Flow/Hydrology	Changes in Peak Flow	Negligible (-)	Negligible (-)	Negligible (-)	Negligible (-)	Low (-)	Very Low (-)
Watershed Conditions	Net Change in EOA	Negligible (-)	Negligible (-)	Neg. (+)	Negligible (-)	Very Low (-)	None
	Road Density and Location	Very Low (-)	Very Low (-)	Low (+)	Very Low (-)	Very Low (-)	Low (+)
	Human Disturbance	Moderate (-)	Moderate (-)	Mod. Low (-)	Moderate (-)	Mod High (-)	Moderate (-)
	Riparian Emphasis Areas	None	None	None	None	None	None
	Landslide and Erosion Rates	Very Low (-)	Very Low (-)	Negligible (-)	Negligible (-)	Low (-)	Very Low (-)

Rating: None – no activity; Negligible – activity would occur, but effects would be negligible; Very Low – activity would occur, but effects are very unlikely to occur; Low – activity would occur, but measurable effects are unlikely to occur; Moderate – Measurable effects are likely to occur.
- Shows negative impact; + show beneficial impact.

GEOLOGY, MINERALS AND SOILS

Forest and range management activities proposed under Alternatives 1-6 would have no effect on the mineral resource or the geology of the Colville Indian Reservation. The proposed action may, however, have an effect on the soil resource.

Maintaining high productivity and desirable hydrologic function are key soil resource management issues for the Colville Reservation. Research reports (Klock 1975, Grier et al 1983) indicate that in North Central Washington soil disturbance and soil compaction are major concerns, particularly as a result of fuels treatments by tractor operations. Soil compaction can have a direct effect on the productivity by limiting plant growth and indirectly be creating conditions that can create soil loss through erosion. These soil compaction conditions have been observed on the Reservation and reported by Hunner and Jones (CCT 1997) and confirmed through observation in 1999 by the author.

The direction in the Forest Plan (CCT 1989 as amended 1992, 1998b) is to strive to manage soil resources so as to maintain long-term productivity of the land. This is achieved by limiting detrimental impacts to less than 20 percent of the ground surface within an activity area.

Maintaining soil productivity is integral to maintaining the long-term productivity of the forest and range ecosystems. Soil productivity is the inherent capacity of a soil to support the growth of plants. Soils are affected by forest and range management activities, primarily by harvesting, road building, and overgrazing, particularly on soils with high moisture content. Reducing soil surface disturbances from harvesting requires considering the effects of the type of logging system and the method of fuel disposal, as well as limitations imposed by the soil itself. Reducing soil surface disturbances from grazing requires considering the number of animals on a unit and time of the grazing period. Soil resource related impacts from harvesting include compaction, displacement, erosion, loss of nutrients and introduction of competing and unwanted vegetation.

For this analysis to determine how the proposed harvest and range activities under each of the proposed alternatives may affect the soil resource, most predominately soil productivity and hydrologic function, the following indicators of site condition have been used:

- Estimated acres of soil surface disturbance
- Number of AUMs permitted.

While the treatment of forest fuels are of much concern, particularly if they are carried out by mechanical treatments on sensitive soils, the programmatic approach to this EIS does not provide site-specific information on which the environmental consequences of the alternatives can be determined. Thus, these concerns must be address through mitigation as shown in Chapter II.

Management Direction Impacts

In Appendix A, 17 Management Directions (L1-L17) have been developed to meet the proposed goals and objectives in managing the soil resources of the Colville Reservation. All of the Management Directions support action that will reduce the direct, indirect and cumulative effects of the proposed alternatives as well as future activities that may affect the natural resource base of the Reservation. Management Directions shown for soil resources in Appendix A are unlikely to create an adverse impact on any of the Reservation's resources.

Operational Impacts

Effects Common to All Alternatives

New roads would be designed to meet or exceed Forest Plan and Soil and Water Best Management Practices. A mitigation plan (Chapter II) has been prepared for the Colville Reservation to protect the soil resource during and after road construction. No ground-based logging with skid trails would occur on slopes greater than 35 percent under all proposed alternatives.

Winter logging on frozen ground or adequate snow conditions, use of designated skid trails, cool burning of fuels and retention of adequate large woody debris are all practices that diminish adverse impacts to the soil resource. These measures would be applied to assist in the maintenance of long-term site productivity under all alternatives.

Observations of past harvest practices on the Reservation indicates that soil permeability is highly variable, but most often surface erosion has occurred on unnatural compacted areas such as roads and landings. Under all alternatives, soils on landings and skid trails may be compacted. As part of watershed mitigation (Chapter II), all severely compacted areas other than system roads would be mechanically ripped where sufficient soil depth permits and seeded following use to reduce erosion potential and to enhance future vegetative growth on these areas.

In addition, many range areas have been compacted by livestock, particularly during extended grazing periods and/or used during periods of high soil moisture. Resting of these pastures would allow the opportunity for vegetation recovery and natural soil processes to restore this land, although the use of cultivation would accelerate the restoration of these rangelands under all alternatives.

Fuels treatments proposed on all alternatives may affect soil nutrient content, pH, soil structure, and erosion potential, with the extent of the effect determined by the site-specific intensity of the treatment and acres treated. Low-intensity burning of slash can be short-term beneficial, improving nutrient cycling, plant stimulation, seedbed preparation and rhizomatous sprouting. High-intensity burning, however, can be detrimental to the soil resource. Machine piling followed by slash burning would be detrimental to the soil resource, particularly on sensitive soils. Jackpot (concentration) fuels treatments as proposed would be done when the soil moisture levels are high to minimize possible detrimental soil resource effects.

Direct and Indirect Effects by Alternative

Detrimental impacts to soils, most particularly those soils identified as sensitive (Hunner and Jones, 1997), include compaction, displacement and severe burning. Proposed Forest Management Direction (Appendix A, L17) states, "the threshold level of detrimental compaction is defined as any bulk density increase of 15 percent or more, and this increase may only occur on less than 20 percent of the activity area." In addition, this 20 percent value holds for any other disturbance, such as displacement, determined to be a "detrimental" soil condition. Severe burning creates a condition in which most woody debris and vegetative ground cover are consumed and mineral soil is exposed. Severely burned soil occurs when the surface is in a condition where most woody debris and the entire forest floor are consumed down to mineral soil.

The total disturbance area or logged area is one primary indicator of soil disturbance impacts. Logging methods that are now or may be used on the Reservation have been ranked according to their usual lever of ground disturbance. Ground-based logging systems are ranked as produced the most disturbance, with aerial systems the least (Patten, 1989). The level of planning analyzed in this EIS, however, does not provide acre-specific definition of the amount of land to be harvested by the various logging methods.

An estimate of the effects of the proposed alternatives on soil disturbance and consequent compaction has been estimated for the six alternative's forest harvest activities during the period 2000-2014 (Table IV-9). Estimates of soil surface disturbance assumes that 45 percent and 85 percent of the area would be harvested by intermediate and regeneration harvest methods respectively, and that moderate to severe soil surface disturbance, on an average would occur on 10 to 15 percent of the harvested area.

Table IV - 9. Estimated Area of Soil Surface Disturbance by Harvest for the Six Alternatives.

YEAR	ALTERNATIVES - ACRES					
	1	2	3	4	5	6
2000	893	829	695	726	1,067	825
2001	1,309	1,212	660	1,057	1,533	784
2002	697	644	662	564	831	788
2003	794	731	597	654	952	779
2004	861	799	817	703	1,029	949
2005	1,159	1,031	797	934	1,357	863
2006	1,348	1,254	848	1,099	1,570	894
2007	870	813	594	694	1,018	946
2008	719	657	540	579	841	850
2009	885	812	553	701	1,025	923
2010	819	765	548	663	953	818
2011	616	566	768	508	713	894
2012	867	808	1,093	696	1,017	953
2013	891	820	741	730	1,045	863
2014	1,380	1,345	797	1,031	1,506	918
Total	14,109	13,086	10,709	11,339	16,457	13,043
It is assumed that Regeneration harvest would affect 85% of the stand and 45% with intermediate harvest. In turn, it is assumed that soil surface disturbance would occur on 15% of the harvest area.						

Alternative 5 followed by Alternative 1 would have the largest direct impacts among the six proposed alternatives on soil surface disturbance and presumed adverse impacts on the soil resource. Greater use of regeneration harvest to improve forest health would create the larger impacts under Alternative 5. Alternatives 2 and 6 would have a moderate comparative impact and Alternatives 3 and 4 would have the least impacts. The Reservation-wide soil resource impacts under Alternative 3 (as well as Alternative 6) are lower than Alternatives 1, 2, 4 and 5 as harvest has been deferred in watersheds that have extreme and high sensitivity or susceptibility to soil disturbance, surface runoff and erosion in order to improve watershed health. Alternative 4 has a comparatively low impact to all alternatives but Alternative 4, as most all harvest activity is intermediate harvest.

Removal of woody biomass either through timber harvesting or burning of fuels would have a direct effect on soil productivity. The soils on the Reservation are moderately low in fertility. Recycling woody debris through the forest floor enhances this fertility. Thus, woody materials exported off the site by the proposed alternatives would have a small, but important effect on long-term soil productivity under all the harvest alternatives. Alternative 5 again would have the largest impact and Alternative 4 would have the least impact. Reduction of woody fuels as estimated under each alternative, most particularly under Alternatives 5 and 6, would reduce the probability of wildfires that have a major detrimental impact to long-term soil productivity, particularly soil types found on the Reservation.

An important direct effect of the proposed action would be the loss of soil productivity on lands covered by roads, skid trails and landings. Alternative 5 would create the largest loss in soil productivity because of roads and landings and Alternative 3 would have the least impact of all alternatives. In addition, Alternative 3 as well as Alternative 6 would be returning some lands back to a productive condition by the proposed deactivation and mitigation of existing roads, particularly those in the streamside management emphasis areas.

In summary, Alternative 5 followed by Alternative 1 would have the greatest although moderate direct detrimental impact on the soil resource, including soil productivity, stability and hydrologic function, on the Colville Reservation. Alternatives 2, 4 and 6 would have a low direct negative impact while Alternative 3 would have a very low or the lowest direct impact on the Reservation's soil resource.

The indirect effects of the proposed action would be probably reduction in future plant growth and perhaps changes in species composition resulting from loss of plant nutrients by surface and gully erosion, physical compaction of the soil matrix, and changes in the soil moisture regime. Implementation of soil and water mitigation measures outlined in Chapter II would make the indirect effects of all alternatives on the soil and geology resource negligible.

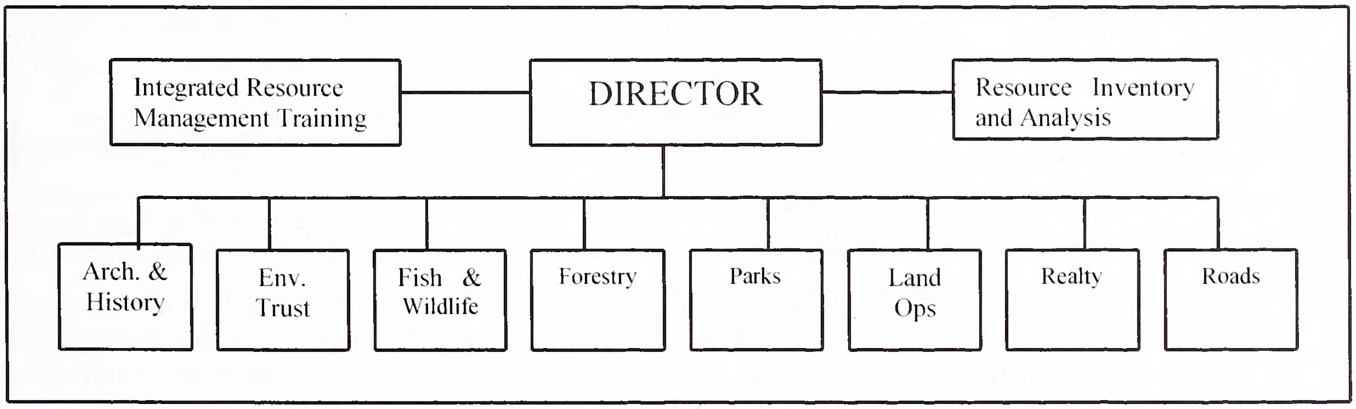
Cumulative Effects

Past, proposed and future foreseeable forest management activities would continue to reduce soil productivity by removing lands from the production base by the construction of permanent roads. The extent and location of possible new roads required to implement Alternatives 1 through 6 have not been identified. Thus, the cumulative effects on soil resource from future roads in unknown. It is recognized that increased soil surface exposure by harvesting and possible road construction increases the probability that more severe adverse effects would be generated under unusual climatic conditions, e.g., intense rainfall or rapid snowmelt. Under normal conditions this cumulative effect is negligible. However, a serious watershed impact (destabilized streams, impaired fish habitat, etc.) would probably be more frequent than once every 50 to 100 years due to the cumulative effects of land use activities on soil and vegetative conditions under Alternatives 1 through 6. Based on these assumptions, Alternative 5 followed by Alternative 1 would have the largest cumulative effects and Alternatives 3 and 4 would have the least effect. Implementation of the IRMP Management Directions for the soil resource as proposed in Appendix A of this EIS provides the tools to markedly reduce the potential for future adverse cumulative effects.

NATURAL RESOURCES DEPARTMENT

Under Alternative 1, the Colville Confederated Tribes Natural Resource Department (NRD) would continue under the present management structure (Figure IV-1). The Department would continue along functional lines and the integrated resource management training would be discontinued.

Figure IV - 1. Current Management Structure of the Colville Indian Reservation Natural Resources Department (Passmore 1998).

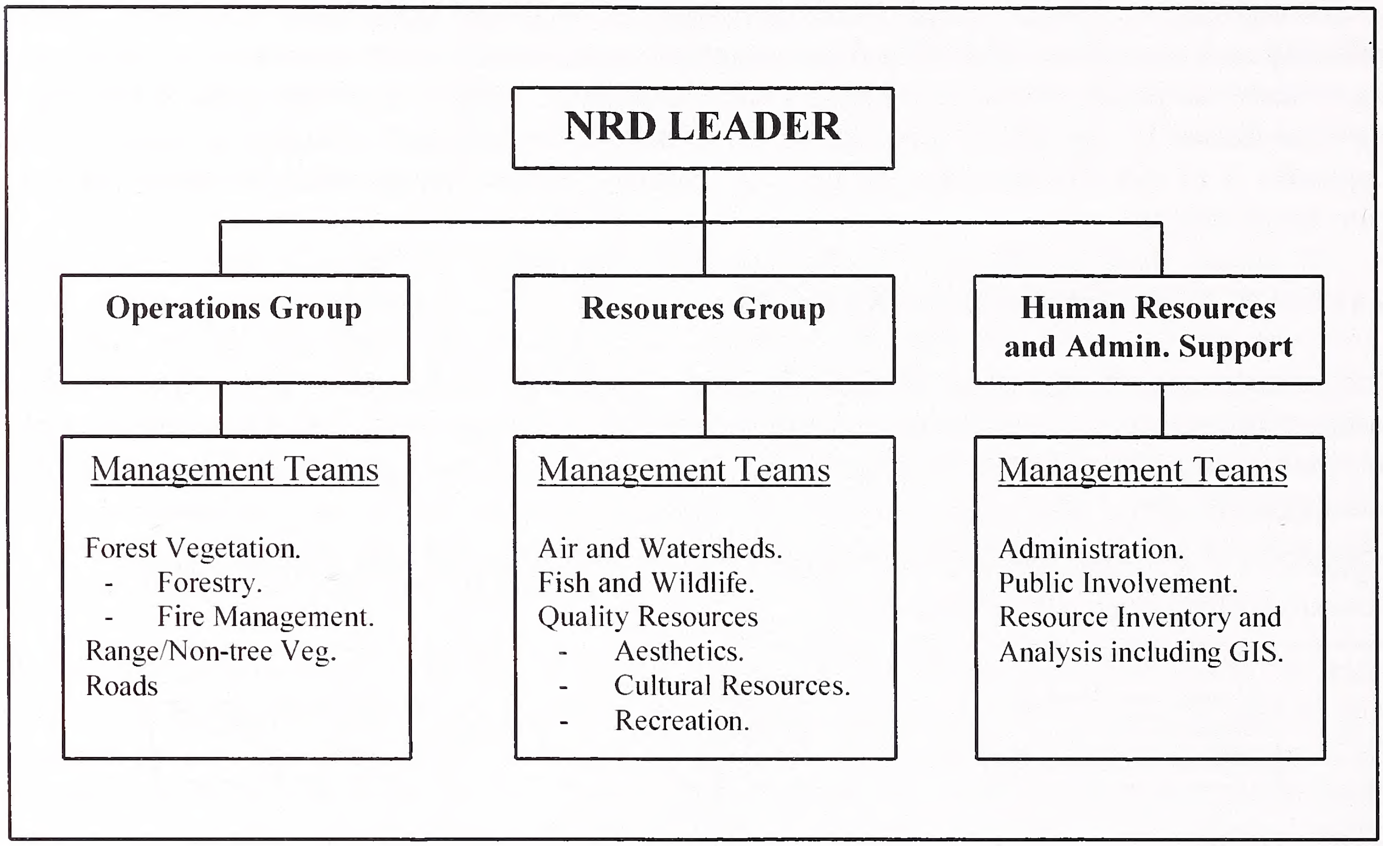


To meet the intent of the Colville Business Council Resolution #1996-23 directing the "Holistic Goal for Management of the Reservation" and to implement the Integrated Resource Management Plan, a reorganization of the Natural Resource Department would be required under Alternatives 2 through 6.

Under Alternatives 2 through 6, a four person Natural Resources Department Executive Team would be formed to implement the "Holistic" Integrated Resource Management Plan as shown in figure IV-2. The leader would be chosen and serve under the direction of the Colville Business Council. The three other members of the Executive Team would be professional resource managers. Each of these managers would oversee the direction of working towards meeting the Desired Future Conditions for their respective area as defined in the IRMP.

The three management areas (groups) would be (1) Operations (2) Resources and (3) Human Resources and Support Services. Each management area would have support staff in the form of DFC teams, not organized by discipline, but organized by support staff determined by the Executive Team that best meets DFC implementation requirements under the holistic management concept.

Figure IV - 2. Natural Resource Department Executive Team for Implementing Holistic Integrated Resource Management on the Colville Indian Reservation.



While the Executive Team would have the flexibility to determine the team responsibilities within each management area, an organizational structure is suggested here.
The Operations Group would support the NRD mission by providing support with a team in the area of forest vegetation management, a second team of range and non-tree vegetation management and a third team for transportation management (roads). The forest vegetation management team would include essentially the same function as the forestry group and the second team would support the lands operations group shown under Alternative 1.

The Resources Group would support the NRD mission by providing support with three teams: Air and Watershed Management, Fish and Wildlife Management, and Quality Management. The Air and Watershed Management team would include the functions of the present Environmental Trust Department while the Fish and Wildlife Management team would include the functions of the present Fish and Wildlife Department. The Quality Management team would support attainment of DFC's in the areas of aesthetics, recreation and cultural resources and would include the present functions of archeology and history as well as parks.

The Human Resources and Support Services Group would support DFC goals directed at public involvement as well as the administrative support function. The present Resource Inventory and Analysis function including GI and the realty function would function as teams under this group.

Again, management teams would be organized so as to support activities to attain the DFC's outlined in Chapter I. Professional or Technical staff may serve on more than one team.

RANGE RESOURCE

Geographically, the Colville Reservation is situated such that it includes a range of elevation, topography, soil types, precipitation, and climatic influences. Consequently, the Reservation supports diverse plant community types. Many of these plant communities have value for livestock grazing. Hard use of the Reservation range has resulted in severe deterioration of many plant communities. Continued hard use would continue under Alternative 1 while Alternatives 2 through 6 proposed opportunities to reduce the present impacts of livestock grazing on plant communities and other resource values.

Management Direction Impacts

In Appendix A, 21 Management Directions (J1-J21) have been developed to meet the proposed goals and objectives in managing the range resource of the Colville Reservation. All of the Management Directions support action that will reduce the direct, indirect and cumulative effects of the proposed alternatives as well as future activities that may affect the natural resource base of the Reservation. The various proposed alternatives support at different levels of movement towards creating a mosaic of desirable rangeland plant communities with diverse forbs, grasses and shrubs that optimize ecosystem processes on the Reservation. These Management Directions shown in Appendix A for range resources are unlikely to create an adverse impact on any of the Reservation's resources.

Operational Impacts

Direct and Indirect Effects

The direct and indirect effects of the proposed alternatives on the Range Resource as described in the following are shown in Table IV-10.

Alternative 1

The current range use and practices would continue at the Reservation-wide 60,924 AUM level under Alternative 1. Alternative 1 would have the least impact on the present management of the range resource on the Reservation. It provides little guidance for range ecosystem improvement and does little to resolve existing and conflicting expectations for rangeland resources between those grazing livestock and users of other rangeland products.

Range Livestock Management - With the present direction of the Reservation's range management program, existing environmental conditions generally can be expected to continue the present adverse impact trends. Those riparian systems degraded by season long livestock use would continue to degrade. On the other hand, in those allotments where management has been intensified by cross fencing and other range development practices to allow increased livestock control, plant community conditions can be expected to stabilize or improve. Present levels of range management education available to the Reservation's livestock operators will promote a gradual intensification of management and subsequent gradual and slight improvement of overall range ecological conditions.

Table IV - 10. Effects of the Proposed Alternatives on Range Resource Values.

RANGE RESOURCE VALUE	ALTERNATIVES					
	1	2	3	4	5	6
Authorized AUM's	60,924	51,785	48,290	121,800	91,350	30,462
Reduction in range area (acres)	0	0	269,500	0	0	269,500
Management emphasis	None	Range Improvement	Range Improvement	Maximum Forage	Intensive Management	Non-forage Products
Range enhancement program	Low	Moderate	Moderate	Intensive	Intensive	Intensive
Degree of forage use	Heavy	Moderate	Light	Moderate	Moderate	Light
Time of grazing	Season long	Rotation	Rotation	Deferred Rotation	Deferred Rotation	Deferred Rotation
Native species diversity	Decreasing	No Change	Mod. Increase	No Change	Mod. Increase	High Increase
Loss of T&E species	Increasing Loss	No Change	No Change	Decreasing Loss	Decreasing Loss	Decreasing Loss
Impacts on unique and special habitat.	Increasing	Slight Decrease	Slight Decrease	No Change	Slight Increase	High Decrease
Area of disturbed soil	Increasing	Slight Decrease	Mod. Decrease	Mod. Decrease	Mod. Decrease	High Decrease
Unwanted vegetation potential	Increasing	Slight Decrease	Slight Decrease	Slight Decrease	Mod. Decrease	Mod. Decrease

On upland forested range, the composition and abundance (or lack of) of forage species beneath the tree canopy is heavily dependent upon two processes: wildfire and forest management practices. Current timber harvest and fire suppression strategies can be expected to maintain the present composition and abundance of forage plants beneath the forest canopy.

Noxious Weeds – In a particular plant community, the species and extent of unwanted vegetation (mostly exotic plants) will influence whether the plant community improves or remains stable with improved livestock control. Success of noxious weed vegetation will continue to be marginally successful under the present range management program. In some cases on degraded range sites, there may be an increase in established weed species such as diffuse knapweed (*Centaurea diffusa*), Dalmatian toadflax (*Linaria genistifolia* spp. *Dalmatica*) and houndstongue (*Cynoglossum officinale*). Additionally, these same sites are open to invasion of new unwanted species such as orange hawkweed (*Hieracium anrantiacum*), yellow hawkweed (*H. pratense*), and leafy spurge (*Euphorbia esula*).

Wild Horses – Horse numbers and distribution are not well defined. The wild horse herd will continue to be a relatively unknown factor in managing the Reservation's rangeland communities for ecosystem function and processes. Ecological condition of the shrub-steppe portion of the Range occupied by the herd is expected to maintain and possibly decline, depending on future control of herd size.

Cultural Plants, Non-timber Forest Products and Sensitive Species – Many of the plants in this category are also highly palatable and quickly selected as forage by livestock. The adverse impact of livestock grazing on many of the species in this category found on the Reservation will continue with season-long grazing. Abundance of these affected species can be expected to continue to slowly decline.

Alternative 2

Alternative 2 proposes a 15 percent across-the Reservation reduction in range products or a reduction to an annual WUM allotment of 51,785. Alternative 2 is a step towards improved range livestock management, but little improvement over existing range conditions is expected.

Range Livestock Management - From an ecological perspective, a 15 percent reduction of allowed AUM's will do little to improve ecological condition of the Reservation's rangelands. Considering the entire Reservation, the bulk of the reduction would come from reduction in livestock use in riparian areas. A lower amount of reduction in use would come from dry meadows and uplands. A 15 percent or less reduction on heavily grazed riparian areas is insufficient to promote a significant positive trend in range ecological condition. A limited reduction in total AUM's without regulating timing of the grazing would continue to result in season-long heavy livestock use in the riparian area.

Reduction of forest management activities as proposed in Alternative 2 would allow forest canopy density to increase in many areas that would not occur under Alternative 1. This would result in a reduction of forage abundance beneath the forest canopy and this reduction would vary by PAG, soils, topography and seral stage of the overstory.

Noxious Weeds – A 15 percent reduction of allowed AUM's would reduce the continued presence and further invasion of noxious weeds as discussed under Alternative 1.

Wild Horses - Insufficient data exists to make a reliable judgment as to the effects of a 15 percent reduction in the AUM utilized.

Cultural Plants, Non-Timber Forest Products and Sensitive Plants. A 15 percent reduction in allowed AUM's would not measurably increase the abundance of the affected species as long as season-long grazing is permitted.

Alternative 3

Alternative 3 would defer grazing on the 41 Watershed Management Units (WMU) that currently have high and extreme watershed sensitivity ratings. This would reduce the current 918,606 acres of rangeland on the Reservation by approximately 269,000 acres thereby reducing the allowable AUM's by 12,634 annually to 48,290 AUM's. These WMU withdrawals, however, are not spaced uniformly across the Reservation and would affect some livestock operators more than others. Quite possibly, these impacts to some operators would be at a level that they could not continue a livestock enterprise on Reservation lands.

Range Livestock Management - Complete removal of livestock from these WMU's would dramatically improve the ecologic condition of those previously overgrazed riparian areas within the withdrawn WMU's. The riparian vegetation would have the opportunity to develop and to more fully support the natural hydrologic functions of the riparian system. The drier upland pastures in the withdrawn WMU's would be variable in their response to complete removal of livestock. Those sites in good and excellent condition generally would respond more quickly to livestock removal than sites in poor condition. On poor condition sites, unwanted exotic plants tend to invade more readily and restrict or even prevent the successional processes that move a plant community toward desirable late successional stages. Recovery on some poor condition sites would be slower with complete non-use than by using livestock grazing to manipulate conditions to enhance desired plant succession.

Lack of forest management activities on the withdrawn WMU's would result in further closure of the forest canopy leading to a decrease in plant diversity and biomass of forest floor species.

Noxious Weeds. Removal of livestock grazing would slow the invasion of many unwanted noxious weed species into currently overgrazed riparian areas. Established deep-rooted perennials such as Russian knapweed (*Acroptilon repens*) would persist. On highly disturbed upland pastures, noxious weeds would persist due of lack of desired species to occupy the range.

Wild Horses – The herd would not be affected by the proposed WMU withdrawals.

Cultural Plants, Non-timber Forest Products and Sensitive Species – Most likely some of these plants of interest will increase in numbers and vigor as a result of removing livestock grazing.

Alternative 4

The range management objective under Alternative 4 would be to move shrub/steppe plant communities to desired ecological condition and to enhance the forage component of the forest communities. Under Alternative 4, efforts would be extended to develop the livestock forage potential towards its maximum sustainable level and would double the present economic input to the Tribes. Conflicting expectations for rangeland resources will continue between those grazing livestock and users of other rangeland products.

Range Livestock Management - Range best management practices (BMPs) would be introduced and employed to enhance the range ecologic conditions. Cross fencing with rotation grazing, out-of-riparian water developments, graveled stream watering and crossing points, riparian pastures, utilization monitoring, and range reseeding would be used wherever applicable on the Reservation. Season-long grazing would be reduced and eventually eliminated.

Programs to introduce livestock operators and other interested public to range improvement opportunities and benefits would be intensified. A range stewardship ethic would be promoted among all range users. The Washington State University Extension Service Coordinated Resource Management Planning Model would be encouraged to facilitate the transition into more intensive livestock management under Alternative 4.

The degree of improvement in ecological condition as well as the increase in available forage would depend to a large part on grant funds made available to accomplish the proposed work. A substantial increase in range ecological condition is anticipated under Alternative 4. The livestock forage target would double allowable AUM's on the Reservation to 121,800.

Noxious Weeds – An integrated weed program would link weed management with efforts to increase range ecological condition under Alternative 4. The emphasis in weed management would be to change site conditions to prevent or to slow unwanted noxious weed invasion. Roadside vegetation management would have high priority. Noxious weed encroachment would be reduced Under Alternative 4 weed encroachment would be reduced to levels such that desired ecological functions and processes are not restricted on all except very disturbed sites unlikely to be rehabilitated.

Wild Horses – Wild horse numbers would be maintained within the carrying capacity of the range communities that sustain the herd. An increase in range ecological conditions under Alternative 4 would result in additional forage being available for the wild horse herd. Thus, herd numbers could be allowed to increase if desired by the Tribes.

Cultural Plants, Non-timber Forest Products and Sensitive Species – Populations of many of these special plants of concerns would increase with improved range ecologic conditions. Range seeding project, however, would most likely suppress development of cultural plants in the areas receiving ground-disturbance cultivation.

Alternative 5

The range management objective under Alternative 5 is to move shrub/steppe communities to desired ecological conditions and to enhance the forage component of the forest communities. The range management objective is the same as in Alternative 4, except that range management activities would emphasize achievement of desired ecologic condition to accommodate other non-livestock range uses and put less emphasis on maximum livestock forage. A modest increase in allowable livestock forage would be developed.

Range management under Alternative 5 would also focus on substantially improving conditions for cultural plants, Threatened and Endangered species, special habitats and wildlife. Collaborative efforts between operators and users of non-livestock range products would result in a rangeland ecosystem that provides a wide variety of products for the Colville Confederated Tribes.

Range Livestock Management – Range Best Management Practices (BMPs) would be employed under Alternative 5 to enhance rangeland ecologic conditions. Cross fencing with rotation grazing, out-of-riparian water developments, graveled stream watering and crossing points, riparian pastures, utilization monitoring and range reseeding are some of the practices recommended. Season-long grazing would be reduced and eliminated.

Programs to introduce livestock operators and other interested public to range improvement opportunities and benefits would be intensified. A range stewardship ethic would be promoted among all range users. The Washington State University Extension Service Coordinated Resource Management Planning Model would be encouraged to facilitate the transition into more intensive livestock management under Alternative 5.

The degree of improvement in ecological condition as well as the increase in available forage would depend to a large part on grant funds made available to accomplish the proposed work. A substantial increase in range ecological condition is anticipated under Alternative 5. The livestock forage target would increase allowable AUM's on the Reservation by 50 percent to 91,350.

Noxious Weeds – An integrated weed program would link weed management with efforts to increase range ecological condition under Alternative 5. The emphasis in weed management would be to change site conditions to prevent or to slow unwanted noxious weed invasion. Roadside vegetation management would have high priority. Noxious weed encroachment would be reduced Under Alternative 5 weed encroachment would be reduced to levels such that desired ecological functions and processes are not restricted on all except very disturbed sites unlikely to be rehabilitated.

Wild Horses – Wild horse numbers would be maintained within the carrying capacity of the range communities that sustain the herd. An increase in range ecological conditions under Alternative 5 would result in additional forage being available for the wild horse herd. Thus, herd numbers could be allowed to increase if desired by the Tribes.

Cultural Plants, Non-timber Forest Products and Sensitive Species – Populations of many of these special plants of concerns would increase with improved range ecologic conditions. Range seeding project, however, would most likely suppress development of cultural plants in the areas receiving ground-disturbance cultivation.

Alternative 6

Alternative 6 emphasizes maximum development of non-livestock range products. Allowed AUMs will be decreased 50 percent. This alternative prescribes removal of livestock from those Watershed Management Units (WMU's) designated "extreme" and "high" risk. Additionally, it prescribes a 29 percent across-the-board reduction of AUM's for the remaining grazing permits. Some livestock operators will no longer hold sufficient range pasture to continue in business. The livestock industry will provide significantly fewer jobs and less income to the community. Conditions for cultural plants, T&E species, special habitats, and wildlife would improve across the Reservation.

The range management objective under Alternative 6 is to move shrub/steppe communities to desired ecological conditions and to enhance the forage component of the forest communities. The range management strategy is the same as in Alternative 4 and 5, except that range management activities would emphasize achievement of desired ecologic condition to accommodate other non-livestock range uses and put less emphasis on maximum livestock forage. In addition, the WMU's with a high and extreme watershed sensitivity rating have been removed from the allotments.

Range Livestock Management – Range Best Management Practices (BMPs) would be employed under Alternative 6 to enhance rangeland ecologic conditions. Cross fencing with rotation grazing, out-of-riparian water developments, graveled stream watering and crossing points, riparian pastures, utilization monitoring and range reseeding are some of the practices recommended. Season-long grazing would be reduced and eliminated.

Programs to introduce livestock operators and other interested public to range improvement opportunities and benefits would be intensified. A range stewardship ethic would be promoted among all range users. The Washington State University Extension Service Coordinated Resource Management Planning Model would be encouraged to facilitate the transition into more intensive livestock management under Alternative 6.

The degree of improvement in ecological condition as well as the increase in available forage would depend to a large part on grant funds made available to accomplish the proposed work. A substantial increase in range ecological condition is anticipated under Alternative 6. The livestock forage target would decrease allowable AUM's on the Reservation by 50 percent to 30,462.

Noxious Weeds – An integrated weed program would link weed management with efforts to increase range ecological condition under Alternative 6. The emphasis in weed management would be to change site conditions to prevent or to slow unwanted noxious weed invasion. Roadside vegetation management would have high priority. Noxious weed encroachment would be reduced. Under Alternative 6 weed encroachment would be reduced to levels such that desired ecological functions and processes are not restricted on all except very disturbed sites unlikely to be rehabilitated.

Wild Horses – Wild horse numbers would be maintained within the carrying capacity of the range communities that sustain the herd. An increase in range ecological conditions under Alternative 6 would result in additional forage being available for the wild horse herd. Thus, herd numbers could be allowed to increase if desired by the Tribes.

Cultural Plants, Non-timber Forest Products and Sensitive Species – Populations of many of these special plants of concerns would increase with improved range ecologic conditions. Range seeding project, however, would most likely suppress development of cultural plants in the areas receiving ground-disturbance cultivation.

RECREATION RESOURCE

Recreation on the Colville Reservation corresponds to the rural nature of the area. The majority of the recreation use occurs in an undeveloped setting with fishing and hunting being popular activities for Tribal Members as well as others. Cultural and traditional uses are also important. These are described in the Cultural Section. Developed recreation sites are located on the major travelways and along Lake Roosevelt Reservoir. Recreation revenues are also an objective of the IRMP.

Management Direction Impacts

Implementation of the alternatives according to the goals, objectives and management direction will protect the recreation resource. Specifically these directions would protect and maintain existing primitive and semi-primitive settings and maintain natural appearing scenery along major travelways and at developed recreation sites. Management Directions for recreation shown in Appendix A are unlikely to create any known adverse impacts to resources on the Reservation.

Operational Impacts

Effects Common to All Alternatives

No harvest activities are proposed in either the Grizzly Mountain Wilderness or the Moses Mountain Natural Areas. The existing natural appearing scenery around developed recreation sites and along major travelways will be maintained by all the alternatives. None of the alternatives address developing additional recreation sites or more recreation revenues. These will be handled with separate analysis efforts.

Direct and Indirect Effects

Implementation of the action alternatives will primarily have indirect effects on the recreation resource. The effects vary by alternative and are described by anticipated effects on the natural appearing scenery and on road access revisions.

Natural Appearing Scenery

Management directions as developed in the IRMP are intended to protect natural appearing scenery along major travelways and around recreation sites. Intermediate harvests have minimal effect on the natural appearance of an area, and may even move it towards its natural historic appearance. Regeneration harvests, however, alter the setting from natural to a modified appearance. The diversity of size/structure stages proposed in the Desired Future Condition will provide variety on a landscape scale that should be pleasant to the recreation user.

The alternatives with more regeneration harvests have the potential for the greatest adverse effect on the natural setting. Alternative 5 has the highest regeneration harvest acreages followed by Alternative 6. Alternatives 1, 2 and 3 have moderate regeneration harvest levels. Alternative 4 has very few regeneration harvest acres and this alternative has the greatest effect towards moving the landscape towards the Desired Future Condition.

Road Access Revisions

No additional road mileage is proposed in any of the alternatives - if a short road is needed an equal mileage will be decommissioned and any roads not needed or creating adverse impacts would also be decommissioned. By use of the no net new road approach it is anticipated that existing roads in poor condition, particularly in close proximity to riparian areas would be decommissioned first. Thus the opportunity exists to create a Reservation-wide management action where there would be no net significant adverse environmental effects by any of the alternatives from road development. There may be, however, adverse effects from road development in localized areas under all alternatives.

With Alternatives 3 and 6 road closures or decommissioning would be initiated on 20 percent of the non-arterial roads within the 41 watershed management units (WMU's). These closures, even though for only 10-15 years, will provide additional semi-primitive recreation experiences.

Cumulative Effects

The actions proposed during the next fifteen years are designed to restore the landscape towards the Desired Future Condition. With the current imbalance of size-structural stages and the forest health condition, these treatments will tend to be visually heavy. It is anticipated that this process will continue in later years until the Desired Future Condition is achieved. Then actions will switch to a maintenance (conservation) mode, which will have far fewer visual effects. Potential effects on the recreation resource will be the greatest as this transition is made - then very minimal as the Desired Future Condition is maintained.

SOCIOECONOMICS

The large number of issues, concerns and opportunities identified during the Visioning sessions for the Colville Integrated Resource Management Plan (Clark 1997) and the scoping sessions for this EIS reflect the importance of the Reservation's natural resource management. This management has a large effect on the social and economic well being of members of the Tribes on and off-Reservation as well as resident and nearby non-Indians. It is estimated that about 75 percent of the revenues available to the Colville Confederated Tribes comes from the management of natural resources on the Tribes trust lands by the USDI Bureau of Indian Affairs. Most all of this revenue is generated by the harvest of timber from the Reservation's forestlands.

Over the past five years about 73.2 MMBF has been harvested annually generating annual gross revenue of $30.7 million on trust lands and 2.2 MMBF for $1.0 million on non-trusts lands. For this analysis only harvest from trust lands has been analyzed. It has been assumed for this analysis as directed by Tribal Resolution that at minimum, the Tribal Enterprise Colville Indian Precision Pine (CIPP) would process 44 MMBF annually. Harvest volumes greater than 44 MMBF may be processed by other than CIPP, although tribal trust revenues are generally 10-15% less for these volumes. Reservation records over the past five years also indicate that one job year is created by the harvesting and processing of 250 MBF.

To test the economic value of each alternative a Net Present Value (NPV) analysis was completed. NPV is defined by Emery and Finnerty (1997) as "The present value of the expected future cash flows minus the costs." The weighted average cost of capital (WACC) again defined by Emery and Finnerty (1997) as "the weighted average of financing costs for a financing package that would allow a project to be undertaken" was 12 percent for the NPV analysis. While other assumptions with regards to the appropriate cost of capital may be used, the relative scale of difference among the six alternatives does not change with varying rates in the cost of capital used in this EIS analysis.

No analysis was made of the annual processing of near 1.0 MMBF of the Reservation's lodgepole pine at the Tribal Enterprise Inchelium Pole Plant. Observations indicate that this timber processing plant does not return any revenues to the Tribes' treasury. Its sole socioeconomic benefit appears to be the providing of about 20 jobs for Tribal members.

To determine the present return to the Tribal treasury from the harvest per thousand board feet of timber (MBF) on trust lands of the Reservation an extensive analysis was made of both Tribal enterprise and USDI BIA records. The return per MBF was within 5 percent for both sources of data over the period 1995 to 1998. From this data it was estimated that the mean return to the Tribal treasury from all sources of timber is about $219 per MBF for that processed at Colville Indian Precision Pine, Inc. (CIPP) and $164 per MBF for that processed at non-CIPP facilities. This dollar return per MBF reflects the revenue received for sale of the timber less the expenses of harvesting, road construction and maintenance, and forest administration including regeneration cost (10% BIA funding). These revenues do not include the present Colville Business Council directed $15 per MBF set-aside for land acquisition not funding of the Natural Resources Department.

The six alternatives vary markedly with respect to their amount of regeneration and intermediate harvest. As regeneration harvest most often has larger trees than intermediate, the return could be considered to have a higher market return (J. Erickson, personal communication, Oct. 1999). Thus, a return adjustment was made accordingly establishing the estimated return for regeneration harvest timber processed by CIPP at $239/MBF and non-CIPP at $184/MBF. Similarly intermediated harvest processed by CIPP was set at $209/MBF and non-CIPP at $154/MBF.

Management Direction Impacts

The management directions developed by the Integrated Resource Management Planning process for social and economic resources are shown in Appendix A under *Land Revenue* and *Non-land Revenue*. The management directions were designed to provide short-term income and long-term net income stability for the Reservation and Tribal membership through the efficient and effective management of its resources. The levels of positive and adverse impacts that may occurs under various proposed alternatives in carrying out these management directions are discussed in the section on *Operation Impacts* below.

Operational Impacts

Direct and Indirect Effects

A stream of cash flow revenue from forest harvest activities has been estimated for each alternative during the period 2000-2014. While these estimates provide a guideline of potential income by alternative to the Tribes, they should not be used for the purpose of budgeting by the Colville Business Council. These revenue estimates have been developed only for the purpose of estimating the relative economic viability of each alternative.

The estimated annual revenues by alternative that would be returned to the tribal treasury are shown in Table IV-11 and the jobs supported shown in Table IV-12 for the analysis period 2000-2014.

Total volumes of timber harvested range from 752 MMBF under Alternative 4 to 1,421 under Alternative 5. Alternatives 1 and 6 harvest a moderate volume level at 1,071 and 1,105 MMBF, respectively, with Alternative 2 slightly less at 953 MMBF. The Alternative 3 harvest is lower at 819 MMBF.

Net revenues for the period 2000-2014 vary among alternatives due to different revenues received from different processing plants and the quality/species of logs delivered and different expenses including logging cost, the cost of construction and maintenance of roads, regeneration costs, and forest administration costs. Estimated net revenues, however, closely reflect the volumes harvested as they range from $156.1 million for Alternative 4 to $243.8 million under Alternative 5. Net revenues for Alternatives 1 and 6 are estimated at $188.1 million and $196.3 million with Alternative 2 at $290.7 million. Alternative 3 is lower at $177.7 million. Largely reflecting the $175 per acre regeneration cost, the estimated return to the Tribal treasury ranges from $205/MBF under Alternative 5 to $217/MBF for Alternative 4. Again, these net revenues do not reflect the present $15/mbf set aside cost for land purchases directed by the Colville Business Council.

Use of a Net Present Value (NPV) analysis is one of the more effective tools to analyze the present comparative financial position of the six alternatives. Alternative 3 and 4 have the lowest NPV at $79.4 million and $71.3 million, respectively, while Alternative 5 has the highest NPV at $132.6 million (Table IV-11). Alternatives 1 and 6 have nearly the same NPV at $101.3 million and $104.4 million while Alternative 2 is slightly lower at $89.9 million. In the NPV analysis, a 12 percent cost of capital was used. While other assumptions with regards to the appropriate cost of capital may be used, the relative scale of difference among the six alternatives does not change with varying rates in the cost of capital used in this EIS analysis.

Table IV - 11. Estimated Net Revenues by Alternative to be Returned to the Tribal Treasury by Timber Harvest during the Period 2000-2014 on the Colville Reservation.

YEAR	ALTERNATIVES ($1,000)					
	1	2	3	4	5	6
2000	$14,309	$127,733	$11,662	$10,367	$18,978	$15,079
2001	$19,378	$17,116	$10,860	$13,317	$25,324	$13,848
2002	$11,632	$10,384	$11,218	$7,997	$15,209	$14,599
2003	$12,805	$11,321	$10,273	$9,263	$17,172	$14,387
2004	$13,812	$12,292	$12,918	$9,870	$18,440	$16,264
2005	$17,702	$14,979	$12,997	$12,423	$22,864	$15,389
2006	$20,201	$17,964	$13,892	$14,260	$26,095	$16,415
2007	$13,841	$12,459	$10,172	$9,636	$17,733	$19,947
2008	$11,972	$10,589	$10,000	$8,618	$15,083	$14,890
2009	$14,230	$12,445	$10,030	$9,430	$18,024	$16,324
2010	$13,319	$11,976	$10,039	$9,585	$16,868	$14,518
2011	$10,594	$9,925	$12,523	$7,322	$13,234	$15,839
2012	$13,913	$12,300	$16,042	$9,299	$18,099	$17,058
2013	$14,163	$12,473	$12,155	$10,165	$18,361	$15,419
2014	$19,640	$18,764	$12,961	$14,588	$29,221	$16,923
TOTAL	$221,515	$197,720	$177,743	$156,141	$290,707	$233,899
Annual Mean	$14,768	$13,181	$11,850	$10,409	$19,380	$15,593
Total Ret $/mbf	$207	$207	$217	$208	$172	$212
NPV	$101,298	$89,936	$79,358	$71,343	$132,617	$104,353
NPV Ret. $/mbf	$95	$94	$97	$94	$93	$94

NPV = Net Present Value. CIPP = Colville Indian Precision Pine, Inc.
CIPP Intermediate Harvest = $209/MBF; Regeneration Harvest $239/MBF.
Non-CIPP Intermediate Harvest = $154/MBF; Regeneration Harvest = $184/MBF.
Working Cost of Capital (WACC) = 12%

Do the large variability in level of regeneration treatments the cost of planting is also variable. The cost of regeneration by alternative is shown in Table IV-12. While the cost of land acquisition is not included in the revenue analysis, its cost is large and is variable among alternatives (Table IV-12).

Table IV - 12. Average Annual Regeneration and Land Acquisition Cost by Alternatives.

ITEM	ALTERNATIVE					
	1	2	3	4	5	6
Conifer Planting Costs	$675,378	$464,026	$511,376	$164,715	$1,160,373	$914,451
Percent of Mang. Budget	41%	33%	39%	14%	54%	53%
Land Acquisition Cost	$1,071,200	$953,100	$818,700	$751,900	$1,421,400	$1,105,100
Regeneration Cost = $175/Acre. Land Acquisition Cost = $15/mbf.						

The direct number of job years provided by the forest management activities also reflects the proposed volume harvested under each alternative (Table IV-13). Over the 15-year period, Alternative 4 would support the lowest average number of annual job years at 201 while Alternative 5 would support 379. Alternatives 1 and 6 provide a moderate level at 286 and 295, respectively whereas Alternatives 2 and 3 support a lower level of average annual job years at 254 and 218, respectively.

Table IV - 13. Estimated Number of Jobs to be Supported Through Timber Harvest by Alternative during the Period 2000-2014 on the Colville Reservation.

YEAR	ALTERNATIVES ($1,000)					
	1	2	3	4	5	6
2000	276	245	215	148	370	284
2001	392	347	196	271	512	256
2002	213	188	203	148	285	272
2003	239	210	182	170	328	267
2004	263	233	244	184	357	311
2005	354	298	245	250	458	291
2006	411	368	264	293	530	312
2007	265	238	180	181	343	325
2008	222	195	176	161	285	281
2009	272	236	176	176	349	311
2010	252	226	176	148	324	272
2011	188	176	233	134	242	300
2012	264	232	317	172	349	325
2013	271	237	225	191	356	291
2014	402	384	242	300	596	322
Total	4,285	3,812	3,275	3008	5,686	4,420
Ann. Mean	286	254	218	201	379	295
250 MBF of Harvest is estimated supports one job.						

The indirect effect of the proposed action by alternatives, although quite large, is difficult to assess. The latest complete study of multipliers for forest employment in the State of Washington was by Waggener (1976, updated 1982). While these multipliers were developed long ago and much economic chaos has occurred in the forest industry since these studies, they appear to be the best available for evaluating the indirect effects of the proposed action on the

Colville Indian Reservation. These economic multipliers as shown in Table IV-14 and indicate a range of additional economic value that is created by the proposed action. As the revenue values in Table IV-11 are net revenues to the Tribes, the appropriate gross output revenues for estimating the indirect effects would be about twice those in the tables.

Table IV - 14. Economic Multipliers Applicable to the Colville Reservation (Waggener 1982).

FORESTRY SECTOR	OUTPUTS[1]	INCOME[2]	INCOME OUTPUT[3]	EMPLOYMENT[4]	EMPLOYMENT[5]
Forestry Employment	1.86	1.81	1.61	2.87	42.4
Logging	2.29	3.07	1.49	2.80	65.2
Sawmills	2.33	3.15	1.43	2.96	70.2
Plywood Mills	2.14	2.98	1.24	2.77	65
Other Wood Mills	1.88	2.80	0.99	2.36	59.5
Weighted Average	n/a	n/a	n/a	2.98	61.8

[1] Each dollar in additional output from sawmilling results in a total cumulative change of output in it an in all related industries. For example, in "Sawmills," the original $1 in sawmilling plus $1.33 in increased outputs from related industries equals $2.33. Technically, this is a type II multiplier.
[2] Each dollar increase in income, for example in sawmilling, will result in an additional income to Reservation residents of $2.15 for a total income change of $3.15.
[3] With reference to the sawmill sector, a $1 change in output will result in an estimated change in total income (direct, indirect and induced) of $1.43.
[4] An additional job in the sawmill sector will lead directly to 2.95 jobs statewide.
[5] An increase of $1 million in output from the sawmill will result in a 70.2 increase in jobs in the State (both directly and indirectly) or a 61.8 increase in jobs across the forestry sector.

The effects of the six alternatives on the economics of non-timber resources, including recreation, water and livestock grazing were also analyzed.

Non-timber economic values for recreation have been developed for the Reservation. Allowing for the difference in multiplier effects for different use, the value of an average visitor use day was estimated at $120 per visitor day. Although there is no visitor use census data, there is no anticipated difference in visitor use days among the six alternatives. At an estimated 3,000 visitor use days this value is estimated at approximately $360,000. The visitor use days and value are not expected to increase significantly in the near future on the Reservation as a result of action proposed under all alternatives.

Mitigation plans for all alternatives, most importantly in alternatives 3 and 6, require the closure of unnecessary roads across the Reservation. Under these plans no significant change in recreational or subsistence use including hunting and cultural plant collection is expected under any alternative.

Under the present allowable 60,900 AUM's of use, gross revenues of about $177,000 would be returned to the Tribes' annually under Alternative 1. The existing status of private livestock operations is not disrupted. With the proposed reduction in allowable AUM's by 15 percent to 51,765 under Alternative 2, livestock grazing will generate an estimated annual gross revenue of $150,500. This reduction in AUM's would necessitate some adjustment of livestock operations on the Reservation. Whether these changes are critical to continuing the livestock enterprise would depend on an individual operator's ability to substitute off-Reservation pastures, cropland forage or to develop compensating management strategies to offset a 15 percent reduction in forage. Under Alternative 2, it is expected that livestock operators entirely dependent on Reservation grazing would be more severely impacted by a reduction in available forage than operates who already have an off-Reservation source. Weed management cost would remain at the present levels.

Under Alternative 3, forage would be available to support 48,290 AUM's that would generate estimated gross annual revenue of $140,350. The economic effects of Alternative 3 would impact some livestock operations more than others. Operators outside the areas withdrawn for watershed protection would be little affected while those now operating in these withdrawn WMU's would be impacted proportionally to the present area used. A few operators would be effectively closed because alternative forage or management strategies are unlikely available.

Under Alternative 4, the allowable AUM's would double to 121,800 generating estimated gross annual revenue of $354,000. However, part of the increased revenue would be needed to offset the increased cost of implementing and administrating an intensive livestock grazing program required to accomplish the desired alternative goal of maximum sustainable livestock forage production. It is expected that livestock operator's financial position would improve with the proposed action. Wild horse management costs would most likely increase.

Under Alternative 5, the allowable AUM's would increase to 91,350 generating estimated gross annual revenue at present fees of $265,500. However, part of the increased revenue would be needed to offset the increased cost of implementing and administrating an intensive livestock grazing program required to accomplish the desired alternative goal of maximum sustainable livestock forage production. It is expected that livestock operator's financial position would improve moderately with the proposed action. Wild horse management costs would most likely increase.

Under Alternative 6, the allowable AUM's would decrease to 30,462 generating estimated gross annual revenue at present fees of $88,500. To meet the land revenue Management Direction F17 requiring minimum rangeland revenue of $120,000 grazing fees would have to be raised about 35 percent under Alternative 6. The economic effects of Alternative 3 would have a major impact on most livestock operations. Operators outside the areas withdrawn for watershed protection would be little moderately affected while those now operating in these withdrawn WMU's would be impacted proportionally to the present area used. Some current livestock operations most likely would have to close because alternative forage or management strategies are unlikely available.

Costs for timber sale fuel treatments are included in the economic analysis and reflected in the Net Present Value for each treatment. The estimated cost, however, pre-commercial thinning (stocking control) and prescribed burning have not been included in the economic analysis or the Net Present Value for each alternative. Estimated cost for pre-commercial thinning averages about $500 per acre and $100 per acre for prescribed burning. Using these estimates the cost for stocking control and prescribed burning for each alternative is shown in Table IV-15. While the

IRMP provides direction for these needed land management activities, no source of funding has been identified.

Table IV - 15. Annual Additional Expenses Identified to Meet Stocking Control and Prescribed Fire Treatments.

TREATMENT	ALTERNATIVES ($)					
	1	2	3	4	5	6
Stocking Control	0	1,550,000	2,800,000	3,000,000	1,550,000	2,700,000
Prescribed Burning	0	640,000	640,000	1,150,000	740,000	740,000
Total Cost	0	2,190,000	3,440,000	4,150,000	2,290,000	3,440,000

FOREST VEGETATION

Biodiversity

Biological diversity is a consequence of the variety of environmental and climatic conditions, life forms, and biological processes that occur within a specific area or region. It is not Tribal policy to mimic nature or to try to exactly duplicate pre-settlement ecosystem conditions through management activities. Under viable ecosystems management concepts (USDA Forest Service 1994) the desired future condition of a landscape must account for both the historic range of variability in biological systems and the goods, services, and amenities desired by society.

Biodiversity is not a quantifiable resource by itself. The factors for assessing the direct, indirect and cumulative effects on biodiversity are highly dependent on the existing conditions and the scale or size of area being evaluated. Biodiversity on the Colville Indian Reservation is best described by the variety of environmental conditions available for maintenance of plant and animal populations. The resulting composition of successional/structural stage habitats relative to the desired range of habitat diversity across the cumulative effects area, the potential for increased fragmentation of interior mature forest habitat, and the availability of suitable corridors within and through the will be used as the base indicators of potential impacts to biodiversity.

Successional/Structural Stage Diversity

The Integrated Resources Management Plan (1997) stipulates that if the successional/structural stages are above or below the Desired Future Condition (DFC) value, the proposed management activities should attempt to create stand conditions that will provide the desired conditions in the reasonable future. Analysis of available size class/successional/structural stage data for existing conditions on the Colville Indian Reservation indicates that of the potential 97 different PAG/size class/successional stage/structural stage combinations 45 percent are below the DFC and 31 percent exceed the DFC. Only 24 percent of the desired future conditions are presently being met.

There is no pattern to the excess and deficit stages except that size class 5 for nearly all successional/structural stages and PAG's is below DFC, whereas 67 percent of size class 4 is above DFC. Two factors are considered as mitigating circumstances for this project. One factor is that a very high percentage of the Class 4 successional/structural stage acreage needs treatment for forest health reasons. And the second factor is that action alternatives 4, 5 and 6 have been designed to modify stands to provide size/successional/structural stage distribution that more nearly meets the DFC than currently exists on the Reservation.

Fragmentation of Habitat and Corridor Availability

Fragmentation occurs when a contiguous block of habitat suitable for an individual or guild of species is broken into smaller isolated patches surrounded by a less suitable structural stage of habitat. With the current social and scientific emphasis being placed on retention of late and old structural stage dependent wildlife species, fragmentation is considered as a particularly undesirable condition when large blocks of moderate (ES4 through LM4) and late and old (ES5 through LM5) structural stage forest are subdivided into smaller non-interconnected patches surrounded by relatively open, early to mid-successional stage vegetation.

In addition to a direct loss of mature forest structural stage habitat, disturbance of mid- and late-successional structural class 5 forests reduces the availability of interior mature forest habitat through edge effect. In many forested plant communities the mature forest stand structure has a very dense overstory that eliminates sunlight from the forest floor and thus has a very sparse understory vegetation layer. When an edge is created by complete removal or heavy thinning of the tree canopy there is a certain distance inside that edge (approximately 400 feet) in which the original closed-stand character is missing or only marginally available. Edge effect may result in reducing the size of individual late and old-structural stage patches below the optimum for species of concern.

Across the Reservation, late and old structural stage forest has had heavy overstory removal harvests over the past 30 years, resulting in a relatively large loss of interior, late and old structural stage habitat values. Although the effects of timber harvest on this habitat fragmentation are generally viewed as negative, when viewed from the biodiversity standpoint, this may not always be the case. Complete isolation of late and old structural stage forest patches is not considered desirable, but the opening of closed-canopy forests for production of large, wild ungulate forage is one of the objectives of wildlife habitat management on the Colville Indian Reservation. Past harvest activities have provided high quality foraging habitat for large ungulates, and additional edge habitat for smaller mammal and bird species that prefer the proximity of early successional stage feeding habitat with mid- to late successional stage security habitat. These early successional stage openings provide a diversity of forested habitats that more nearly match historic levels for the area.

Corridors are considered an extremely important part of biodiversity since they provide avenues for dispersal of both plants and animals. Suitable "interior forest" habitat patches may become isolated from each other if corridors having MS4 through LM5 structural stages or acceptable security habitat are not retained. There are four general characteristics of effective corridors: the wider the corridor, the better; the shorter the corridor, the better; corridors that provide habitats suitable to the species of concern are the best; and ridges and riparian drainages provide traditional, natural corridors. Corridors on the Colville Indian Reservation are for the most part composed of mid- to late-successional stage habitats with moderate diameter trees (MS4 to LM 4) and occupy stream-bottom riparian habitats. For this analysis the minimum width for suitable corridor habitat will be 400 feet.

Management Direction Impacts

In Appendix A, 150, management directions for forest vegetation are shown that have been prepared by the Integrated Resource Management Planning process. The management directions provide an adaptive process where suitable habitat conditions are provided for native and non-native species to maintain biodiversity. The impacts of these management directions are evaluated mostly individually within the *Operation Impacts* discussion for *Forest Vegetation* and *Wildlife* in the following sections.

Operational Impacts

Effects Common to all Action Alternatives

Successional/Structural Stage Diversity

All action alternatives will result in changes to size class and successional/structural stages of forest habitats. These shifts in habitat structural stage distribution will create variable impacts depending on the management activity. Management Directions E8, E9, E10, E15, E16, E20, E21, E22, E23, E26, E27, E28 and E29 all provide emphasis on managing the current forest vegetation in a manner that will result in a size/successional/structural stage diversity that more nearly approximates the Desired Future Condition.

As an example, in the ponderosa pine and dry Douglas-fir habitats common on the Colville Indian Reservation, mature forest stands naturally exhibit very open overstory and understory structures. Management activities, such as commercial and pre-commercial thinning, that remove advanced tree regeneration from the understory would actually create single-layered ponderosa pine and dry Douglas-fir stands more characteristic of late-seral/climax conditions for the region.

With or without natural or human-related disturbance, seral cover types and structural stage composition of the forest environment on the Colville Indian Reservation will change at varying rates over time. The species composition, distribution, and rate of change associated with human-caused modifications to the environment have been the subject of numerous studies and are somewhat predictable. Harvest methods, such as, regeneration and commercial thinning from below followed by broadcast burning would cause the most pronounced changes in successional and structural stage diversity. The expected short-term habitat changes related to proposed forest management activities under all six alternatives and without management treatments are presented in Tables IV-16 to IV-22. Two time periods are presented: 15 years (year 2014) is the period during which the proposed management treatments will be applied and an additional 25 years of stand development (year 2040) were analyzed. In nearly all situations, the end of the 40 year time period will be the earliest that measurable changes in size class/successional/structural stage distribution will occur.

Fragmentation of Habitat and Corridor Availability

At the landscape scale of analysis used for this Reservation-wide EIS it is not possible to quantitatively assess habitat fragmentation. Fragmentation will be addressed for all project level activities. Management Directions N2 and N4 place emphasis on reduction of fragmentation and providing for adequate distribution, occurrence and connectivity of mature/old structure stands.

Corridors will be retained under all alternatives. Management Directions M36, M39, M43 and M44 relating to riparian buffer zones for perennial and intermittent streams will retain corridors currently present along most major drainages. These 200-foot wide or less buffers do not provide the width considered suitable for retention of interior forest conditions, but in most cases this is all that is currently available. Management Direction N22 stipulates that suitable upland corridor habitat with widths of at least 400 feet will be retained under all alternatives to provide connectivity between larger blocks of habitat.

Direct and Indirect Effects

Successional/Structural Stage Diversity

Activities related to stand regeneration timber harvests (e.g., seed tree and shelterwood treatments) generally result in an increase in early seral stages of forest plant communities and a reduction in mid- to late successional stages of closed-canopy forest habitats. Stand treatments such as individual tree selection, small group selection and commercial thinnings generally maintain or advance the successional/structural stage. Commercial and pre-commercial thinning treatments are performed to reduce competition with retained future harvest crop trees. Many of the late succession/small timber (L4) stands that have scattered large diameter trees and that are proposed to be thinned or underburned will be modified to open, larger-diameter tree dominated stands more characteristic of late stage (L5) ponderosa pine habitat.

Table IV-16 through IV-22 compare existing forest size class/successional/structural stages with those created under the six proposed action alternatives on the Reservation. The affects of each alternative are discussed by PAG.

Table IV - 16. Effects of No Harvest and Six Harvest Alternatives on Ponderosa Pine Plant Association Group on the Colville Reservation.

STRUCT. CLASS	COND.[1]	STRUCTURAL STAGE [2]											
		E-S		E-M		M-S		M-M		L-S		L-M	
		Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040
1	HRV	1309-6543 (1-5%)											
	Yr 1999	30,050 (23%)											
	DFC	3926-9160 (3-7%)											
	No Har.	30,050	0										
	Alt. 1	30,050	0										
	Alt. 2	30,050	0										
	Alt. 3	30,050	0										
	Alt. 3	30,050	0										
	Alt. 5	30,050	0										
	Alt. 6	30,050	0										
2	HRV	1309-13086(1-10%)											
	Yr 1999	1,179 (1%)											
	DFC	7652-17012 (6-13%											
	No Har.	1,179	30,050										
	Alt. 1	1,179	30,050										
	Alt. 2	1,179	30,050										
	Alt. 3	1,179	30,050										
	Alt. 3	1,179	30,050										
	Alt. 5	1,179	30,050										
	Alt. 6	1,179	30,050										
3	HRV	1309-13086(1-10%)											
	Yr 1999	14,713 (11%)											
	DFC	7652-17012 (6-13%											
	No Har.	14,713	1,179										
	Alt. 1	14,713	1,179										
	Alt. 2	14,713	1,179										
	Alt. 3	14,713	1,179										
	Alt. 3	14,713	1,179										
	Alt. 5	14,713	1,179										
	Alt. 6	14,713	1,179										
4	HRV	26172-39258 (20-30%)		6543-19629 (5-15%)									
	Yr 1999	35,410 (27%)		46,211 (35%)									
	DFC	26172-39258 (20-30%)		13086-19629 (10-15%)									

STRUCT. CLASS	COND.[1]	STRUCTURAL STAGE[2]											
		E-S		E-M		M-S		M-M		L-S		L-M	
		Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040
	No Har.	35,410	39,500	46,211	32,348								
	Alt. 1	35,823	39,789	45,798	32,059								
	Alt. 2	36,662	40,376	44,959	31,471								
	Alt. 3	35,646	39,685	45,975	32,163								
	Alt. 4	35,823	39,789	45,798	32,059								
	Alt. 5	35,823	39,500	45,798	32,059								
	Alt. 6	35,674	39,685	45,947	32,163								
5	HRV	45801-65430 (35-50%)		6543-13086 (5-10%)									
	Yr 1999	0 (0%)		3,296 (3%)									
	DFC	32715-49726 (25-38%)		3926-10469 (3-8%)									
	No Har.	0	10,623	3,29 6	17,159								
	Alt. 1	0	10,747	3,29 6	17,035								
	Alt. 2	0	10,999	3,29 6	16,784								
	Alt. 3	0	10,964	3,29 6	17,088								
	Alt. 4	0	10,747	3,29 6	17,035								
	Alt. 5	0	10,623	3,29 6	17,035								
	Alt. 6	0	10,702	3,29 6	17,080								

[1] Condition: HRV – Historic Range of Variability; Existing – Existing Conditions on Reservation; DFC – Desired Future Conditions on Reservation; No Har. – No harvest would occur during the period 2000-2014; Alt. 1 –6 Alternatives described in Chapter II.
[2] Structural Stage: E-S Early Seral; E-M Early Mature; M-S Mid-Seral; M-M Mid-Mature; L-S Late Seral; L-M Late Mature.
Total Ponderosa Pine PAG acreage 130,859.

Table IV - 17. Effects of No Harvest and Six Harvest Alternatives on Douglas-fir Warm Dry Plant Association Group on the Colville Reservation.

STRUCT. CLASS	COND.[1]	STRUCTURAL STAGE [2]											
		E-S		E-M		M-S		M-M		L-S		L-M	
		Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040
1	HRV	309-1546 (1-5%)											
	Yr. 1999	11,515 (37%)											
	DFC	928-2165 (3-7%)											
	No Har.	11,515	0										
	Alt. 1	11,515	0										
	Alt. 2	11,515	0										
	Alt. 4	11,515	0										
	Alt. 4	11,515	0										
	Alt. 5	11,515	0										
	Alt. 6	11,515	0										
2	HRV	309-3093 (1-10%)								309-3093 (1-10%)			
	Yr. 1999	0 (0%)								0 (0%)			
	DFC	1856-4020 (6-13%)								309-3093 (1-10%)			
	No Har.	0	0							0	0		
	Alt. 1	0	0							0	0		
	Alt. 2	0	0							0	0		
	Alt. 4	0	0							0	0		
	Alt. 4	0	0							0	0		
	Alt. 5	0	0							0	0		
	Alt. 6	0	0							0	0		
3	HRV	309-3093 (1-10%)								309-3093 (1-10%)			
	Yr. 1999	3,591 (12%)								0 (0%)			
	DFC	1856-4020 (6-13%)								309-3093 (1-10%)			
	No Har.	3,591	11,515							0	0		
	Alt. 1	3,591	11,515							0	0		
	Alt. 2	3,591	11,515							0	0		
	Alt. 4	3,591	11,515							0	0		
	Alt. 4	3,591	11,515							0	0		
	Alt. 5	3,591	11,515							0	0		
	Alt. 6	3,591	11,515							0	0		
4	HRV	10824-15463 (35-50%)		309-3093 (1-10%)						309-3093 (1-10%)		309-3093 (1-10%)	
	Yr. 1999	3,919 (13%)		6,865 (22%)						0 (0%)		5,036 (16%)	
	DFC	10824-13917 (35-45%)		309-1546 (1-5%)						309-1546 (1-5%)		309-1546 (1-5%)	
	No Har.	3,919	6,334	6,865	4,805					0	0	5,036	3,525
	Alt. 1	3,944	6,352	6,903	4,832					0	0	4,973	3,481

STRUCT. CLASS	COND.[1]	STRUCTURAL STAGE [2]											
		E-S		E-M		M-S		M-M		L-S		L-M	
		Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040
	Alt. 2	3,919	6,334	7,057	4,941					0	0	4,844	3,391
	Alt. 3	3,933	6,344	6,887	4,821					0	0	5,000	3,500
	Alt. 3	3,944	6,352	6,903	4,832					0	0	4,973	3,481
	Alt. 5	3,944	6,352	6,903	4,832					0	0	4,973	3,481
	Alt. 6	3,935	6,346	6,889	4,822					0	0	4,996	3,499
5	HRV	7732-12370 (25-40%)		309-3093 (1-10%)						309-3093 (1-10%)		309-1546 (1-5%)	
	Yr. 1999	0 (0%)		0 (0%)						0 (0%)		0 (0%)	
	DFC	4330-8969 (14-29%)		309-1237 (1-4%)						309-1237 (1-4%)		309-1237 (1-4%)	
	No Har.	0	1,176	0	2,060					0	0	0	1,511
	Alt. 1	0	1,183	0	2,071					0	0	0	1,492
	Alt. 2	0	1,176	0	2,118					0	0	0	1,453
	Alt. 3	0	1,180	0	2,066					0	0	0	1,500
	Alt. 3	0	1,183	0	2,071					0	0	0	1,492
	Alt. 5	0	1,183	0	2,071					0	0	0	1,492
	Alt. 6	0	1,180	0	2,067					0	0	0	1,499

[1] Condition: HRV – Historic Range of Variability; Yr. 1999 – Existing Conditions on Reservation; DFC – Desired Future Conditions on Reservation; No Har. – No harvest would occur during the period 2000-2014; Alt. 1 –6 Alternatives described in Chapter II.
[2] Structural Stage: E-S Early Seral; E-M Early Mature; M-S Mid-Seral; M-M Mid-Mature; L-S Late Seral; L-M Late Mature.
Total Douglas-fir Warm Dry PAG acreage 30,926.

Table IV - 18. Effects of No Harvest and Six Harvest Alternatives on Douglas-fir Warm Moist Plant Association Group on the Colville Reservation.

STRUCT. CLASS	COND.[1]	STRUCTURAL STAGE [2]											
		E-S		E-M		M-S		M-M		L-S		L-M	
		Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040
1	HRV	2355-11773 (1-5%)											
	Yr. 1999	31,343 (13%)											
	DFC	7064-16483 (3-7%)											
	No Har.	31,343	0										
	Alt. 1	47,916	0										
	Alt. 2	42,518	0										
	Alt. 3	45,409	0										
	Alt. 4	31,343	0										
	Alt. 5	56,011	0										
	Alt. 6	52,349	0										
2	HRV	2355-23547 (1-10%)								2355-11773 (1-5%)			
	Yr. 1999	9,079 (4%)								0 (0%)			
	DFC	14128-30610 (6-13%)								2355-11773 (1-5%)			
	No Har.	9,079	31,343							0	0		
	Alt. 1	9,079	47,916							0	0		
	Alt. 2	9,079	42,518							0	0		
	Alt. 1	9,079	45,409							0	0		
	Alt. 4	9,079	31,343							0	0		
	Alt. 5	9,079	56,011							0	0		
	Alt. 6	9,079	52,349							0	0		
3	HRV	2355-23547 (1-10%)								2355-11773 (1-5%)			
	Yr. 1999	26,957 (11%)								3,766 (2%)			
	DFC	14128-30610 (6-13%)								2355-11773 (1-5%)			
	No Har.	26,957	9,079							3,766	0		
	Alt. 1	29,112	9,079							1,611	0		
	Alt. 2	29,538	9,079							1,185	0		
	Alt. 1	28,767	9,079							1,956	0		
	Alt. 4	30,106	9,079							617	0		
	Alt. 5	28,626	9,079							2,097	0		
	Alt. 6	28,378	9,079							2,345	0		
4	HRV	23547-58866 (10-25%)		23547-47093 (10-20%)						2355-23547 (1-10%)		11773-35320 (5-15%)	
	Yr. 1999	32,934 (14%)		62,683 (27%)						2,1958 (9%)		37,142 (16%)	
	DFC	23547-47093 (10-20%)		11773-35320 (5-15%)						2355-11773 (1-5%)		11773-23547 (5-10%)	

STRUCT. CLASS	COND.[1]	STRUCTURAL STAGE [2]											
		E-S		E-M		M-S		M-M		L-S		L-M	
		Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040
	No Har.	32,934	50,011	62,683	43,878					2,1958	19,137	37,142	25,999
	Alt. 1	37,997	55,710	42,373	29,661					2,1958	16,982	37,142	25,999
	Alt. 2	38,999	56,837	46,337	32,436					2,1958	16,556	37,142	25,999
	Alt. 3	37,188	54,799	45,488	31,842					2,1958	17,327	37,142	25,999
	Alt. 4	40,334	58,340	55,283	38,698					2,1958	15,988	37,142	25,999
	Alt. 5	36,856	54,425	36,066	25,246					2,1958	17,468	37,142	25,999
	Alt. 6	36,274	53,770	40,017	28,012					2,1958	17,716	37,142	25,999
5	HRV	82413-117733(35-50%)		11773-35320 (5-15%)						2355-11773 (1-5%)		11773-35320 (5-15%)	
	Yr. 1999	0 (0%)		5,108 (2%)						0 (0%)		4,495 (2%)	
	DFC	37674-61221 (16-26%)		7064-30610 (3-13%)						2355-9419 (1-4%)		7064-21192 (3-9%)	
	No Har.	0	9,880	5,108	23,913					0	6,587	4,495	15,638
	Alt. 1	0	11,399	5,108	17,820					0	6,587	3,169	14,312
	Alt. 2	0	11,700	5,108	19,009					0	6,587	3,601	14,744
	Alt. 3	0	11,156	5,108	18,754					0	6,587	3,370	14,513
	Alt. 4	0	12,100	5,108	21,693					0	6,587	4,495	15,638
	Alt. 5	0	11,057	5,108	15,928					0	6,587	2,522	13,665
	Alt. 6	0	10,882	5,108	17,113					0	6,587	2,815	13,958

[1] Condition: HRV – Historic Range of Variability; Yr. 1999 – Existing Conditions on Reservation; DFC – Desired Future Conditions on Reservation; No Har. – No harvest would occur during the period 2000-2014; Alt. 1 –6 Alternatives described in Chapter II.
[2] Structural Stage: E-S Early Seral; E-M Early Mature; M-S Mid-Seral; M-M Mid-Mature; L-S Late Seral; L-M Late Mature.
Total Douglas-fir Warm Moist acreage 235,465.

Table IV - 19. Effects of No Harvest and Six Harvest Alternatives on Douglas-fir Cool Dry Plant Association Group on the Colville Reservation.

STRUCT. CLASS	COND.[1]	STRUCTURAL STAGE [2]											
		E-S		E-M		M-S		M-M		L-S		L-M	
		Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040
1	HRV	848-4239 (1-5%)											
	Yr. 1999	0 (0%)											
	DFC	2543-5934 (3-7%)											
	No Har.	0	0										
	Alt. 1	6,857	0										
	Alt. 2	5,049	0										
	Alt. 3	5,321	0										
	Alt. 4	1,686	0										
	Alt. 5	10,303	0										
	Alt. 6	8,342	0										
2	HRV	848-8478 (1-10%)								848-4239 (1-5%)			
	Yr. 1999	16,447 (19%)								0 (0%)			
	DFC	5087-11021 (6-13%)								848-4239 (1-5%)			
	No Har.	16,447	0							0	0		
	Alt. 1	16,447	6,857							0	0		
	Alt. 2	16,447	5,049							0	0		
	Alt. 4	16,447	5,321							0	0		
	Alt. 4	16,447	1,686							0	0		
	Alt. 5	16,447	10,303							0	0		
	Alt. 6	16,447	8,342							0	0		
3	HRV	848-8478 (1-10%)								848-4239 (1-5%)			
	Yr. 1999	8,648 (10%)								2,095 (2%)			
	DFC	5087-11021 (6-13%)								848-4239 (1-5%)			
	No Har.	8,648	16,447							2,095	0		
	Alt. 1	8,648	16,447							2,095	0		
	Alt. 2	8,648	16,447							2,095	0		
	Alt. 3	8,648	16,447							2,095	0		
	Alt. 4	8,648	16,447							2,095	0		
	Alt. 5	8,648	16,447							2,095	0		
	Alt. 6	8,648	16,447							2,095	0		
4	HRV	21194-29671 (25-35%)		8478-16955 (10-20%)						848-4239 (1-5%)		4239-8478 (5-10%)	
	Yr. 1999	7,201 (8%)		15,916 (19%)						7,870 (9%)		22,682 (27%)	
	DFC	16955-25433 (20-30%)		4239-8478 (5-10%)						848-4239 (1-5%)		4239-8478 (5-10%)	

STRUCT. CLASS	COND.[1]	STRUCTURAL STAGE [2]											
		E-S		E-M		M-S		M-M		L-S		L-M	
		Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040
	No Har.	7,201	13,689	15,916	11,141					7,870	7,604	22,682	15,877
	Alt. 1	9,624	15,385	17,512	12,258					7,116	7,076	13,040	9,128
	Alt. 2	9,776	15,491	18,240	12,766					7,315	7,216	13,642	9,549
	Alt. 4	9,079	15,003	17,151	12,006					7,285	7,194	15,206	10,644
	Alt. 4	10,679	16,123	20,490	14,343					7,684	7,474	13,248	9,274
	Alt. 5	8,921	14,893	15,526	10,868					6,737	6,811	12,903	9,032
	Alt. 6	8,593	14,663	15,601	10,921					6,953	6,962	14,764	10,335
5	HRV	29671-42388 (35-50%)		848-8478 (1-10%)						848-4239 (1-5%)		848-8478 (1-10%)	
	Yr. 1999	0 (0%)		1,707 (2%)						0 (0%)		2,209 (3%)	
	DFC	15260-24585 (18-29%)		848-3391 (1-4%)						848-3391 (1-4%)		848-3391 (1-4%)	
	No Har.	0	2,160	1,707	6,482					0	2,361	2,209	9,014
	Alt. 1	83	2,970	2,455	7,709					0	2,135	898	4,810
	Alt. 2	83	3,021	2,503	7,975					0	2,194	972	5,065
	Alt. 4	64	2,788	2,287	7,432					0	2,186	1,192	5,754
	Alt. 4	119	3,323	2,781	8,928					0	2,305	898	4,872
	Alt. 5	59	2,735	2,238	6,896					0	2,021	898	4,769
	Alt. 6	48	2,626	2,137	6,817					0	2,086	1,147	5,576

[1] Condition: HRV – Historic Range of Variability; Yr. 1999 – Existing Conditions on Reservation; DFC – Desired Future Conditions on Reservation; No Har. – No harvest would occur during the period 2000-2014; Alt. 1 – 6 Alternatives described in Chapter II.
[2] Structural Stage: E-S Early Seral; E-M Early Mature; M-S Mid-Seral; M-M Mid-Mature; L-S Late Seral; L-M Late Mature.
Total Douglas-fir Cool Dry PAG acreage 84,775.

Table IV - 20. Effects of No Harvest and Six Harvest Alternatives on Douglas-fir Cool Moist Plant Association Group on the Colville Reservation.

STRUCT. CLASS	COND.[1]	STRUCTURAL STAGE [2]											
		E-S		E-M		M-S		M-M		L-S		L-M	
		Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040
1	HRV	2508-25075 (1-10%)											
	Yr. 1999	16,744 (7%)											
	DFC	15045-27583 (6-11%)											
	No Har.	16,744	0										
	Alt. 1	38,715	0										
	Alt. 2	32,542	0										
	Alt. 3	32,980	0										
	Alt. 3	24,882	0										
	Alt. 5	63,943	0										
	Alt. 6	52,975	0										
2	HRV	2508-25075 (1-10%)								2508-12538 (1-5%)			
	Yr. 1999	8,322 (3%)								5,011 (2%)			
	DFC	15045-27583 (6-11%)								2508-12538 (1-5%)			
	No Har.	8,322	16,744							5,011	0		
	Alt. 1	8,322	38,715							5,011	0		
	Alt. 2	8,322	32,542							5,011	0		
	Alt. 3	8,322	32,980							5,011	0		
	Alt. 3	8,322	24,882							5,011	0		
	Alt. 5	8,322	63,943							5,011	0		
	Alt. 6	8,322	52,975							5,011	0		
3	HRV	2508-25075 (1-10%)								2508-12538 (1-5%)			
	Yr. 1999	20,261 (8%)								7,173 (3%)			
	DFC	15045-27583 (6-11%)								2508-12538 (1-5%)			
	No Har.	20,261	8,322							7,173	5,011		
	Alt. 1	20,261	8,322							7,173	5,011		
	Alt. 2	20,261	8,322							7,173	5,011		
	Alt. 3	20,261	8,322							7,173	5,011		
	Alt. 3	20,261	8,322							7,173	5,011		
	Alt. 5	20,261	8,322							7,173	5,011		
	Alt. 6	20,261	8,322							7,173	5,011		
4	HRV	62688-100301 (25-40%)		25075-50150 (10-20%)						2508-25075 (1-10%)		12538-25075 (5-10%)	
	Yr. 1999	15,743 (6%)		45,055 (18%)						37,219 (15%)		85,424 (34%)	

STRUCT. CLASS	COND.[1]	STRUCTURAL STAGE [2]											
		E-S		E-M		M-S		M-M		L-S		L-M	
		Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040
	DFC	50150-75226 (20-30%)		12538-37613 (5-15%)						2508-12538 (1-5%)		2508-12538 (1-5%)	
	No Har.	15,743	31,281	45,055	31,539					37,219	33,226	85,424	59,797
	Alt. 1	25,427	38,060	62,809	43,966					21,163	21,987	52,071	36,450
	Alt. 2	26,340	38,699	64,484	45,139					22,041	22,602	54,778	38,345
	Alt. 3	30,716	41,762	50,284	35,199					25,381	24,940	60,824	42,577
	Alt. 4	44,795	51,618	55,200	38,640					21,025	21,890	54,283	37,998
	Alt. 5	20,186	34,391	46,607	32,625					21,415	22,164	48,034	33,624
	Alt. 6	19,154	33,669	46,246	32,372					25,088	24,735	56,722	39,705
5	HRV	62688-100301 (25-40%)		12538-37613 (5-15%)						2508-12538 (1-5%)		2508-12538 (1-5%)	
	Yr. 1999	0 (0%)		4,356 (2%)						0 (0%)		5,444 (2%)	
	DFC	27583-57673 (11-23%)		2508-22568 (1-9%)						2508-10030 (1-4%)		2508-10030 (1-4%)	
	No Har.	0	4,723	4,356	17,872					0	11,166	5,444	31,071
	Alt. 1	0	7,628	4,356	23,199					0	6,349	5,444	21,065
	Alt. 2	0	7,902	4,356	23,701					0	6,612	5,444	21,877
	Alt. 3	0	9,215	4,356	19,441					0	7,614	5,444	23,691
	Alt. 4	0	13,438	4,356	20,916					0	6,308	5,444	21,729
	Alt. 5	0	6,056	4,356	18,338					0	6,424	5,444	19,854
	Alt. 6	0	5,746	4,356	18,230					0	7,526	5,444	22,461

[1] Condition: HRV – Historic Range of Variability; Yr. 1999 – Existing Conditions on Reservation; DFC – Desired Future Conditions on Reservation; No Har. – No harvest would occur during the period 2000-2014; Alt. 1 – 6 Alternatives described in Chapter II.
[2] Structural Stage: E-S Early Seral; E-M Early Mature; M-S Mid-Seral; M-M Mid-Mature; L-S Late Seral; L-M Late Mature.
Total Douglas-fir Cool Moist PAG acreage 250,752.

Table IV - 21. Effects of No Harvest and Six Harvest Alternatives on Grand Fir Plant Association Group on the Colville Reservation.

STRUCT. CLASS	COND.[1]	STRUCTURAL STAGE [2]											
		E-S		E-M		M-S		M-M		L-S		L-M	
		Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040
1	HRV	582-2912 (1-5%)											
	Yr. 1999	0 (0%)											
	DFC	1747-6406 (3-11%)											
	No Har.	0	0										
	Alt. 1	5,514	0										
	Alt. 2	4,137	0										
	Alt. 3	3,737	0										
	Alt. 4	3,906	0										
	Alt. 5	7,811	0										
	Alt. 6	5,542	0										
2	HRV	582-2912 (1-5%)				582-5824 (1-10%)				582-2912 (1-5%)			
	Yr. 1999	3,398 (6%)				0 (0%)				791 (1%)			
	DFC	1747-6406 (3-11%)				582-5824 (1-10%)				582-2912 (1-5%)			
	No Har.	3,398	0			0	0			791	0		
	Alt. 1	3,398	5,514			0	0			791	0		
	Alt. 2	3,398	4,137			0	0			791	0		
	Alt. 3	3,398	3,737			0	0			791	0		
	Alt. 4	3,398	3,906			0	0			791	0		
	Alt. 5	3,398	7,811			0	0			791	0		
	Alt. 6	3,398	5,542			0	0			791	0		
3	HRV	582-2912 (1-5%)				582-5824 (1-10%)				582-2912 (1-5%)			
	Yr. 1999	4,430 (8%)				0 (0%)		714 (1%)		3,286 (4%)			
	DFC	1747-6406 (3-11%)				582-5824 (1-10%)				582-2912 (1-5%)			
	No Har.	4,430	3,398			0	0	714	0	2286	791		
	Alt. 1	5,225	3,398			0	0	714	0	1491	791		
	Alt. 2	5,303	3,398			0	0	714	0	1413	791		
	Alt. 3	4,961	3,398			0	0	714	0	1755	791		
	Alt. 4	5,386	3,398			0	0	714	0	1330	791		
	Alt. 6	4,995	3,398			0	0	714	0	1721	791		
	Alt. 6	4,831	3,398			0	0	714	0	1885	791		
4	HRV	5824-11648 (10-20%)		2912-8736 (5-15%)		8736-17471 (15-30%)		5824-11648 (10-20%)		582-2912 (1-5%)		582-2912 (1-5%)	
	Yr. 1999	1,732 (3%)		10,499 (18%)		0 (0%)		16,754 (29%)		3,704 (6%)		11,943 (21%)	
	DFC	5824-11648 (10-20%)		2912-5824 (5-10%)		4659-8736 (8-15%)		2912-4659 (5-8%)		582-2912 (1-5%)		582-2912 (1-5%)	
	No Har.	1,732	5642	10,499	7,349	0	0	16,754	12,442	3,704	4,879	11,943	8360
	Alt. 1	6,244	9596	12,312	8,618	0	0	13,325	10,041	2,871	3,501	4,366	3056
	Alt. 2	6,784	10052	12,491	8,744	0	0	13,794	10,370	2,885	3,432	4,541	3179

STRUCT. CLASS	COND.[1]	STRUCTURAL STAGE [2]											
		E-S		E-M		M-S		M-M		L-S		L-M	
		Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040
	Alt. 3	4,742	8280	11,709	8,196	0	0	14,442	10,823	3,145	3,956	6,857	4800
	Alt. 3	7,294	10492	12,679	8,875	0	0	13,774	10,356	2,840	3,318	4,139	2997
	Alt. 5	4,747	8318	11,789	8,252	0	0	12,681	9,591	2,917	3,763	4,687	3281
	Alt. 6	3,871	7541	11,414	7,990	0	0	13,864	10,419	3,146	4,087	6,795	4756
5	HRV	5824-11648 (10-20%)		582-5824 (1-10%)		5824-11648 (10-20%)		2912-8736 (5-15%)		582-2912 (1-5%)		582-2912 (1-5%)	
	Yr. 1999	0 (0%)		0 (0%)		0 (0%)		0 (0%)		0 (0%)		1,987 (3%)	
	DFC	3494-5824 (6-10%)		582-2912 (1-5%)		3494-5824 (6-10%)		2330-2912 (4-5%)		582-1747 (1-3%)		582-1747 (1-3%)	
	No Har.	0	520	0	3,150	0	0	0	5,026	0	1,111	1,987	5,570
	Alt. 1	0	1873	0	3,694	0	0	0	3,998	0	861	1,987	3,297
	Alt. 2	0	2035	0	4,747	0	0	0	4,138	0	866	1,987	3,349
	Alt. 3	0	1423	0	3,513	0	0	0	4,333	0	944	1,987	4,044
	Alt. 3	0	2188	0	3,804	0	0	0	4,132	0	852	1,987	3,229
	Alt. 5	0	1423	0	3,537	0	0	0	3,804	0	875	1,987	3,393
	Alt. 6	0	1161	0	3,424	0	0	0	4,159	0	944	1,987	4,026

[1] Condition: HRV – Historic Range of Variability; Yr. 1999 – Existing Conditions on Reservation; DFC – Desired Future Conditions on Reservation; No Har. – No harvest would occur during the period 2000-2014; Alt. 1 –6 Alternatives described in Chapter II.
[2] Structural Stage: E-S Early Seral; E-M Early Mature; M-S Mid-Seral; M-M Mid-Mature; L-S Late Seral; L-M Late Mature.
Total Grand Fir PAG acreage 58,238.

Table IV - 22. Effects of No Harvest and Six Harvest Alternatives on Subalpine Fir Plant Association Group on the Reservation.

STRUCT. CLASS	COND.[1]	STRUCTURAL STAGE [2]											
		E-S		E-M		M-S		M-M		L-S		L-M	
		Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040
1	HRV	851-8513 (1-10%)											
	Yr. 1999	5,152 (6%)											
	DFC	5108-9364 (6-11%)											
	No Har.	5,152	0										
	Alt. 1	12,127	0										
	Alt. 2	10,480	0										
	Alt. 4	9,625	0										
	Alt. 4	5,666	0										
	Alt. 5	15,947	0										
	Alt. 6	12,412	0										
2	HRV	4257-8513 (5-10%)				851-8513 (1-10%)				851-4257 (1-5%)			
	Yr. 1999	,208 (8%)				0 (0%)				1,554 (2%)			
	DFC	5108-9364 (6-11%)				851-8513 (1-10%)				851-4257 (1-5%)			
	No Har.	7,208	5,152			0	0			1,554	0		
	Alt. 1	7,208	12,127			0	0			1,554	0		
	Alt. 2	7,208	10,480			0	0			1,554	0		
	Alt. 4	7,208	9,625			0	0			1,554	0		
	Alt. 4	7,208	5,666			0	0			1,554	0		
	Alt. 3	7,208	15,947			0	0			1,554	0		
	Alt. 6	7,208	12,412			0	0			1,554	0		
3	HRV	4257-12770 (5-15%)				851-8513 (1-10%)				851-4257 (1-5%)			
	Yr. 1999	15,775 (19%)				0 (0%)		882 (1%)		5,387 (6%)			
	DFC	5108-9364 (6-11%)				851-8513 (1-10%)				851-4257 (1-5%)			
	No Har.	15,775	7,208			0	0	882	0	5,387	1,554		
	Alt. 1	16,893	7,208			0	0	882	0	4,269	1,554		
	Alt. 2	17,012	7,208			0	0	882	0	4,150	1,554		
	Alt. 3	16,494	7,208			0	0	882	0	4,668	1,554		
	Alt. 4	17,603	7,208			0	0	882	0	3,559	1,554		
	Alt. 5	16,472	7,208			0	0	882	0	4,690	1,554		
	Alt. 6	16,245	7,208			0	0	882	0	4,917	1,554		

STRUCT. CLASS	COND.[1]	STRUCTURAL STAGE [2]											
		E-S		E-M		M-S		M-M		L-S		L-M	
		Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040	Yr 2014	Yr 2040
4	HRV	6810-21283 (8-25%)		2554-10216 (3-12%)		10216-23837 (12-28%)		4257-12770 (5-15%)		851-8513 (1-10%)		2554-8513 (3-10%)	
	Yr. 1999	2,777 (3%)		8,061 (9%)		0 (%)		17,984 (21%)		7,127 (8%)		10,289 (12%)	
	DFC	6810-12770 (8-15%)		2554-6810 (3-8%)		6810-15324 (8-18%)		1703-5959 (2-7%)		851-4257 (1-5%)		851-4257 (1-5%)	
	No Har.	2,777	17,719	8,061	5,643	0	0	17,984	13,471	7,127	10,376	10,289	7,202
	Alt. 1	6,241	21,262	8,865	6,206	0	0	14,031	10,704	6,822	9,044	3,653	2,557
	Alt. 2	6,613	21,641	9,335	6,534	0	0	14,302	10,893	6,789	8,902	4,138	2,897
	Alt. 1	5,008	2,000	8,581	6,007	0	0	15,444	11,693	6,931	9,520	6,025	4,217
	Alt. 4	8,445	23,514	11,120	7,784	0	0	14,677	11,156	6,628	8,199	4,880	3,416
	Alt. 5	4,939	19,929	7,533	5,273	0	0	13,648	10,436	6,937	9,546	2,926	2,048
	Alt. 6	4,235	19,210	7,707	5,395	0	0	15,067	11,429	6,999	9,816	5,333	3,733
5	HRV	6810-15324 (8-18%)		1703-10216 (2-12%)		4257-12770 (5-15%)		4257-17026 (5-20%)		851-4257 (1-5%)		851-8513 (1-10%)	
	Yr. 1999	0		731 (1%)		0 (0%)		0 (0%)		0 (0%)		2,204 (3%)	
	DFC	1703-7662 (2-9%)		851-5108 (1-6%)		1703-10216 (2-12%)		1703-5108 (2-6%)		851-3405 (1-4%)		851-3405 (1-4%)	
	No Har.	0	833	731	3,149	0	0	0	5,395	0	2,138	2,204	5,291
	Alt. 1	0	1,872	731	3,390	0	0	0	4,209	0	2,037	1,855	2,951
	Alt. 2	0	1,984	731	3,532	0	0	0	4,291	0	2,037	1,937	3,178
	Alt. 3	0	1,502	731	3,305	0	0	0	4,633	0	2,079	1,980	3,788
	Alt. 4	0	2,534	731	4,067	0	0	0	4,403	0	1,988	2,178	3,642
	Alt. 5	0	1,482	731	2,991	0	0	0	4,094	0	2,081	1,664	2,542
	Alt. 6	0	1,270	731	3,043	0	0	0	4,520	0	2,100	1,841	3,441

[1] Condition: HRV – Historic Range of Variability; Yr. 1999 – Existing Conditions on Reservation; DFC – Desired Future Conditions on Reservation; No Har. – No harvest would occur during the period 2000-2014; Alt. 1 –6 Alternatives described in Chapter II.
[2] Structural Stage: E-S Early Seral; E-M Early Mature; M-S Mid-Seral; M-M Mid-Mature; L-S Late Seral; L-M Late Mature.
Total Subalpine Fir PAG acreage 85,131.

Ponderosa Pine PAG

There is currently an excess of E-S1 and E-M4 and a deficit of E-S2 and E-S5. Currently 43 percent of the PAG meets DFC. Under all six proposed alternatives these conditions would not change during the 15-year period of treatment implementation. Following these treatments and after an additional 25 years of stand development there will be an excess of E-S2, E-S3, E-M3, and E-M5 and a deficit of E-S1, E-S3 and E-S5. These results are moving towards the DFC for the PAG. As this environment is generally very slow in growth it will require additional management activity for the size class/successional/structural stage conditions to meet DFC in the future.

Douglas-fir Warm Dry PAG

There is currently an excess of E-S1, E-M4 and L-M4 and a deficit of E-S2, L-S2, L-S3, E-S4, L-S4, E-S5, E-M5 and L-S5. Currently 8 percent of the PAG meets DFC. Under all six proposed alternatives these conditions will not change during the 15-year period of treatment implementation. Following these treatments and after an additional 25 years of stand development the only changes will be an excess of E-S3, E-M5, and L-M5 and a deficit of E-S1. These results are moving slowly towards the DFC for all stages except the Late Successional-Single Layer size classes, but it will require additional management activity for the size class/successional/structural stage conditions to meet DFC in the future.

Douglas-fir Warm Moist PAG

There is currently an excess of E-S1, E-M4, L-S4 and L-M4 and a deficit of E-S2, L-S2, E-S5, E-M5, L-S5 and L-M5. Currently 23 percent of the PAG meets DFC. Under all six proposed alternatives these conditions will not change during the 15 year period of treatment implementation except there will be a deficit of L-S3 created under all alternatives. Following these treatments and after an additional 25 years of stand development there will be an excess of E-S2, E-S4, L-S4, and L-M4 and a deficit of E-S1, L-S2, E-S3, L-S3 and E-S5. The acreage values show a trend in movement towards the DFC for the PAG, but it will require additional treatments to meet DFC in a timely manner.

Douglas-fir Cool Dry PAG

There is currently an excess of E-S2, E-M4, L-S4 and L-M4 and a deficit of E-S1, L-S2, E-S3, E-S5 and L-S5. Currently 31 percent of the PAG meets DFC. Under all six proposed alternatives these conditions would not change during the 15-year period of treatment implementation except for E-S1 there would be excess created under Alternatives 1, 5 and 6 and alternatives 2 and 3 will meet DFC. Following these treatments and after an additional 25 years of stand development there will be an excess of E-S3, E-M4, L-S4, L-M4, E-M5 and L-M5 and a deficit of E-S1, L-S2, L-S3, E-S4 and E-S5. The acreage values show a trend in movement towards the DFC for the PAG, but it will require additional treatments to meet DFC in a timely manner.

Douglas-fir Cool Moist PAG

There is currently an excess of E-M4, L-S4 and L-M4 and a deficit of E-S2, E-S4, E-S5 and L-S5. Currently 46 percent of the PAG meets DFC. Under all six proposed alternatives these conditions will not change during the 15 year period of treatment implementation except there will be an excess of E-S1 created under Alternatives 1, 2, 3, 5 and 6. Following these treatments and after an additional 25 years of stand development there will be an excess of E-S2, and L-M5 and a deficit of E-S1, L-S2 and E-S3. The acreage values show a trend in movement towards the DFC for the PAG, but it will require additional treatments to meet DFC in a timely manner.

Grand Fir PAG

There is currently an excess of E-M4, M-M4, L-S4, L-M4 and L-M5 and a deficit of E-S1, M-S2, M-S3, E-S4, M-S4, E-S5 E-M5, M-S5, M-M5 and L-S5. Currently 21 percent of the PAG meets DFC. Under all six proposed alternatives these conditions will not change during the 15 year period of treatment implementation except there will be an excess of E-S1 created under Alternative 5 and Alternatives 1, 2, 3, 4 and 6 meet DFC and E-S4 and L-S4 meet DFC under alternatives 1, 2 and 4. Following these treatments and after an additional 25 years of stand development there will be an excess of E-M5, and M-M5 and a deficit of L-S2 and L-S5 will meet DFC. The acreage values show a trend in movement towards the DFC for the PAG, but it will require additional treatments to meet DFC in a timely manner.

Subalpine Fir PAG

There is currently an excess of E-S3, L-S3, E-M4, M-M4, L-S4 and L-M4 and a deficit of M-S2, M-S3, E-S4, M-S4, E-S5, E-M5, M-S5, M-M5and L-S5. Currently 21 percent of the PAG meets DFC. Under all six proposed alternatives these conditions will not change during the 15 year period of treatment implementation except there will be an excess of E-S1 created under Alternatives 1, 2, 3, 5 and 6 with Alternative 4 meeting DFC and L-S3 alts 2, 3 and 4 and L-M4 Alternatives 1, 2 and 5 also meet DFC. Following these treatments and after an additional 25 years of stand development there will be an excess of E-S2, E-S4, and L-M5, a deficit of E-S1 and L-S2 and E-S3, L-S3, E-M4, L-M4, E-M5, M-M5 and L-S5 will meet DFC. The acreage values show a trend in movement towards the DFC for the PAG, but it will require additional treatments to meet DFC in a timely manner.

Over the 15- and 40-year analysis periods each of the alternatives results in the changes listed in Table IV-23 to existing size class/successional/structural stage conditions on the Reservation. It is obvious from this data that harvest treatments can bring forest conditions more in line with DFC values, but it must be an ongoing program.

FRAGMENTATION OF HABITAT AND CORRIDOR AVAILABILITY

Under Alternatives 3 and 6 all harvest is deferred in the Upper and Lower San Poil River Watershed Management Units (WMU 6-18 and 7-24) for the 15 year planning period. This action is taken to reduce impacts on the wildlife corridor habitat that provides for movement between the east and west side of the Reservation.

Table IV - 23. Change in Meeting Desired Future Condition (DFC) Values for all Structural Stages Relative to Existing Conditions.

TIME/CONDITION	ALTERNATIVE (% OF PAG CATEGORIES)					
	1	2	3	4	5	6
15 Years	12	16	0	16	-4	-4
40 Years	-16	-16	-16	-12	-16	-12
Size Class 5 after 15 years	0	0	0	0	0	0

Cumulative Effects

A similar level and approach to timber harvest is planned on the Colville Indian Reservation for the foreseeable future (next 15 years). Additional and future harvest activities beyond the boundaries of the Reservation and more than 15 years away cannot be speculated upon here.

Successional/Structural Stage Diversity

Due to the Colville Tribes desire for multiple resource management, habitat conditions for many wildlife species cannot be maintained at an optimum for the species. Yet, across the Colville Indian Reservation habitat diversity appears to be adequate for wildlife species and populations present. The diversity of habitats and block sizes both within and adjacent to the Colville Indian Reservation meet the needs of wildlife species that utilize the area as all or part of their home range territories. Habitat diversity on the Reservation (Tables IV-16 through IV-22) is somewhat under represented in the grass/forb/shrub (E-S1) habitats on summer range and old/late (L-S5, L-M5 and L-L5) successional/structural stage habitats on winter range. Subsequently, habitat features, such as white-tailed deer winter thermal cover, are limiting for producing higher populations of many species.

Short-term cumulative effects of this and adjacent projects on habitat diversity are expected to be positive since all proposed management actions would create more early and late-successional stage foraging habitats. Over the long term, improved forest health and reduced potential for stand-replacing wildfires through reduction in fuel loadings will benefit the majority of plant and animal species using the Analysis Area and adjacent habitats.

Fragmentation of Habitat and Corridor Availability

Analysis for a programmatic EIS such as this cannot be performed at a level of detail sufficient to evaluate actual harvest stand locations. Given that Forest Vegetation and Wildlife Resource goals, objectives and directions will be implemented at the project level, it is anticipated that no fragmentation of interior mature forest habitat in the adjacent cumulative effects area will occur as a result of proposed timber harvest along the periphery of the Colville Indian Reservation. Also, no loss of corridors through the Analysis Area for species travel between suitable habitats outside the Analysis Area will occur under any alternative implemented on the Reservation.

Threatened, Endangered and Sensitive Plant Species

The IRMP states the desired future condition is to provide habitat for threatened, endangered, and sensitive plant species. In accordance with the Endangered Species Act of 1973, as amended, habitat supporting federally listed species will be retained, maintained, or improved as needs are identified. Tribal policy states that proposed projects must not result in loss of species viability or create a significant downward trend in a species population that may lead toward federal listing as a threatened, endangered, or candidate species.

Although state-listed plants do not have the protection of the Endangered Species Act of 1973, as amended, Tribal policy directs that, if state-listed plants occur in a project area, they should be managed to prevent the need for their future placement on the federal list of threatened or endangered species. Future projects on the Reservation will meet or exceed these stated goals through the exclusion of specific sites or habitats from management activities.

Effects Common to all Alternatives

No federally listed threatened or endangered plant species are known to be present within the proposed project area.

Although not found on the Reservation, Ute's ladies-tresses, a federally listed threatened species, has been found in wetland/riparian habitats along the Okanogan River. There is a potential for this species to be present on wetland and riparian areas, including springs and wet meadows, river meanders and floodplains on the Reservation. Site disturbance related to timber harvest on the Reservation would probably not occur in habitats occupied by this species, but grazing of wet meadows and riparian habitats could result in a negative effect on small, localized populations of Ute's ladies-tresses. Due to the extremely infrequent occurrence of this species in central Washington, it is unknown what the affect would be on viable populations of the species in this region.

Direct and Indirect Effects

No direct effects to threatened, endangered or sensitive plant species due to timber harvest-related activities are anticipated under any action alternative. One species listed by the USFWS as threatened has been located adjacent to the Reservation. No timber harvest related-activities will occur within a 100-foot riparian buffer of stream habitat suitable for Ute's ladies-tresses under any action alternative. Therefore, no direct impact from harvest activities is anticipated and viable populations of the species would not be affected.

Continued grazing with no proposed changes to livestock use of riparian/wetland habitats will pose a potential negative impact to Ute's ladies-tresses if it occurs in these habitats on the Reservation. Proposed non-forest vegetation management might inadvertently burn through riparian habitat suitable for Ute's ladies-tresses.

Cumulative Effects

Past logging in riparian zones both in and downstream of the may have impacted local populations of Ute's ladies-tresses. Heavy grazing by domestic and wild ungulates in many of the lower elevation forested riparian areas within the cumulative effects area has decreased overall plant diversity and probably resulted in the removal of flowers and vegetative material of federal and state-listed species.

There are no foreseeable future timber harvest or forest management activities on the Colville Indian Reservation that would impact known or suspected threatened, endangered or sensitive plant species. Future resource management activities being planned within the cumulative effects area include livestock grazing, underburning for wildlife habitat enhancement, stream and riparian enhancement and various road closures. These activities are designed to not impact or will include mitigation for impacts to habitat suitable for known listed species in the area. No future forest management activities will occur directly in low elevation riparian habitats. Foreseeable forest management activities within upland habitats of the cumulative effects area may impact small populations of listed species, but it is not possible at this time to predict if the impact would be detrimental or beneficial. Although some small populations of listed plants will undoubtedly be affected, it is unlikely that the viability of any threatened, endangered, or candidate species population will be negatively impacted.

Past logging activities in the uplands of the cumulative effects area may have impacted suitable habitat for state-listed species shown in Table III-27. Because of the lag time between sensitive species surveys and the dynamic nature of species lists, it is very difficult to predict potential species presence and impacts. Qualified botanists before harvest would conduct surveys of proposed disturbance sites or non-harvest activities are started.

Unwanted Vegetation

Prevention, no action, early treatment, maintenance and correction are all strategies considered for control of unwanted vegetation on the Analysis Area. Prevention as described in Chapter II noxious weed mitigation, would be the first priority in all alternatives. Monitoring of the results of all strategies used would be conducted for five years following the completion of the timber sale. Monitoring would be focused on new roads, disturbed areas of soils in harvest units including skid trails and landings, existing roads, and dispersed campsites. A revision of the unwanted vegetation implementation plans may be necessary if the use of manual, mechanical or horticultural methods is inadequate in some areas. A separate environmental analysis would be conducted if chemical methods were to be considered.

Direct and Indirect Effects

Under each of the action alternatives, the risk of noxious weed spread and benefits of treatment are approximately proportional to the acreage of disturbed soil resulting from the timber sale activity and livestock grazing and to the current level of infected roadsides, landings, turnouts, and dispersed campsites. Noxious weeds could enter the Analysis Area via the major travel corridors and haul routes. Alternatives where no new roads are proposed would have the least disturbed soil and risk of noxious weed spread. Thus, the greatest hazard of noxious weed infection would be in Alternatives 1, 2, 4 and 5 and the least in Alternatives 3 and 6. The direct effects of the proposed actions on noxious weed risk depend on soil disturbance, loss of competition from native forbs, canopy removal providing sunlight for survival and vehicle and livestock movement throughout the area. The direct and indirect effects under all alternatives would be an increase in acreage infected with noxious weeds.

Cumulative Effects

The presence of noxious weeds depends on the rate of disturbance. Timber harvest and grazing can be expected to continue on a yearly basis. This would increase the risk of weed infestations into newly harvested areas, particularly from those areas that require treatment along roads, landings, skid trails, and disturbed soils in harvest units. Over time, forest succession will eliminate noxious weeds in most all locations except where an area is re-disturbed by management activities and natural disturbances such as grazing, wildfires and landslides.

The presence of unwanted vegetation will reach maximum levels one to five years after harvest and then decline. The greatest potential for infestations is in tractor-logged regeneration treatment cuts, but over the long term their presence will diminish until a future rotation harvest disturbs existing native vegetation communities. Under these conditions Alternatives 3 and 6 would have the least long-term unwanted vegetation impacts and Alternatives 1, 2, 4 and 5 would have the greatest long-term impacts. However, the level of cumulative effects of all proposed action alternatives would depend upon the effectiveness of the mitigation measures carried out under each alternative.

Non-tree Vegetation

Prior to European settlement, the non-tree vegetation on the Reservation appears to have been more vigorous and abundant than now exists because of the periodic fires that kept the forest canopy more open and a lack of livestock overgrazing. Recent exclusion of fire has permitted the forest canopy to become overstocked and the non-tree vegetation component of the Area has been reduced. Action proposed in Alternatives 1 through 6 will have an effect on the non-tree vegetation component of the Colville Indian Reservation.

Effects Common to All Alternatives

Manipulation of the tree component by selective logging or by thinning can, in part, replace the function of fire in the system. Removal of the canopy can make more light, heat, and moisture available to the non-tree component. Forest stands with a reduced canopy produce less needle cast that results in a thinner litter layer on the forest floor. A reduction in the stand's canopy cover that leads to a thinner litter layer can be expected to favor establishment of shade-intolerant understory species. This addition of non-tree biomass will increase structural diversity of the system, provide habitat for a variety of wildlife and forage for big-game and livestock. Biomass of shade dependent non-tree species would be reduced to a level closer to what existed prior to European settlement.

Tractor skidding, to include yarding of unmerchantable material, will reduce non-tree vegetation initially, but over the long-term, ground disturbance will increase biomass production. Helicopter logging will minimize disturbance of non-tree vegetation.

The impact of livestock grazing on non-tree vegetation must be considered with the impacts of tree removal and underburning. Numerous investigations have shown that controlled grazing on northwest forested rangelands is compatible with maintenance of non-tree vegetation. However, the riparian portion of the landscape is especially sensitive to livestock management. Grazing only in the early part of the growing season when upland forage is succulent and air temperatures are relatively cool can avert the potential negative impacts of grazing to critical riparian zones. Grazing of riparian zones during late summer/fall, when temperatures are high and the only green feed is in the riparian zone, should be avoided. With the removal of logging activity from riparian zones, a change in grazing management will have a great impact on riparian conditions and wildlife habitat. Further, deferment of grazing for one year in areas of forest management activity would help non-tree vegetation recover from disturbance. Forest management activity can also affect grazing management improvements such as fences and water sites. These potential impacts will be discussed by alternative. Underburning may reduce forage production in the short term, but will increase forage in the long term.

Direct and Indirect Effects

The direct and indirect effects are related to level of disturbance or use by various activities in the forest environment. As discussed above the removal of forest canopy is generally viewed as positive for understory vegetation. As a result, Alternatives 5 and 6 having the greatest level of regeneration harvest should have the greatest response from understory vegetation. Alternatives 1, 2 and 3 will have intermediate responses and Alternative 4 with the lowest level of regeneration harvest treatment will provide the least response from shrubs and forbs.

Livestock grazing levels are inversely related to potential understory vegetation growth. Alternative 1 with nearly 61,000 AUM's would have the greatest negative impact and Alternative 6 with the withdrawal of grazing from 41 WMU's and planned rangeland improvements would have the least impact. Alternatives 2 through 5 would have moderate impacts between these two extremes.

Cumulative Effects

The cumulative effects of opening forest canopies, reducing grazing levels, reducing natural and harvest-generated fuels and bring successional/structural stage diversity closer to the desired future conditions will be positive for non-forest vegetation. Some types of wildlife habitat, e.g., sage grouse breeding/brooding/thermal/security habitat may be adversely impacted at least in the short-term until renovated areas of their home ranges return to optimal conditions.

Further discussion on the cumulative effects to non-woody vegetation is presented in the *Range Resource* section of this Chapter.

TIMBER RESOURCE

With or without additional natural or human-related disturbance the timber resource on the Colville Reservation will change over time. Natural changes would be towards further development of more climax forest conditions with associated changes in species composition, stocking levels and structural stages. This natural stand development would be periodically interrupted by natural disturbances including insect and disease attacks and stand replacement fires. The rate of change associated with human-caused modifications to the environment has been the subject of numerous studies and is somewhat more predictable. Discussion in this section will summarize the impacts of Alternatives 1 through 6 on the timber resource of the Colville Reservation.

Historically two general forest conditions existed on the Reservation. There were (1) forestlands below 3,500 feet elevation and on the southern slopes supporting open stands of ponderosa pine with a ground cover of bunch grass, and (2) mixed species forestlands, often heavily stocked with little ground cover located at the upper elevations, north slopes and sheltered valleys. These historic conditions were determined from early reports, elder observations and land survey notes. These data were used to develop the Historic Range of Variability (HRV) for each Plant Association Group (PAG) by Boyce and Dumas (1997) and summarized by PAG in Tables IV-16 through IV-22.

Past forest management strategies, including fire exclusion and selective cutting, have created a marked changes in structure, composition and density of the forest across the Reservation from those observed historically. Fire suppression has removed the primary force in natural thinning of forest stands as well as a powerful natural process that created stand composition of mostly seral species. This process favored the retention of species characterized by thick-barked fire resistant trees or shade intolerant pioneer species. Selective harvest methods over past years on the Reservation have markedly change species composition by disproportionately removing seral species while opening up the forest canopies only sufficient to favor the establishment of either brush or shade tolerant climax species. Present forest stands on the Reservation following seventy years of these management impacts are many multi-layered stands that support more trees than were supported historically. These overstocked stands are now susceptible to increased insect and disease infestation and are now at a higher risk to stand replacement wildfires.

Management Direction Impacts

Alternatives 2 through 6 would be implemented in accordance with the goals, objectives and management directions shown in Appendix A. These management directions would guide the actions towards meeting the Integrated Resource Management Plan objectives and assist in attaining the Tribes' Holistic Goal. This direction would give guidance for both protection and production. Guidance is specific to Plant Association Groups and also includes specific management emphasis areas.

Management options are presented and evaluated in the alternatives. These are designed to produce various ways to more the landscape towards the desired future condition range of size/structure stages and also to address the forest health issue.

From a timber resource viewpoint, the utilization of the management directions in carrying out the proposed management actions under Alternative 5 would have the greatest positive impact on moving the Reservation towards desired future conditions while Alternative 3 would provide the least impact.

Operational Impacts

Effects Common to All Alternatives

All alternatives would be implemented in accordance with associated management direction and guidelines: Alternative 1 - the direction from Alternative CD presented in the Amendment to Final Assessment for 1989 Forest management Plan, Colville Indian Reservation, October 16,1998, and Alternative 2-6 - implementation of the Integrated Resources Management Plan, the goals, objectives and directions to fulfill the Tribes' Holistic Goal (CCT 1997). These goals, objectives and management directions are shown in Appendix A.

All alternatives propose timber harvest and would move forestlands on the Reservation towards Desired Future Conditions. However, the rate of movement and approach varies among the proposed alternatives. All alternatives would generate revenues for the Tribal treasury.

Direct and Indirect Effects

Alternatives 1 through 6 will have direct and indirect effects on the timber resource of the Colville Reservation. These effects are described by (1) timber harvest levels, (2) achieving Desired Future Conditions (DFC) in size structural stage balance, (3) forest health and (4) forest productivity and sustainability.

A true "no action" alternative, an alternative without harvest, silvicultural treatment and natural disturbance was not analyzed. The estimated effects of no action, however, are included in Tables IV-14 through IV-20 for comparative purposes. Alternatives 3 through 6 also contain management direction options in addition to the IRMP goals, objectives and directions indicated above. These options are discussed in Appendix A.

TIMBER HARVEST LEVEL

To achieve the Tribes' Holistic goal in Alternatives 2 through 6, an ecosystem management strategy will be implemented. The ecosystem management approach will involve changes in forest management including the following:

- Process rather than outputs would be emphasized, but outputs would be estimated.
- A balance of stand conditions is emphasized rather than an established rotation age. The majority of the forest could have standard rotation ages but the large tree component would be extended - closer to a pathological rotation (250-300 years) for late successional multi-storied stands and to 200-250 years for seral, single-storied stands.
- Disturbances are expected and management adjustments would be necessary. Adaptive management will be ongoing and the norm. The management focus would be on the Desired Future Conditions and approaches needed to move forest management towards this goal.

Three management strategies would be employed for accomplishing ecosystem management:

- Restoration - Management emphasis to move ecosystems to desired conditions and processes, and/or to healthy forestlands, rangelands, and aquatic systems.

- Conservation - Management emphasis on protection and maintenance of forest, rangeland, and aquatic conditions, health and integrity, recognizing that natural processes dominate the landscape and gradual change will occur.

- Production - Management emphasis directed at providing, growing, or making goods and services available for human needs and/or desires, while sustaining productivity and maintaining associated values. (ICBEMP - DEIS Glossary 1998)

These strategies can be used to describe management actions on the Reservation. Currently the general forest condition is not what is desired for the future so restoration action will take priority.

Restoration would follow two course of action:

1. Restoration would be used to address the size/structural stage balance of Desired Future Conditions. This action would address stand composition, tree size and stand structure to achieve the desired balance of forest conditions for each PAG. Actions would include:

   - Develop future large tree stands (Size Class 5) - These conditions are currently deficit. Treatment would be designed to extend S4 stands (small/medium trees) until they develop the S5 characteristics. This would involve sanitation to reduce insects and disease to endemic levels and thinning (commercial and pre-commercial) to bring stocking and species composition to the desired level. Stand age would be extended beyond the current rotation age - to 150-200 years for single-story, seral stands to 250-300 years for late successional, multi-storied stands.
   - Thinning - Where the size class is at the desired level the overstocking and species composition can be adjusted by thinning.
   - Regeneration - Non-stocked (Size Class 1) areas can be moved to S2 (seedling/ sapling) by natural or artificial regeneration generally with seral species. Site preparation and removal of competing vegetation may be needed to achieve the desired stocking levels.

2. Restoration to address the forest health conditions. These actions recognize the current forest health problems - dwarf mistletoe, root rot, bark beetles and defoliators. Actions would treat overstocking, species composition, and stand structure. This action would include:
   - Regeneration harvests - seed tree, shelterwood, clearcut or group selection methods. Reserve or "legacy trees" will be retained. Natural regeneration will be favored but artificial planting will be utilized to achieve the desired seral species composition.
   - Thinning - commercial and pre-commercial to control stocking levels, adjust species composition and reduce insect and disease risk.
   - "Sanitation" - Remove diseased and insect infested trees or pockets to reduce risk of infecting the remaining stand. This usually would be done in conjunction with a thinning operation.

Restoration actions would include both of these courses of action - treat both priority forest health condition and conditions in stands out of balance in size and structure. This would improve forest health as well as move the forest towards a balanced Desired Future Condition.

Once the stands are in the desired condition the conservation strategy would be applied. This is to retain and maintain the desired conditions. The recently thinned stands would be an example of these stands. Actions would include:

- "Sanitation" of insect and disease outbreaks to reduce levels back to endemic levels.
- Prescribed fire to reduce fuel loading, control excessive in-growth of vegetation, reduce dwarf mistletoe buildup and reduce risk of stand replacement fire. In most cases prescribed fire cannot be applied until the overstocking and fuels buildup is addressed.
- Maintain the desired levels of size classes S1 and S2. Where natural disturbances do not create the level needed, regeneration harvests, with reserve trees, will be initiated to develop the desired amount of openings for the regeneration actions.

The Production strategy would be used sparingly on the Reservation. One example of its use would be in the lodgepole zone where stocking has been controlled and a short rotation maintained. The natural processes would be constrained to retain the lodgepole pine dominance and provide a continuing flow of products.

Two general classes of silvicultural treatments are proposed:

1. Regeneration Harvests

Forests on the Reservation historically have contained stands with a complex of multiple even-aged pockets within an area. Past failures of unevenaged management practices and the buildup of forest health risks, however, have resulted in the current proposal for even-aged regeneration practices. Regeneration harvests will vary in size to achieve the stand size diversity described in the management objectives. Large tree retention objectives would be met. Generally, some planting would be done to achieve the desired composition of seral species. These silvicultural treatments would include:

- Clear cut – Harvest where only "legacy" trees are left
- Regeneration Reserve Tree – Regeneration harvest where numbers and types of leave trees designed to meet other resource objectives.
- Seed Tree – Harvest where 2-10 trees/acre remain as a seed source.
- Shelterwood – Regeneration harvest where 20-30 trees/acre remain as a seed source.

2. Intermediate Harvests

This is a generalized treatment with the objective of removing diseased and insect infected trees, adjusting the stocking to the desired level and improving the composition, form and growth of residual trees. Silvicultural treatments include:

- Commercial Thin – Partial harvest to adjust stocking levels when there is a commercial value for the trees removed.
- Improvement Cut – Partial harvest to improve the health and vigor of the residual stand.

- Sanitation/Salvage – Removal of diseased or insect infected trees or salvage of windthrown or fire killed trees.
- Overstory Removal – Harvest of excess overstory trees after new stand has become established.
- Unevenaged Cut – Miscellaneous harvest where specific treatment is not defined.

The timber harvest level and silvicultural treatments for Alternative 1 and Alternative 2 were develop by the Natural Resources Department, Colville Confederated Tribes. Alternative 1 reflects the current management practices and Alternative 2 employs IRMP strategies. The harvest level of Alternatives 4 and 5 are the same as Alternative 1. With Alternative 4 the silvicultural treatments would emphasize intermediate harvesting to move the size/structural stages of stands towards the desired future conditions. Alternative 5 would blend moving to desired future conditions with regeneration harvests to reduce the existing impacts of insects and disease levels.

Proposed treatments for key size/structural stages within each PAG in Alternatives 4 and 5 are summarized in Table IV-24. Alternative 3 adjusts Alternative 1 harvest levels to address concerns raised in scoping regarding watershed health and wildlife habitat. Alternative 6 adjusts Alternative 5 harvest levels to address concerns raised in scoping regarding watershed health and wildlife habitat.

To assess the changes in size/structure over time an estimate of growth was made. It is recognized that younger trees and thinned stands will put on faster diameter growth while over-mature and overstocked stands will have minimal growth. For this assessment, an assumption of an overall average growth rate of 15 rings/inch was made. This would increase the stand size by two inches every 15 years (the cutting cycle). A stand would then move one size class every 30 years (or 2 cutting cycles). However, size class 4 (9"-21") spans 12" and thus, would take three cutting cycles to move to the size class 5. These assumptions regarding the movement of size over time for the alternative analyses is shown in Table IV-25:

The acreage that would be harvested by year, PAG, and silvicultural treatment for each alternative is shown in Appendix E, Table E-1. In turn, the volumes of timber that would be harvested from this acreage for each alternative are shown in Appendix E, Table E-2. Further details on the harvest acreage and timber harvest volumes by RMU and WMU for each alternative are in the Project Analysis File at the Natural Resources Department, Colville Confederated Tribes, Nespelem, Washington.

Achieving Desired Future Conditions

The Current Existing Condition (CEC) and Desired Future Condition (DFC) are summarized in Tables IV-16 to IV-22. These summaries show a deficit in size class 5 (21"+ dbh) stands that is distributed throughout all plant association groups. There is a surplus of mid-successional acres in all plant association groups - both single-storied and multi-storied conditions and a deficit of early successional, single storied stands.

Table IV - 24. Proposed Treatments for Key Size/Structural Stages in Alternatives 4 and 5.

PAG	HARVEST	TREATMENT	ALTERNATIVE		POTENTIAL (%)	
S/S	Acres		4	5	Regeneration	Intermediate.
PP						
EM4	3668	Intermediate	Intermediate	Intermediate		68
ES4	1716	Intermediate	Intermediate	Intermediate		32
Total	5384					
	Distribution	Intermediate	100%	100%		
DFCD						
EM4	6,905	Regeneration	Intermediate	Intermediate	28	26
ES3	4,315	Intermediate	Intermediate	Intermediate	-	17
LM4	12,950	Regeneration	Intermediate	Regeneration	54	50
LM5	1,725	Regeneration	Intermediate	Intermediate	7	7
LS4	2,590	Regeneration	Regeneration	Regeneration	11	
Total	28,485					
	Distribution	Intermediate	91%	45%		
		Regeneration	9%	55%		
DFCM						
ES3	9495	Intermediate	Intermediate	Intermediate		15
LM4	35,610	Regeneration	Intermediate	Regeneration	71	55
LM4	11,870	Regeneration	Regeneration	Regeneration		
LS4	18,990	Regeneration	Intermediate	Regeneration	29	30
Total	75,965					
	Distribution	Intermediate	85%	13%		
		Regeneration	15%	87%		
DFWD						
EM4	1,366	Intermediate	Intermediate	Intermediate		49
ES3	789	Intermediate	Intermediate	Intermediate		29
LS4	612	Intermediate	Intermediate	Intermediate		22
Total	2,767					
	Distribution	Intermediate	100%	100%		
DFWM						
EM4	27,905	Regeneration	Intermediate	Regeneration	92	47
ES3	12,685	Intermediate	Intermediate	Intermediate		21
ES4	12,685	Intermediate	Intermediate	Intermediate		22
LM5	2,535	Regeneration	Intermediate	Intermediate	8	4
LS3	3,564	Intermediate	Intermediate	Intermediate		6
Total	59,374					
	Distribution	Intermediate	100%	53%		
		Regeneration		47%		
GF						
ES4	1,030	Regeneration	Intermediate	Intermediate	8	7
LM4	6,175	Regeneration	Intermediate	Intermediate	48	62
LM4	3,090	Regeneration	Intermediate	Regeneration		
LS3	1,545	Intermediate	Intermediate	Intermediate		10
LS4	1,030	Regeneration	Intermediate	Regeneration	5	7
MM4	6,175	Regeneration	Regeneration	Regeneration	42	14

PAG	HARVEST	TREATMENT	ALTERNATIVE		POTENTIAL (%)	
S/S	Acres		4	5	Regeneration	Intermediate.
MM4	2,060	Regeneration	Intermediate	Regeneration		
Total	21,105					
	Distribution	Intermediate	71%	42%		
		Regeneration	29%	58%		
SAF						
EM4	2,595	Regeneration	Intermediate	Intermediate	16	10
ES3	6,875	Intermediate	Intermediate	Intermediate		26
LS3	3,040	Intermediate	Intermediate	Intermediate		11
LS4	805	Intermediate	Intermediate	Intermediate		3
LM4	8,350	Regeneration	Intermediate	Regeneration	50	31
LM5	805	Regeneration	Regeneration	Regeneration	5	
MM4	4,915	Regeneration	Intermediate	Regeneration	29	19
Total	27,385					
	Distribution	Intermediate	97%	37%		
		Regeneration	3%	63%		

The CEC was compared to the DFC for each PAG and size/structural stage to determine the acreages outside the desired range (CEC-OR). In addition, the Reservation's Continuous Forest Inventory summaries were used to identify priority dwarf mistletoe and root rot risk stands. The CEC-OR and the pathogen risk lands were combined to develop a summary of acres needing silvicultural treatments to achieve successional stage balance (Table III-9).

These lands with priority action for treatment are further identified in Table IV-25. Priority 1 actions are those areas needing treatment to move the stands to within +/- 10 percent of the desired future condition while in Priority 2, treatment would bring these stands within the range of the desired future condition.

The timber stands on the Reservation are typical of forests in the Inland Northwest. They are not homogeneous, uniform stands. Rather they contain great diversity within the stand with pockets of small trees interspersed within stands containing large trees, often with two or three canopy layers. Even assuming thinnings would be from below, the activity will not automatically convert the entire stand to a single layer situation. An analysis was made of the Colville Reservation forest inventory statistics to determine the portion of multi-storied stands that would be converted to single-storied by an intermediate harvest activity. The following assumptions were made:

- The activity would reduce the stand basal area to 10 sq. ft/Ac below the DFC.
- The excess basal area would be taken from the pole and small tree sizes.
- The percent of these poles and small trees removed is an indication of the percentage of the stand that would be converted to a single-storied stand.

Table IV - 25. Priority Actions to Achieve Desired Future Conditions.

PRIORITY 1				PRIORITY 2			
PAG	Action	Objective	Acres	PAG	Action	Objective	Acres
Ponderosa Pine				Ponderosa Pine			
EM4	Comm.Thin	Fut.ES5(CFL)	3,668	ES1	Plant	FutES2(CFL)	1,214
EM4	Comm.Thin	Fut.ES5(NF)	23,105	ES1	Plant	FutES2(NF)	13,995
				ES3	Pr. Burn	FutES4(CFL)	1,954
				ES3	Pr. Burn	FutES4(NF)	2,035
				ES4	Comm.Thin	FutES5(CFL)	1,716
				ES4	Comm.Thin	FutES5(NF)	1,525
				EM4	Comm.Thin	FutES5(NF)	3,240
Total			26,773				2,5679
Douglas-fir Warm Dry				Douglas-fir Warm Dry			
EM4	Comm.Thin	ES4 Struct.	1150	ES3	Comm.Thin	FutES4(CFL)	789
EM4	Comm.Thin	FutES5(CFL)	216	ES3	Comm.Thin	FutES4(NF)	360
EM4	Comm.Thin	FutES5(NF)	700	LS4	Comm.Thin	FutES5(CFL)	612
				LS4	Comm.Thin	FutES5(NF)	540
				ES1	Plant	FutES2	480
				ES1	Plant	FutES2	670
				EM4	Comm.Thin	ES4 Struct.	1,150
				EM4	Comm.Thin	FutES5(NF)	1,150
Total			2,066				5,751
Douglas-fir Warm Moist				Douglas-fir Warm Moist			
EM4	Comm.Thin	FutES5	15,220	ES4	Comm.Thin	FutES5	12,685
ES1	Plant	FutES2(CFL)	5,075	EM4	Prescrib. Burn	FutES5	12,685
			20,295	LM5	PCT	LM5 Struct.	2,535
				ES1	Plant	FutEs2(CFL)	9,775
				ES1	Plant	FutES2(NF)	15,590
Total			20,295				53,270
Douglas-fir Cool Dry				Douglas-fir Cool Dry			
EM4	Comm.Thin	FutES5	6905	LM4	Comm.Thin	FutES5	8635
				LM4	Comm.Thin	ES4 Struct.	4315
				ES3	Comm.Thin	FutES4	4315
				LS4	Regen/Pl.	FutES2	2590
Total			6,905				19855
Douglas-fir Cool Moist				Douglas-fir Cool Moist			
LS4	Comm.Thin	Fut.ES4	7,120	LM4	Comm.Thin	Fut.ES5	23,740
				LM4	Comm.Thin	ES4 Struct.	11,870
				LS4	Comm.Thin	ES4 Struct.	11,870
444				LM4	Regen/Pl	Fut.ES2	11,870
Total			7,120				59,350
Grand Fir				Grand Fir			
LM4	Comm.Thin	Fut.MS5	3,085	LM4	Comm.Thin	ES4 Struct.	3,090
MM4	Regen/Pl	Fut.ES2	1,030	LM4	Comm.Thin	Fut.ES5	3,090
				MM4	Regen/Pl	Fut.ES2	5,145
22				LS4	Comm.Thin	Fut.LS5	1,030
Total			4,115				12,355
Subalpine Fir				Subalpine Fir			
LM5	Regen/Pl	Fut.ES2	805	LM4	Comm.Thin	Fut.ES5	2,415

				LM4	Comm.Thin	Fut.EM5	360
				LM4	Comm.Thin	Fut.LM5	1,610
				MM4	Comm.Thin	Fut.MS5	540
				MM4	Comm.Thin	Fut.MM5	1,250
				MM4	Comm.Thin	MS4 Structure	3,125
				LS4	Comm.Thin	Fut.LS5	805
				ES3	Comm.Thin	Fut.ES4	3,750
Total			805				13,855

Table IV - 26. Assumed Growth by Size Class for Stands on the Colville Reservation.

CURRENT SIZE CLASS	SILVICULTURAL TREATMENT			
	Regeneration		Intermediate	
	Year 1	Year 30	Year 1	Year 30
S – 1		S – 2		S – 2
S – 2		S – 3	S – 2	S – 3
S – 3		S – 4	S – 3	S – 4
S - 4	S - 1	S - 2	S - 4	S – 4 70% S – 5 30%

The portion of multi-storied stands that would be converted to single-storied by an intermediate harvest is summarized in Table IV-27.

Table IV - 27. Percent of Multi-Storied Stands Converted to Single-Story by Intermediate Harvest

PAG STRUCUTAL /STAGE	CONV. (%)	PAG STRUCTURAL/STAGE	CONV. (%)
Douglas-fir Warm Dry		Ponderosa Pine	
EM-4	0	LM-4	50
LM-4	30	LM-5	0
Douglas-fir Warm Moist		Grand Fir	
EM-4	30	MM-4	70
Douglas-fir Cool Moist		Subalpine Fir	
LM-4	60	EM-4	30
		MM-4	50
Douglas-fir Cool Dry		LM-4	60
EM-4	40		
LM-4	20		
LM-5	10		

Composite summaries of the historic, current existing condition and desired future condition for each PAG as well as summaries of projected changes as a result of each alternative's actions are included in Tables IV-16 through IV-22. These tables estimate the effects of only the first 15-year cutting cycle and do not include any assumptions of later harvest. To evaluate the effects of the regeneration harvests the nonstocked (S1) and seedling/sapling (S2) should be considered together.

There is an increased risk of accelerated insect and disease damage from some of the intermediate cuts proposed in Alternative 4. This is due to leaving infected trees during these thinnings and accelerated root rot activity following these entries. Based on field review and the Inventory Statistics the healthy seral trees are:

- Ponderosa Pine - All
- Western Larch - Size Class 2 and 3
- Lodgepole Pine - Size Class 2

The Douglas-fir and the larger western larch and lodgepole pine are generally infected by dwarf mistletoe. An average stocking level following the intermediate harvest is assumed to be about 50 trees/Ac. (Average spacing 15'-20').

With these assumptions and an analysis of the Forest Inventory Statistics the projected insect and disease losses that would require regeneration harvest within 30 years in these thinned stands would be:

- DFWM - EM4 10% Loss
- DFCD - LM4 40% Loss
- DFCM - LS4, LM4 40% Loss
- GF - LS4, LM4, MM4 25% Loss
- SAF - EM4, LM4, MM4 15% Loss

The above criteria were used to estimate the changes in successional stages towards achieving the desired future condition as a result of treatment of priority acres. The effects of the proposed actions in achieving the desired balance of size/structural stages varies a great deal between plant association groups. The results of this analysis for each PAG are shown in Tables IV-28 through IV-34.

Table IV - 28. Changes in Structural Stage by Priority Treatment for the Ponderosa Pine Plant Association Group.

PRIORITY	TREATMENT	ALTERNATIVES – (ACRES)					
		1	2	3	4	5	6
1	CT; EM-4	826	2504	473	826	826	527
	Percent	3	9	2	3	3	2
2	Pl; ES - 2	1,214	15,209	15,029	15,029	15,029	15,029
	PB; ES - 3	1,954	1,954	3,389	3,989	3,989	3.989
	CT: ES - 4	389	1,179	222	389	389	248
	Total	3,557	4,347	19,420	19,587	19,587	19,446
	Percent	14	17	76	76	76	76
Total		4,383	6,851	19,853	20,413	20,413	19,973
Percent		8	13	38	39	39	38

Assumptions: Alt. 1 and 2 treat only CFL acres - no planting and prescribed burning on non-CFL areas. Alt 1 and 2 achieve only 8% and 13% of the priority treatment needs, respectively. Alt's. 3 through 6 would treat the priority non-CFL acres, thereby treating 38%-39% of the priority needs. The ES1 areas need to be reviewed to determine if all should be considered forested lands.
CFL – Commercial Forest Land; CT – Commercial Thin; Pl – Plant; PB -

Table IV - 29. Changes in Structural Stage by Priority Treatment for the Douglas-fir Warm Dry Plant Association Group.

PRIORITY	TREATMENT	ALTERNATIVES – (ACRES)					
		1	2	3	4	5	6
1	CT; EM - 4	141	426	88	141	141	90
	Percent	7	21	4	7	7	4
2	CT; ES - 3	83	252	48	83	83	53
	CT; LS – 4	63	192	36	63	63	40
	Pl; ES - 1	480	480	1150	1150	1150	1150
	Total	626	924	1234	1296	1296	1243
	Percent	11	16	21	23	23	22
Total		767	1,350	1,314	1,437	1,437	1,333
Percent		10	17	17	18	18	17

Assumptions: Alt's. 1 and 2 treat only CFL acres - no planting on non-CFL areas. Alt's. 3 through 6 treat the priority non-CFL acres. More acres are thinned with Alt. 2. Alt's 2 Through 6 all treat 17%-18% of the priority needs. Alt. 1 treats only 10 % of these needs.
CFL – Commercial Forest Land; CT – Commercial Thin; Pl – Plant; PB -

Table IV - 30. Changes in Structural Stage by Priority Treatment for the Douglas-fir Warm Moist Plant Association Group.

PRIORITY	TREATMENT	ALTERNATIVES – (ACRES)					
		1	2	3	4	5	6
1	CT; EM - 4 *	15,190	15,220	12,761	15,220	11,767	10,020
	Pl: ES - 1	5,075	5,075	5,075	5,075	5,075	5,075
	Total	20,265	20,295	17,836	20,295	16,842	15,095
	Percent	100	100	88	10	83	74
2	CT; ES – 4*	7,500	9,463	6,637	11,547	6,120	5,211
	PCT; LM – 5	1,437	1,721	1,207	2,099	1,113	948
	PB; EM – 4	12,685	12,685	12,685	12,685	12,685	12,685
	Pl; ES - 1	9,775	9,775	25,365	23,565	23,565	23,565
	Total	31,797	33,644	45,894	51,695	45,283	44,209
	Percent	60	63	86	97	85	83
Total		52,062	53,939	63,730	71,991	62,125	59,304
Percent		71	73	87	98	84	81

* 90% of treated acres. Estimate 10% of treated acres would need regeneration harvest within 30 years and would not meet objectives.
Assumptions: Alt's 1, 2 and 4 fully meet all priority 1 needs. Alt 4 treats 98% of all priority 1 and 2 needs. Alt's 3, 5 and 6 treat 87%, 84% and 81% respectively. Alt's 1 and 2 treat only CFL acres, but the others also plant and prescribe burn the priority non-CFL acres. Alt 2 thins additional acres. Alt's 1 and 2 accomplish 71% and 73% of the priority needs, respectively.
Note: The S1 non-CFL acres that need to be planted appear to be abnormally high?
– Commercial Thin; Pl – Plant CFL – Commercial Forest Land; CT; PB -

Table IV - 31. Changes in Structural Stage by Priority Treatment for the Douglas-fir Cool Dry Plant Association Group.

PRIORITY	TREATMENT	ALTERNATIVES – (ACRES)					
		1	2	3	4	5	6
1	CT; EM - 4	3,088	3,282	2,393	4,432	2,192	1,774
	Percent	45	48	35	64	32	26
2	CT; LM – 4*	3,563	3,788	2,762	5,114	2,529	2,048
	CT; ES - 3	2,019	2,146	1,565	2,898	1,433	1,160
	R/Pl: LS - 4	754	555	585	186	1133	917
	Total	6,336	6,489	4,912	8,198	5,095	4,125
	Percent	32	33	25	41	26	21
Total		9,424	9,771	7,305	12,630	7,287	5,899
Percent		35	37	27	47	27	22

* 60% of treated acres. Estimate 40% of treated acres would need regeneration harvest within 30 years and would not meet objectives.

Assumptions: Alt. 6, with more intermediate cuts, treats the most priority needs (47%). Alt's. 1 and 2 treat 35% and 37% of the priority needs. Alt. 5, with more regeneration harvest, treats 27%. Providing other resource protection in Alt's. 3 and 6 reduces the priority treatments to 27% and 22%, respectively.

CFL – Commercial Forest Land; CT – Commercial Thin; Pl – Plant

Table IV - 32. Changes in Structural Stage by Priority Treatment for the Douglas-fir Cool Moist Plant Association Group.

PRIORITY	TREATMENT	ALTERNATIVES – (ACRES)					
		1	2	3	4	5	6
1	CT; LS – 4*	5,810	6,358	4,278	7,120	1,270	974
	Percent	82	89	60	186	18	14
2	CT; LM – 4*	10,652	11,657	7,843	15,218	2,327	1,787
	CT; LS – 4*	0	0	0	1,180	0	0
	R/Pl: LM - 4	11,870	11,217	11,584	5,778	11,870	11,870
	Total	22,522	22,874	19,427	22,176	14,197	13,657
	Percent	38	39	33	37	24	23
Total		28,332	29,232	23,705	29,296	15,467	14,631
Percent		43	44	36	44	23	22

* 60% of treated acres. Estimate 40% of treated acres would need regeneration harvest within 30 years and would not meet objectives.

Assumptions: Alt.4 treats 100% of priority 1 needs. Alt's. 1, 2 and 4 treat 43% - 44% of priority needs. Alt's. 5 and 6 treat the fewest, with 23% and 22%. Alt. 3 treats an intermediate level, with 36%. More regeneration harvest is provided in Alt's 1, 5 and 6 than necessary to meet priority successional balance needs.

CFL – Commercial Forest Land; CT – Commercial Thin; Pl – Plant; PB -

Table IV - 33. Changes in Structural Stage by Priority Treatment for the Grand Fir Plant Association Group.

PRIORITY	TREATMENT	ALTERNATIVES – (ACRES)					
		1	2	3	4	5	6
1	CT; LM - 4 *	3,085	3,085	2,469	3,085	2,630	1,866
	R/Pl: MM - 4	1,030	1,030	1,030	1,030	1,030	1,030
	Total	4,115	4,115	3,499	4,115	3,660	2,896
	Percent	100	100	85	100	89	70
2	CT; LM – 4*	613	977	0	1,362	0	0
	R/Pl; MM – 4	1,286	707	539	611	2,251	1,298
	CT; LS - 4	418	459	279	502	297	211
	Total	2,317	2,143	818	2,475	2,548	1,509
	Percent	19	17	7	20	21	12
Total		6,432	6,258	4,317	6,590	6,208	4,405
Percent		39	38	26	40	38	27

* 75% of treated acres. Estimate 25% of treated acres would need regeneration harvest within 30 years and would not meet objectives.

Assumptions: All Alternatives treat the majority of the priority #1 needs. Alternatives. 1, 2, 4 and 5 treat between 38% and 40% of all the priority needs. Providing additional resource protection in Alt's. 3 and 6 reduces the treatment levels to 26% and 27%.

CFL – Commercial Forest Land; CT – Commercial Thin; Pl – Plant; PB -

Table IV - 34. Changes in Structural Stage by Priority Treatment for the Subalpine Fir Plant Association Group.

PRIORITY	TREATMENT	ALTERNATIVES – (ACRES)					
		1	2	3	4	5	6
1	R/Pl; LM – 5	349	267	224	2[illegible]	540	363
	Percent	43	33	28	3	67	45
2	CT; LM – 4*	2,677	2,964	1,724	4,379	1,611	1,127
	CT; MM – 4*	1,640	1,816	1,057	2,684	1,024	690
	CT; LS – 4	305	338	196	499	190	128
	CT; ES - 3	2,641	2,924	1,701	4,321	1,648	1,112
	Total	305	338	196	499	190	128
	Percent	2,641	2,624	1,701	4,321	1,648	1,112
Total		7,612	8,309	4,902	11,909	5,073	3,420
Percent		52	57	33	81	35	23

* 85% of treated acres. Estimate 15% of treated acres would need regeneration harvest within 30 years and would not meet objectives.

Assumptions: Alt.4 treats the most priority needs with 81%. Alt's 1 and 2 are at a middle level with 52% and 57%, respectively. Alternatives 3, 5 and 6 treat the fewest priority needs, with 33%, 35% and 23%, respectively.

CFL – Commercial Forest Land; CT – Commercial Thin; Pl – Plant; PB -

The data shown in Tables IV-28 through IV-34 by PAG is summarized in Table IV-35. There is a wide difference between PAG's in the percentage of acres treated to meet size/structure stage balance, with the Douglas-fir Warm Moist PAG being the closest to coming into balance. The ponderosa pine and the Douglas-fir Warm Dry PAGs would move the least towards balance.

Alternative 4, which was designed with emphasis on providing balance meets the greatest amount of priority needs on a weighted average basis (60%). The weighted average for the remainder of the alternatives ranges from 42 percent to 49 percent in treating priority needs to meet size/structure balance.

Table IV - 35. Percent of Priority Acres Treated to Achieve Successional Stage Balance

PAG	AREA (ACRES)	ALTERNATIVE (%)					
		1	2	3	4	5	6
Ponderosa Pine	52452	8	13	38	39	38	38
Douglas-fir Warm Dry	7817	10	17	17	18	18	17
Douglas-fir Warm Moist	73565	71	73	87	98	84	81
Douglas-fir Cool Dry	26760	35	37	27	47	27	22
Douglas-fir Cool Moist	66470	43	40	36	44	23	22
Grand Fir	16470	39	38	26	40	38	27
Subalpine Fir	14660	52	57	33	81	35	23
Total	258194						
Weighted Average		42	45	49	60	46	42

Forest Health

The existing condition of the Reservation's forests with altered species composition, increased stand density and canopy structure, has an important effect on the susceptibility of these forest lands to insect and disease attack. Historically, insect and disease events were typically small disturbances of short durations with fewer losses than today. Now extensive areas are affected and severe losses can occur across the landscape. On the Reservation losses are caused by four groups of pathogens: defoliators, bark beetles, dwarf mistletoe and root diseases.

The hazard rating discussed in Chapter III indicates about 65 percent of the forest is in a condition that has a high hazard pathogen susceptibility rating. For the PAG's and structural/size stage groups found on the Reservation, 64 were considered to have a very high hazard. Due to multiple very high ratings, ten PAGS and structural/size groups are considered to have an extremely high hazard.

Silvicultural treatments are designed to improve the health and vigor of the stands and to reduce the susceptibility to insect and disease losses. Regeneration harvests would physically treat the stands to remove insect and disease epicenters and then restock with seral species to emulate the historic condition. Intermediate treatments would reduce the insect and disease hazard to a lesser degree. With an intermediate treatment, disease and insect infected trees would be removed, the species composition would be improved and the stocking levels adjusted. However, in some cases, due to the current condition of the stands, the hazard would not be fully addressed. In some cases future regeneration would be necessary due to continued losses. These conditions were previously discussed in this Chapter.

Each proposed alternative treats the forest health situation to varying degrees. The proposed treatments of very high hazard areas are summarized in Table IV-36.

During the 2000-2014 cutting period, only about 20 percent of the very high hazard areas will be treated. Defoliator and dwarf mistletoe conditions will be treated somewhat more than bark beetle and root rot conditions. About 17 percent of the composite, or extremely high hazard conditions would be treated.

Alternative 5, with the most regeneration harvests, treats the most high hazard areas, 23 percent of the composite rating areas. Alternative 1, the current practices, treats the second highest level, followed by Alternative 6, which is similar to Alternative 5 but with additional emphasis on watershed health and wildlife habitat protection. Alternative 4, with emphasis on achieving successional stage balance, is in fifth place and Alternative 3 treats the fewest very high hazard areas.

Table IV - 36. Acres of Very High Insect and Disease Hazard Treated by Alternative.

PATHOGEN	AREA NEEDING TREATMENT	ALTERNATIVE					
		1	2	3	4	5	6
Defoliators							
Acres	452,569	105,828	99,620	81,306	98,821	118568	93,575
Percent		23	22	16	22	26	21
Rank		2	3	6	4	1	5
Bark Beetles							
Acres	25,235	40,658	39,119	29,426	34,282	51,321	38838
Percent		16	16	12	14	20	15
Rank		2	3	6	5	1	4
Dwarf Mistletoe							
Acres	348,766	85,945	78,970	67,073	71,732	99,665	79,700
Percent		25	23	19%	21	29	23
Rank		2	4	6	5	1	3
Root Rots							
Acres	219,415	38,509	34,191	28,092	32,062	49,178	37,415
Percent		16	16	13	15	22	17
Rank		2	4	6	5	1	3
Composite (Extreme Hazard)							
Acres	217,708	38,509	34,191	28,092	32,062	49,178	37,415
Percent		18	16	13	15	23	17
Rank		2	4	6	5	1	3

Reforestation

With regeneration harvest some reforestation is generally done to assure the establishment of seral species in the new stands. To meet desired future conditions there is also a backlog of non-stocked areas in need of reforestation. The priority for this backlog would be commercial forestland (CFL) acres but to fully meet Holistic goals the non-CFL acres should also be included. Reforestation needs by alternative are summarized in Table IV-37.

Table IV - 37. Reforestation Needs by Alternative

REFORESTATION TREATMENTS	ALTERNATIVES (ACRES)					
	1	2	3	4	5	6
Regeneration	57,889	41,448	43,833	14,243	100,775	78,381
Backlog – CFL	11,469	11,469	11,469	11,469	11,469	11,469
Backlog – Non-CFL	30,255	30,255	30,255	30,255	30,255	30,255
Total	99,613	83,172	85,557	55,967	142,499	120,105

Forest Productivity

Productivity and growth of the timber resource has been increasing on the Reservation. Between 1958 and 1995 the average volume/acre has increased from 8,200-board feet/acre to 9,200-board feet/acre. During this same period, the net annual growth rate increased from 75-board feet/acre/year to 172-board feet/acre/year. There is a large percentage of the growing stock in the 60-80 year old age class, which is also the age at which trees are accelerating in board feet volume growth. Much of the growth increase during these last four decades was due to in-growth of previously unmerchantable stems.

The timber growth is most likely to decline in the near future because of this growing stock age distribution and as stress induced entomological and pathological agents cause additional mortality. From a long-term management standpoint, the current age-size class structure is imbalanced to that of natural conditions. By treating to improve the successional stage balance and diversity and addressing the priority forest health hazards, these predicted declines in growth could be minimized.

The current management plan estimates the long-term annual sustained yield of 138 MMBF. This is based on the 1995 continuous forest inventory and on a projected annual harvest of 75-million board feet/year. Projected average annual harvests with the action alternatives range from a high of 94.8 MMBF annually in Alternative 5 with the most regeneration harvests to 50.1 MMBF annually in Alternative 4 which emphasizes intermediate cuts to develop successional balance. All proposed alternatives would be harvesting below the projected long-term sustained annual yield of 138 MMBF.

Sustainability

Sustained yield is commonly used as a measure of sustainability - the ability to continue to produce the desired level of goods and services over a period of time and on into the future. Ecosystem management and the Tribes' perspective look at sustainability in a broader sense. Tribal members expect a variety of values from their forest. Historically, timber revenues have funded a large share of the Tribal government. Hunting for subsistence and sport is a major part of Tribal like. Additionally, a wide range of traditional and cultural activities take place on a continuing basis including various ceremonial and gathering activities.

Sustainability embodies all these values and has four central concepts:

1. There must be equity for today's land stewards. The Tribal membership must be able to make a good living and receive necessary services. Timber revenues are important.
2. There should be equity for future generations. Leave options open for future generations and future uses. Developing viable and sustainable ecosystems with a balance of successional stages is needed.
3. Long-term sustainability must take precedence over short-term profit. The land base must remain productive.
4. Environmental enhancement, leaving the world better than we found it, is also desired. This involves active land management.

The Holistic goal and the Integrated Resources Management goals, objectives and management directions address these values on a resource-by-resource basis. The environmental effects of each of the proposed alternatives are discussed by resource subject throughout this Chapter.

Cumulative Effects

As previously discussed the timber stands on the Colville Reservation are in a condition that is outside their historic range of variability. Increased stocking levels, altered species composition and multi-layered canopy layers have increased the risk of insect and disease losses and increased the risk of large stand replacement fires. The areas treated will reduce the insect and disease hazard, reduce the risk of fire losses and improve the diversity of successional stages. Treatments are designed to move the stands toward the balance of successional stages identified as the desired future condition.

The actions analyzed in this document are for the next harvest cycle of fifteen years on the Colville Reservation. These actions will only partially move the landscape towards the desired future condition of size/structure stages and partially remove susceptibility to insect and disease and fire losses. The effects of these first cycle actions are summarized in this Chapter. It is anticipated that these actions will continue in the future until the desired future conditions are achieved. Conservation actions will then be implemented to maintain these desired conditions.

Holistic goals and the ecosystem management approach require adaptive management strategies. Natural disturbances (e.g., insect and disease outbreaks, large fires, windthrow, etc.) are common in this area. To achieve and maintain the Integrated Resources Management goals and the desired future conditions adjustments will be necessary along the way to for these events when they do occur. This will be an on-going process.

WATER RESOURCE

The Colville Indian Reservation is a source of high quality waters providing beneficial uses for residents, fish and wildlife in north central Washington. Proposed activities that may affect the water resource on the Reservation are those that create ground disturbance and vegetation modification. Models have been developed to predict potential sediment delivery, water yield, and peak flows in the forest environment from such activities as timber harvest. As the nature of this EIS is programmatic and does not show site-specific activities, available modeling cannot be used effectively to predict impacts other than to analyze use an equivalent open area (EOA) analysis. For definition and use of EOA, please see *Glossary*. Hunner and Jones (1997) have made an extensive analysis of existing watershed conditions (See *Fisheries Resources*, *Geology Minerals and Soils* as well as *Water Resource, Chapter III*) that can be used to estimate the effects of the proposed action. Thus, through the interpretation of the data provided by Hunner and Jones (1997) and further watershed analysis evaluations, the potential effects of the six proposed alternatives on the water resource indicators (Table II-1) has been made for the period 2000-2014. The effects of the six alternatives on key water resource indicators are shown in Table IV-38.

To determine the change in Equivalent Open Area (EOA) that would be created by each proposed alternative an existing crown closure or stand density analysis was made of the Reservation from a July 1998 Landsat TM Image. Crown closure across the Reservation was classified into four classes (0-10%, 11-40%, 41-70% and 71-100%). Using this crown closure data Equivalent Open Area closure was calculated for each of the 209 WMUs and aggregated to find the average EOA for 14 Resource Management Units (RMU). The Southwest Plateau RMU was not analyzed as no timber harvest activities are planned during the period 2000-2014.

To determine the effects of vegetation modification proposed in each alternative on the EOA, it was assumed that a regeneration harvest unit would decrease the crown closure by two classification units and that intermediate harvest would decrease the crown closure by one unit. For example, an existing 71-100% crown closure unit would become an 11-40% crown closure unit with a regeneration harvest treatment while an intermediate harvest unit would only decrease to 41-70% crown closure. Then, as the EOA for a WMU was computed for the existing conditions, the EOA following silvicultural treatments was computed in the same matter. In turn, the difference between the existing EOA and that following harvest treatments was calculated and shown for each WMU affected by harvest in Table E-3 in Appendix E. The estimated direct change in EOA by alternatives for the 14 RMUs is shown in Table IV-39.

The cumulative effects of the proposed treatments, however, are markedly different than the direct effects shown in Table IV-40. Earlier harvest units are regenerating and their crown closure is increasing. Thus, hydrologic maturity is being established in the previously affected watersheds where stand densities are increasing and the Equivalent Open Area is decreasing.

Using the Colville Confederated Tribes GIS database an analysis was made of all harvest units on the Reservation over the past decade to determine their location by WMU and silvicultural treatment whether it be regeneration or intermediate treatments. Again, using the same analytic process as used to determine the direct effects of harvest activities on EOA, the increase in crown closure that would be created by re-growth was calculated for each WMU. In turn, for each WMU the net change in EOA (existing – harvest effect + growth effect) was estimated and shown in Table D-4, Appendix D. The estimated net cumulative change in EOA by alternatives for the 14 RMUs is shown in Table IV-40.

Management Direction Impacts

In Appendix A, 90 management directions were developed for the restoration and enhancement of the water resource under the Integrated Resources Management Plan. These management directions would assist in providing guidance for the Tribes for moving the Reservation's water resources towards the desired future condition. All of the management directions shown in Chapter II would be beneficial to the resource and for the most part, would not result in adverse impacts to other resource values on the Reservation.

Operational Impacts

Effects Common to All Alternatives

All six alternatives would modify forest vegetation and require the construction and reconstruction of roads and varying levels and intensities. Thus, water resource values have the potential to be modified under all alternatives. However, no additional long-term adverse effects to the water resource or beneficial downstream uses are expected to occur under the proposed alternatives. A long-term positive benefit to the water resource would occur from the continuation of protecting riparian management emphasis areas, particularly those that have been impacted by past management activities.

Direct and Indirect Effects

Water Quality

Road construction most often has the greatest impact on watershed sedimentation and water quality. The Reservation has already been noticeably impacted by roads with existing road density ranging from 3.25 to 4.8 miles per square mile. The requirements for roads in each alternative have not been defined, as the site-specific harvest details are not covered in this programmatic EIS. However, management direction requires the decommissioning or gating of unused roads, most particularly in riparian management emphasis areas under all alternatives. In addition, under Alternatives 3 and 6, the management direction would be to reduce the total road densities in the "high" and "extreme" watershed sensitivity WMUs to the desired future condition of less than 3.0 miles per square mile. These road closures through decommissioning and gating would have a marked direct impact on improving long-term water quality, most noticeably under Alternatives 3 and 6.

Table IV - 38. Effects of Proposed Action by Alternatives on Key Water Resource Factors.

WATER RESOURCE FACTOR	INDICATOR	RISK BY ALTERNATIVE					
		1	2	3	4	5	6
Water Quality	Stream Temperature	Low (-)	Very Low (-)	Negligible (-)	Negligible (-)	Low (-)	Very Low (-)
	Hazardous Materials	None	None	None	None	None	None
Habitat Access	Physical Barriers	None	None	None	None	None	None
Habitat Elements	Sediment	Low (-)	Very Low (-)	Very Low (-)	Negligible (-)	Low (-)	Very Low (-)
	Coarse Woody Material	Negligible (-)	None	Negligible (-)	None	Negligible (-)	Negligible (-)
	Pool Character and Quality	Negligible (-)	Negligible (-)	Negligible (-)	None	Negligible (-)	Negligible (-)
	Off-Channel Habitat	None	None	None	None	None	None
Channel Conditions and Dynamics	Width Depth Ratio	Negligible (-)	Negligible (-)	Negligible (-)	None	Negligible (-)	Negligible (-)
	Streambank Condition	None	None	None	None	Negligible (-)	None
	Floodplain Connectivity	None	None	None	None	Negligible (-)	None
Flow/Hydrology	Changes in Peak Flow	Negligible (-)	Negligible (-)	Negligible (-)	Negligible (-)	Low (-)	Very Low (-)
Watershed Conditions	Net Change in EOA	Negligible (-)	Negligible (-)	Neg. (+)	Negligible (-)	Very Low (-)	None
	Road Density and Location	Very Low (-)	Very Low (-)	Low (+)	Very Low (-)	Very Low (-)	Low (+)
	Human Disturbance	Moderate (-)	Moderate (-)	Mod. Low (-)	Moderate (-)	Mod High (-)	Moderate (-)
	Riparian Emphasis Areas	None	None	None	None	None	None
	Landslide and Erosion Rates	Very Low (-)	Very Low (-)	Negligible (-)	Negligible (-)	Low (-)	Very Low (-)

Rating: None – no activity; Negligible – activity would occur, but effects would be negligible; Very Low – activity would occur, but effects are very unlikely to occur; Low – activity would occur, but measurable effects are unlikely to occur; Moderate – Measurable effects are likely to occur.
- Shows negative impact; + show beneficial impact.

Table IV - 39. Direct Change in Percent Equivalent Open Area (EOA) by Resource Management Unit (RMU) for Six Harvest Alternatives.

RMU	NAME	AREA	CURRENT EOA [1]	ALTERNATIVES					
				1	2	3	4	5	6
		Acres	%	Mean/ High WMU	Mean/ High WMU %	Mean/ High WMU %	Mean/ High WMU %	Mean/ High WMU %	Mean/ High WMU %
1	Hall Creek	115,423	53	4.5 11	4.3 10	2.7 9	4.1 10	4.9 12	2.7 10
2	Twin Lakes	61,490	41	6.3 10	6.1 10	2.9 7	5.7 10	6.9 11	3.2 7
3	Wilmont	75,695	51	5.6 11	5.5 11	4.3 11	5.2 10	6.1 12	3.3 12
4	Ninemile	80,463	39	8.0 12	7.6 11	5.3 12	7.2 11	8.9 12	5.9 12
5	Hellgate	62,957	65	3.7 10	3.4 9	2.9 8	3.3 9	4.1 11	3.2 8
6	Upper San Poil	152,113	45	2.9 10	2.7 10	1.9 10	2.6 10	3.2 11	2.1 11
7	Lower San Poil	95,673	66	4.6 9	4.4 9	3.2 9	4.1 9	4.9 9	3.4 9
8	West Fork SPR.	41,107	36	7.8 11	7.6 10	7.9 11	7.0 9	8.8 12	8.8 12
9	U. Nespelem River	84,625	53	5.7 10	5.5 9	5.7 10	5.0 9	6.2 11	6.2 11
10	L. Nespelem River	59,191	71	3.5 9	3.4 8	3.5 9	3.1 8	3.9 10	3.9 10
11	Buffalo	65,062	81	0.2 0 - 1	0.2 0 - 1	0.0 0	0.1 0 - 1	0.2 0 - 2	0.0 0
12	Lost Creek	42,127	40	8.3 11	7.9 10	8.3 11	7.3 9	9.0 12	9.0 12
13	Omak	121,917	65	4.7 9	4.5 9	4.7 9	4.1 8	5.0 10	5.0 10
14	Kartar	131,390	83	2.5 7	2.3 6	2.5 7	2.3 7	2.7 8	2.7 8
15	SW Plateau	N/A	>90	-	-	-	-	-	-
Total		1,189,233	58	5.6	5.4	4.4	5.0	6.1	4.7

[1] Determined by classification of 1998 Landsat TM image.

Table IV - 40. Net Cumulative Change in Percent Equivalent Open Area (EOA) by Resource Management Unit (RMU) for Six Alternatives.

RMU	NAME	AREA	CURRENT EOA [1]	ALTERNATIVES					
				1	2	3	4	5	6
		Acres	%	Mean/ High WMU %	Mean/ High WMU %	Mean/ High WMU %	Mean/ High WMU %	Mean/ High WMU %	Mean/ High WMU %
1	Hall Creek	115,423	53	2.1 8.9	1.9 8.5	0.0 8.9	1.6 8.1	2.5 9.9	0.3 9.9
2	Twin Lakes	61,490	41	2.8 7.6	2.6 7.1	-0.6 4.4	2.2 6.7	3.4 8.6	-0.3 4.8
3	Wilmont	75,695	51	3.4 11.0	3.3 10.6	2.2 11.0	2.6 10.2	3.9 11.9	1.1 11.9
4	Ninemile	80,463	39	6.1 11.8	5.7 6.8	3.5 11.8	5.4 10.8	7.0 13.2	4.1 13.2
5	Hellgate	62,957	65	-6.1 1.0	-6.4 0.9	-7.0 1.0	-6.6 0.5	-5.7 1.7	-6.6 1.7
6	Upper San Poil	152,113	45	0.9 5.6	0.8 5.6	-0.1 5.6	0.7 4.6	1.3 6.9	0.2 6.9
7	Lower San Poil	95,673	66	1.1 5.9	1.0 5.6	-0.2 5.0	0.7 4.6	1.4 6.7	0.0 5.7
8	West Fork SPR	41,107	36	3.8 10.8	3.6 10.4	3.8 10.8	3.0 7.8	4.7 11.6	4.7 11.6
9	U. Nespelem R.	84,625	53	-1.2 8.3	-1.4 7.9	-1.2 4.9	-1.9 4.2	-0.7 9.3	-0.7 9.3
10	L. Nespelem R.	59,191	71	-2.2 0.2	-2.3 0.0	-2.2 0.2	-2.6 0.0	-1.9 0.9	-1.9 0.9
11	Buffalo	65,062	81	0.0 0.4	0.0 0.4	-0.2 0.0	-0.1 0.3	0.0 0.4	0.0 0.4
12	Lost Creek	42,127	40	-2.1 5.5	-2.5 5.1	-2.1 5.5	-3.1 4.5	-1.4 6.1	-1.4 6.1
13	Omak	121,917	65	0.2 8.9	0.0 8.7	0.2 8.9	-0.4 7.9	0.6 9.6	0.6 9.6
14	Kartar	131,390	83	-1.5 2.6	-1.7 2.7	-1.5 2.6	-1.7 2.3	-1.3 2.8	-1.3 2.8

Total	1,189,23 03	58	0.9	0.7	-0.6	0.3	1.4	0.0

[1] Determined by classification of 1998 Landsat TM image.
Negative values indicate overstory canopy recovery from harvest units during the 1988-98 period than would be greater than created during the 2000-2014 period.

Some loose soil that is generated by road maintenance, renovation and hauling would be transported to streams during the first major rainstorm in the fall or during snowmelt in the spring. The amount of loose soil that reaches the streams as sediment would most likely be minor and would not remain in the stream channel for longer than one year where roads have been properly constructed and maintained. However, improperly constructed and maintained roads can be a sediment source for years if the gully out (not outsloped or inadequate inside ditch). Under these conditions that do occur on the Reservation (Personal Communication, Hunner 1999), sediment movement from road-affected areas can be large and sediment plugs from such activities may remain in stream systems for years.

Maintenance roadwork that corrects construction deficiencies would reduce the amount of sediment that enters streams over the long-term and would benefit fish, amphibians and other aquatic life. Construction of temporary spur roads would displace soil and cause surface compaction. The action is unlikely to result in stream sedimentation because soils exposed by construction would be on or near ridges.

In addition, these temporary roads would be discontinuously ripped, water-barred and seeded during the dry season of the same calendar year.

Even under the implementation of Soil and Water BMPs, using a yarding system that minimizes the exposure of bare mineral soil, and the avoidance of harvest and no road construction in riparian management emphasis areas under all alternatives, a negligible to very low direct adverse effect on water quality can be anticipated (Table IV-38). In comparison, Alternative 5 followed by Alternative 2 would have the largest impact on water quality while Alternatives 3, 4 and 6 would have the smallest impacts.

Mass failures are uncommon on forestlands on the Reservation. Thus, actions proposed under all alternatives would unlikely lead to water quality impacts from mass soil failures.

Water Quantity

No hydrographic data for stream channels on the Reservation or any other local information to show how a hydrograph would be modified by land management activities are available. Watershed research studies in north central Washington indicate that a ten percent or larger change in streamflow including peak flows would have to be initiated to create a measurable change in flow. Based on professional judgment and with the distribution and silvicultural practices proposed, it is unlikely that the proposed activities under any alternative would create a measurable change in streamflow. This professional judgment is supported by data in Table IV-40 that shows the range in net change in EOA, a significant indicator of streamflow impacts, ranges from a –0.6 to 1.4 percent for the Reservation. In comparison, Alternative 5 followed by Alternative would have the largest impact on water quantity while Alternatives 3, 4 and 6 would have the smallest impacts.

Water Temperature

Summer stream temperatures may increase if vegetative cover is removed from a watershed, particularly from the riparian zone. Conversely, management practices that create increased vegetative cover in the riparian zone may reduce stream temperatures during the critical summer month period. Stream temperature may also be reduced if increased baseflow occurs during the warm summer months, thereby, benefiting the downstream users including fisheries. No activities are proposed in the riparian management zones and baseflow would unlikely be modified within streams on the Reservation. Thus, there would be no measurable effect on stream temperatures under all alternatives.

Channel Stability

Degradation of channel stability is highly unlikely under any of the proposed alternatives as streamflow would not be measurable affected.

Wetlands

Wetlands as part of the riparian management emphasis areas are protected and would not be affected by the proposed action. Alternatives 1, 5 and 6 may provide a slight benefit to the wetlands where higher levels of regeneration harvest would reduce transpiration demands. Thus, the reduction in evapotranspiration may augment wetland moisture content.

Wild and Scenic Rivers

There are no existing or potential Wild and Scenic Rivers on the Reservation or downstream.

Cumulative Effects

As noted earlier the cumulative effects of each alternative would reflect past, present and future action. Changes in EOA provide the best indicator to determine cumulative effects for this programmatic analysis. Thus, the net change in EOA has been determined to reflect past, present and future activities on the Reservation and is shown in Table IV-36 through IV-38. The largest change in net EOA on a Reservation-wide Basis is 1.4 percent under Alternative 5 and the lowest is –0.6 percent under Alternative 3. Within individual RMUs the variability in net EOA is larger ranging from –7.0 to +7.0 percent (mean values from Table IV-39). For individual WMUs, the cumulative impacts on EOA are shown in Tables D-3 and D-4 in Appendix D.

While the cumulative effects may vary widely among WMUs over the period of 2000-2014, in general, the Reservation-wide negative cumulative effects of the proposed action under all alternatives would range from negligible to very low. The relative impacts on a given WMU would be highly dependent upon forest management following Soil and Water Best Management Practices.

WILDLIFE RESOURCE

Providing for the critical habitat needs of threatened, endangered, candidate, or sensitive species, big-game species, and other wildlife species is considered in evaluating the consequences of the proposed action alternatives for the Colville Indian Reservation. This analysis is based on the Integrated Resource Management Plan and focuses on habitat diversity factors including cover requirements, snag availability, prey and forage availability, riparian habitat, structural stage diversity, corridor integrity, and habitat fragmentation. This discussion is tiered to the Phase 1 Wildlife Resources Report on file at the Reservation offices that provide supplemental assessments of impacts to the habitat conditions and wildlife populations. For a discussion of potential impacts to fish species of the Colville Indian Reservation and cumulative effects area, see the Fisheries Resources section of this EIS.

Threatened, Endangered, or Candidate Species and Species of Concern

The U.S. Fish and Wildlife Service performs the identification of species listed as threatened or endangered. For a species to be classified as a candidate, there must be a prediction or evidence of a significant decline in population and in habitat quality leading to a reduced geographic range for the species. On federal lands and for federally funded projects NEPA policy requires preparation of a biological assessment to address project impacts on threatened or endangered species. In addition, projects must not contribute to reclassification of candidate species as federally threatened or endangered status.

Wildlife from both the federal and state lists of threatened or endangered species known or suspected to occur on the Colville Indian Reservation include the gray wolf, northern bald eagle, grizzly bear, greater Sandhill crane, lynx, ferruginous hawk, western sage grouse, sharp-tailed grouse and bull trout (see Table III-26). All of these species, except ferruginous hawk, are known to either inhabit or to occasionally visit the Colville Indian Reservation or adjacent habitats. The bull trout is discussed in the Fisheries Resources sections of this EIS.

Impact Assessment

Based on the following analyses, no adverse effects from the proposed actions are anticipated relative to maintaining viable populations of threatened, endangered or candidate species that reside or temporarily use the Colville Indian Reservation. Table IV-41 summarizes the predicted impacts to individual animals or localized populations for each of the threatened, endangered, candidate and big-game species of concern under each alternative.

Although wild animals generally are negligibly impacted by low-level, non-aggressive sharing of habitat with humans (Ream 1980), wildlife use of some areas could be discouraged by short-term, high-intensity activities such as timber harvesting, prescribed burning, hunting, and weekend recreation. Year-round road closures following harvest activities could minimize, but not eliminate, these intrusions. Little to no change in the levels of human activity and wildlife disturbance is expected as a result of proposed project activities under alternatives 1, 2, 4, or 5 on the Reservation. Alternatives 3 and 6 would measurably reduce impacts for some wildlife species and their habitat.

Table IV - 41. Rating[1] of Potential Impacts of Proposed Alternatives on Individual Animals[2] Classified as Threatened, Endangered, Candidate or Game Species of Concern.

SPECIES	ALTERNATIVE					
	1	2	3	4	5	6
Gray Wolf	None	None	None	None	None	None
Grizzly Bear	None	None	None	None	None	None
Lynx	Neg.	Neg.	Low+	Neg.	Neg.	Low+
Rocky Mountain Elk	Low+	Low+	Low+	Neg.	Neg.	Low+
Mule Deer	Low +	Low+	Low+	Neg.	Neg.	Low+
White-tailed Deer	Low-	Low-	Low-	Low-	Low-	Low-
Moose	Low+	Low+	Low+	Neg.	Neg.	Low+
Sandhill Crane	None	None	None	None	None	None
Northern Bald Eagle	Neg.	Neg.	Low+	Neg.	Neg.	Low+
Ferruginous Hawk	None	None	None	None	None	None
Western Sage Grouse	Neg.	Neg.	Low+	Low-	Low-	Low+
Sharp-tailed Grouse	Neg.	Neg.	Low+	Low-	Low-	Low+
Bull Trout	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.

1/ Ratings: None = Species not present or no impact to critical habitat;
Negligible = unmeasurable or compensating beneficial and adverse effects;
Low = minor, non-life threatening effect; + = beneficial effect; - = adverse effect.
2/ No adverse effects are anticipated relative to viable populations of the indicated species.

A common cumulative effects area has been assumed for most wildlife species. It is recognized though that the size of effects area varies for every species. The cumulative effects area being analyzed (the entire Reservation) is large enough to provide one or more home range territories for the majority of resident animal species. Transitory occupants, such as grizzly bear, wolves and many avian species have very large ranges, often including seasonal migrations. The cumulative effects of the proposed actions on these species are discussed individually.

Management Direction Impacts

In Appendix A, 39 management directions for wildlife are shown that have been prepared by the Integrated Resource Management Planning process. The management directions provide an adaptive process to ensure viable populations of diverse plants and animals to meet spiritual, cultural and subsistence needs of the Tribes' membership. The impacts of these management directions are evaluated mostly individually within the *Operational Impacts* discussion for *Forest Vegetation* and *Wildlife* in the following sections. As pointed out in discussion below, some of the management directions may be difficult to achieve and would have a low adverse impact on species populations.

Operational Impacts

Effects Common to All Action Alternatives

The Management Directions discussed below were developed in the Phase 2 report for the IRMP (CCT 1998a). They are listed under the Wildlife section in Appendix A of this EIS.

Threatened, Endangered and Candidate Species Impacts

There have been very few Class 1 sightings of either gray wolf or grizzly bear on or near the Reservation. It is likely that individual transient animals sporadically travel through the more remote areas of the Reservation. The most critical factors defining large carnivore habitats are the availability of large ungulate prey and isolation from human disturbance. Roaded access within gray wolf and grizzly bear home ranges is a major factor in reducing security from human disturbance. The preferred road density is less than one mile per square mile of habitat (Theil 1985, Jensen et al. 1986).

A suitable large ungulate prey base exists on the Reservation. But, road density is just over five miles per square mile of area and most of these roads are currently open to vehicle traffic with no seasonal restrictions on use.

Project impacts under any of the action alternatives are unlikely to affect viable populations of gray wolves or grizzly bears adversely. Both species occur at extremely low densities in north central Washington and can easily avoid any direct disturbance associated with timber harvest in the Project Area. Such wide-ranging mammals typically encounter a variety of habitat types in managed and natural forest landscapes (Irwin et al. 1989). Harvest of timber would result in a slight improvement of elk and deer summer forage conditions, resulting in higher populations of potential prey. Alternatives 1,2, 4, and 5, with the largest proposed harvest and with the greatest amount of road opening and construction for harvest activities, would have the greatest potential for impact in terms of human activity in the area. Alternatives 3 and 6, having reduced harvest activity and minimal new road construction, would have a lower impact. Implementation of Management Directions E31, N1, N2, N3, N4, N8, N10, N11, N13, N15, N17, N22, N28 and N30 (Appendix A) should ensure suitable security and adequate prey availability for large predator species.

Physical closure of many existing and new roads after post-harvest activities, except the primary through and destination routes, would greatly improve security for wolves and grizzly bear that may wander through the Reservation. Implementation of Management Direction N12 would reduce the density of roads open to passenger vehicles from just over five miles per square mile of habitat to less than 1.5 miles per square mile. Although it would not eliminate disturbance, year-round road closures to all motorized vehicles would greatly reduce human disturbance during all but the hunting season.

The availability of lynx-preferred high elevation habitat and habitat for their preferred prey, snowshoe hare, appears to be the limiting factors controlling lynx use of the Reservation. Lodgepole pine harvest areas above 4,500 feet elevation could provide improved habitat for increased populations of small mammals on which lynx prey. Under all action alternatives local lynx populations would, at best, remain stable and could decline as natural successional processes reduce shrub/seedling/sapling winter habitat preferred by their primary prey. Management Directions E20, E24, N1, N2, N3, N4, N8, N22, N30 and N33 (Appendix A) should ensure suitable lynx foraging and denning habitat in the Grizzly and Moses Mountain areas.

Sandhill cranes generally use only large tracts of open habitat, such as, grain fields, grasslands, meadows, marshes dominated by emergent vegetation and large shallow ponds. Sandhill cranes may be found resting and foraging on the Reservation for short periods during their spring and fall migration between breeding territories in northern Canada and wintering grounds in southern California and Mexico. There are no known cases of Sandhill cranes nesting in north central Washington. Management Directions J6, J13, J15, J16, N2, N17, N18, N28, N30, N36 and N37 (Appendix A) will insure availability of future resting and foraging habitat for Sandhill crane migrants.

There are a number of bald eagle nesting sites on the Reservation along the boundary waters of Lake Roosevelt. Some of these birds may even be year-round residents, as two bald eagle winter roosting sites exist on the Reservation above Lake Roosevelt. Winter concentrations in northeastern Washington of bald eagles feeding on waterfowl and carrion are well documented. Management Directions N29, N30, N31 and N37 effectively protect both breeding and winter roosting sites from disturbance by timber management activities. Management Direction N41 under Alternatives 3 and 6 will provide additional year-round protection to active bald eagle nesting sites.

There are extremely few observations of ferruginous hawk occurring on or over the Reservation. This species does occur in the Columbia Basin and may occasionally venture into the non-forest habitats that occupy the southeastern third of the Reservation. Management Directions J6, J13, J15, N16, N25, N30 and N37 (Appendix A) would effectively protect breeding sites should any be established.

Sage grouse historically ranged from the Columbia River, north to Oroville, west to the foothills of the Cascades and east to the Spokane River. Their preferred habitat contains medium to dense sagebrush stands with tall and short sagebrush overstory and a variety of shrub/steppe forbs and grasses. Contiguous sagebrush habitat that covers hundreds of acres is essential for support of a viable local sage grouse population.

Only two isolated populations of sage grouse remain in Washington. One population exists in Douglas and Grant counties and the second exists on the Yakima Firing Range in Kittitas and Yakima counties. A few individual birds or a small non-breeding population of sage grouse still occur on the southwest region of the Reservation. An occasional individual bird may immigrate across the Columbia River from the Douglas/Grant County population. With implementation of Management Directions J6, J13, J15, N1, N2, N3, N28, N30, N35 and N37 (Appendix A), it is assumed that habitat suitable for a breeding population of sage grouse could be developed on the Reservation. Increases in livestock grazing proposed for Alternatives 4 and 5 would be greatly detrimental to habitat used by this species.

The preferred habitat for sharp-tailed grouse is the shrub/steppe plant community, dominated by sagebrush and bunchgrass. Spring breeding habitat centers on big sagebrush, summer shifts more to bitterbrush dominated sites and winter habitat is more dependent on riparian areas. The sharp-tailed grouse decline in Washington is primarily attributed to loss and degradation of habitat. Excessive livestock grazing, agriculture, and brush control using herbicides and fire are primarily responsible for loss of habitat. Remaining sharptail shrub-steppe habitat is severely fragmented and in poor condition, especially in Okanogan County where winter habitat has been removed. Loss of nesting, brood rearing, and wintering habitat are important factors limiting population growth.

The Colville Indian Reservation has the largest, most stable sharp-tailed grouse population remaining in the state. The population is estimated at 352 birds and is currently considered to be self-sustaining. Any increases in livestock grazing or other agricultural use or clearing of preferred habitat could result in reduced breeding success and eventual loss of the species from the lands. Implementation of Management Directions J6, J13, J15, N1, N2, N3, N28, N30, N35 and N37 (Appendix A) should ensure maintenance of the existing population and provide for an increase to a population of 1,600 to 2,000 birds. Increases in livestock grazing proposed for Alternatives 4 and 5 would be greatly detrimental to habitat used by this species.

The goal of Management Direction N35 to eventually have a sharp-tailed grouse population of greater than 10,000 birds on the Reservation is not realistic, as suitable habitat covering approximately 500,000 acres would need to be available. This would require greatly reducing, if not eliminating, all grazing and agricultural activities on the sagebrush-dominated southwestern portion of the Reservation.

Mature Forest Habitat Dependent Species

Of the 333 species found on the Colville Indian Reservation, there are very few that are specifically dependent on mature/old-growth forest habitat (IRMP 1997). There are currently less than 34,000 acres on the reservation classified as mature forest (Structural Class 5). Under all action alternatives there will be no measurable change in the amount of structural class 5 (>21 inch dbh) habitat over the 15-year management period. But by the end of the second treatment period (year 2040) and with implementation of Management Directions E9, E10, E26, E27 and N4 (Appendix A) there should be an increase of approximately 160,000 acres in structural class 5 habitat.

Riparian Ecosystem Dependent Species

All riparian ecosystems within the Project Area would be maintained per Management Directions E82, M31, M34, M36, M39, M40, N17, N18, N19, N24, N36 and N37 (Appendix A) affording maximum habitat protection for travel corridors and suitable habitat for riparian dependent wildlife populations. The desired future condition that riparian areas continue to provide riparian ecosystem functions will be met.

Snag and Down Woody Material Dependent Species

Pileated woodpeckers as well as a guild of primary cavity excavators are used as the indicator species for snag and down woody material components of the forested habitat. This guild includes species such as white-headed woodpeckers, black-backed woodpeckers, Lewis' woodpeckers, common flickers, chickadees and nuthatches. Secondary cavity nesters, such as owls and flying squirrels, become additional beneficiaries of a viable primary excavator population. The availability of snags and future snags (green tree replacements) for nest sites and downed logs as a food source for insect prey is generally the habitat-limiting factors for these species.

An improvement in forest health resulting from harvest of insect-infested trees will result in a decrease of foraging opportunities for woodpeckers and other insect-gleaning bird species. Safety considerations during timber harvest operations invariably require the felling of some large snags that provide suitable nesting and foraging habitat for cavity-dependent species. Even though management guidelines to retain sufficient snags and down woody material to support certain levels of potential populations will be met, harvest activities will produce a slightly negative impact on both primary and secondary cavity nesters.

Tribal Management Direction N9 stipulates that a minimum population of 500 pairs of pileated woodpeckers be maintained with a minimum habitat patch size of 100 acres per pair. The structural composition of the patch would be related to old forest, as represented in Structural Stage 5 and an additional 50,000 acres in Structural Stages 3 and 4 will be designated for stand replacement. Based on the best available data on species requirements, a set of minimum snag, down woody material and greentree recruitment guidelines was developed for the Phase 2, IRMP (CCT 1998a). These values are presented by PAG in Wildlife Guideline 1.1 in the Phase 2 Goals, Objective, Standards and Guidelines materials.

Density of snags >12 inches dbh were 3.0/acre and greater than 20 inches dbh were 0.6/acre on the Reservation. The number of existing snags exceeds the requirements for the quantity of greater than 15-inch snags needed to maintain 100 percent population levels. Based on stand data for the Reservation, downed woody material averages 22.3 logs/acre greater than 12 inches diameter. Under all alternatives, as a minimum the numbers of snags and down woody material listed under IRMP Phase 2 WLG 1.1 will be retained or created following harvest activities.

Management Directions E30, E45, N2, N4, N5, N6, N7, N12, N26, N27, N30 and N37 (Appendix A) all provide positive habitat management measures for cavity nesting species. As partial mitigation, post-harvest treatments under all action alternatives would marginally improve pileated woodpecker foraging habitat where logging slash is left unburned on site. Decreased human activity in the area after timber harvest and road closure would slightly improve security conditions for pileated woodpeckers. Reduced access for firewood gathering could, over time, provide an increase in nesting and foraging habitat for cavity-dependent species.

Unique Habitat Features

Although suitable habitat for Townsend's big-eared bats exists on the Reservation, there have been no sightings of the species. Management Direction N20 would reduce the potential for disturbance of this and other bat species where they occur. If unique habitats are identified during harvest unit layout, appropriate boundary adjustments will be made in consultation with Natural Resource Department wildlife biologists.

Management Direction N21 protects talus habitat for reptile and other wildlife species that may be dependent on this specific form of habitat.

Management Direction N34 protects common loon nesting and brooding habitat on Twin Lakes from disturbance by watercraft and shoreline development.

Big-game Habitat

Management Directions N1, N2, N3, N4, N10, N11, N12, N13, N14, N15, N16, N17, N18, N22, N36, N37 and N39 (Appendix A) provide guidelines for management of big-game populations and big-game habitat to be applied under all alternatives. For more specific discussion of potential activity impacts see Big-Game section of Direct and Indirect Effects discussion below.

Other Wildlife Species

Project impacts under all action alternatives are not likely to adversely affect either individuals or viable populations of raptors, such as northern goshawks, golden eagles, merlins, or flammulated owls. Any active or historic raptor nesting sites that occur on the Reservation would be protected prior to harvest as per Management Directions N25, N28, N30, N31 and N37 (Appendix A). This should result in no impact to individual nesting pairs and therefore no impact to viable populations of raptors on the Reservation.

Effects of proposed harvest alternatives on other animals would vary with species, site characteristics, and type of harvest. Most animal populations would initially be depressed in timber harvest units due to mortality (small, relatively sedentary vertebrates) or displacement (larger and more mobile animals). Herbaceous plant growth within one to two years of harvest would result in rapid recovery by many species, particularly where shrubs or down woody material are maintained for cover. Small mammals that favor early seral communities including several species of shrews and voles, deer mouse, snowshoe hare, and porcupine would benefit. Deer, elk, black bear, seed-eating birds, and many raptors also would be attracted to openings where vigorous understory vegetation was created by seedtree, and shelterwood harvests. Partially harvested stands would generally be less severely altered than regeneration treatments and would therefore retain a greater proportion of the original habitat characteristics and wildlife species.

Direct and Indirect Effects

Threatened, Endangered and Candidate Species Impacts

Project impacts under all action alternatives could have a slight adverse effect on individual transient wolves or grizzly bears, but are considered unlikely to have an adverse effect on viable populations. The level of harvest treatments in Alternatives 1, 2, 4, & 5 (16,500 acres or more in the Subalpine Fir PAG) would open forest canopies and create small scattered openings throughout the high elevation habitats preferred by these species. The increase in human activity during timber harvest and potential increase in hunting pressure due to slightly increased access on the Reservation would be more of a hazard to these animals than habitat modification. Since north central Washington is on the edge of the wolf's and grizzly bear's geographic range, population density is quite low and the removal of one animal through illegal or accidental shooting or trapping would affect the local population.

Alternatives 3 and 6 will eliminate all timber management activities within 660 feet of all active bald eagle nest trees, providing a slight additional reduction in human disturbance for these individuals (Management Direction N41, Appendix A).

Management Directions N40 and N42 proposed for Alternatives 3 and 6 require all reported sightings of T&E species to be monitored and evaluated and appropriate action taken as needed.

Mature Forest Habitat

Proposed timber harvest and vegetation management activities will increase the amount of open forest habitat. Under Alternatives 3 and 6 the deferring of harvest on approximately 30,000 acres for 10 to 15 years will provide slightly more summer thermal cover and much reduced disruption to fawning/calving habitat and corridors relative to other proposed treatments.

While undefined at this level of planning and analysis road construction and reconstruction is anticipated under all alternatives. Most likely Alternatives 1, 4 and 5 would make additions to current road systems. Following project activity, however, these roads will be closed to vehicular traffic, returning open road density to original levels. In the deferred watersheds of Alternatives 3 and 6, 20 percent or greater of the non-arterial roads would be closed. The desired future condition for all alternatives is to reduce the road density to 1.5 miles per square mile. These closures would greatly reduce but not eliminate human access to the area.

Riparian Habitat

Roadway closures proposed for Alternatives 3 and 6 will be concentrated in streamside habitats and riparian management zones. Also, no ground-based tractor harvest would be permitted in riparian management emphasis areas (approximately 100 feet on either side of a stream). Canopy closures are to be maintained at 70 percent on perennial streams and 40 percent on intermittent channels. All planned harvest and associated management activities within the riparian zone will be conducted over the shortest practical period.

Snags and Down Woody Material Habitat

All harvest activities will result in some loss of snags and down woody material from the treatment area. Some loss will be direct through the need to remove hazardous snags during logging operations or as the result of firewood gathering, while other losses will be the indirect loss of down logs during treatment of slash.

Management Direction N43, specific for Alternatives 3 and 6, stipulates a minimum of two dead trees 12 inches in diameter and 40 feet in height will be left on all timber management sites. IRMP Phase 2 Wildlife Guidelines 1.1 also prescribe desired levels of snags, green recruitment trees and down woody material. Meeting these goals will mitigate some of the inadvertent loss resulting from harvest activities.

Big-Game Habitat

Rocky Mountain elk, mule deer, white-tailed deer and moose are year-round residents on the Analysis Area. Big-game populations in the Intermountain West generally have geographically separate winter and summer ranges, each providing a different set of climate-moderating features. Winter ranges in mountainous, forested habitats of eastern Washington are generally characterized by closed-canopy conifer forest, elevations below 3,000 feet, and mostly south-facing slopes with snow accumulations of less than 12 to 24 inches. Studies have indicated that twenty percent of the land base having forest canopy closure of 70 percent or greater with trees more than 40 feet tall provides optimal thermal cover, a dispersed snowpack, and litter/lichen foraging sources (Thomas 1979). They also found animal use was concentrated under cover and along edge habitat with foraging generally extending 180 feet or less out into natural or managed openings. These are not the conditions found in many actively used winter ranges of Washington, Oregon, Montana and Wyoming, where there are no trees and few tall shrubs present, indicating the need for dense overstory thermal cover for mule deer and elk may be overstated.

Although winter thermal cover does not appear to be a limiting factor for elk, moose or mule deer on the Reservation, under all alternatives the winter thermal habitat will decrease for large ungulate populations using the Analysis Area. Table IV-42 shows the distribution of habitat cover types that currently exist on winter range and the amount of cover that is expected to be available following full implementation of proposed treatments for each of the six action alternatives. All action alternatives will open or remove forest canopies creating early and mid-successional stages of highly productive shrub and forb foraging habitats. At least half to all of the hiding cover shown in the table also serves as foraging habitat. Due to their need for greater thermal cover, hiding cover and reduced snow depths, white-tailed deer will be negatively impacted by the loss of closed canopy forest habitat on winter range areas.

Table IV - 42. Distribution of Winter Range Habitat Cover Types by Alternative as Percent of Land Area within Analysis Area.

COVER TYPE	OPTIMAL COVER	EXISTING COVER	ALTERNATIVES (%)					
			1	2	3	4	5	6
Thermal (>70% Canopy Cover)	20	10	6	6	7	6	6	7
Hiding (41-70% Canopy Cover)	15	22	21	21	21	22	20	20
Foraging (<40% Canopy Cover)	65	68	73	73	72	72	74	73

Summer range is characterized by more open-canopy forest (50 percent or greater canopy closure), interspersed with grass/forb/shrub-dominated foraging habitat (Irwin and Peek 1983), generally above 4,000 feet elevation. Animal activity changes to north and east slopes, with mid-day use of cool, dense shade and thickets or late and old structural stage habitats being utilized for thermoregulation (Hershey and Leege 1982). Animals often move along well-established traditional routes, both seasonally and daily.

Table IV-43 shows the distribution of habitat cover types that currently exist on summer range and the amount of cover that is expected to be available following full implementation of proposed treatments for each of the six action alternatives. All action alternatives will open or remove forest canopies creating early successional stages of highly productive shrub and forb habitats. At least half to all of the hiding cover shown in the table also serves as foraging habitat. Although forage is not a limiting factor for big game populations on the Reservation, under all alternatives the increase in foraging habitat will be beneficial to large ungulate populations using the Analysis Area seasonally or year-round. Since thermal, hiding, and foraging cover types are often not mutually exclusive habitats, much of the wildlife habitat on the reservation serves as all three cover types at the same time.

Table IV - 43. Distribution of Summer Range Habitat Cover Types by Alternative as Percent of Land Area within Analysis Area.

COVER TYPE	OPTIMAL COVER	EXISTING COVER	ALTERNATIVES (%)					
			1	2	3	4	5	6
Thermal (>70% Canopy Cover)	25	37	28	28	30	28	28	31
Hiding (41-70% Canopy Cover)	20	35	32	33	33	34	30	31
Foraging (<40% Canopy Cover)	55	28	40	39	37	38	43	39

Increased livestock grazing proposed under alternatives 4 and 5 will be detrimental to all big-game species through both adverse habitat modification and direct interaction of animals.

Harvest activities and planned road construction will result in an increase of human disturbance to big-game using the Analysis Area during project activities. The majority of access to proposed timber harvest sites is planned on roads that are currently open to vehicular traffic. Project mitigation calls for roads that are newly constructed or reopened for harvest activity to be closed following timber harvest and related slash treatment and/or reforestation. Following post-harvest activities, year-round road closure by gates and other obstructions on all but primary through-routes would greatly aid the security of elk, deer and moose and reduce their dependence on hiding cover.

Other Wildlife Species

Effects of proposed harvest alternatives on other animals would vary with species, site characteristics, and types of harvest. Most animal populations would initially be depressed in timber harvest units due to mortality (for small, relatively sedentary vertebrates and invertebrates) or displacement (for larger and more mobile animals). Herbaceous plant growth within one to two years of harvest would result in rapid recovery by many species, particularly under intermediate harvest treatments where shrubs and down woody material are maintained for cover. Small mammals that favor early seral communities including seed-eating birds, several species of shrews and voles, deer mice, and porcupine would benefit from regeneration harvest treatments.

Primary and secondary cavity-dependent species favoring older forest communities, including red squirrels, woodpeckers, small owls, and some bark and foliage-gleaning passerines, would take longer to reoccupy cutover areas. Retention of late and old structural stage stands will partially mitigate habitat losses for cavity-dependent species. As a result of implementing the IRMP Phase 2 Wildlife Guidelines 1.1, timber harvesting under any alternative is not expected to measurably affect potential nesting or foraging habitat for smaller cavity-dependent species, although some suitable snag habitat will be lost. The greatest impacts will occur under Alternative 5 in units where insect-damaged, diseased, or windblown timber is salvaged. Human activity in the area after timber harvest and road closures is not expected to measurably affect small animal use of the area, but reduced access for firewood gathering would aid in maintaining foraging and nesting habitat for all primary and secondary cavity-dependent species.

Although there will be a small loss of mature forest habitat, little fragmentation of existing late and old structural stage habitat units is anticipated to occur under any action alternative. With judicious layout of harvest units, all alternatives can be designed to retain suitable corridors among all mature and late and old structural stage habitats.

Cumulative Effects

Threatened and Endangered Species and Species of Special Concern

Habitat changes that result from the proposed alternatives, together with similar activities that affect the surrounding landscape, will play a collective role in determining status of populations and habitat for threatened, endangered or candidate wildlife and desirable game species. The

Reservation currently provides some habitat suitable for two transitory endangered species and breeding habitat for one threatened species. The cumulative effects on these species of the proposed and foreseeable future management activities combined with the proposed mitigation would be unlikely to create adverse impacts to the viability of either their populations or individual animals. Coordinated road closures for the Reservation and adjacent forested lands would greatly reduce potential impacts from human/wildlife interactions.

Big-Game Habitat

Habitats and populations of elk, deer and moose on the Reservation would be both benefited and negatively impacted by all action alternatives. Populations within and adjacent to the Reservation would be impacted by forest management activities through temporary displacement of some animals to surrounding habitats. Following post-harvest activities, browse regeneration in harvested stands will improve foraging habitat for animals using the area and reduce pressure on adjacent stands. The existing summer range cover:forage ratio is roughly 70:30, and the winter range ratio is 30:70, whereas the optimal ratio is considered to be nearer 40:60. The proposed harvest treatments for all alternatives would improve the summer range to about a 60:40 ratio, but the winter range ratio would be further reduced to about 25:75 (see Tables IV-42 and IV-43). As a result, current and future on-site timber harvests could result in improved summer habitat conditions and increased populations of large ungulate species, but the winter range would become less favorable, particularly for white-tailed deer. Reduced forage and increased adverse animal interactions would result from proposed increased livestock grazing under alternatives 4 and 5.

Effects of timber harvest on pileated woodpeckers and other primary cavity excavators would be additive to the effects of past and future wildfire and harvests, and non-harvest forest management activities on adjacent areas. Prescribed burning of piled harvest slash would have less of an effect on prey/foraging habitat than the frequent burns experienced in the past. Proposed yarding of harvest slash materials will result in greatly reduced acreage requiring underburning for heavy fuel loads. This treatment will greatly increase retention of large down woody materials both standing and down over past practices.

Since cavity dependent species are primarily associated with mature and late and old structural stage forest successional stages that would be reduced by harvesting large diameter trees, localized populations of these species may decline under all of the proposed alternatives. The retention of late and old structural stage habitat and the requirement to retain a minimum number of large trees within treated stands for old-growth dependent species would partially mitigate the cumulative effects of harvest activities from proposed action on the Reservation and from foreseeable future actions in nearby forest lands. Implementation of IRMP Phase 2 snag and down woody materials management guidelines should result in the retention of suitable habitat conditions for these and other snag and mature-forest dependent species. No adverse cumulative effect is anticipated on viable populations of these species.

Mature Forest Habitat

Because of the large home ranges and low population densities of lynx, the effects on this species from management treatments in lodgepole pine and adjacent subalpine fir mature-forest habitats would only be manifested over large areas. Effects of the proposed harvest alternatives may be important when added to land management activities in the surrounding landscape, particularly on higher-elevation lands to the north. Timber harvest and road construction on a large majority of lands surrounding the Reservation has removed the wilderness-like mature-forest environment preferred by lynx. Conversely, harvest of mature lodgepole pine stands and regeneration with the same species would be advantageous for snowshoe hares, the primary prey of lynx. Road closure mitigation throughout the cumulative effects area and maintenance of unroaded high-elevation lodgepole pine habitats could be an important factor to maintaining or increasing lynx populations.

Other Wildlife Species

Cumulative effects would vary with species and harvest activities throughout the forest landscape. In general, increased habitat diversity and forest successional stage mosaics creating more edge and foraging opportunities would provide a cumulative long-term benefit to other wildlife species not specifically discussed in this report.

PROBABLE ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED

Implementation of any of the proposed alternatives would inevitably result in some adverse environmental effects. The severity of the effects can be reduced by adhering to the Management Direction provided by the Integrated Resource Management Area Plan Management (Appendix A) and with mitigation proposed in this document.

The preceding discussions in this Chapter identify and describe the environmental effects associated with each alternative, and the measures proposed to mitigate adverse effects. Technically and feasibly, most adverse environmental effects can be avoided. Practically however, implementation of any alternative would result in some adverse effects for which the costs for mitigation would be prohibitive. The following sections identify most of the adverse environmental effects considered unavoidable.

AIR QUALITY

Short-term adverse impacts on air quality, primarily from smoke, cannot be avoided in the range of alternatives. Prescribed fire is a necessity in the management of healthy vigorous forest stands on the Colville Indian Reservation. Wildfires generally occur at times and under conditions that impact local air quality to a greater extent than do prescribed fires.

Road construction and silvicultural practices also contribute slightly to the temporary degradation of air quality within the Reservation.

CULTURAL RESOURCES

Current methodology cannot ensure that all cultural resource sites and materials will be found. Provisions in all timber sale and service contracts protect known cultural resources and require cessation of work when a previously unknown cultural resource site is discovered. Pending advances in inventory techniques, some sites may be inadvertently destroyed or damaged. Such impacts are considered unavoidable.

FIRE

Impacts of wildfires on the total array of the Reservation's forest resources cannot be totally avoided. Wildfires will continue to randomly occur in time and space. Areas with the highest probability of a catastrophic wildfire can be identified and treated to reduce this risk. Risk of fire damage increases in areas that promote increased recreational use and areas of recent timber harvest activities that create higher fuel loads.

The severity of the impacts of a fire depends on the intensity of the fire, determined by the quantity of fuel, weather conditions, and topography. Short-term loss of vegetation and soil disturbances will occur due to the construction of fire lines. Potential soil erosion could result in short-term water quality degradation. Recreational opportunities could be interrupted or limited in fire areas for short periods. The aftermath of a small prescribed fire would be visibility obvious for only a short time, whereas the effects of a major wildfire on vegetation composition would remain visible for decades.

Management use of prescribed fire can also result in adverse impacts to resources, such as soil and air quality. The severity of these impacts depends on intensity and duration of the prescribed fire. Fuels management prescriptions are designed to achieve an acceptable level of fuel load reduction while maintaining acceptable impacts to non-target resources.

GEOLOGY/SOILS

Road construction would reduce the overall productivity of the land by the area removed from production. In addition, loss of soil stability and hydrologic function by forest practices would adversely affect the Reservation's landscape hydrologic performance, runoff processes, soil quality, water quality, and flow regimes. Logging operations would also decrease long-term soil productivity on about 10 percent or less of the area due to topsoil displacement or compaction and removal of nutrients from the local ecosystem. Subsequent surface erosion would also produce a slight decrease in soil quality.

RECREATION/AESTHETICS

Project activities, such as timber harvesting and road construction, will temporarily disrupt the normal recreational and subsistence uses occurring in a given area. Short-term effects, such as wood debris on the ground, disturbance of understory vegetation, dust, smoke, and noise pollution, would cause a temporary change in the local landscape that may be unappealing to some visitors.

While the proposed actions have been designed to comply with the Management Direction for the Integrated Resource Management Plan (Chapter II), there would, nonetheless be some aesthetics. Although roads and harvest units often cause visual alteration of the landscape, following revegetation of the site, the effects become less noticeable with the passage of time.

VEGETATION

Ground-disturbing activities, such as timber harvest, road construction, fuels treatment, skid trail and landing rehabilitation and some natural events would result in the invasion of exotic species adversely altering the native species composition of the affected sites.

WATER

Although the IRMP Management Directions (Appendix A), the Best Management Practices, and the Monitoring Plan have been designed to prevent adverse effects to soil and water, the potential for water resource damage does exist. A small risk that sediment production will exceed natural rates exists when roads are built, timber is harvested, or other activities take place that disturbs vegetation and soils. Sediment could also be produced through both surface and channel erosion. In addition, water quantity or water quality parameters would exceed natural levels following forest management activities.

Implementation of Best Management Practices coupled with IRMP Management Directions (Appendix A) may prevent or mitigate major adverse impacts to the established beneficial uses of soil and water. Newly developed or improved Best Management Practices will be incorporated into all projects as they become available.

WILDLIFE

During management activities, especially those related to timber harvest, individual birds and mobile mammals would be displaced to adjacent habitats, thermal and hiding cover would be lost, and big-game and large predator security would be decreased. Displacement of animals would present different problems to different species. To wide-ranging species, such as elk, and deer the displacement would result in a slightly reduced home range or moderately higher populations in areas of displacement. Smaller animals, such as red squirrels and goshawks, could also be forced into territories of other individuals of their species and therefore, be placed in a highly competitive situation. Some of these effects would be temporary, lasting from days to a few years. Longer-term or permanent adverse effects would result from some small mammals and soil dwelling animals perishing and from loss of certain habitats for decades due to timber harvest, post sale activities, road construction or removal of snags for safety reasons.

RELATIONSHIP BETWEEN SHORT-TERM USE AND LONG-TERM PRODUCTIVITY

AIR QUALITY

The use of prescribed ire to reduce the flammability and excess levels of fuels would affect long-term forest productivity by reducing the risks and consequences of a major wildfire. The temporary impacts of smoke from prescribed fire would have minor effects on the use of the Reservation's resources such as recreation sites and aesthetics. Long-term benefits of using prescribed fire to reduce natural fuels would more than outweigh the short-term impact to air quality.

FIRE

Effective wildfire prevention and suppression reduce the direct damage to existing timber stands and other resources. Nevertheless, natural long-term successional processes that change the vegetative composition and often increase stand density can also reduce timber productivity. Excessive fuel buildups may result in a catastrophic wildfire, greatly reducing site productivity.

Within the Reservation, some excess fuel accumulations have already developed from fire exclusion and tree mortality related to pathogen damage. Prescribed fire can be used

GEOLOGY/SOILS

Soil protection is an essential objective of management activities that seek to maintain critical soil physical, biological and chemical characteristics ensuring long-term site productivity, stability and hydrologic function. Accelerated erosion, compaction, and other detrimental effects would be reduced through careful application of road planning, design and construction techniques, as well as timber harvest and site preparation methods. Carrying out soil protection measure outlined in the IRMP Management Directions (Appendix A) would maintain critical soil physical and chemical characteristics (including nutrient levels), and would ensure long-term site productivity. Some loss of productive land is expected due to new road construction and harvest landing development.

RECREATION/AETHETICS

Increasing recreational opportunities could result in increased long-term use of the Reservation. The type and amount of recreational opportunities the area can provide depend on availability of road and trail access, developed sites, and the percent of the area opened or closed to motorized use.

Short-term scenic modification of the Reservation would occur from proposed timber harvest and road construction. These modifications would most likely return to natural conditions in the long-term.

VEGETATION

All action alternatives would provide increased timber production on acres allocated to timber management. Replacement of existing, slow growing and root-diseased stands of trees by younger, more vigorous, and disease-resistant stands will result in greater long-term timber production. Opportunities to increase productivity would be foregone in areas where timber management is precluded, such as designated late and old structural stage stands and scenic corridors.

WATER

Long-term adverse impacts to the water resource are unlikely to occur and the beneficial uses now occurring would continue with the proposed activities. In fact, some alternatives proposed the reduction of road densities and the deferral of sensitive watershed for harvest all of which will contribute to markedly improving water quality on the Reservation. Stream channel morphology, however, could be temporarily or permanently altered as a consequence of short-term direct or indirect effects, such as road crossing, surface erosion and increased streamflow.

WILDLIFE

Harvesting of timber will benefit some wildlife by providing more browse and forage for populations of species such as elk and deer.

Road density will increase over the short-term slightly affecting some species. Road closures following post-harvest activities of all alternatives will reduce open road densities to below pre-harvest levels resulting in long-term positive affect for most species.

Some wildlife habitat would be disturbed for short periods and small amounts will be lost, but none of the alternatives is expected to displace any species permanently. The cover:forage ratio will vary with changes in successional stages, harvest, and reforestation. All alternatives create minor amounts of structural class 1and 2 habitat, a slight positive increase in foraging habitat for large wild ungulate species.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The following discussion focuses on resource commitments considered as irreversible or irretrievable. This definition applies to all resources and activities. An "irreversible effect" is a term that describes the loss of future options and applies primarily to the effects of use of non-renewable resources or to those factors that are renewable only over long periods, such as soil productivity. All resources that constitute a forest ecosystem are considered renewable, except cultural artifacts and mineral deposits. All forms of vegetation, watershed conditions, wildlife habitats, etc. can be restored to their natural state given sufficient time and management. The length of time needed, however, must be reasonable and realistic in order for the commitment to be considered reversible.

An "irretrievable commitment" of resources applies to loss of production, loss of harvestable resources, or the commitment of renewable natural resources. For example, some or all of the timber production from an area is irretrievably lost during the time that an area is used as a winter sports (recreation) site. With a change in use, timber production can be resumed. The production lost is irretrievable, but the action is reversible.

AIR QUALITY

Prescribed burning and dust from roads and machinery would temporarily affect local air quality, but would not constitute an irretrievable or irreversible commitment of resources.

CULTURAL RESOURCES

Cultural resource studies represent, in essence, the scientific and controlled irretrievable destruction of a cultural resource site. Once undertaken, the effects of data collection are irretrievable, and represent an irreversible commitment of the resource. Conventional archaeological techniques and methods would be used for data collection projects, with a commitment to high-quality field and laboratory work to ensure the consistency and usefulness of the data.

FISH

Fish populations identified on the Reservation would not be lost from any activity proposed under all alternatives.

FIRE

An irreversible loss of forest resources would most likely occur by catastrophic wildfire if silvicultural treatments as proposed under all alternatives are not undertaken. No irreversible commitment of resources associated with fire prevention, suppression, or fuels program would occur as they could be modified or curtailed anytime.

GEOLOGY/SOILS

A short-term irretrievable loss in soil productivity, stability and hydrologic function would occur in timber harvest landings, skid trails, and slash piles created by ground-based logging. Road construction represents a small irretrievable loss in the soil resource, even after the road is closed and revegetated. The soil and water IRMP Management Directions (Appendix A) are designed to avoid or reduce the potential for irreversible losses from proposed management activities.

RECREATIONAESTHETICS

An irretrievable loss of the natural character of the landscape would occur in areas where timber harvests and road construction occur. In these areas, a natural-appearing forested landscape would take several decades to replace. With silvicultural treatments designed to move the forest landscape towards desired future conditions, the Reservation in the long-term would have a more pre-European settlement appearance.

SOCIOECONOMIC

Loss of some benefits, primary timber-oriented jobs and both personal and Tribal income would be irretrievable under some management strategies such as Alternatives 3 and 6 that limit or defer timber harvest. Grazing fees would be either gained or lost for the next 15 years from the modification of present grazing allotments. From an overall Reservation viewpoint, under-managed forest and rangelands result in reduced production of timber volumes and forage that lead to both short- and long-term economic losses.

VEGETATION

Productivity losses, due to the slow growing, over mature and pathogen damaged condition of current stands, cannot be recovered. Additional losses of merchantable products through decay and mortality within current stands would also be an irretrievable commitment.

Under all action alternatives, timber production would also be an irretrievable loss in areas identified for the protection and management of other resources, such as late and old structural stage or scenic quality retention areas.

There would be no irreversible or irretrievable loss of livestock forage and big-game browse in traditional forage areas under all alternatives.

OLD-GROWTH

No irreversible and irretrievable commitment would be made on old-growth reserved for protection under all alternatives. Late and old structural stage stands proposed for treatment would experience a short-term irretrievable loss of value as old-growth until successional processes return stand characteristics to late and old structural stage conditions.

WATER

Some alternatives under worst-case situations may temporarily reduce the water quality within the Reservation over the next 15 years. No irreversible change in water quality would occur.

WILDLIFE

Under all action alternatives, a short-term loss of wildlife cover and displacement of wildlife would occur in proposed timber harvest units. Also, some loss of snag habitat would occur in timber harvest units and because of new road construction. These would be an irretrievable commitment of resources.

SPECIFICALLY REQUIRED DISCLOSURES

EFFECTS OF ALTERNATIVES ON THREATENED AND ENDANGERED SPECIES AND CRITICAL HABITAT

Whatever the alternative selected, protection of listed species will take precedence over any management activities. The Colville Confederated Tribes will participate in and comply with all appropriate Threatened and Endangered species recovery plans.

EFFECTS OF ALTERNATIVES ON FLOOD PLAINS AND WETLANDS

All designated flood plains and wetlands found on the Reservation will be managed per Management Directions outlined in Appendix A.

ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL OF ALTERNATIVES

Alternatives that require the most road building will have the least potential for conserving energy. The energy from petroleum products required to carry out any of the action alternatives is insignificant when viewed relative to the national and worldwide petroleum reserves.

EFFECTS OF ALTERNATIVES ON SOCIAL GROUPS

Differential effects would occur on the civil rights of American citizen by implementation of all alternatives. Preferences for contracting and jobs associated with proposed activities in this EIS would be provided to members of the Colville Confederated Tribes.

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ACRONYMS
AND GLOSSARY

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Abbreviations:

BIA	Bureau of Indian Affairs
BMP(s)	Best Management practices
CA	Compacted Area
CCT	Colville Confederated Tribes
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DBH	Diameter at breast height
DEIS	Draft Environmental Impact Statement
DFC	Desired Future Conditions
EIS	Environmental Impact Statement
EOA	Equivalent Open Acres
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
GIS	Geographic Information System
HRV	Historic Range of Variability
IDT	Interdisciplinary planning team
IRMP	Integrated Resource Management Planning
MBF	Thousand Board Feet
MMBF	Million Board Feet
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
PAG	Plant Association Group
PNV	Present Net Value
RMU	Resource Management Unit
ROD	Record of Decision
SIP	State Implementation Plan
TCP	Tradition Cultural Properties
USDA	United States Department of Agriculture
USDI	United States Department of Interior
USF&WS	United States Fish and Wildlife Service
VRM	Visual Resource Management
WDOE	Washington Department of Ecology
WMU	Watershed Management Unit.

Accelerated Erosion. Any increase in the natural rate of erosion process such as landslides, stream channel scour, or dry ravel. Accelerated erosion can be caused by management activities that (1) alter the natural erosion resisting forces (root strength, inter-particle binding), (2) alter the flow of ground or surface waters, or (3) change the natural slope locations of soil or rock materials.

Adaptive Management. A type of natural resource management in which decisions are made as part of an on-going process. Adaptive management involves testing, monitoring, evaluation, and incorporating new knowledge into management approaches based on scientific findings and the needs of society. Results are used to modify management policy.

Affected Environment. The natural, physical, and human-related environment that is sensitive to changes due to proposed actions.

Air Quality. Refers to standards for various classes of land as designated by the Clean Air Act, P.L. 88-206, Jan. 1978.

Airshed. A geographical area that, because of topography, meteorology and climate, shares the same air.

Alternative. One of several policies, plans or projects proposed for decision-making.

Anadromous Fish. Fish that are born and reared in freshwater, move to the ocean to grow and mature, and return to freshwater to reproduce. Salmon and steelhead are examples.

Anthropogenic. Action created by man.

Aquatic Ecosystem. The stream channels and associated riparian habitat, lake or estuary bed, water, biotic communities and habitat features that occur within them.

Archaeological. Refers to material remains, usually from the past, which when scientifically analyzed are used to describe and explain former ways of life.

Best Management Practices (BMP). Practices determined by the resource professional to be the most effective and practicable means of preventing or reducing the amount of water pollution generated by non-point sources; used to meet water quality goals.

Big-game. Those species of large mammals normally managed as a sport-hunting resource and include such animals as deer, elk and bear.

Biodiversity or Diversity. The relative distribution and abundance of different plant and animal communities and species within an area.

Biological Corridor. A habitat band linking areas reserved from substantial disturbance.

Biological Diversity. The variety of life and its processes.

Biological Legacies. Large trees, down logs, snags, and other components of the forest stand left after harvesting for the purpose of maintaining site productivity and providing structures and ecological functions in subsequent stands.

Broadcast Burning. Allowing a prescribed fire to burn over a designated area within well-defined boundaries for reduction of fuel hazards or as a silvicultural treatment, or both.

Candidate Species. Those plants and animals included in Federal Register "Notice of Review" that are being considered by the U.S. Fish and Wildlife Service for listing as threatened or endangered.

Canopy. The more or less continuous cover of branches and foliage formed collectively by adjacent trees and other woody species in a forest stand.

Cavity Excavator. A wildlife species that digs or chips out cavities in wood to provide a nesting, roosting, or foraging site.

Cavity Nester. Wildlife species, most frequently birds, that require cavities (holes) in trees for nesting and reproduction.
Cavity Habitat. Snags, broken-topped live trees and down logs used by wildlife species that excavate and/or occupy cavities in these trees.

Class I (air quality) Areas. Special areas (i.e., national parks and certain wilderness areas) protected for their air quality related values.

Clearcut Harvest. A regeneration method under an even-aged silvicultural system. When suitable seed trees are either non-existent or unprotectable, all trees within a defined area are removed at one time. Regeneration then occurs from (1) natural seeding from adjacent stands, (2) seed contained in the slash or logging debris, (3) advance growth, or (4) planting or direct seeding. An even-aged forest usually results.

Climax Vegetation. The culminating stage in plant succession for a given site. The species composition of the vegetation has reached a highly stable condition over time and perpetuates itself unless disturbed by outside forces.

Coarse Woody Debris (Large Woody Debris). Portion of trees that have fallen or been cut and left in the woods. Usually refers to pieces at least 20 inches in diameter.

Commercial Thinning. The removal of merchantable trees from most often an even-aged stand to encourage growth of the remaining trees.

Compaction (relative to this EIS). Refers to soil becoming consolidated by the effects of surface pressure often from heavy machinery or vehicle and pedestrian traffic.

Concentrate Burning. Prescribed fire used to remove mad-made or natural collections of concentrated woody debris. Generally the fire is hotter than in broadcast burning or underburning.

Connectivity. A measure of the extent to which conditions between late-successional/old-growth forest areas provide habitat for breeding, feeding, dispersal, and movement of late-successional/old-growth-associated wildlife and fish species.

Contemporary. Refers to those traditional practices, whether specific to the Plateau culture or Pan American, currently in use by Tribal members.

Core Area. That area of habitat essential in the breeding, nesting and rearing of young, up to the point of dispersal of the young.

Corridor (landscape). A landscape element that connects similar patches of habitat through an area with different characteristics.

Cover. Vegetation used by wildlife for protection from predators, or to mitigate weather conditions, or to reproduce. May also refer to the protection of the soil and the shading provided to herbs and forbs by vegetation.

Council on Environmental Quality. An advisory council to the President of the United States established by the National Environmental Policy Act of 1969. It reviews federal programs for their effect on the environment, conducts environmental studies and advises the president on environmental matters.

Critical Habitat. Under the Endangered Species Act, (1) the specific areas within the geographic area occupied by a federally listed species on which are found physical and biological features essential to the conservation of the species, and that may require special management considerations or protection; and (2) specific areas outside the geographic area occupied by a listed species when it is determined that such areas are essential for the conservation of the species.

Culture. Rules and standards that, when acted upon by the members of a society, produce behavior that falls within a range of variance the members consider proper and acceptable (Haviland 1989:297)

Cultural Resources. The physical remains of human activity (artifacts, ruins, burial mounds, petroglyphs, etc.) having scientific, prehistoric or social values.

Cumulative Effect. The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can also result from individually minor, but collectively significant actions taking place over a period of time.

Desired Future Condition.

Diameter at Breast Height (dbh). The diameter of a tree 4.5 feet above the ground on the uphill side of the tree.

Dispersed Recreation. Outdoor recreation in which visitors are diffused over relatively large areas.

Developed Recreation Site. Distinctly designated areas where facilities are provided for concentrated public use, e.g., campgrounds, picnic areas, boating sites, and ski areas.

Dispersed Recreation. Outdoor recreation that takes place outside developed recreations sites or in wilderness areas.

Ecosystem. The complete biological and abiotic system formed by the interaction of a group of organisms and their environment.

Ecosystem-based Management. Scientifically based land and resource management that integrates ecological capabilities with social values and economic relationships to produce, restore, or sustain ecosystem integrity and desired conditions, uses, products, values and services over the long term.

Ecosystem Health (forest health, rangeland health, aquatic system health). A condition where the parts and functions of an ecosystem are sustained over time and where the system capacity for self-repair is maintained, such that goals for use, values and services of the ecosystem are met.

Edge. Where different plant communities meet, or where variations in successional stage or vegetation conditions within the plant community come together.

Effects (or Impacts). Environmental consequences as a result of a proposed action. Effects provide the scientific and analytical basis for comparison of alternatives. Effects may be either direct (caused by the action and occur at the same time and place) or indirect (occurring later in time or at a different location, but are reasonably foreseeable or cumulative results of the action).

Effects and impacts as used in this EA are synonymous. Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic quality, historic, cultural, economic, social, or healthy effects, whether direct, indirect, or cumulative. Effects may also include those resulting from actions that may have both beneficial and detrimental effects, even if on the balance it appears that the effects would be beneficial.

Emissions. Substances discharged into the air, such as from tractors and trucks.

Endangered Species. Any species defined through the Endangered Species Act of 1973 as amended, as being in danger of extinction throughout all or a significant portion of its range and published in the Federal Register.

Endemic. The population of plants, animals, insects, or diseases at their normal levels. Often relating to endemic populations of potentially injurious forest insects, in contrast to epidemic levels not in balance with predator populations.

Environmental Impact Statement (EIS). A formal document to be filed with the Environmental Protection Agency that considers significant environmental impacts expected from implementation of a major federal action.

Ephemeral Streams. Streams that flow only as a direct response to rainfall or snowmelt events. They have no perennial baseflow.

Epidemic. An abnormally high population of potentially injurious plants, animals, or diseases. A population that exceeds its normal balanced level, in contrast to endemic levels.

Equivalent Open Area (EOA). A term used to equate the amount of forest canopy to be removed by a proposed harvest activity to the amount of canopy removed by a clearcut. For purposes of this analysis, one acre of vegetation removal equals one EOA.

Erosion. Detachment or movement of soil or rock fragments by water, wind, ice, or gravity. Accelerated erosion is more rapid than normal, natural, or geologic erosion, primarily resulting from the activities of people, animals, or natural catastrophes.

Essential Habitat. Areas with essentially the same characteristics as critical habitat but not declared as such. These habitats are provided to meet recovery objectives for endangered, threatened, and proposed wildlife species.

Eutrophication. Natural process in shallow lakes where plant growth in the lake increases and the ability to decompose organic material decreases. This action leads to the gradual filling in of the lake.

Fee land. Land ownership that may be absolute, conditional, or determinable. Non-members, members, or the Tribes may hold title or inherit fee land.

Floodplain. The lowland and relatively flat area adjoining inland and coastal waters, including, at a minimum, areas that are subject to a one percent or greater chance of flooding in any given year.

Forage. All browse and non-woody plants that are available to livestock or game animals and used for grazing or harvested for feeding.

Forage Areas. Vegetated areas with less than 60 percent total combined canopy closure of trees and tall shrubs (greater than seven feet in height).

Forest Health. The ability of forest ecosystems to remain productive, resilient, and stable over time and to withstand the effects of periodic natural or human caused stresses such as drought, insect attack, disease, climatic change, flood, resource management practices and resource demands.

Forest Succession. The orderly process of change in a forest as one-plant community or stand conditions is replaced by another, evolving towards the climax type of vegetation.

Forb. Any herb other than grass.

Fragmentation. Breaking up of contiguous areas into progressively smaller patches of increasing degree of isolation. The opposite of connectivity defined above.

Fuels. Combustible wildland vegetative materials present in the forest, which potentially contribute to a significant fire hazard.

Fuels Management. Manipulation or reduction of fuels to meet Forest protection and management objectives while preserving and enhancing environmental quality.

Green recruitment tree. Live large trees that may be dying or defective, which are designated to be retained on site as future replacement trees to meet standing dead wood (snag) or down wood requirements.

Guidelines. Actions, priorities, processes, or prescriptions that are expected to help meet objectives. Guidelines are not required, but would be considered in the planning and analysis of resource management projects.

Habitat Diversity. The distribution and abundance of different plant and animal communities and species within a specific area.

Habitat Fragmentation. The breaking up of habitat into discrete islands through modification or conversion of habitat by management activities.

Habitat Type. (Vegetative). An aggregation of all land areas potentially capable of producing similar plant communities at climax.

Hardwoods. A conventional term for broadleaf trees and their wood products.

Heritage Resource. Any definite location or article associated with past human activity identifiable through field survey, historical documentation, or oral evidence; includes archaeological or architectural sites, structures, or places, and places of traditional cultural or religious importance to specified groups whether or not represented by physical remains.

Hiding Cover. Vegetation capable of hiding 90 percent of a standing adult deer or elk at 200 feet or less. Includes those shrub and forested stand conditions that provide adequate tree stem or shrub layer density to hide animals. In some cases, topographic features also can provide hiding cover.

Historic Range of Variability.

Historical. Refers to the period of time for which there are written records (after European contact).

Hydrologic. Pertains to the quantity, quality and timing of water yield from forested lands.

Hydrologic maturity. Forest stands are considered hydrologically mature when evaporation, interception, precipitation, and influences on the snowmelt process are the same as fully stocked mature stands (PAGs are in the E4, M4, L4, E5, M5 and L5 structural stage classes). Forestlands with PAGs E1, E2, M2 and L2 are considered open and hydrologic immature. Regeneration harvest silvicultural treatments will open a stand and cause the area to become hydrologically immature. The level of hydrologic maturity of a watershed is described by the equivalent open area factor that is a function of the cumulative open area in multiple stands in a mature or immature state.

Impacts. A spatial or temporal change in the environment caused by human activity. See effects.

Indicator Species. Species of fish, wildlife, or plants adapted to a particular kind of environment, which reflect ecological changes to the environment caused by land management activities.

Indirect Effects. Secondary effects which occur in locations other than the initial action or significantly later in time.

Integrated Resource Analysis/Design. A methodology whereby a target landscape is incorporated into the "Desired Future Condition" for an analysis area through an integrated resource analysis. (The analysis area for this EIS is the entire 1.4 million-acre Colville Indian Reservation.) The analysis would include:

1. Data collection bases upon IRMP (see below) goals, standards, guidelines as well as issues and concerns expressed by members of the public.
2. Data analysis and interpretation, which are most often stated as opportunities or constraints related to resources, and arrayed on "resource layer" GIS maps (e.g., sensitive soils, recreation sites, timber stands, wildlife habitat areas of concern).
3. Review and synthesis, which is the integration of IRMP direction, local issues/concerns and site specific resource information to develop the future landscape pattern.
4. Develop a proposed course of action and evaluate its efforts.
5. Implement and monitor the course of action.

Integrated Resource Management Planning (IRMP). An integrated reservation consensus-based process requiring public participation that produces a Land and Resource Management Plan for review by both the public and government entities. The "plan" establishes direction for land use and specifies broad resource management goals and objectives (strategies).

Interdisciplinary Approach. Utilization of more than one individual, representing numerous areas of knowledge and skill, focusing on the same task, problem, or subject. Team member interaction provides needed insight to all stages of the process.

Intermediate Harvest. A silvicultural treatment conducted to modify or guide the development of an existing crop of trees, but not to replace it with a new one.

Intermittent Stream. Any nonpermanent flowing drainage feature having a definable channel and evidence of scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two criteria.

Irretrievable. Refers to losses of production, harvest, or a commitment of renewable natural resources. For example, some or all of the timber production from an area is irretrievably lost during the time an area is used as a winter sports (recreation) site. If the use is changed, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible.

Irreversible. Refers primarily to the use of nonrenewable resources, such as minerals, or cultural resources, or to those factors that are renewable only over long time spans, such as soil productivity. Irreversible also includes loss of future operations.

Issue. A point, matter, or question of public discussion or interest, to be addressed or resolved through the planning process.

Issue Indicator. A specific, measurable element that expresses some features or attribute relative to an issue.

Land Use Allocation. Allocations of a land area that defines allowable uses/activities, restricted uses/activities, and prohibited uses/activities. Each allocation is associated with a specific management objective.

Landscape. A heterogeneous land area with interacting ecosystems that are repeated in similar form throughout.

Late Successional Forests. Forest seral stages that include mature and old-growth age classes of trees.

Lek. A gathering area for displaying and mating used during the spring by sharp-tailed grouse and often referred to as a dancing ground.

Limiting Factor. Physical or biological condition that constrains a population size of a species in a defined geographic area, e.g., winter range for elk.

Lop and Scatter. A forest fuels reduction treatment where following tree felling, limbs and branches are cut-off and scattered in the harvest unit.

Management Direction. A statement of multiple use and other goals and objectives, along with the associated management prescriptions and standards and guidelines to direct resource management.

Management Prescription. A set of land and resource management policies that, as expressed through Standards and Guidelines, creates a Desired Future Condition over time.

Mass Movement. The downslope movement of earth caused by gravity. Includes but is not limed to landslides, rock falls, debris avalanches, and creep. It does not include surface erosion.

Mature Stand. A mappable stand of trees for which the annual net rate of growth has peaked. Stands are generally greater than 80-100 years old and less than 180-200 years old. Stand age, diameter of dominant trees, and stand structure at maturity vary by forest cover types and local site conditions. Mature stands generally contain trees within a small average diameter, less age class variation, and less structural complexity than old-growth stands of the same forest type. Mature stages of some forest types are suitable habitat for spotted owls. However, mature forests are not always spotted owl habitat, and spotted owl habitat is not always mature forest.

Mitigation. Mitigation includes (1) avoiding the impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (3) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and (5) compensating for the impact by replacing or providing substitute resources or environments.

Monitoring. The process of collecting information to evaluate if objectives and anticipated or assumed results of a management plan are being realized or if implementation is proceeding as planned.

Multi-aged Stand. A forest stand which has more than one distinct age class arising from specific disturbance and regeneration events at various times. These stands normally will have multi-layered structure.

Multi-layered Canopy. Forest stands with two or more distinct tree layers in the canopy; also called multi-layered stands.

National Ambient Air Quality Standards (NAAQS). Standards designed to protect public health and welfare, allowing an adequate margin of safety. For particulate matter less than ten microns in size (PM10), 50 micrograms per cubic meter annual average and 150 micrograms peer cubic meter, 24-hour average; not to be exceeded more than once per year.

National Environmental Policy Act of 1969. This law requires the preparation of environmental impact statements for every major Federal Action that causes a significant effect on the quality of the human environment.

National Environmental Policy Act (NEPA) Process. An interdisciplinary process, which concentrates decision making around issues, concerns, alternatives, and the effects of alternatives on the environment.

Natural Regeneration. Renewal of a tree crop by natural means using natural seed fall and/or tree regeneration existing before stand harvest.

No-Action Alternative. The No-Action Alternative is required by regulations implementing the National Environmental Policy Act (NEPA) (40 CFR 1502.14). The No-Action Alternative provides a baseline for estimating the effects of other alternatives. When a proposed activity is being evaluated, the No-Action Alternative discusses conditions under which current management direction would continue unchanged.

Non-attainment. Failures of a geographical area to attain or maintain compliance with ambient air quality standards.

Non-point Pollution. Pollution whose source is an area, a collection of sites or some other type of "group" sources. Erosion and sedimentation are examples. Exhaust from many autos, as in a parking lot, is generally considered non-point pollution. It is compared with point pollution.

Noxious Weeds. Rapidly spreading plants that can cause a variety of major ecological or economic impacts to both agriculture and wildland.

Old growth. A forest stand usually at least 180-220 years old with moderately high canopy closure; a multi-layered, multi-species canopy dominated by large overstory trees; high incidence of large trees, some with broken tops and other indications of old and decaying wood (decadence); numerous large snags; and heavy accumulations of wood, including large logs on the ground (coarse woody debris).

Old-growth-dependent Species. An animal species so adapted that it exists primarily in old-growth forests or is dependent on certain attributes provided in older forests.

Open Road Density. The linear measure of road system open to use relative to total habitat available (miles/square mile).

Overstory. That portion of trees which form the uppermost layer in a forest stand which consists of more than one distinct layer (canopy).

Overstory Removal. The final stage of cutting where the remaining overstory trees are removed to allow the understory to grow. Overstory removal is generally accomplished three to five years after reforestation and when adequate stocking has been achieve.

Patent land. Land held in fee, granted by the government to another, usually for schools, missions, etc.

Peak Flow. The highest amount of stream or river flow occurring in a year or from a single storm event.

Perennial Streams. Streams that flow continuously throughout the year.

Plant Association Group (PAG). Refers to a grouping of similar plant associations that are commonly referred to as habitat types on the Colville Reservation. Plant association represents the classified group, and the term habitat type refers to the geographical, on the ground location of a plant association.

Plant Community. An association of plants of various species found growing together in different areas with similar site characteristics.

Point Pollution. Pollution that originates at a single identifiable source, such as a sewage treatment plant or fireplace. It is compared with non-point pollution.

Precommercial Thinning. The practice of removing some of the trees less than merchantable size from a stand so that remaining trees will grow faster.

Preferred Alternative. The alternative recommended for implementation based on analysis developed in the EIS (40 CFR 1502.14).

Prescribed Burning. The intentional application of fire to wildland fuels in either their natural or altered state. Burning is conducted under such conditions as to allow the fire to be confined to a predetermined area and to produce an intensity of heat and rate of spread required to meet planned objectives (e.g., silvicultural, wildlife management, reduction of fuel hazard, etc.).

Prescribed Fire. A preplanned wildland fire burning under specified conditions to accomplish specific planned objectives. It could result from either a planned or unplanned ignition.

Prescription. Management practices selected and scheduled for application on a designated area to attain specific goals and objectives.

Rain-on-Snow Event. A winter storm that is characterized by precipitation falling as rain, rather than snow, and melting of existing snowpack.

Range Condition. The degree of similarity of the existing plant community's species composition to the species composition of the plant association identified for that rangeland. If at least 50 percent of the species composition, for a plant community, are made up of species found in the plant association determined for that site, the site would be rated as being in good condition. For a fair condition rating the community must have at least 25 percent of species present in the plant association. Poor rated rangeland will have less than 25 percent of species present in the plant association.

Range of Alternatives. A range of alternatives provides a set of different ways for managing public lands, offering many different levels of goods and services. Each alternative is one way of managing the Reservation's resources, expressed as management emphasis leading to a unique set of goods and services being available to the public.

Range Site. Rangeland with specific physical characteristics (soil, topography, annual precipitation) that differs from other kinds of rangeland in its ability to produce distinctive kinds and amounts of vegetation.

Range Unit. Unit of landscape delineated for the management of livestock grazing.

Raptors. Predatory birds, such as falcons, hawks, eagles, or owls.

Reforestation. The natural or artificial restocking of a forest area with trees--includes measures to obtain natural regeneration, as well as tree planting and seeding. Reforestation is used to produce timber and other forest products, protect watershed functioning, prevent erosion, and improve other social and economic values of the forest, such as wildlife, recreation, and natural beauty.

Regeneration. The renewal of a tree crop, whether by natural or artificial means. This term may also refer to the crop itself (seedlings, saplings).

Regeneration Harvest. A silvicultural system using stand regeneration methods that include modified versions of the seed tree, shelterwood and overstory removal harvest methods. Stands remaining after regeneration harvest will generally resemble reserve seed tree cuts with about 15 percent of the original stand remaining.

Rehabilitation. To return unproductive lands, other than roads and trails, to good health through stabilization so as to produce the same vegetation (or similar species) as found in adjacent areas.

Renovation – Roads. Protection of the road investment by surface grading, reshaping ditch lines, improving and installing additional drainage structures and replacement of deteriorating culverts. Renovation also includes converting road prisms from ditched to out-sloped roadbeds with waterdips, which reduces long-term maintenance costs and properly drains roads during storm events.

Residual Stand. Trees remaining in forested stand after some event, such as selection cutting.

Resource Management Unit. Management units (15) on the Reservation that range from 41,107 to over 150,000 acres that differ by vegetation, geology and hydrologic attributes. Boundaries are generally formed by a higher order watersheds and are an aggregation of Watershed Management Units

Restoration Thinning. The silvicultural practice of manually removing competitive vegetation so that the remaining trees will grow faster.

Riparian Areas/Habitats. Areas of land that are directly affected by water, usually having visible vegetation or physical characteristics reflecting the influence of water. Streamsides, lake edges, or marshes are typical riparian areas.

Riparian Reserves. Designated riparian areas found outside Late-Successional reserves.

Riparian Zone/Habitat/Emphasis Area. Those terrestrial areas where the vegetation complex and microclimate conditions are products of the combined presence and influence of perennial and/or intermittent water, associated high water tables and soils which exhibit some wetness characteristics. Normally used to refer to the zone within which plants grow rooted in the water table of these rivers, streams, lakes, ponds, reservoirs, springs, marshes, seeps, bogs and wet meadows.

Road Maintenance. The upkeep of the entire road system including surface and shoulders, parking and side areas, structures, and traffic-control devices necessary for its safe and efficient utilization.

Scenic Resource. The composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for visitors.

Scoping. The procedure by which the Forest Service determines the range of issues and extent of analysis necessary for a proposed action. This includes but is not limited to: the range of actions, alternatives, and impacts to be addressed; the identification of significant issues related to a proposed action; and establishing the depth of environmental analysis, data, and task assignments needed.

Sediment. Any material carried in suspension by water, which would ultimately settle to the bottom. Sediment has two main sources: from the water channel itself and from disturbed upland sites.

Seed Tree. A tree selected as a natural seed source within a shelterwood or seedtree harvest cut. Sometimes, these trees are also reserved for seed collection.

Seedlings and Saplings. Non-commercial-size young trees, generally occurring in plantations.

Seral Stages. The series of relatively transitory plant communities that develop during ecological succession from bare ground to the climax stage. Generally there are five stages recognized: early-seral, mid-seral, late-seral, mature-seral, and old-growth.

Site Preparation. An forest management activity to prepare an area for regeneration including fuels reduction and reduction of unwanted competing vegetation.

Site Tree/Index. A measure of forest productivity expressed as the height of the tallest trees in a stand at an index age.

Slash. The residue on the ground following felling and other silvicultural operations and/or accumulating there as a result of a storm, fire girdling, or poisoning of trees.

Snag. A standing dead tree usually without merchantable value for timber products, but having characteristics of benefit to cavity nesting wildlife species.

Soil Compaction. An increase in bulk density (weight per unit volume) and a decrease in soil porosity resulting from applied loads, vibration, or pressure.

Soil Productivity. Capacity or suitability of a soil for establishment and growth of a specified crop or plant species, primarily through nutrient availability.

Stand. A community of trees or other vegetation uniform in composition, physiognomy, spatial arrangement, or condition to be distinguishable from adjacent communities.

Stand Density. The number of trees growing in a given area where in forestry it is expressed either as trees per acre or percentage of the ground that is covered by overstory trees.

Stand Structure. The mix and distribution of tree sizes, layers and ages in a forest.

State Implementation Plan (SIP). A state document required by the Clean Air Act. It describes a comprehensive plan of action for achieving specified air quality objectives and standards for a particular locality or region within a specified time, as enforced by the state and approved by the Environmental Protection Agency.

Stream Order. Streams are systematically classified based on the network of tributary branches within a drainage basin. Each non-branching channel segment (smallest size) is designated a first-order stream. A stream that receives water from only first-order segments is termed a second-order stream, and so on. The order of a particular drainage basin is determined by the order of the principle or largest segment.

Streambed Particle Size Distribution. A graphical representation of the size class composition of a cross section of streambed. The composition is statistically determined by sampling the composition of particle sizes in the streambed, not the area covered by individual particles.

Structural Diversity. Variety in a forest stand that results form layering or tiering of the canopy and the die-back, death and ultimate decay of trees. In aquatic habitats, the presence of a variety of structural features such as logs and boulders that creates a variety of habitat.

Succession. A series of dynamic changes by which one group of organisms succeeds another through stages leading to potential natural community or climax. An example is the development of series of plant communities called seral stages following a major disturbance.

Successional Stage. A stage or recognizable condition of a plant community that occurs during its development from bare ground to some climax plant community.

Suitable Forest Land. Forest land (as defined in CFR 219.3, 219.14) for which technology can ensure timber production without irreversible resource damage to soils, productivity, or watershed conditions; for which there is reasonable assurance that such lands can be adequately restocked (as provided in CFR 219.4); and for which there is management direction that indicates that timber production is an appropriate use of that area.

Surface Erosion. The detachment and transport of soil particles by wind, water, or gravity. Surface erosion can occur as the loss of soil in a uniform layer (sheet erosion), in many rills or dry rattle.

Suspended Sediment. Sediment suspended in a fluid by the upward components of turbulent currents or by colloidal suspension.

Sustainability. Refers to meeting the needs of the present without compromising the abilities of future generations to meet their needs; emphasizing and maintaining the underlying ecological processes that ensure long-term productivity of goods, services, and values without impairing the productivity of the land. In commodity production, sustainability refers to the yield of a natural resource that can be produced continually at a given intensity level of management.

Thermal Cover. Vegetative cover used by animals to modify the adverse effects of weather. A forest or shrub stand at least 5 feet in height with tree canopy cover of at least 70 percent provides thermal cover for mule deer. For elk thermal cover is defined as 30 to 60 acres in size, 40 feet tall or greater coniferous stands with crown closure exceeding 70 percent. Deciduous and conifer stands may serve as thermal cover in summer, but deciduous stands are not effective in winter.

Threatened Species. Any species of plant or animal which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range, and which has been designated in the Federal Register as such. In addition, some states have declared certain species in their jurisdiction as threatened or endangered.

Traditional. Refers to old cultural practices (stories, customs, religious rites, kinship ties, etc.) passed down for generations.

Trust land. Lands held by the United States government for the benefit and use of the Colville Confederated Tribes or individual Tribal members. Only tribes or trial members may hold title. If conveyed to a non-member, trust land goes into fee status.

Underburning. The use of prescribed fire, most often below an overstory canopy to remove excess forest fuels. Generally conducted in the spring months and a cooler fire than broadcast burning.

Understory. Vegetation (trees or shrubs) growing under the canopy formed by taller trees.

Viable Population. A wildlife or plant population that contains an adequate number of reproductive individuals to appropriately ensures the long-term existence of the species.

Viewshed. A portion of the Forest that is seen from a major travel route, or high use location.

Water Quality. The chemical, physical and biological characteristics of water.

Water Yield. The quantity of water derived from a unit area of watershed forming streamflow.

Watershed. An entire area that contributes water to a drainage system or stream.

Watershed Management Unit (WMU). A subunit of a Resource Management Unit that generally follow the boundary of a first- or second-order watershed. The 209 Reservation WMUs range in size from less than 200 acres to near 20,000 acres and are the basic management unit on the Reservation.

Wildfire. Any wildfire not designated and managed as a prescribed fire with an approved prescription.

Wildlife Diversity. The relative abundance of wildlife species, plant species, communities, habitats or habitat features per unit area.

Yarding. The act or process of moving logs to a landing.

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LIST OF AGENCIES AND ORGANIZATIONS TO WHOM COPIES OF THE DOCUMENT HAVE BEEN SENT

Federal Agencies and Officials:

MEMBERS COLVILLE BUSINESS COUNCIL, COLVILLE CONFEDERATED TRIBES

ADVISORY COUNCIL ON HISTORIC PRESERVATION, Lakewood, CO.

U.S. DEPARMENT OF INTERIOR
Bureau of Indian Affairs
Office of Environmental Policy and Compliance
Bureau of Land Management, District Office, Wenatchee, WA
Bureau of Reclamation, District Office, Grand Coulee, WA.

USDA FOREST SERVICE
Environmental Coordination, Portland, OR
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Federal Congressional Delegation:

U.S. Representative Doc Hastings
U.S. Representative George Nethercutt
U.S. Senator Slade Gordon
U.S. Senator Patty Murray

State Agencies and Officials:

State of Washington, Office of the Governor
Washington Department of Ecology
Washington Department of Fish and Wildlife
Washington Department of Transportation
Washington Interagency Committee for Outdoor Recreation
Washington State Parks and Recreation Commission
North Central Washington Air Pollution Control Authority

Local Agencies and Organizations:

Ferry County Commissioners
Okanogan County Commissioners
Douglas County Commissioners
Chelan County commissioners
Okanogan County Public Utility District, Environmental Coordinator
Douglas County Public Utility District, Environmental Coordinator
Chelan County Public Utility District, Environmental Coordinator
Wenatchee World
Northwest Ecosystem Alliance

APPENDICES

APPENDIX A – IRMP MANAGEMENT DIRECTIONS

IRMP GOALS, OBJECTIVES AND MANAGEMENT DIRECTION COMMON TO ALTERNATIVES 2 THROUGH 6.

The Colville Integrated Resource Management Plan developed a set of management goals, objectives and directives to fulfill the Tribe's Holistic Goal for the Reservation and its members (CCT 1997). The multiple factors related to each of these management issues have been summarized for the Resources Areas in Table II-1.

Management direction options as developed during EIS scoping and alternative development have also been included under each environmental component and form the foundation for differentiating the proposed action presented under Alternatives 3, 4, 5 and 6. The comparison of outputs and effects in Chapter II and the environmental consequences discussed in Chapter IV reflect analyses based on meeting these goals and objectives under the desired management directions.

Aesthetics

Management Goal

We affirm our connection to Mother Earth and the Circle of Life. Nature's beauty combines sensory satisfaction with an intellectual appreciation of the spiritually and socially significant. Our Reservation is clean, green, healthy, pleasing to our senses, and man-made features and structures complement nature while meeting the spiritual, cultural, social and economic needs of the Tribal Members.

Management Objectives

1. Meet aesthetics resource goal based on management principles and techniques established by Tribal and/or federal codes regulations, contracts, MOUs/MOAs, and plans – augment or strengthen these mechanisms as needed.
2. Maintain or enhance desired scenic quality through management of vegetation and road densities.
3. Protect and enhance the visual qualities of natural or man-made landscapes considered to be unique, rare, or fragile based on Tribal values.

Management Directions

A1. A civil administrative code for dealing with illegal dumps and littering within the reservation boundaries would be established

A2. Vegetation management activities would be designed to mimic natural form, diversity and structure.

A3. A strategy would be developed to reduce road densities, while providing reasonable membership access to root, berry, medicinal plants, and other cultural sites.

A4. Seasonal road closures and foot or non-motorized vehicle trails will be used for vehicle access control.

A5. Landscapes of special Tribal values would be defined and mapped

A6. A visual sensitivity rating based on biophysical characteristics, viewing factors, and member's values for landscapes within the Reservation would be developed.

A7. Criteria would be established to evaluate impacts of human activities in relation to desired visual qualities.

A8. Best management practices (BMPs) would be developed for aesthetic resource mitigation.

Management Direction Options Alternatives 3-6

A9. A Visual Resource Management (VRM) map of the Reservation would be developed to assist resource managers in the design of future activities.

Air Resources

Management Goal

The air resource is of high quality; low in particulates and pollutants

Management Objectives

1. Maintain or improve the quality of ambient (outdoor) air within the exterior boundaries of the Colville Indian Reservation.
2. Continue efforts to meet National Ambient Air Quality Standards, Prevention of Significant Deterioration, and the Washington State Visibility Protection Plans.
3. Maintain and enhance air quality and visibility on the Reservation in a manner consistent with the National Clean Air Act and the Washington State Implementation Plan (SIP).
4. Prescribed fire and other fuel management techniques would be used to reduce the potential for wildfire emissions.
5. Consider alternative emission reduction techniques whenever they are compatible with land allocation objectives and other management actions/direction (see USDA Forest Service 1995).

Management Directions

B1. Resource management activities on the Reservation would be in compliance with the requirements of the 1963 National Clean Air Act as amended in 1966, 1970, 1977 and 1990. These requirements include meeting the National Ambient Air Quality Standards (NAAQS), Prevention of Significant Deterioration (PSD) Program and would coordinate with the Washington State Implementation Plan (SIP).

B2. The NRD air quality managers would be responsible for adopting plans and rules by year 2003 sufficient to attain and maintain national air quality standards, prevent significant deterioration of air quality, remedy existing visibility impairment and prevent future impairment in mandatory Class I Federal areas caused by manmade sources of pollution including prescribed burning on the Reservation in accordance with direction by the Environmental Protection Agency (1998).

B3. By the year 2010, reduce particulate matter emissions and impacts from prescribed burning by 50 percent from the baseline period (1990-2000). This will be accomplished by planning, conducting monitoring, and if necessary, adjusting prescribed fire activities in coordination with the Washington State Implementation Plan.

B4. Minimize broadcast burning in favor of lower intensity underburning. Use emission reduction mitigation measures and smoke dispersal techniques to the greatest extent practical.

B5. Management activities on the Reservation that may affect air quality would be assessed and mitigation measures developed if impacts occur.

B6. Wildfire hazard reduction, site preparation and the use of prescribed fire for species habitat mitigation as well as forest and range health mitigation will be implemented in a manner consistent with ecosystem management objectives.

B7. Where appropriate, use dust abatement measures during construction activities and on roads during wood product removal.

B8. Perform conformity determinations required by the Clean Air Act as part of implementing planning

Management Direction Options Alternatives 3-6

None

Cultural Resources

Management Goal

Our culture, traditions, and practices are woven throughout every aspect of our lives: the personal, social, economic, spiritual, and political. We ensure their institutionalization in our family lives, work places, schools, judicial system, and governing body. Our identity and survival is tied directly to the land, which we preserve and protect by fully exercising our rights as a sovereign nation.

Management Objectives

1. Strengthen existing programs, regulations, and guidelines for preserving and protecting the cultural resources of the Confederated Tribes of the Colville Indian Reservation.
2. Identify cultural resources of significance to the Tribes within the Colville Reservation and usual and accustomed areas.
3. Preserve, protect, and enhance cultural resources that are significant to the political integrity, the cultural identity and practices, and the health and welfare of the Colville Confederated Tribes.
4. Provide a sustainable level of culturally significant plants that meet the spiritual, cultural, subsistence and/or recreational needs of Tribal members.
5. Educate staff and Tribal members about the existence, use and ecology of cultural plants.
6. Enhance awareness and understanding of the history and culture of the Tribes and the importance of its role in the development of Washington and the United States.
7. Strengthen or improve the influence of traditional practices and values within the Tribal organization.
8. More opportunities to practice Tribal traditions would be provided.

Management Directions

C1. Privately owned lands (fee, trust, and patent) would be included in management strategies.

C2. Responsibility for addressing inheritance laws would be delegated to protect Tribal land base and membership.

C3. A controlled access electronic database/inventory of archaeological and historical sites, traditional use areas, and burial sites would be maintained and continually updated. The existing database would be expanded to include place names, their characteristics, value and location.

C4. Cultural Resource surveys would be conducted per federal and Tribal regulations and standards.

C5. Federal and Tribal codes, regulations, and standards would be used as minimums for managing cultural resources

C6. Habitats that have the potential to support or that historically supported culturally significant plants and animals would be enhanced or restored.

C7. Sustainable harvest levels would be determined for culturally significant species.

C8. The locations and acres that produce culturally significant foods and medicines would be increased.
C9. The purity of foods and medicines for spiritual integrity would be ensured.
C10. The integrity of spiritual sites including views and geographical locations with place name would be ensured.
C11. The Natural Resources Department would survey the locations and abundance of culturally significant plants.
C12. The Natural Resource Department would provide a guide to the ecology of culturally significant plants.
C13. Management practices would be developed that maintain or promote the abundance of culturally significant plants.
C14. The Natural Resource Department would create and manage a herbarium that includes cultural plants.
C15. The cultural practices associated with the collection, preparation, and use of cultural plants would be documented.
C16. The Natural Resource Department would employ cultural resources protection technicians
C17. A Tribal history and culture component would be included in employee orientation and ongoing cultural sensitivity training.
C18. Divergent expectations regarding treaty rights uses and federal trust obligations would be minimized to foster understanding and greater trust by the use of cultural information transfer programs.
C19. Individuals from the traditional cultural groups would be included in resource management planning and the scoping of field trips for cultural information transfer programs.
C20. The role and authority of the cultural resources board, elders, and ad hoc advisory groups would be defined in Tribal Code.
C21. Tribal codes, agreements, plans of operations, etc. that interfere with the spirit or practice of native American traditions by individual members or that interfere with the exercise of Indian rights protected by federal laws, treaties, executive orders, etc. would be revised.

Management Direction Options Alternatives 3-6

None

Fish Resources

Management Goal

The surface waters of the Reservation have an abundance of anadromous and non-anadromous salmonids (trout, whitefish, steelhead and in the past, salmon) and those other species the Tribes desire. The fisheries on and around the Reservation reproduce successfully and provide sustenance, cultural and recreational value for the Tribal Members from a landscape with balanced water and nutrient cycles.

Management Objectives

1. Genetic diversity and local adaptation within and among all stocks will be maintained or increased to sustain long-term productivity and fitness.
2. Maintain or increase the quantity and quality of habitat necessary to sustain and restore fish populations.
3. Maintain, enhance or restore stream, lake and reservoir habitats that are conducive to salmonid passage, rearing, adult residency and spawning.
4. Enhance all anadromous fisheries where the potential currently exists.

5. Promote Tribal cultural and sustenance fisheries through natural reproduction and hatchery supplementation.
6. Conserve remaining native aquatic species strongholds and high quality habitat and water.
7. Implement management practices that regulate the numbers of fish harvested by the Tribal Membership and the general public.

Management Directions

D1. The management, fishing activities and use of fish both on and off Reservation would be in accordance with the requirements of Colville Tribal Code Chapter 4-1 (Fish, Wildlife and Recreation).

D2. Hatchery or other enhancement programs would avoid significant negative impacts to wild salmonids and other indigenous/native species while promoting/enhancing consumptive fisheries.

D3. The quantity and distribution of non-indigenous fish species or stocks that compete with, prey on, or parasitize salmonids and other indigenous species would be managed.

D4. Desired and managed species of fish would be defined for the various water bodies on and surrounding the Reservation.

D5. Provide and maintain passage to all usable salmonid habitat for all life stages.

D6. Reduce or prevent salmonid entry into artificial channels or conduits.

D7. Continue or improve fishery harvest opportunities by identifying surplus production through the use of various predictive models or other biologically sound techniques.

D8. Continue associated harvest assessment, such as population surveys, creel census, regulation development, and coordination with enforcement personnel.

D9. Continue fish run rebuilding efforts through mitigation via the Mid-Columbia Coordinating Committee.

D10. Continue development of individual tributary fishery management plans.

D11. Continue to develop anadromous fish production programs and facilities as needed, which includes review of current mitigation production facilities to assess their contribution to Tribal fisheries.

D12. Enhance fisheries habitat through coordinated, cooperative Columbia River Basin wide planning processes, including implementation of the sub-basin plans.

D13. Improve research and monitoring of anadromous fish, including data gaps identified in the sub-basin plans.

D14. Participate in Columbia River basin activities and committees in the Columbia Basin Fish and Wildlife Authority.

D15. Develop and implement specific management plans that restore adequate temperature, flows and habitat necessary for aquatic resources in the Okanogan River system.

D16. Use programs of stable, cost effective artificial production to provide significant fishery benefits while having minimal adverse impacts on the long-term productivity of naturally spawning fish and their ecosystems.

D17. Protect, rehabilitate and reestablish naturally spawning populations using integrated principles of genetic conservation, ecology, and hatchery production and fish management.

D18. Plan and implement watershed restoration activities to conserve fish strongholds and habitats occupied by species of concern or federally listed threatened, endangered, and candidate species.

D19. An annual Fisheries Operation Plan including expected revenues and harvest numbers of fish would be produced.

D20. A catch rate would be provided of one fish/hour (catch per unit effort – CPUE) or greater in catchable sizes. This would provide an average annual harvest of approximately 50,400 fish, 48% rainbow trout, 44% eastern brook trout and 8% Lahontan cutthroat trout.

- Rainbow trout would average 342.9-mm (13.5 inches) fork length with condition factor (K) values greater than 152*10-7.
- Eastern brook trout would average 304.8-mm (12 inches) fork length with condition factor (K) values greater than 152*10-7.
- Lahontan trout would average 508-mm (20 inches) fork length with condition factor (K) values greater than 152*10-7.

D21. The natural production of salmonid where feasible would be increased where consistent with native species conservation.

D22. About 22,679 kg (50,000 lbs.) of resident populations of fish would be annually produced including 160,000 fingerling rainbow trout, 330,000 sub-catchable rainbow trout, 80,000 legal size rainbow trout, 196,000 fingerling eastern brook trout, 330,000 sub-catchable eastern brook trout, and 100,000 Lahontan cutthroat trout.

D23. Hatchery production would be consistent with harvest standards and guidelines.

- Approximately 130,000 rainbow trout eggs would be obtained from Reservation brood sources by the year 2000.
- Approximately 850,000 eastern brook trout eggs would be obtained annually from Owhi Lake.
- Approximately 200,000 eastern brook trout eggs would be obtained annually from Omak Lake.
- Fish would be reared using culture techniques that result in only slightly abraded fins (<25%)
- Fish would be reared using culture techniques that prevent the manifestation of disease.

D24. The adfluvial rainbow trout in North and South Nanamkin Creeks and spring spawning rainbow trout in Round and Twin Lakes would be monitored and enumerated for assessment as potential Reservation Brood sources for rainbow trout.

D25. A pre-release fish index would be developed and utilized.

D26. The experimental thermal unit otolith-marking program would continue.

D27. Otolith recovery efforts would be initiated in Twin Lakes and Owhi Lake fisheries using an existing creel census program to assess the contribution of fingerling and sub-catchable brook trout to the Reservation fishery program.

Management Direction Options Alternatives 3-6

None

Forest Vegetation

Management Goal

Provide suitable habitat conditions for desirable native and non-native species (flora and fauna) to maintain biodiversity that includes the diversity of genes, species and ecosystems, as well as the evolutionary process that link them. Managed landscapes will more closely resemble those created by the activities of historic disturbances agents such as fire (natural and aboriginal ignitions), wind, insects, disease and animals.

Management Objectives

1. Restore ecosystem processes by managing vegetation structure, stand density, species composition, patch size, patterns, and fuel loading and distribution so ecosystems are resilient to endemic levels of fire, insects and disease.
2. Manage production activities and their levels on available and suitable lands to produce commodities that create or maintain the Desired Range of Future Conditions while sustaining ecosystem processes including disturbance intensities and frequencies.
3. Restore fire as a natural process by developing and implementing prescribed fire plans on a landscape scale.

4. Rehabilitate wildfire disturbed areas to restore native species, maintain productivity and prevent accelerated soil loss.

Management Directions

E1. Timber harvest operations would be implemented that produces 63.5 MMBF annually (includes 44MMBF for Colville Indian Precision Pine) (Alternative 2).

E2. Large areas of Wilderness management emphasis, and non-harvestable lands (129,532 acres) with areas of aesthetic appeal, wildlife and cultural concerns would be managed with no timber harvesting permitted.

E3. Land use categories (i.e. timber production, wildlife, water, fisheries, range, agriculture and recreation) may vary by management emphasis area or administrative boundary.

E4. Removal of forestlands from the suitable timber base does not exclude forest vegetation management for other resource benefits.

Allowable timber sale quantity management requirements

E5. All lands with a potential timber productivity of less than twenty (20) cubic feet per acre per year would be removed from the suitable timber base used to calculate allowable timber sale quantity.

E6. All lands that cannot be successfully regenerated within ten years after harvest would be removed from the suitable timber base used to calculate allowable timber sale quantity, but may still be treated to meet other resource objectives.

E7. If any area is reserved from harvest for any reason and the basis for the reason is not temporary in nature, the area would be removed from the suitable timber base used to calculate allowable timber sale quantity, but may still be treated to meet other resource objectives.

Ponderosa Pine and Douglas-fir PAG Management:

E8. In PP and DF PAGs, dominance of PP and WL in mature and old single-layer forests and mature older multilayer forest would be increased. DF will be decreased in all structural stages, except where historically maintained by the dominant fire regime.

E9. Late-seral multi-layered-forested ecosystems would be converted to single-layered ecosystems or multi-layered late-seral structural conditions consistent with existing biophysical environments and disturbance regimes.

E10. Thinning, harvesting and/or prescribed fire would be used on existing mid-seral forest structural stage stands to promote development of late-seral single-layer ponderosa pine stands.

E11. Several stages would be represented in a management unit by the distribution of patch sizes as shown in Table 1 (CCT, 1998a).

E12. Seral stages in a management unit would be represented by the distribution shown in Tables 2-6 (CCT 1998a).

E13. Low intensity prescribed fires over pre-determined acreage would be used every 25 to 50 years, or at an interval considered appropriated for local conditions to reduce fuel accumulations and understory tree densities.

E14. Stand canopy layers would be minimized and stocking density reduced through thinning, harvesting and/or prescribed fire in Douglas-fir mid-seral structural stage stands to reduce susceptibility to dwarf mistletoe and western spruce budworm.

Grand Fir PAG Management:

E15. In the Grand fir (GF) PAG, the dominance of early successional, shade intolerant species would be increased and the presence of late-successional, shade-tolerant species would be decreased where mixed severity fire regimes are characteristic of the management unit.

E16. Thinning, harvesting, and/or prescribed fire in PP, WL and LP stands would be used to maintain stand densities that mimic those following stand-replacing fire under desired future fire regimes. These species would be maintained as the dominant overstory consistent with the biophysical environment present.

E17. Non-surface disturbing activities would be emphasized during stand treatments to minimize the spread and incidence of root rot.

E18. Ladder fuels would be removed and stand densities reduced to a level at which fire cannot spread in tree canopies dominated by PP, DF and/or WL.

E19. Seral stages for the GF PAG would be represented by the distribution of patch size guidelines shown in Table 7 and by the distribution shown in Table 8 (CCT 1998a).

Subalpine fir PAG Management

E20. Thinning, harvesting and/or prescribed fire would be used to reduce stocking in Engelmann spruce and subalpine fir stands to allow regeneration of early successional lodgepole pine and aspen.

E21. Removing competitive vegetation would restore aspen seral stages.

E22. Wildfire will be allowed when conditions permit to remove shade-tolerant species and restore forest structure in higher elevation lands where there is a low economic value or ecological risk, e.g. Moses Mountain and Grizzly Natural Area.

E23. Seral stages for SAF PAGs would be represented by the distribution of patch size guidelines shown in Table 9 and by the distribution shown in Table 10 and 11 (CCT 1998a).

Lodgepole Pine Management Emphasis Area (not defined as a PAG):

E24. In the lodgepole pine management emphasis area, dominance of lodgepole pine would be maintained. Seral stages shall be represented by the distribution shown in Table 12. (IRMP Phase II, 1998a).

E25. Thinning, harvesting and/or prescribed fire would be used to maintain LP desired stand densities to reduce susceptibility to mountain pine beetle epidemics.

All PAG Management:

Composition and Structure

E26. Ecosystem Analysis would be conducted at the landscape plan level to resolve potential conflicts between the preservation of terrestrial and aquatic species and habitats and the restoration of stand structure.

E27. Vegetation management would be used to restore late-seral structure and early seral species composition and to reduce area in mid-seral structure, where these plant community characteristics are outside the Desired Range of Future Conditions.

E28. Patch size of stand treatments would be matched to local predicted disturbance regimes.

E29. A variety of conditions, seral stages and distribution of large trees would be provided across the landscape.

E30. A characteristic representation of all size classes of down woody material (CCT 1997, IRMP Phase II, WLG 1.1) would be maintained through time on all actively managed forest sites. Standing dead trees would be left as a future large woody debris source.

E31. Stand treatment entries over time would be minimized to reduce stand disturbance effects.

Reforestation

E32. All forestlands harvested within the Reservation by regeneration harvest methods would be reforested.

Forest Protection

E33. All forestlands on the Colville Indian Reservation would be protected in accordance with the requirements in Colville Tribal Code Chapter 4-12.

Shorelines

E34. All forest practices on the Colville Indian Reservation shoreline lands would be in accordance with the requirements of Colville Tribal Code Chapter 4-15-31.

Prescribed Fire:

E35. Specific directions would be provided by management objectives (See fire management section below).
E36. Fire behavior, fuel loading, duff composition and tree mortality models would be used to determine where desired stand conditions could be attained with prescribed fire.
E37. More than one natural and/or prescribed fire event may be used to achieve a desired stand condition.

Insects and Disease:

E38. Stand stocking densities would be controlled by thinning, harvesting and/or prescribed fire to prevent insect epidemics.
E39. Soil compaction and disturbance would be minimized during stand treatments to maintain stand vigor.
E40. Prescribed broadcast fire and stocking control thinning would be used in stands that have been severely infected by dwarf mistletoe.
E41. Creating stand species composition changes and minimizing treatment entries would be used to reduce stand susceptibility to annosus root disease.
E42. Using harvest treatments that do not favor the regeneration of shade-tolerant species would reduce the susceptibility of stands to laminated root rot.
E43. Using harvest and thinning treatments that favor the regeneration of tolerant species in infected areas would reduce the susceptibility of stands to Armillaria root disease.

Post-fire Harvest:

E44. Unharvested areas would be left in each of the community types present during wildfire salvage activities.
E45. Standing hollow or otherwise large damaged trees would be retained when they don't pose a safety hazard.

<u>Wilderness and Natural Areas</u>:

Silviculture

E46. No silviculture treatments would be prescribed in wilderness or natural areas.

Harvest Procedures

E47. Logging Systems: None
E48. Road Systems: No new road construction; existing minimal access is maintained.
E49. Site Preparation – None

Fire Management – Prescribed Fire

E50. Only natural ignition, or those planned ignitions necessary to prevent catastrophic loss of the wilderness resources.
E51. Any prescribed fire activity will be designated to minimize degradation to aesthetics and wilderness values of the management emphasis area.
E52. An annual fire management plan would be developed and specific direction from fire management and natural resources would be requested and included in this plan.

Fire Management - Suppression

E53. Extensive directions in Interim Forest Management Plan (page 58, CCT 1991)

Insect and Disease Management

E54. Management activities only allowed if there is a confirmed epidemic that may cause catastrophic loss of timber outside of the emphasis area and only with the express approval of the Tribal Business Council.

Forest Development

E55. No development would be prescribed in wilderness or natural areas.

Area Management

E56. Light-hands on the land tactics for confine, contain and control strategies for both natural and management ignition would be used in the Moses Mountain Wilderness Area. There would be no temporary roads, no use of motor vehicles or motorized equipment off established roads, no landing of aircraft, no other form of mechanical transport, and no new structures or installation except as necessary to meet minimum requirements for the administration of the area, including measures required in emergencies. (Tribal Resolution 1992-289)

E57. A prescribed Natural Fire Burn Plan would be developed for the Moses Mountain Wilderness Area.

E58. A Management Ignition Burn Plan would be developed for the Moses Mountain Wilderness Area.

E59. Light-hands on the land tactics for confine, contain and control strategies for both natural and management ignition would be used in the Grizzly Mountain Wilderness Area (Resolution 1992-289). The Director, in coordination with the agency's Forestry organization, Fire Control Section and Interdisciplinary Team, shall prescribe such measures as may be necessary to prevent catastrophic losses of the wilderness resource from insects, diseases or fire and to prevent such agents from causing unacceptable losses to adjacent lands outside of the wilderness boundary (Tribal Resolution 1988-186)

E60. A prescribed Natural Fire Burn Plan would be developed for the Grizzly Mountain Wilderness Area.

Wildfire rehabilitation:

E61. Wildfire disturbed areas would be rehabilitated and/or revegetated with ecologically appropriate species adapted to the fire regime's site characteristics and would move the site towards the desired future condition.

E62. Native species would be used in re-vegetation seedlings, except where little chance of success is predicted for establishing native species and introduced species must be used to protect the resource.

<u>Wildlife Management Sensitive Areas</u> (i.e., Hellgate and Omak Refuges)

Silviculture

E63. Relatively small regeneration units would be preferred, where site preparation and engineering limitations allow. Clearcut units would not be allowed.

E64. Improvement cuts may be acceptable when sufficient amount of cover is maintained.

E65. Western larch would not to be favored for natural or artificial regeneration.

Harvest – Logging Systems

E66. Cable and ground-based systems would be acceptable.

E67. Permanent and high volume traffic roads would not be located in high wildlife travel areas.

E68. Secondary roads would be designed to facilitate eventual closure.

E69. Road construction would be avoided in topographic "saddles."

E70. All right-of-way slash would be disposed of quickly.

E71. Moist areas would be avoided in road construction.

E72. Roads in heads of drainages, wet meadows, "loop" roads, roads in known calving areas would be closed to all traffic as soon as feasible.

Harvest - Site Preparation

E73. Pile or broadcast burning would be recommended.

E74. Slash cleanup would be scheduled outside the heavy use time periods in winter range.

E75. All slash would be reduced on regeneration harvests units to a depth not to exceed 1.5 feet.

Fire Management - Prescribed Fire

E76. A burn prescription would be developed

E77. Tribal Fish and Wildlife concerns would be addressed in the planning process for all prescribed fire operations.

Fire Management - Suppression

E78. Light-hand-on-the-land tactics would be utilized as much as feasible.

E79. An annual Fire Management plan would be developed and specific directions from the Fish and Wildlife Department would be requested and included in the plan.

Insects and Disease

E80. Management limited to that which is necessary to prevent catastrophic loss of the resource.

Forest Development

E81. Limiting of pre-commercial thinning to consent of Tribal Fish and Wildlife Department.

<u>Streamside Management Emphasis Area (SMEA)</u>

Silviculture

E82. Forest management treatments would be excluded from the streamside management emphasis area unless specifically approved on a case-by-case basis. In most cases the specifically approved activities would be restricted to sanitation/salvage operations that could be easily accomplished without detrimental disturbances to the management emphasis area and meet other riparian management requirements.

Harvest – Sanitation and Salvage Only

E83. Logging Systems – Cable is primarily preferred.

E84. Road Systems – Strict adherence to Colville Forest Practices Water Quality Act (Tribal Code 4-7) and other riparian management requirements (Tribal Code 4-15).

E85. Site Preparation – None

Fire Management -Prescribed Fire

E86. Prescribed fire would only be used within the SMEA when necessary to prevent loss of target resources.

Fire Management - Suppression

E87. Light-hand-on-the-land tactics would be required within the SMEA.

E88. An annual Fire Management Plan would be developed

E89. The use of heavy equipment would be limited within the SMEA to that necessary to control wildfire and provide protection to the resource.

E90. Handlines would be utilized whenever possible.

E91. A rehabilitation plan would be required when heavy equipment is used within the SMEA.

E92. All wildfires would be controlled or suppressed.

E93. A minimum amount of vegetative cover would be removed in suppression activities.

Insects and Disease

E94. Sanitation and salvage harvest would only be used when the integrity of the SMEA is not compromised and meets other riparian management requirements.

Forest Development

E95. Pre-commercial thinning would be approved.

<u>Cultural and Archeological Sites</u>

Silviculture

E96. An extended rotation may be used.

E97. Regeneration harvest methods would be designed to protect or enhance cultural food sources.

Harvest

E98. Ground-based logging on slopes less than 35 percent and aerial on steeper slopes.

E99. Some roads may need to be closed to logging traffic during peak gathering times.

Fire Management – Prescribed Fire

E100. Fuels management and habitat manipulation plans would be developed as needed to perpetuate the target resource.

E101. Cultural resource concerns would be addressed in the planning process for all prescribed fire operations.

Fire Management - Suppression

E102. Light-hand-on-the-land tactics would be utilized as much as possible.

E103. An annual Fire Management Plan would be developed and specific direction from the Cultural Resources Manager would be requested and included in the plan.

Other Considerations

E104. Directional felling techniques would be undertaken to fall trees away from any archeological sites.

E105. All heavy machinery would be kept at least 200 feet away from any possible archeological site.

E106. Herbicidal site preparation treatments and pesticide treatments would be prohibited.

E107. Brush would be controlled to prevent the site from becoming overgrown.

Designated Road Buffer Areas

Silviculture

E108. Sanitation and salvage harvest may be used where approved.

E109. Stocking control would be used to maintain the health of selected large trees.

Harvest

E110. Logging Systems – Ground-based or cable.

E111. Road systems – Protection of aesthetic values would be paramount.

E112. Site Preparation – Hand piling or lop and scatter would be preferred.

Fire Management - Prescribed Fire

E113. Fuels management and habitat manipulation plans would be developed as needed to perpetuate the target resource.

E114. All logging slash excess to the long-term needs of the site would be disposed of within minimum site distance.

E115. Hand piling would be required in visually sensitive areas.

E116. All prescribed fire activities within this management emphasis area would be directed at the enhancement of aesthetic values.

Fire Management - Suppression

E117. Light-hand-on-the-land tactics would be utilized as much as possible.

Insects and Disease

E118. The removal of hazard trees would be used to prevent catastrophic loss.

Forest Development

E119. Thinning would be used to prevent resource loss and maintain large trees as long as possible.

Recreation Management Emphasis Area

Silviculture

E120. Hazard trees would be removed.

Harvest

E121. Logging Systems: Ground-based only.

E122. Road Systems: Maintain as needed for recreational access.

E123. Site Preparation – None.

Fire Management - Prescribed Fire

E124. Hazardous fuel reduction burns would be allowed within the Recreation Management Emphasis Area with the approval of the Parks and Recreation Department.

Fire Management - Suppression

E125. An annual Fire Management Plan would be developed and specific direction from the Park and Recreation Departments would be requested and included in this plan.

Insects and Disease

E126. The removal of hazard trees would be used to prevent catastrophic loss.

Forest Development

E127. Thinning would be used to prevent resource loss and maintain large trees as long as possible.

Timber Management Emphasis Area

Silviculture

E128. All silvicultural treatments with the exception of clearcutting would be used.

Harvest

E129. Logging Systems: Cable and ground-based where appropriate.

E130. Road Systems: Road systems would be planned for future entry and consideration of impacts on water quality.

E131. Site Preparation: All treatments may be used where necessary to establish conifer and hardwood tree regeneration.

Fire Management - Prescribed Fire

E132. The complete range of prescribed fire treatments would be available.

E133. Prescribed fire treatments planned as part of a timber sale proposal would pass through the IR team process for review.

Fire Management - Suppression

E134. Light-hand-on-the-land tactics would be required within the Recreation Management Emphasis Area.

E135. An annual Fire Management Plan would be developed and specific direction from the Forest Management Branch would be requested and included in this plan.

Insects and Disease

E136. Potential outbreaks would be reduced by use of stand treatments.

Forest Development

E137. All options would be available.

Hydrological Management Emphasis Area

Silviculture

E138. Rotation ages would be extended where feasible.

E139. Treatments with high watershed impacts would be deferred.

Harvest

E140. Logging Systems: Cable systems would be preferred.

E141. Road Systems: Road construction disturbance would be minimized.

E142. Site Preparation: All options would be available.

Fire Management - Prescribed Fire

E143. All prescribed fire within this management emphasis area would be compatible with the protection of the watershed.

E144. Hydrological concerns would be addressed in the planning process for all prescribed fire operations within the hydrologic management emphasis area.

E145. Handlines would be utilized whenever possible.

E146. A rehabilitation plan would be required when heavy equipment is used within the hydrologic management emphasis area.

Fire Management - Suppression

E147. All wildfires would be suppressed.

E148. Light-hand-on-the land tactics would be required within this management emphasis area.

E149. An annual Fire Management Plan would be developed and specific direction from the Forest Management Branch would be requested and included in this plan.

Insects and Disease

E150. All options where approved.

Forest Development

E151. All options where approved.

Management Direction Options

E152. The proposed management alternatives evaluate the Colville Business Council directive to increase economic benefits of timber harvest from an annual cut of 65 MMBF per year to 30,000 acres treated per year and 75 MMBF per year of timber harvest (Resolution 1997-743).

E153. Provide a minimum of 44 MMBF annually to fulfill the obligation to Colville Indian Precision Pine for the duration of said obligation.

Ponderosa Pine and Douglas-fir PAG Management:

E152. In PP and DF PAGs, stand canopy layers would be minimized and stocking density reduced through thinning, harvesting and/or prescribed fire in Douglas-fir mid-seral structural stage stands to reduce susceptibility to dwarf mistletoe and western spruce budworm.

All PAG Management

Composition and Structure:

E153. Large blocks of existing late-seral structural stands would be maintained in a representative pattern that occurred with historical disturbance events.

E154. Prescribed fire and/or range management practices would be used to control undesired tree species and enhance desired native species in wet and dry meadows.

Post-fire, Post Harvest:

E155. The mechanical piling of slash for burning would not be used.

Land Revenue

Management Goal

The landscape will be managed to produce short-term income and long-term net income stability. A level of revenue or output will be adopted for the various forms of income including food, fiber, wood, recreation, wildlife and water. Income from these sources include either direct sale by the Tribes or indirectly through User Fees, e.g. lease of land or grazing allotments.

Management Objectives

1. Provide revenue or commodities to the tribes in accordance with directives from the Colville Business Council. Emphasis in timber revenue would be on current cash flow.
2. Operational Plans would be formulated such that timber harvest and other silvicultural vegetation management is carried out efficiently creating or maintaining the Desired Range of Future Conditions while maintaining ecosystem processes including disturbance intensities and frequencies.
3. A standard silviculture terminology glossary would be prepared for use with Operational Plans and silvicultural prescriptions.
4. Reduce life and property loss due to wildfire and decrease future wildfire suppression costs by actively managing fuels and fire hazards.
5. Provide special forest product revenue or commodities to the Tribes in accordance with directives from the Colville Business Council. Emphasis in special products will be on harvest levels by the membership.
6. Provide wildlife revenue or commodities to the Tribes in accordance with directives from the Colville Business Council. Emphasis in wildlife revenue will be on current cash flow while emphasis on wildlife commodities will be on number of harvested animals.
7. Provide a level of wildlife commodities for harvest for those species approved by directives from the Colville Business Council.
8. Provide a level of fish commodities for harvest for those fish species approved in accordance with directives from the Colville Business Council.
9. Maintain a hatchery program(s) to supplement fish populations on the Reservation.
10. Provide range revenue or commodities to the Tribes in accordance with directives from the Colville Business Council. Emphasis would be on current cash flow of revenue generated from livestock grazing fees.

11. Minimize large annual shifts in commercial activity that causes rapid changes in demand for labor (gain or loss) and capital, including the offering of livestock forage.
12. Formulate operational plans such that grazing and other vegetation management practices are carried out efficiently to create or maintain the desired range of future conditions while at the same time maintaining ecosystem processes, including disturbance intensities and frequencies.
13. Provide recreation revenue or commodities to the Tribes in accordance with directives from the Colville Business Council. Emphasis would be on current cash flow of revenue generated from tourism.
14. Minimize large annual shifts in commercial activities that cause rapid changes in demand of labor (gain or loss) and capital, including the offering of developed recreation site and business concessions.

Management Directions

Timber

- F1. A minimum of 44 MMBF of timber would be provided annually to fulfill the obligation to Colville Indian Precision Pine for the duration of said obligation.
- F2. Timber harvest operations would be implemented that produces approximately 63.5 MMBF annually under proposed Alternative 2 (includes 44MMBF for Colville Indian Precision Pine).
- F3. Post-harvest activities and timber stand improvement activities with administrative fees would be funded at 10 percent of revenue adjusted for harvest cost.
- F4. Large annual shifts in commercial activities that cause rapid changes in demand of labor (gain or loss) and capital, including the offering of timber and forage would be minimized.
- F5. A minimum of five Forest Operational Plans per year with silvicultural forest vegetation treatment activities for the current entry totaling a minimum of 20,000 acres would be produced annually. (See Table 2.1, CCT 1998a).
- F6. Single or combination of watershed management units would be used to delineate boundaries for forestry operational planning.
- F7. Operational Planning area reentry schedules would be 15 years for timber harvest and variable reentry schedules for other forest management activities.
- F8. Fuels would be reduced to a low hazard rating on areas that currently have or will have a hazard rating of high or extreme on ten-acre or larger units following vegetation management and areas which have a moderate rating on 60-acre or larger units as defined by the Colville Reservation Fuels Management Plan rating system.

Fire Management - Suppression

- F9. Protection of life and property would be a high priority within or adjacent to urban interface areas.

Special Forest Products

- F10. Tribal members would only be allowed to harvest special forest products on trust and fee lands
- F11. A special forest product harvest program would be established to define allowable harvest levels, issue permits and collect revenues.
- *F12.* Silvicultural treatments may be modified to support the growing conditions of species that comprise special forest products.

Wildlife

- F13. Wildlife harvest permits and tags would be sold to nonmembers at sufficient cost to generate a desired minimum of $10,000 annual gross revenue.
- F14. An annual Operational Plan for generating wildlife revenue including hunting and trapping with regulation would be produced annually.
- F15. A Tribal Member Guide Regulation Program would be established and fees collected from guides to pay for the cost of the program.

F16. An annual Operational Plan for generating annual wildlife harvest numbers would be prepared.

Range and Livestock

F17. Approximately $177,000 adjusted for inflation would be provided annually as income to the Tribe by issuing grazing permits and collecting fees.

F18. A minimum of 68,600 AUMs would be provided annually on the Reservation.

F19. The current AUM payment rate for Tribal Members would be increased to more accurately reflect changes in land management practices for other resources such as watershed protection.

F20. A minimum of four Operational Grazing Plans (CCT, 1997) would be produced annually with grazing practices that effect vegetation for livestock forage totaling a minimum of 60,000 acres. Recommended targets are shown in Table 13.1 (CCT 1997).

F21. Operational Planning areas would be delineated according to current grazing permit areas, but as existing leases expires, they may be modified to more closely match reservation IRMP planning areas.

F22. Range management Best Management Practices (BMPs) would be evaluated annually on Operation Planning areas.

Recreation

F23. An annual Operational Recreation Plan with permit regulations as well as expected revenue for both Tribal administered facilities and concessionaires would be produced.

F24. A minimum of $15,000 adjusted for inflation would be provided as income to the Tribe by the issuing of permits for the use of developed recreation sites.

F25. The capacity of developed recreation sites and opportunities for outdoor recreation would be expanded on the Reservation.

F26. A business concessionaire program for Tribal Members would be established for the Reservation that would establish numbers of concessions, types of concessions, location covered by individual concessions and receipts to be collected from the concessionaires.

F27. Operational Recreation Planning areas would be delineated and current developed recreation sites and future developed recreation sites would be evaluated annually.

F28. Operational Recreation Planning area BMPs would be evaluated annually.

Management Direction Options Alternatives 3-6

F29. Timber harvest operations would be implemented that produce 54.6 MMBF annually (includes 44MMBF for Colville Indian Precision Pine). (Alternative 3)

F30. Timber harvest operations would be implemented that produce 50.1 MMBF annually (includes 44MMBF for Colville Indian Precision Pine). (Alternative 4)

F31. Timber harvest operations would be implemented that produce 94.8 MMBF annually (includes 44MMBF for Colville Indian Precision Pine). (Alternative 5)

F32. Timber harvest operations would be implemented that produce 73.7 MMBF annually (includes 44MMBF for Colville Indian Precision Pine). (Alternative 6).

F33. A minimum of three Operational Grazing Plans (CCT, 1998a) would be produced annually with grazing practices that effect vegetation for livestock forage totaling a minimum of 45,000 acres. Recommended targets are shown in Table 13.1 (CCT 1998a)

Non-land Revenue

Management Goal

The Natural Resources Department will seek outside income through interaction with other Government entities (Federal, State and Local) or private enterprises only when it facilitates obtaining the resource goals of the Colville Reservation.

Management Objectives

1. Obtain revenues/services or commodities for the Natural Resources Department in accordance with directives from the Colville Business Council.
2. Obtain revenues/services or commodities for the Natural Resources Department in accordance with directives from the Colville Business Council that would assist in identifying, locating, preserving and protecting the cultural (archaeological, traditional, historical and contemporary) resources of the Confederated Tribes of the Colville Indian Reservation and usual and accustomed places.
3. Obtain revenues/services or commodities for the Natural Resources Department in accordance with directives from the Colville Business Council which would assist in restoring ecosystem processes on the Reservation by managing forest vegetation structure, stand density, species composition, patch size, pattern, and fuel loading and distribution so these ecosystems are resilient to endemic levels of fire, insects and disease.
4. Obtain revenues/services or commodities for the Natural Resources Department in accordance with directives from the Colville Business Council which would assist in maintaining viable populations of native and desired non-native species of wildlife/fish and their supporting habitats on the Colville Indian Reservation and usual and accustomed places.
5. Obtain revenues/services or commodities for the Natural Resources Department in accordance with directives from the Colville Business Council which would assist in restoring ecosystem processes on the Reservation by managing range vegetation structure, density, species composition, patch size, pattern, and fuel loading and distribution so these ecosystems are resilient to de-vegetation, soil loss and declining site productivity.
6. Enter into negotiations with the Federal Government to resolve what Trust Responsibilities are regarding natural resource management for both lands within the current Reservation and usual and accustom areas.

Management Directions

Business Council Directives

G1. The primary emphasis in obtaining funding would be that which can be utilized to identify threshold impact levels for various activities such as water withdrawal, grazing, timber harvesting, developed recreation sites, etc.

G2. The formulation and administration of federal ANA (Administration for Native Americans) requirements pertaining to water and air quality standards would be implemented that currently produces $95,197 in annual revenues for the Reservation Environmental Trust Program.

G3. The formulation and administration of federal NEPA requirements pertaining to water and air quality standards would be implemented that currently produces $73,120 in annual revenues for the Reservation Environmental Trust Program.

G4. Pursuant to a negotiated resolution of Trust Responsibilities of the Federal Government, funding for the implementation of said Trust Responsibilities would be obtained which produces approximately $362,300 for the Environmental Trust Fund.

G5. Federal EPA funding would be requested for environmental education programs designed to enlighten the public on environmental issues, promote public support and involvement in soil and water resource protection and restoration on the Reservation.

G6. Additional funding and technical assistance and new agreements with other land management agencies would be pursued to develop soil and water protection and improvement (mitigation) programs on the Reservation.

History and Archeology Program

G7. Pursuant to a negotiated resolution of Trust Responsibilities of the Federal Government, funding for the implementation of said Trust Responsibilities would be obtained which produces approximately $180,000 for the Reservation's History and Archeology Program.

G8. The formulation and administration of federal BPA (Bonneville Power Administration) requirements pertaining to cultural and archeological standards would be implemented that currently produces $60,000 in annual revenues for the History and Archeology Program.

G9. The formulation and administration of State of Washington requirements pertaining to cultural and archeological standards would be implemented that currently produces $71,224 in annual revenues for the History and Archeology Program.

G10. The formulation and administration of federal ACE requirements pertaining to cultural and archeological standards would be implemented that currently produces $22,725 in annual revenues for the History and Archeology Program.

Forestry and Fire Management Program

G11. Pursuant to a negotiated resolution of Trust Responsibilities of the Federal Government, funding for the implementation of said Trust Responsibilities would be obtained which produces approximately $3,862,300 and $1,099,759 for the Reservation's forestry and fire management programs, respectively.

G12. Timber stand improvement backlog acreage would continue to be funded by forest development add-on monies.

G13. Funds for post-harvest activities and timber stand improvement would continue to be requested through allowable ASCS cost share funding.

Fish and Wildlife Program

G14. The formulation and administration of federal BPA requirements pertaining to wildlife and fisheries standards would be implemented that currently produces $2,224,652 in annual revenues for the Fish and Wildlife Program.

G15. The formulation and administration of Corp of Engineers/Douglas County PUD requirements pertaining to wildlife and fisheries standards would be implemented that currently produces $211,346 in annual revenues for the Fish and Wildlife Program.

Range Management Program

G16. Pursuant to a negotiated resolution of Trust Responsibilities of the Federal Government, funding for the implementation of said Trust Responsibilities would be obtained which produces approximately $342,000 and $251,000 for the Reservation's range management and land operations programs, respectively.

Watershed Management Programs

G17. An estimated $2,102,000 in cost share and technical assistance to be made available by the NRCS over the next ten years (until year 2008) would be used for watershed improvements and management practices in the Omak Creek Watershed as described in the Omak Creek Watershed Plan and Environmental Assessment.

G18. Watershed improvements and management practices would be implemented in accordance with the 1998 Okanogan and Methow Riparian Improvement Project and the Omak Creek Watershed Plan. ($80,000 was made available for the project from the Washington DNR through a Jobs for the Environment Grant)

G19. An estimated $950,000 is cost share funding projected to made available by the USDA through the Environmental Quality Incentive Program would be utilized over the next five years to improve watershed function on the Reservation in the Owhi and "Frosty Meadows" watersheds.

G20. Funding for cooperative financial and technical assistance efforts would be pursued with federal, state, county and private agencies.

Management Direction Options Alternatives 3-6

None

Natural Resources Department

Management Goal

Establish an organization that is capable of embracing the resource goals of the Colville Reservation. The NRD in understanding the complexities of interpreting the Tribes Holistic Resource Goal into resource goals would formulate operational objectives (strategies) and action steps (tactics) at the various levels within the organization. The NRD will have the expertise in personnel management and supervision to follow-through on implementation of operational goals, action steps, and budgeting at the various levels of the organization.

Management Objectives

1. The Natural Resource Department (NRD) Director and NRD Program Managers would be accountable to ensure the Integrated Resource Management Plan (IRMP) is implemented.
2. Ensure that the IRMP management direction for the 14 resource goals is implemented using multi-scaled, hierarchical (in time and space) methods as appropriate.
3. Ensure that both a Reservation wide and an operational level of planning are implemented for all resource management activities.
4. Meet the resource goals based on management principles and techniques established by Tribal and/or state and federal codes, regulations, contracts, MOUs/MOAs and plans.
5. Develop internal structure within resource programs for executing the four components of adaptive management: testing, monitoring, evaluation and incorporation of new knowledge into management approaches based on scientific findings and needs of society.
6. Design a specific integrated monitoring and evaluation plan.

Management Directions

H1. NRD program managers and their subordinate managers would ensure that:
- Objectives and standards are continually developed, monitored and updated as needed.
- Implementation of the IRMP is consistent.
- Employees are fully trained, rewarded for their performance and disciplined for performance non-compliance

H2. An NRD implementation memorandum of understanding will be developed with the Colville Business Council that provides for the following internal management direction.
- Timely program collaboration.
- A streamlined consultation process.
- Program monitoring and adaptive management.
- Executive oversight.
- Conflict resolution.

H3. The NRD Director along with the Program Manager would set the scope of or determine the need for interdisciplinary input in the development of Reservation–wide and operational plans.

H4. NRD Program Managers would have opportunity to provide both positive and negative input into decisions that affect the management of NRD.

H5. Each Program Manager and supervisor would receive a minimum of 16 hours management training annually.

H6. Adaptive management techniques would be utilized to reevaluate the priority of the 14 resource goals every five years or more often at the direction of the Colville Business Council.

H7. Each of the 14 resource goals (desired future conditions) would be reviewed annually for compliance towards meeting these goals.

H8. Management directions as defined in the Record of Decision for this IRMP EIS will be used in designing and implementing future management actions.

H9. The Reservation-wide level of planning would include strategic planning based upon the objectives defined in the Record of Decision for this IRMP EIS.

H10. The operational level of planning would include tactical planning based upon the objectives defined in the Record of Decision for this IRMP EIS.

H11. NRD would develop and implement a plan to index and store Tribal and federal codes, regulations, contracts, MOUs/MOAs, permits, plans, and other important documentation as needed where the documents are easily accessible for review (with confidentiality preserved, as needed) by project staff, the Tribal membership and other departments and programs.

H12. The four steps of adaptive management would be applied annually to the objectives and management directives defined by the Record of Decision of this IRMP EIS.

H13. The four steps of adaptive management would be applied on an operation plan basis to best and special management practices (BMPs), restorative measures, and other on the ground management practices.

H14. Effective communications and coordination with staff of other Tribal and BIA programs, and with the Tribal membership and land users of the Reservation will be established on all aspects of the adaptive management process.

H15. Specific reasons for monitoring, information to monitor, items to monitor and scale or appropriate level of monitoring would be established on all NRD projects.

H16. NRD will develop and maintain a common glossary of resource management terms to facilitate effective communications and data collection.

Management Direction Options Alternatives 3-6

None

Public Involvement

Management Goal

Assure the Tribal Member's values are clearly stated and reflected in the management of their resources. The planning process empowers the Tribal Members and their communities by "Listening with Respect" to them. This process is a living part of our management activities.

Management Objectives

1. Ensure that the Tribal Members' culture values and traditions are involved in every phase of resource management (planning - implementation – monitoring).
2. Provide effective and frequent opportunities for public involvement and participation in natural resources management planning and decision-making.

Management Directions

I1. The Natural Resources Department would continue developing a Tribal Member-driven integrated resource management process that serves the needs and desires of Tribal communities - culturally, environmentally, and economically.

I2. The Natural Resources Department would be respectful, sincere, helpful and responsible to the needs and desires of the Tribal Members/Communities.

I3. The Natural Resources Department would focus their planning and management on the desires and needs of the Tribal communities.

I4. The Natural Resources Department staff would treat one another and every living thing like "All My Relations" with honor and respect.
I5. The Natural Resources Department integrated resources management process involves and informs anyone who wants to participate.

Management Direction Option Alternatives 3-6

None

Range Resource

Management Goal

Create a mosaic of desirable rangeland plant communities with diverse forbs, grasses and shrubs that optimize ecosystem processes (photosynthesis, hydrologic cycle, nutrient cycle, etc.). Desired plant communities will be influenced by watershed, wildlife and Tribal Members' needs.

Management Objectives

1. Use a system for describing rangeland vegetation that adequately describes composition, structure and processes of the site.
2. Maintain ecosystem health, community structure and species composition in areas where rangeland is currently at or near their identified optimum plant association condition.
3. Improve or maintain the ecosystem health of rangeland that is currently in fair condition by emphasizing an improvement in plant characteristics, such as species composition and community structure.
4. Improve or maintain the ecosystem health of rangeland that is currently in poor condition.

Management Directions

J1. A minimum of 30,500 AUMs would be provided annually on the Reservation.
J2. A minimum of four Operational Grazing Plans would be produced annually with grazing practices that effect vegetation for livestock forage totaling a minimum of 60,000 acres. Recommended targets are shown in Table 13.1 in IRMP Phase II (CCT 1998a).
J3. Operational Planning areas would be delineated according to current grazing permit areas, but as existing leases expire, they may be modified to more closely match Reservation IRMP planning areas
J4. Range management Best Management Practices (BMPs) would be evaluated annually on Operation Planning areas.
J5. The "State and Transition Model" would be used for classifying condition of rangeland vegetation and for determining appropriate range management activities for project planning (CCT1998a).
J6. The habitat elements of native plant and animals, including threatened, endangered, special status, and culturally important species, would be maintained.
J7. Management activities would be designed to prevent an increase in noxious weed populations and distribution.
J8. Prescribed fire would be used on approximately 2,000 acres per year and natural fire on approximately 1,000 acres per year to maintain and restore desired plant communities.
J9. Prescribed fire would be used to manage woody species in order to meet natural resource objectives.
J10. Prescribed fire would be conducted during the early spring to avoid injuring desirable and cultural plants.

J11. Rangeland treatments that alter the vegetative composition of a site, like prescribed fire, seeding or plantings, must be based on the potential of the site and should contribute to the functioning of the hydrologic cycle, mineral cycle and the processes of succession and photosynthesis on that site.
J12. Rangeland treatments would promote the health and vigor of native perennial vegetation and/or desired exotic perennial vegetation.
J13. Rangeland treatments would support the conservation of threatened, endangered, special status and culturally important species.
J14. The following areas would be seeded with the appropriate mix of grass species following disturbance activity: logging roads, roadsides, landings, skid trails, firelines (prescribed and wildfire) and intensely burned areas.
J15. The cover requirements for wildlife would be considered when designing vegetation manipulation projects.
J16. The effects of range vegetation management strategies would be considered on habitat patch size and fragmentation.
J17. A high priority conversion of exotic monoculture to native plant communities would be considered for a range of species including sage grouse.
J18. Vegetation manipulation projects would cover an extensive area so that livestock and wildlife would not concentrate in the treatment areas.
J19. Rangeland treatments would be followed up with management that extends the life of the treatment and addresses the cause of the original need.
J20. Seeding of disturbed areas would be in the fall, late winter or early spring.
J21. Seeding of disturbed rangeland should follow Reservation defined criteria shown in guideline RV-G4.17 (CCT 1998a).
J22. The Natural Resources Department will develop and implement an Integrated Unwanted Vegetation Management Plan.

Management Direction Options Alternatives 3-6

J23. Prescribed fire would be used on 3,000 to 45,000 acres annually to maintain and restore desired plant communities.

Recreation Resource

Management Goal

Provide diverse year-round recreational opportunities for all age groups and ability levels with an emphasis on Tribal Member utilization as well as resource protection.

Management Objectives

1. Provide natural/primitive settings in non-roaded areas for Tribal members to enjoy.
2. Provide a broad range of outdoor recreation opportunities and activities for Tribal members and for nonmembers in designated areas.
3. Develop or maintain recreation opportunities that are socially, environmentally and economically sustainable.
4. Develop a Parks and Recreation operational plan.

Management Directions

K1. The management of recreation facilities and activities on the Reservation would be in accordance with the requirements of Colville Tribal Code Chapter 4-1 (Fish, Wildlife and Recreation).

K2. The existing primitive or semi-primitive settings that provide opportunities for solitude and other benefits would be maintained.

K3. Recreational use at traditional camping, hunting, fishing, gathering, spiritual and ceremonial areas on the Reservation would be primarily reserved for Tribal members.

K4. A variety of recreational opportunities would be made available focusing mainly on dispersed recreation with some developed sites within the forested area.

K5. Family oriented recreational opportunities would be provided and/or enhanced.

K6. Where appropriate recreational facilities would be developed in response to user demands.

K7. Natural appearing scenery would be maintained along major travel ways and at developed recreation sites.

K8. Recreation areas open for the general public would be located along existing state and county roads, boundary waters, and adjacent to areas currently utilized as recreation sites.

K9. Tourist development opportunities would be reviewed to ensure that they fit well into the ecosystem and the natural environment is the central attraction.

K10. Recreation development would have minimum impacts on the natural environment.

K11. Tourism development opportunities would be designed to become self-supporting.

K12. Construction management and visitation would be designed to minimize energy usage and encourage people involved with the tourism opportunity to be environmentally sensitive.

K13. The capacity of developed recreation sites and opportunities for outdoor recreation would be expanded on the Reservation.
- Additional cultural facilities and activities would be developed.
- A business concessionaire program would be established for the Reservation that would establish numbers of concessions, types of concessions, location covered by individual concessions and receipts to be collected from the concessionaires.

K14. The following recreational uses are allowed (by permit) in the Omak and Hellgate Game Reserves. Designated recreation areas are allowed through the issuance of a Conditional Use Permit.
- Hiking and bridle trails.
- Day camp areas and picnic grounds.
- Hunting, fishing and trapping by Tribal members only.
- Educational and recreational camps.

Management Direction Options Alternatives 3-6

K15. A Recreation Opportunity Spectrum (ROS) map of the Reservation would be prepared to guide future development and management.

Soil Resource

Management Goal

The soil resource sustains the quality of other resources. It has high, long-term productivity and stability. Soil porosity and nutrient content is high and soil compaction, displacement and erosion is minimal.

Management Objectives

1. Restore and maintain adequate nutrient content, soil moisture, erosion control, and decomposition processes through vegetation management to provide for natural site productivity levels over the long term.
2. Conduct management activities and land uses that minimize and mitigate disturbance such as detrimental compaction, displacement, erosion, puddling, and severe burning of the mineral surface soil.
3. Restore and maintain soil and soil processes in riparian areas to ensure high water quality.
4. Develop soil productivity protection and restoration activities as part of ecosystem management planning.
5. Develop information exchange programs to facilitate and promote soil resource management.

Management Directions

L1. Soil quality standards S-QS-1, S-QS-2 and S-QS –3 (CCT 1998a) would be met with all harvest and other resource management activities.

L2. Adequate ground cover (plants, litter, coarse debris) would be provided to reduce evaporative losses and conserve moisture for plant growth.

L3. Adequate canopy cover and ground cover would be provided to protect the mineral soil from the weather and slow surface runoff.

L4. Biomass recruitment would be provided over time to maintain favorable soil chemical, biological and physical characteristics.

L5. Levels of vegetation composition, density, size class and distribution would be provided in both standing and downed biomass comparable to that with which soils evolved over recent geologic time.

- Biomass distribution recommendations for varying vegetation types and geoclimatic environments would be developed to provide nutrient supplies that are sustainable spatially and temporally.
- Future studies would measure present soil fertility by management intensities and establish nutrient requirements for each of the resources.

L6. Methods would be used in timber harvesting, grazing and other activities that maintain long-term soil productivity, hydrologic function and stability over a high percentage of the landscape. Detrimental impacts of soil properties shall be limited in extent and concentrated in designated areas.

- The frequency of timber harvest treatment entries in any one stand would be minimized.
- The season, treatment type, harvest method, activity level, and site preparation technique would be considered in maintaining forest site conditions that promote soil hydrologic function and stability. Land use decisions would be based on site characteristics.
- The season, timing, frequency, duration and intensity of grazing use in maintaining soil and plant conditions that promote or restore soil infiltration rates and permeability would be considered in decisions related to range vegetation management.
- Impacted soils from forestry, grazing, recreation and other practices would be identified and mitigated to a predetermined level and extent to enhance watershed functions as quickly as possible after the disturbance activity.
- Ground disturbance effects would be mitigated as needed to minimize adverse impacts from activities where BMPs do not perform as expected due to improper prescription design or implementation.
- Severely compacted areas would be restored where feasible through ripping or other means during the next project entry to improve landscape productivity and soil hydrologic function.

L7. Meet all soil quality standards applicable to riparian areas.

- Detailed soil inventories and mapping would be performed in riparian and floodplain areas that are inaccurately defined by the reservation-wide soil survey.

L8. The presence of potential impacts to floodplain and riparian soils would be identified in project level environmental analyses and documents.
  - The type of activity in stream corridors and riparian areas would be restricted and the allowable activities would be limited to designated areas, seasons, duration and/or intensity levels to minimize adverse soil impacts.

L9. Floodplain and riparian wetland areas would be managed to protect or restore natural infiltration rates.
  - Priority protection would be given to riparian areas along streams and reaches characterized by unstable, sensitive soils or a sensitive vegetation community.

L10. Soil quality standards would be modified or developed as necessary on a reservation-wide or site-specific basis to protect or restore riparian soils and to achieve riparian management objectives.

L11. Watershed analysis tools would be used to determine potential areas requiring special attention and management and to assist in determining appropriate protection and restoration measure.

L12. BMPs and site-specific recommendations would be identified, selected, scheduled and executed on all watershed projects so as to meet soil quality standards. Monitoring and site evaluations would determine the adequacy of the practices used.
  - BMPs would be adopted or designed for soil types and sensitivity classes and groups that were determined in the Reservation Soil Resource Inventory.
  - Management practices that may be used on sensitive soils would be developed for the Reservation.
  - GIS maps and databases would be developed and verified to identify soil problem sensitive areas including those areas susceptible to mass wasting that require special soil and vegetation management practices.

L13. Soil rehabilitation measures would be developed to implement in the event of soil disturbing activities such as fire suppression or wildfire.
  - Fire rehabilitation plans would be based on fire intensity and size of burned area, focusing on soil erosion issues.

L14. Management activities in each WMU that are adversely affecting the soil resource would be evaluated so as to develop and recommend alternative mitigation practices.

L15. Soil technical assistance would be requested from the Natural Resources Conservation Service and other land management agencies to support soil protection and mitigation programs on the Reservation.

L16. The Reservation's soil inventory manuscript and database would be updated and reviewed on a reoccurring interval of five years with the NRCS.

L17. The threshold level of detrimental soil compaction is defined as any bulk density increase of 15 percent or more, and this increase may only occur on less than 20 percent of the activity area.

L18. On all harvest units on sustained slopes greater than 35 percent aerial methods of harvest yarding would be utilized. On ground to be harvested by ground-based skidders, designated skid trails meeting watershed management direction would be flagged and their use would be required during yarding.

L19.

Management Direction Options Alternative 3-6

None

Water Resource

Management Goals

1. Water - Water quality is high and water quantity, distribution and timing of runoff are sufficient to meet existing and desired future needs.
2. Watersheds - Landscape hydrologic performance and processes sustain the water, soil and other resources. Wetland, riparian, and other aquatic ecosystems exist as functioning systems. Soil and vegetation conditions favorably influence runoff processes and the disposition of water within a watershed (on a landscape).

Management Objectives

1. Manage for water of high quality that meets resource and human needs on the Reservation.
2. Manage for streamflow conditions and runoff timing that support the needs of dependent sources.
3. Manage flows and water quality for instream and related stream corridor values by balancing instream needs with out-of-stream demands.
4. Manage Reservation lakes for balanced nutrient cycles and adequate water quality to support cultural values, recreational use and desired fish species.
5. Manage for safe, high quality groundwater supplies and water table elevations to meet needs of dependent resources.
6. Develop and conduct water management activities as part of ecosystem planning.
7. Develop and conduct restoration activities for waters with degraded condition and function as part of ecosystem management planning.
8. Enhance water quality and quantity to support aquatic resources, human health and cultural values in the Reservation boundary waters for existing and future uses.
9. Protect Tribal water rights on and off the Reservation.
10. Manage water conveyance and removal activities, leases, permits, rights-of-way and easements in a manner consistent with aquatic resource objectives.
11. Manage agriculture and forest chemicals in a manner that minimizes harmful effects on aquatic resources and human health
12. Manage solid waste and wastewater in a manner that prevents ground and surface water contamination.

Management Directions

Agriculture

M1. All shoreline agriculture land uses are subject to regulations defined in Tribal Code 4-8-8 and 4-15-19. Agriculture refers to all methods of livestock, tree fruit, crop, vegetation and soil management. These methods include but are not necessarily limited to the related activities of tilling, fertilizer application, soil preparation and maintenance, harvesting, animal husbandry practices, the control of weeds, plant diseases and insect pests.

Aquaculture

M2. All Aquaculture activities would be in conformance with Tribal Code 4-15-30.

Aquatic Habitat

M3. All shoreline uses and activities that would affect threatened and endangered fish species habitat are subject to regulations defined in Tribal Code 4-15-14.

Best Management Practices

M4. Soil and water best management practices (BMPs) would be used to mitigate the effects of resource management activities on the water resource. Applicable BMPs to the Colville Indian Reservation are provided in Tribal Code Chapter 4-7-60 and Colville Tribal Fish and Wildlife Department Riparian Management Guidelines (June 1, 1992).

M6. New regulations for Indian agriculture and range lands recently (1998) published for review in the Federal Register when approved would be used to provide BMPs for non-point source (NPS) pollution from dryland, irrigated cropping systems, noncommercial operations, and grazing not regulated by Tribal statue or BMPs.

M7. BMPs would be identified, selected, scheduled and executed along with site-specific recommendations for projects to protect and maintain desired water quality.

M8. Special management practices would be designed and used on a site-specific basis where it is determined that standard BMPs would not protect and maintain the water resource.

Boundary Waters On and Off Reservation

M9. Assistance would be provided to off-Reservation collaborators by the Natural Resources Department for designing an ambient (baseline) monitoring program to measure water resource conditions and trends in the boundary waters.

M10. Assistance would be provided to off-Reservation collaborators by the Natural Resources Department for improving communications and comprehensive management strategies for the Columbia and Okanogan River systems.

M11. The NRD would lead efforts to collaborate with the Washington Department of Ecology (DOE) to develop Total Maximum Daily Loads (TMDLs) under Section 303(d) of the Clean Water Act for streams in and downstream of the Colville Reservation.

Domestic Water Supply

M12. In accordance with the Source Water Assessment and Protection (SWAP) amendment to the Clean Water Act, the NRD will complete the following items by the year 2003.

- Delineate all sources of public drinking water supplies (watersheds for surface waters sources and wellhead protection areas for ground water sources).
- Inventory all potential sources of contamination within these source water areas that may impact drinking water quality.
- Conduct an analysis to assess the relative susceptibility (vulnerability) of the drinking water supply to contamination.
- Provide uses of the drinking water supply, all information on the source of and threats to their drinking water supply.

Floodplains

M13. All shoreline stabilization and flood protection would be in compliance with Tribal Code 4-15-27.

M14. A Reservation-wide stream mapping and conditions survey would be performed that includes delineation of 100-year floodplains on Type I and II streams.

M15. Projects causing short-term impacts on floodplain values would only be allowed if specific mitigation measures designed to minimize the impacts are documented in the project environmental analysis.

M16. The timing, variability and duration of floodplain inundation and water table elevation in meadows and wetlands would be maintained or restored.

Forest and Agriculture Chemicals

M17. A Tribal Code would be developed for the handling, storage and application of fertilizers, pesticides and agricultural/forest chemicals on the Reservation. FIFRA and other federal rules also apply.

M18. Untested herbicides that are not registered would not be used on the Reservation.

M19. The application of chemicals would be restricted and closely monitored in wellhead protection and groundwater recharge areas.

M20. Specific BMPs would be designed to eliminate the direct entry of pesticides to waters, while minimizing off-target drift.

M21. The storage of fuels and other toxicants would be prohibited within wellhead protection management emphasis areas.

Groundwater

M22. Groundwater withdrawal activities would be managed and regulated with threshold levels and with respect to instream values and flow requirements (Tribal Code 4-10).

M23. A groundwater quality-monitoring program would be designed focusing on areas with land activities that may adversely impact groundwater suitability for use.

M24. Strategies to address and prevent contamination within wellhead protection management emphasis areas and groundwater recharge areas would be designed.

M25. The extent of water that can be withdrawn from Reservation and regional groundwater systems without adversely affecting down-gradient and downstream rights, including instream resource values, would be determined by year 2003.

M26. A system for regulating consumptive use would be designed such that ground water sources are not depleted to/in excess of threshold impact levels.

Recreation

M27. All shoreline recreation development and maintenance would be in compliance with Tribal Code 4-14-25.

M28. The adverse effects from recreation facilities would be prevented or minimized to ensure attainment of aquatic, terrestrial and riparian objectives.

Regulatory and Enforcement

M29. Enforcement of the forest practice directions will be in accordance with the Tribal Administrative Procedure Act (Tribal Code Chapter 2-4).

M30. A hydraulic project approval must be obtained from the Colville Natural Resources Department prior to constructing any form of hydraulic project or other work that will use, divert, obstruct, or change the natural flow or bed of any river or stream or that will utilize any of the waters of the Reservation or materials from the stream beds. The confederated Tribes of the Colville Reservation have jurisdiction to enforce the Tribal hydraulics project permit system in accordance with Tribal Code Chapter 4-9 and 4-12.

Riparian

M31. The presence of potential impacts to riparian areas and floodplains would be identified in project level environmental analyses and documents.

M32. WMUs would be managed according to soil resource standards (CCT 1998a) for acceptable levels of vegetation density, ground cover, organic debris and soil disturbance.

M33. The minimum Large Woody Debris distribution desired to be achieved in streams in the future where areas are defined by the existing plant association group:

PAG	Pieces of LWD>16"dia. and 20'in length/mile
Non-forest	2-5
Ponderosa Pine	5-10
Warm dry Douglas-fir	5-10
Warm moist Douglas-fir	15-25
Cool dry Douglas-fir	10-15
Cool moist Douglas-fir	30-35
Grand fir	40-45
Warm subalpine fir	40-45
Cold subalpine fir	35-40

M34. Trees would be felled in riparian areas where they pose a safety risk, but the tree would be left on site to meet LWD objectives.
M35. Logs would be end-lined out of streamside areas when harvest is allowed within RMZs.
M36. No piling and/or burning of slash would be permitted within 100 feet of active intermittent or perennial stream channel margins.
M37. Debris from silvicultural activities would be removed from streams in an agreed upon manner that would cause the least disturbance. Under some conditions the material would be left in stream.
M38. Silviculture and range management prescriptions would allow for adequate levels of large organic debris and future recruitment.
M39. No ground skidding equipment would be permitted within 50 feet of active intermittent stream channel margins and 100 feet of perennial stream margins.
M40. A minimum 70 percent shade potential (crown closure or topography) would be maintained when possible adjacent to stream channels.
M41. Mining permits would be suspended if the operation does not meet watershed or riparian objectives.
M42. Sand, gravel and other mining within riparian management emphasis areas would be permitted only if no practicable alternative exists, if the action(s) will not retard or prevent attainment of objectives, and if adverse effects to aquatic species can be avoided.
M43. Riparian management emphasis areas would be provided along all perennial and intermittent streams, lakes, wetlands, and other water bodies.
M44. Riparian management emphasis areas for stream channels would meet the minimum width requirements of Tribal Code and would be further delineated on the following criteria:
  a. Flood prone areas including the 100-year floodplain.
  b. Areas of active channel migration.
  c. Extent of riparian and potential riparian vegetation
  d. Soil type.
  e. Adjacent sideslope sensitivity.
  f. Extent of vegetation that has the potential to provide shade and LWD to channels.
M45. Riparian management emphasis areas for lakes and wetlands would be delineated on the following criteria:
  a. Area inundated by normal high water.
  b. Areas usually influenced by a high water table and saturated soils consistent with mean annual precipitation regimes.
  c. Extent of riparian vegetation.
  d. Soil type.
  e. Adjacent sideslope sensitivity.
M46. No ground-based tractor operation harvest would be permitted in the riparian management emphasis area in either perennial or intermittent streams (an existing channel must be identified that supports streamflow more than 21 days annually). Cable line pull would be permitted where applicable. The riparian management emphasis area would be designated as one mature tree height (approximately 100 feet) and canopy closure would be maintained greater than 70 percent on perennial streams and 40 percent on intermittent channels. Riparian leave trees would not be considered to provide necessary canopy closure if identified as highly susceptible to blow-down after harvest.

Roads and Structures

M47. The construction and maintenance of all transportation facilities including roads and highways, bridges and causeways, bikeways, trails, railroad facilities, airports and other related facilities, uses and activities are subject to regulations defined in Tribal Code 4-15-29.

M48. The reduction of road related effects on watershed and aquatic resources would be given a high priority for watershed restoration actions. Total road density would be reduced to less than 4-miles/square mile. Desired open road density would be reduced to less than 1.5 miles/square mile wherever feasible across the Reservation

M49. New road construction would be designed to prevent or minimize adverse effects on aquatic/riparian and terrestrial species and their habitats.

M50. Roads and landings would be located outside of riparian management emphasis areas (at least 150 feet) except if all other practicable alternatives have been eliminated in project level analysis.

M51. Road planning criteria would be developed for the following:
  a. Road design criteria, elements, and standards that govern construction and reconstruction.
  b. Road management objectives for each road.
  c. Criteria that govern road operation, maintenance, and management.
  d. Requirements for pre-, during and post-storm inspections and maintenance.
  e. Mitigation plan for road failures.

M51. New and improved existing culverts, bridges and other stream crossings would be designed to accommodate a 100-year flood, including associated bedload and debris where those structures pose a substantial risk to riparian conditions and downstream values.

M52. Roads not needed for future management activities would be closed, stabilized or obliterated.

M53. The location, operation and maintenance of rock quarries, gravel pits, borrow pits and spoil disposal areas not covered by the Surface Mine Reclamation Act of 1971 (USDI 1971) would be in accordance with direction provided under Tribal Code 4-6.

Shoreline Management

M54. A substantial development permit in accordance with the Shoreline Use and Development Chapter of the Colville Tribal Code must be obtained prior to conducting forest practices or any other developments that are "substantial developments" within the "shoreline" area within the exterior boundaries of the Colville Indian Reservation. Areas subject to regulation include all Type 1, 2, 3, and 4 waters of the Reservation and shall include lakes and reservoirs and the shorelines associated with such lakes, reservoirs, floodplains, wetlands and the underlying lands associated with such floodplains and wetlands.

M55. All shoreline areas of the Reservation are designated on the criteria contained in the Confederated Tribes of the Colville Reservation Shoreline Management Plan (Chapter 4-15, Appendix B).

M56. Activities that require the clearing, grading and filling of shoreline areas and alteration of natural drainage features within shoreline jurisdiction will be in accordance with Tribal Code 4-15-13.

M57. All shoreline uses and activities that take place within environmentally sensitive shoreline areas (including geological hazard areas) are subject to Tribal Code 4-15-14.

M58. All forest practices on the Reservation would comply with the Tribal Shoreline Management Code 4-15-31.

M59. The condition of structures on lakes and reservoirs would be examined to evaluate whether each meets the integrated needs of resources when in fully functional or operational condition.

Surface Waters

M60. All surface waters on the Reservation including streams, lakes and ponds will be classified as Type 1, 2, 3 or 4 in accordance with the requirements of Tribal Code Chapter 4-8-7 and 4-8-8. Management of the Reservation's surface waters would meet the requirements of the Tribal Code by stream type.

M61. Instream minimum flow requirements would be established for streams on the Reservation.

M62. Surface water withdrawal activities would be managed and regulated within threshold levels and with respect to instream values and flow requirements.

M63. Stressed lake and reservoir systems would be identified, assessed and prioritized for corrective action and restoration on a five-year reoccurring basis.

M64. Issuance of additional water conveyance permits would be prohibited in watersheds that support fish spawning/rearing habitat until instream flows are documented and shown to be adequate to accommodate both the needs of aquatic and riparian dependent species and the amount of water being conveyed.

M65. Ecosystem analysis would be completed with interdepartmental review prior to issuing water conveyance permits.

M66. All water conveyance intakes would meet established standards, or conveyance permits would be revoked.

M67. Leases, permits, rights-of-way and easements would be issued and adjusted such that adverse effects on aquatic resources are prevented or minimized.

Surface Water Quality

M68. The quality of Reservation waters will be protected from the adverse effects of mining activities and forest practices by requirements provided in Tribal Code Chapter 4-6.

M69. Tribal Code Chapter 4-8 establishes the Tribal Water Quality Standards for the surface waters and ground waters located within the exterior boundaries of the Colville Indian Reservation. General Water uses and Criteria Classes for Reservation water quality standards are shown in Tribal Code Chapter 4-8-6. Procedures for enforcement are shown in Tribal Code Chapter 4-8-10.

M70. Water quality standards for water classes on the Reservation would be reviewed every three years and revised as necessary based on results of ambient (baseline) monitoring.

M71. Management parameters would be set and planned activities conducted in an integrated manner within threshold impact levels identified for various activities with regard to water quality.

M72. Desired sediment maximums would not exceed the following RMU standards in stream channels (If these desired maximums are consistently exceeded, the NRD would evaluate possible remedial programs for sediment reduction):

RMU	% fines<0.6mm
Buffalo, Hellgate, Kartar,	35
L. Nespelem, SW Plateau	35
Lost, Nespelem R., Ninemile	30
Omak, L. San Poil R., Wilmont	30
Hall, U. San Poil R., West Fork	25
San Poil Rd., Twin Lakes	25

Water Rights

M73. Surface and ground water development activities would be assessed on and off the Reservation that are or have potential for infringing upon Tribal water rights and degrading aquatic resources or values through direct, adverse impacts on water quantity and quality.

M74. The Tribes would work with the State and others to protect federally established (reserved) water rights and to regulate those activities that potentially have direct or indirect adverse effects on Tribal water rights.

M75. Future water use permitting or the issuing of water rights in off-Reservation and boundary water areas where Tribal waters and water-supported values are being adversely impacted would be eliminated following NRD review where mitigation for the impacts cannot be resolved.

M76. Policies would be developed by the NRD to maximize Tribal and individual Indian water rights and to extend Tribal jurisdiction and control to all on-Reservation water uses.

Watershed Management

M77. The Reservation is divided into 15 Resource Management Units that contain 209 Watershed Management Units (discrete hydrologic units). RMUs area approximately 40,000 to more than 150,000 acres while WMUs are less than 1,000 to about 25,000 acres in size. RMUs and WMUs are the basic management units on the Reservation.

M78. A cumulative impact analysis system would be developed and utilized to determine activity threshold levels for each WMU.

M79. WMUs that have exceeded their activity threshold levels would be identified and mitigation measures designed to lower cumulative activity impacts to below threshold levels within a predetermined time frame.

Watershed Vegetation

M80. Watersheds would be reforested following harvest activities according to approved silvicultural prescriptions prepared before harvest in accordance with Tribal Code 4-7.

M81. All shoreline vegetation management uses and activities are subject to regulations defined in Tribal Code 4-15-15.

M82. Silvicultural treatments and instream mitigation efforts would be conducted in targeted watersheds to elevate (restore) seasonal low flows and improve water quality and aquatic habitats.

M83. Levels of canopy cover would be managed in each WMU to meet desired future conditions.

M84. Periods of low or no timber harvest would be planned in forested watersheds that are hydrological immature or sensitive due to previous silvicultural treatments or wildfire.

Waste Management

M85. Shorelines would not be used for any sanitary landfill operations or the disposal of solid waste in accordance with Tribal Code Chapter 4-15-28.

M86. On-site wastewater treatment and disposal systems would be developed and maintained in accordance with Tribal Code Chapter 4-5.

Wetlands

M87. All wetlands on the Reservation including streams, lakes and ponds will be classified and managed as (1) non-forested wetlands (Type A or Type B) or (2) forested wetlands.

M88. All shoreline uses and activities that take place in or near a wetland are subject to regulations defined in Tribal Code 4-15-14.

M89. The Wetland 4-Tier Rating System described in the Washington State Department of Natural Resources Wetlands Rating System for Eastern Washington would be used for assessing wetlands on the Reservation.

M90. A wetland buffer management emphasis area of 200 feet would be required adjacent to wetland areas identified by the Tribes as having exceptional resource functions and values, unless a greater distance is required by other provisions of the Shoreline Management Program (Tribal Code 4-15).

Management Direction Options Alternatives 3-6

M91. Harvest activities would be delayed for one harvest planning period (15 years) on all "extreme" sensitivity watersheds and delayed one decade (10 years) on all "high sensitivity watersheds."

M92. At minimum, at least 20 percent of the non-arterial road mileage in each of the extreme and high sensitivity watersheds would be closed to vehicle travel. Preference would be given to closing roads that pass through the Streamside Management Emphasis Area.

Wildlife

Management Goal

Maintain viable populations (numbers and distribution of reproductive individuals which ensures their continued existence within the Reservation boundaries and the usual and accustomed areas) of native and desired non-native species of wildlife, and their supporting habitats, while providing wildlife in sufficient numbers to meet the cultural, subsistence and recreational needs of Tribal Members.

Management Objectives

1. Restore and/or maintain habitat conditions at or above a level capable of supporting healthy sustainable/viable and productive populations and communities of diverse plant and animal species to meet spiritual, cultural and subsistence needs of the membership.
2. Contribute to the recovery and management of listed species (Federal or State: Endangered, Threatened, Candidate or Sensitive) populations and/or habitats by restoring or protecting habitat quality, quantity, and effectiveness for listed species.
3. Manage rangelands and range units to maintain or enhance habitat requirements (including breeding, feeding, protection, dispersal, and travel) of species closely associated with or dependent on native rangeland, forested uplands, meadows and riparian areas.
4. Institute wildlife population management practices that maintain sufficient wildlife numbers to meet the cultural, subsistence, recreational and economic needs of Colville Tribal Members.
5. Wild free roaming horses and their habitat shall be managed and controlled in a manner that maintains a wild horse herd on the Reservation.

Management Directions

N1. The management, hunting and use of wildlife both on and off Reservation would be in accordance with the requirements of Colville Tribal Code Chapter 4-1 (Fish, Wildlife and Recreation).

N2. Management activities would reduce fragmentation of wildlife habitat necessary to provide for the life requisites of viable populations of terrestrial species by:
- a. Fostering the restoration of vegetation structure and composition.
- b. Fostering the restoration of linkage management emphasis areas between similar habitats.
- c. Providing habitat patch sizes consistent with the needs of various wildlife species.

N3. Terrestrial species habitat would be restored or maintained so that terrestrial species can move freely within and between blocks of habitat for the purpose of genetic interchange, emigration, and immigration.

N4. Analyses would be conducted and strategies produced to provide for adequate distribution, occurrence, and connectivity of mature/old structure stands. In the absence of these analyses, the following apply:
- a. Large remnant trees would be retained in mature and old, single- and multi-layered stands consistent with the PAG matrix for forest vegetation and desired range of future conditions.
- b. Mature/old stands would be connected within and among watersheds. Connectivity would be in a contiguous network pattern in two or more directions in the forested portions of watersheds.
- c. Mature/old structure stands would be connected by stands in which medium diameter or larger trees are common and canopy closures are at least 50 percent of the historical closure for the PAG. Preferred connectivity stand widths would be at least 400 feet at their narrowest point where topography or vegetative structure permits.

N5. Snags in harvest units would be retained in clumps with their associated understory vegetation intact.

N6. Where appropriate, future snags, now green leave trees, would be identified and retained in areas currently or projected to be deficient in snag numbers.

N7. In areas where additional snags or downed logs are desired, those existing would be protected during prescribed fire activities.

N8. Integrated management strategies addressing the long-term ecological integrity of sites and ecosystems would be developed to provide for associated species viability or conservation.

N9. Forested areas would be managed to provide for a minimum population of 500 pairs of pileated woodpeckers with a minimum habitat patch size per pair of 100 acres. The structural composition of the patch would be related to old forest (trees greater than 180 years, standing dead trees with DBH greater than 20 inches and greater than 40 feet in height; large down wood present) as represented in structural stage 5 (ES5, EM5, MS5, MM5, LS5, LM5) and an additional 50,000 acres in structural stage 3 and 4 designated for stand replacement.

N10. For deer and elk in forested areas, the following forage:cover ratios by elevation would be maintained at the RMU scale.

Elevation	% Forage	% Cover
>4,000 feet	55-60	40-45
2,500 – 4,000 feet	45-55	45-55
<2,500 feet	60-75	25-40

a. Plant Association Groups in the cool and/or moist category would be managed for at the higher cover value.

b. In the above, 50 percent of the cover value can be in hiding cover, 25 percent in thermal cover (trees greater than 40 feet in height and canopy cover of 70 percent or greater, and the remaining 25 percent of cover can be hiding or thermal.

N11. Deer and elk forage areas would not be wider than 1,200 feet between areas of thermal or escape cover with an exception to this requirement in the dryer ponderosa pine PAG.

N12. Open road densities based on a WMU basis would be reduced to 1.5 miles per square mile.

N13. Winter habitat would be provided to support 12,000 to 15,000 deer, 1,500 to 2,000 elk and 50 to 75 moose within the bounds of the reservation.

N14. Habitat would be provided in the Hellgate Reserve capable of supporting 80 to 120 bighorn sheep.

N15. The Hellgate and Omak Lake Ridge Game Reserves would be managed to maximize wildlife habitat and population requirements.

N16. Wildlife management strategies for wildlife mitigation properties associated with Grand Coulee and Chief Joseph dams would be coordinated with and/or integrated with adjacent land management strategies.

N17. Habitat features such as wetlands, bogs, wet meadows, seeps and springs would be protected forest wetland vegetation or wetland association dependent wildlife.

N18. Foraging, nesting and hiding requirements of terrestrial riparian-dependent species would be addressed as a high priority in management decisions related to vegetative treatments.

N19. Woody riparian vegetation consistent with desired fire regimes would be maintained where it is within desired ranges of future conditions, to provide linkage between habitat and higher elevation management emphasis areas.

N20. Human access to bat habitat features such as caves, old mines, and old buildings would be minimized to reduce potential disturbance.

N21. Before possible disturbance activities, the potential habitat value of talus would be evaluated for reptiles and other talus dependent species.

N22. Travel corridors would be designated with widths of at least 400 feet and provide connectivity between larger blocks of habitat.

N23. Land exchange among various Reservation landowners would be used as a method to improve habitat value.

N24. Degraded or declining aspen habitat would be restored.

N25. Raptor nest sites and important roost sites for key species would be protected from habitat disturbance within a radius of 500 feet (750 feet for goshawks). To protect fledgling activities, disturbance activities would be avoided within 0.5 miles during the period March 1 through August 31.

N26. Firewood programs would be managed to be consistent with snag and downed wood guidelines.

N27. Firewood cutting would be restricted to dead standing trees less than 15 inches in diameter at breast height and within 200 feet of a road.

N28. In full recognition of the ecological importance of individuals or groups of species with known viability concerns, Tribal management actions would not result in the extirpation of a species from the Reservation.

N29. The integrity of bald eagle nesting territories and winter roost sites would be maintained and/or enhanced.

- Timber harvesting activities would not occur within 0.25 miles of an active bald eagle nest from February 1 through August 31.
- Timber harvest would not occur within 0.25 miles of an active bald eagle winter roost site.

N30. For State of Washington listed threatened or endangered species, management recommendations would be used as found in "Priority Habitats and Species" or in State approved Habitat Conservation Plans (HCP) unless Tribal or Federal Agencies develop more stringent recommendations.

N31. Large coniferous and deciduous trees (> 75 feet in height) suitable for nesting and perching would be identified by the NRD and protected within 0.5 miles of prominent water bodies such as Twin Lakes and the Columbia and Okanogan Rivers.

N32. No new road construction would occur within 0.25 miles of cliff habitat potentially capable of supporting peregrine falcon nesting activity.

N33. Vegetation management prescriptions meeting the requirements for maintaining lynx habitat would be maintained in the Reservation's lodgepole pine management emphasis area.

- The Kettle Crest Lynx Analysis Unit would be maintained in at least 30 percent lynx forage habitat, 30 percent or greater in travel cover and travel corridor habitat and 10 percent or more in denning cover. The remaining up to 30 percent of the area can be in non-lynx habitat.

N34. Loon nesting and brood rearing habitat on Twin Lakes would be protected from disturbance by watercraft and shoreline development. A No wake zone would be marked with buoys from March 1 through July 15.

N35. Sharp-tailed grouse would be returned to their historic range on the Reservation from the current 119,990 acres of grassland and shrub-steppe habitat west of the San Poil River to include an additional 30,000 acres of grassland and shrub-steppe habitat east of the San Poil River.

- For sharp-tailed grouse in shrub-steppe vegetation zones, 5 to 26 percent of the area in this zone would be maintained with a shrub canopy cover of 30-40 percent (approximately 4,450 to 7,300 plants/acre). Plant communities consisting predominantly of perennial bunchgrasses would be maintained on approximately 70 percent of the area in the shrub-steppe zone. Winter food and cover needs would be met on 10 to 20 percent of the area and consists of riparian, deciduous tree and tall shrub vegetation. Nesting habitat requirements would be maintained within 1.6 miles radius of a lek on a minimum patch size of 400 acres per lek with slopes less than 50 percent, where possible favoring a northeast aspect. Winter habitat requirements would be protected within 3.3-mile radius of a lek.

- Habitat would be provided for an interim population goal of 1,600 to 2,000 sharp-tailed grouse with a long-term population goal of greater than 10,000 birds across the Reservation. The current population is about 350 birds.

N36. Management requirements for protecting wildlife habitat including riparian and wetland dependent species are shown under the management direction section for *Range Vegetation*.

N37. Wildlife populations on the Reservation would be monitored and modification would be considered if they change rapidly.

- When a wildlife population exhibits a marked decline over a three (3) year period, appropriate regulatory methods would be implemented to reverse the downward trend in the population.
- over a three (3) year period and it exceeds population goals and/or habitat capable of supporting them, appropriate regulatory methods would be implemented to bring the population balance within their historic range.

N38. A wild horse management plan for the Reservation would be developed that addresses wild horse territories, population objectives and habitat requirements.

N39. An annual Operational Plan for generating annual wildlife harvest numbers would be prepared.

- Based on February survey data, a deer population of 8,000-15,000 animals would be maintained with an expected annual harvest level of 1,700 animals.
- Based on February survey data, an elk population of 500-2,000 animals would be maintained with an expected annual harvest level of 365 animals.
- Based on February survey data, a moose population of 75 animals would be maintained with an expected annual harvest level of 6 animals.
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Management Direction Options Alternatives 3-6

Threatened, Endangered and Sensitive Species

N40. All reported sightings are to be monitored and evaluated.

N41. All timber management activities are prohibited within 660 feet of all active bald eagle nests.

N42. As other species are sighted and documented, appropriate action will be taken as determined by the individual needs of that particular species.

Species Associated with Dead Trees and Riparian Areas

N43. A minimum of two dead trees will be left, where available, on all timber management activities. Preferably, these would be at least 12 inches in diameter at breast height and a minimum of 40-feet tall.

APPENDIX B – RESERVATION FISH SPECIES

Table B-1. Fish species and ratings of Colville Indian Reservation Streams and Lakes (Source: Hunner and Jones 1997).

STREAMS	SPECIES[1] PRESENT	SPECIES[1] PAST KNOWN	*Resource* MANAG. UNIT	STREAM CLASS RATING[2]
Alice Creek	RT	UK	San Poil South	Class III
Anderson Creek	BK	UK	San Poil North	Class III
Armstrong Creek	BK	BK	Nespelem River	Class III
Barnaby Creek	BK,KO,RT	BK,RT,SS,CH	Hall Creek	Class II
Bear Creek	BK,RT	SS, NT	San Poil North	Class III
Beaver Dam Cr.	BK,RT	BK,RT	Twin Lakes	Class II
Bridge Creek	RT,BK	SS,KO,RT,NT,BK,BT, CH	San Poil North	Class II
Brush Creek	RT (above hwy)	SS	San Poil South	Class III
Buckhorn Creek	UK	UK	Hall Creek	Class III
Cache Creek	BK	UK	San Poil South	Class III
Canteen Creek	CT	UK	Ninemile Creek	Class I
Capoose Creek	BK	BK	San Poil North	Class III
Cobbs Creek	BK	UK	Hall Creek	Class III
Cook Creek	CT,BK	UK	Ninemile Creek	Class I
Copper Creek	RT,BK	RT,BK,SS	San Poil South	Class III
Cornstalk Creek	BK	UK	Twin Lakes	Class III
Cougar Creek	BK	UK	Wilmont	Class I
Coyote Creek	RT?, BK	BK, SS?	Kartar Creek	Class II
Deerhorn Creek	UK	UK	W.F. San Poil	Class IV
Dick Creek	BK (goes dry)	UK	San Poil South	Class III
Dry Creek	UK	UK	Wilmont	Class I
Empire Creek	No fish above hwy	SS,BK	San Poil South	Class III
Faye Creek	BK (goes dry)	UK	Ninemile Creek	Class I
Forty Mile Creek	UK	UK	San Poil North	Class III
Gibson Creek	BK (goes dry)	UK	Ninemile Creek	Class I
Gold Creek	BK,RT	KO,BK,RT,SS, CH	W.F. San Poil	Class II
Granite Creek	RS,BK,RT	BK,RT,RS	Twin Lakes	Class IV
Grizzly Creek	RT	UK	Hall Creek	Class III
Haley Creek	UK	UK	Omak Creek	Class IV
Hall Creek	RT,BK,DC	BK,RT,CT,SS,NT	Hall Creek	Class II
Hall Creek, W. Fk				Class I
Iron Creek	RT,BK	SS,RT,NT,BK	San Poil South	Class III
Jack Creek	BK,RT,SC,LS, RT above hwy	SS,NT,SC	San Poil South	Class III
Jerred Creek	UK (goes dry)	UK	Ninemile Creek	Class I
Joe Moses Creek	BK,RT	UK	Little Nespelem	Class II
John Tom Creek	BK (below RD)	UK	San Poil South	Class III
Jones Creek	BK	UK	Ninemile	Class I
Kartar Creek	BK, UK	Rt,BK,UK	Kartar Creek	Class III
Kincaid Creek	BK	UK	Nespelem River	Class II
King Creek	UK	UK	W.F. San Poil	Class IV
Klondyke Creek	BK,CT,SC	UK	Ninemile Creek	Class I
Lime Creek	No fish above hwy	SS,NT	San Poil South	Class III

STREAMS	SPECIES[1] PRESENT	SPECIES[1] PAST KNOWN	*Resource* MANAG. UNIT	STREAM CLASS RATING[2]
Little Jim Creek	UK	BK,RT	Hall Creek	Class III
Little Nespelem	BK,RT	BK	Little Nespelem	Class II
Louie Creek	BK,RT	SS,NT,BK	San Poil South	Class III
Lynx Creek	BK,RT	UK	Hall Creek	Class II
Manila Creek	RT,SC,LS, RT above falls	SS,NT,BK,RT,SC	San Poil South	Class III
McAllister Creek	No fish (goes dry)	UK	San Poil South	Class III
Meadow Creek	RT,SC,LS (RT above falls)	SS,NT,SC	San Poil South	Class III
Mill Creek	BK,SC,RT	NT,RT,BK,SC	Nespelem River	Class II
Mission Creek	UK	RT,BK	Omak Creek	Class IV
Nespelem River	RT,BK,BT,SC	RT,BK,BT,CT,NT,SC	Nespelem River	Class II
Nez Perce Creek	BK,RT	UK	Wilmont	Class III
Nine Mile Creek	CT,BK,RT,SC	CT,BK,RT,CH	Ninemile Creek	Class II
Nineteen Mile Cr.	BK, RT?	SS,NT,BK,RT,CH	San Poil North	Class III
No Name Creek	BS,RS,LC	BS,RS,LC	Kartar Creek	Class II
No. Nanamkin Cr.	RT,BK	SS,NT,RT,BK	San Poil North	Class III
North Star Creek	BK,SC	NT,BT,BK,RT,SC	Nespelem River	Class III
Olds Creek	BK	UK	Ninemile	Class I
Omak Creek	RT	RT,BK,SS	Omak Creek	Class III
Onion Creek	BK	BK	Hall Creek	Class II
Parmenter Creek	BK	UK	Nespelem River	Class IV
Peel Creek	UK	UK	Nespelem River	Class IV
Peter Dan Creek	UK	BK	Buffalo Lake	Class IV
Rock Creek	UK	UK	Wilmont	Class I
San Poil River	RT,BK,SF,KO,BS, RS,MW,SC,SB,DC ,LS,CM	SS,RT,BK,KO,SF,CT, NT,BS,NW,RS,CH	San Poil North	Class I
San Poil, W. Fk	BK,RT	SS,KO,NT,BK,RT	W.F. San Poil R.	Class III
Seventeen Mile Cr.	BK,RT	SS,NT,RT,BK	San Poil North	Class III
Silver Creek	BK (above RD)	UK	San Poil South	Class III
Sitdown Creek	BK,RT	UK	Hall Creek	Class II
Six Mile Creek	RT, SC below falls	UK	Hellgate	Class IV
So. Nanamkin Cr.	RT,BK	SS,NT,RT,BK	San Poil North	Class III
Spring Creek	BK	BK, CH	Hall Creek	Class III
Stapaloop Creek	BK,RT	BK,BT	Omak Creek	Class III
Stepstone Creek	UK	UK	Nespelem River	Class III
Stranger Creek	BK,RT,RS	NT,KO,BK,RT	Twin Lakes	Class II
Strawberry Creek	RT	UK	W.F. San Poil	Class III
Swimptkin Creek	BK	BK	Omak Creek	Class III
Three Forks Creek	UK	UK	Wilmont	Class I
Three Mile Creek	No fish	UK	Hellgate	Class IV
Thirteen Mile Cr.	RT,BK	SS,NT,RT,BK	San Poil North	Class III
Thirty Mile Cr.	BK,RT	SS,NT,BK,CH	San Poil North	Class III
Trail Creek	BK	UK	Omak Creek	Class III
Twentyfive Mile Cr.	BK	NT,BK	San Poil North	Class III
Twentyone Mile Cr.	BK	NT,BK,CH	San Poil North	Class III
Twentythree Mile Cr.	BK	NT,BK,DC	San Poil North	Class III

STREAMS	SPECIES[1] PRESENT	SPECIES[1] PAST KNOWN	*Resource* MANAG. UNIT	STREAM CLASS RATING[2]
Wannacot Creek	BK	BK	Omak Creek	Class III
Wells Creek	BK,RT	UK	Ninemile Creek	Class I
Whitelaw Creek	BK,SC	UK	Nespelem River	Class IV
Wilmont Creek	RT,BK	RT,BK,NT	Wilmont	Class II

Fish-bearing Lakes	**Species[1] Past known**	**Species[1] Present**	**RMU**	**Trophic Status[3]**
Buffalo Lake	PS,KO,RT,BS,BK, CT	LB,KO,BK,RT,BS,PS	Buffalo Lake	Meso-trophic
Five Lakes	BK,RT	UK	Buffalo Lake	?
McGinnis	BK,RT	UK	Buffalo Lake	Meso-eutrophic
Rebecca	PS,LB	LB,PS	Buffalo Lake	Eutrophic
Camille	RT,CT	UK	Hall Creek	Eutrophic
Elbow	BK,RT	BK,RT,LB,BB	Hall Creek	Meso-trophic
LaFleur	BB,BK,RT	BK,RT,LB,BB	Hall Creek	Eutrophic
Nicholas	RT,RB,CT	RT	Hall Creek	Meso-trophic
Simpson, lower	BK,RT	BK,RS	Hall Creek	Eutrophic
Simpson, upper	BK	UK	Hall Creek	Meso-trophic
Sugar	RT,CT,BK	RT	Hall Creek	Meso-eutrophic
Alkali	UK	None	Kartar Creek	Eutrophic
Big Goose	LB	LB	Kartar Creek	Meso-eutrophic
Grant	BK,RT	UK	Kartar Creek	Meso-eutrophic
Hidden	BK	UK	Kartar Creek	?
Omak	BS,BK,RT,LC,RS, PM,SC	LC,BS,PM,RS,SC	Kartar Creek	Meso-trophic
Rat	UK	UK	Kartar Creek	?
Stinking	UK	UK	Kartar Creek	?
Cox	UK	UK	Little Nespelem	?
Little Owhi	UK	UK	Little Nespelem	?
Owhi	BK	BK	Little Nespelem	Eutrophic
Crawfish	BK,RT,T,KO,RS	RT,BK,RS	Lost Creek	Meso-trophic
Great Western	UK	UK, probably none	Nespelem River	?
Johnson	BK,RT	UK, probably none	Nespelem River	Eutrophic
Summit	RT,BK,BT,CT	BK	Omak Creek	Mesoligo-trophic
Cody	RT,BK	UK	San Poil North	Meso-trophic
French Johns	UK	RT	San Poil South	?
Bedard	RT	UK	SW Plateau	?
Cook	UK	CP	SW Plateau	?
Duley	RT,BK,CP,LB	UK	SW Plateau	Eutrophic

STREAMS	SPECIES[1] PRESENT	SPECIES[1] PAST KNOWN	*Resource* MANAG. UNIT	STREAM CLASS RATING[2]
Little Goose	BK,KO,RT,RS	BK,RT	SW Plateau	Eutrophic
Mirror	BK,RT	UK, probably none	SW Plateau	?
Soap	RT	UK, Probably none	SW Plateau	Meso-eutrophic
Apex	BB,LB	BK	Twin Lakes	Eutrophic
Bourgeau	BB,LB,RT	BK,RT,BB	Twin Lakes	Meso-eutrophic
North Twin	RT,BK,RS,LB,BS, FM	RT,BK,PW,BS,SS,RS,FN, LB,NT,KO,CT	Twin Lakes	Meso-eutrophic
South Twin	RT,BK,LB,RS,BS, FM	RT,BK,PW,BS,SS,RS,FM, LB,NT,KO,CT	Twin Lakes	Meso-eutrophic
Round	BK,RT,RS	CT,CH,BK,RS,RT	Twin Lakes	Eutrophic
Gold	BK,RT,CT,SS,NT, BS	BK,CT	W.F. San Poil	Meso-eutrophic
Fish	BK,RT, CH	BK,LB	Wilmont	Eutrophic

[1]Species: BK - Eastern Brook Trout - Rainbow Trout; BT - Brown Trout; CT - Cutthroat Trout;
KO - Kokanee; LC - Lahontan Cutthroat Trout ; PW - Pygmy Whitefish; LW - Lake Whitefish;
RS - Redside Shiners; DC - Dace; SF - Squawfish; FM - Flathead Minnow: SC - Sculpins;
PM - Peamouth; NT - Native Trout (either bull trout or cutthroat trout); LB - Largemouth Bass;
SB - Smallmouth Bass; PS - Pumpkinseed; BG - Bluegill; YP - Yellow perch; TC - Tench; CP - Carp;
LS - Largescale sucker; BS - Bridgelip sucker; CM - Chiselmouth; BB - Brown Bullhead;
SS - Salmon Steelhead; MW - Mountain Whitefish; UK - Unknown; CH - Chinook (1977)

[2]Stream class ratings from Chapter 4-8, Tribal Code. See Appendix for definitions.

[3] The nutrient and algal criteria for classifying lakes on the basis of lake productivity is listed below. The values range from those of low productivity Lakes (Oligotrophic) to high productivity lakes (Eutrophic) with values in between indicating more or less average productivity lakes (Mesotrophic).

Productivity Criteria	Oligotrophic	Mesotrophic	Eutrophic
Total N micro g/L at spring overturn	<100	100-500	500-1000
Total P, micro g/L at spring overturn	0-2	2-7	>7
Chlorophyll a, micro g/L growing season mean	0-2	2-7	>7
Secchi disc (m), growing season mean	6	3-6	<3
Hypolimnetic oxygen depletion rate mgOxygen/square m/day	<250		>500

APPENDIX C – WATERSHED SENSITIVITY RATINGS

Table C-1. Inherent Watershed Sensitivity, Inherent Watershed Sensitivity and Current Watershed Sensitivity Ratings by Watershed Management Units for the Colville Indian Reservation (Index Data from Hunner and Jones 1997).

RESOURCE MANAG. UNIT	WATERSHED MANAGEMENT UNIT	ID	INHERENT WATERSHED SENSITIVITY RATING			CURRENT INHERENT WATERSHED SENSITIVITY RATING			CURRENT MANAGED WATERSHED SENSITIVITY RATING		
			Index	Rating	Class	Index	Rating	Class	Index	Rating	Class
Buffalo/ Swawilla	Buffalo Creek	11-06	84.7	High	6	249.9	High	6	1000	High	6
	Buffalo Lake	11-03	78.3	Mod High	5	234.9	High	6	470	Low	2
	Seatons Grove	11-07	26.1	Mod. Low	3	67.9	Low	2	1222	Moderate	4
	Coulee Dam	11-09	31	Mod. Low	4	83.7	Mod. Low	4	2678	Mod. High	5
	McGinnis Lake	11-05	98.4	High	6	290.3	Extreme	4	1161	High	6
	Peter Dan creek	11-07	53.6	Mod.	4	152.8	Mod.	4	5501	High	6
	Poker Joe Creek	11-01	10.9	Very Low	1	26.2	Very Low	1	614	Mod. Low	3
	Rebecca Lake	11-02	23.3	Low	2	60.6	Low	2	485	Low	2
	Swawilla Basin	11-09	55.5	Mod.	4	138.8	Mod.	4	3331	Mod. High	5
Hall Creek	Barnaby Creek	1-04	29.8	Mod. Low	3	84.6	Mod. Low	3	4061	High	6
	Cobbs Creek	1-06	13.5	Very Low	1	31.2	Very Low	1	998	Mod. Low	3
	Columbia River 1	1-01	46.6	Mod.	4	116.5	Mod. Low	4	1049	Mod. Low	3
	Columbia River 2	1-02	22.1	Low	2	51.5	Low	2	206	Low	2
	Columbia River 3	1-03	16.9	Very Low	1	39.7	Very Low	1	159	Very Low	1
	Grizzly Creek	1-14	59.2	Mod.	4	143.3	Mod.	4	143	Very Low	1
	John's Mountain Crk.	1-16	146.4	Extreme	4	360.1	Extreme	4	17285	Extreme	7
	Little Jim Creek	1-05	21.7	Low	2	61.6	Low	2	1971	Moderate	4
	Lower Hall Creek	1-07	33.8	Mod. Low	3	91.3	Mod. Low	4	2922	Mod. High	5
	Lower Lynx Creek	1-18	46.8	Mod.	4	135.3	Mod.	4	3247	Mod. High	5
	North Fork Hall Crk.	1-09	55.7	Mod.	4	161	Mod.	4	7728	High	6
	Onion Creek	1-09	54.6	Mod.	4	148	Mod.	4	592	Low	2
	Sitdown Creek	1-15	103.9	Extreme	7	251.4	High	6	12067	Extreme	7
	Sleepy Hollow Creek	1-12	31.7	Mod. Low	3	88.4	Mod. Low	3	1061	Mod. Low	3
	Stall Creek	1-11	54.7	Mod.	4	133.5	Mod.	4	4806	High	6
	Upper Hall Creek	1-13	56	Mod.	4	150.6	Mod.	4	5422	High	6
	Upper Lynx Creek	1-17	138.4	Extreme	7	336.3	Extreme	7	4036	Extreme	7
	West Fork Hall Creek	1-18	40.5	Mod. Low	3	85.1	Mod. Low	3	170	Very Low	1
Hellgate	Brody Creek	5-21	69.2	Mod High	5	193.1	Mod High	5	1738	Moderate	4

RESOURCE MANAG. UNIT	WATERSHED MANAGEMENT UNIT	ID	INHERENT WATERSHED SENSITIVITY RATING			CURRENT INHERENT WATERSHED SENSITIVITY RATING			CURRENT MANAGED WATERSHED SENSITIVITY RATING		
			Index	Rating	Class	Index	Rating	Class	Index	Rating	Class
	Columbia River 10	5-10	29.6	Mod. Low	3	67.8	Mod. Low	3	203	Low	2
	Columbia River 11	5-14	20.2	Low	2	46.7	Low	2	140	Very Low	1
	Columbia River 12	5-12	66	Mod High	5	156.4	Mod.	4	156	Very Low	1
	Columbia River 13	5-13	63	Mod	3	186.5	Mod High	5	1119	Mod. Low	3
	Columbia River 14	5-14	15.5	Very Low	1	35.2	Very Low	1	70	Very Low	1
	Columbia River 15	5-15	72.5	Mod High	5	177.6	Mod High	5	1598	Moderate	4
	Columbia River 16	5-16	46.2	Mod.	2	117.8	Mod. Low	3	707	Mod. Low	3
	Columbia River 17	5-17	31.2	Mod. Low	3	84.9	Mod. Low	3	340	Low	2
	Columbia River 18	5-18	38.5	Mod. Low	3	90.5	Mod. Low	3	181	Very Low	1
	Columbia River 9	5-09	55.2	Mod.	3	130.8	Mod.	4	785	Mod. Low	3
	Cottonwood	5-02	41.6	Mod. Low	3	94.4	Mod. Low	3	1510	Moderate	4
	Hellgate Canyon	5-22	82.8	High	6	240.9	High	6	964	Mod. Low	3
	Johnny-George	5-07	30.4	Mod. Low	3	87.2	Mod. Low	3	698	Mod. Low	3
	Louie Creek #2	5-06	33	Mod. Low	3	91.4	Mod. Low	3	183	Very Low	1
	N. Fork Threemile	5-04	55.4	Mod. High	5	159	High.	6	2862	Mod. High	5
	Rattlesnake Draw	5-06	35.2	Mod. Low	3	96.8	Mod. Low	3	871	Mod. Low	3
	Redford Canyon	5-10	60.5	Mod.	4	161.5	Mod	4	5814	High	6
	Sixmile Creek	5-01	61.1	Mod.	3	169.2	Mod High	5	1015	Mod. Low	3
	S. Fork Threemile	5-05	65.9	Mod High	5	194.4	Mod High	5	4666	High	6
	Threemile Creek	5-03	39.4	Mod. Low	3	78.8	Mod. Low	3	709	Mod. Low	3
	Whitestone Creek	5-20	70.8	Mod High	5	202.5	Mod High	5	203	Low	2
Kartar	Beaverhouse	14-02	48.6	Mod.	4	141.4	Mod.	4	1131	Mod. Low	3
	Columbia River 24	14-24	34.2	Mod. Low	3	81.7	Mod. Low	3	654	Mod. Low	3
	Columbia River 25	14-25	14.8	Very Low	1	36.6	Very Low	1	586	Low	2
	Coyote #1	14-09	20.2	Low	2	58.4	Low	2	2102	Moderate	3
	Goose Flats	14-13	25.2	Low	2	59	Low	2	944	Mod. Low	3
	Harrison Creek	14-08	32.8	Mod. Low	3	90.9	Mod. Low	3	727	Mod. Low	3
	Kartar Creek	14-06	25.3	Low	2	66.8	Low	2	1069	Mod. Low	3
	Lost Creek #2	14-10	14.4	Very Low	1	43.2	Very Low	1	691	Mod. Low	3
	Nason Creek	14-05	24.7	Low	2	70.6	Low	2	1130	Mod. Low	3
	Noname	14-01	77.4	Mod High	5	164.8	Mod	1	162	Very Low	1
	Omak Lake	14-12	54.6	Mod. Low	3	148	Mod. Low	3	592	Low	2

RESOURCE MANAG. UNIT	WATERSHED MANAGEMENT UNIT	ID	INHERENT WATERSHED SENSITIVITY RATING			CURRENT INHERENT WATERSHED SENSITIVITY RATING			CURRENT MANAGED WATERSHED SENSITIVITY RATING		
			Index	Rating	Class	Index	Rating	Class	Index	Rating	Class
	Poison Oak Creek	14-03	43.7	Mod. Low	3	125	Mod.	4	1500	Moderate	4
	Rattlesnake Creek	14-04	27.8	Mod. Low	3	78.1	Mod. Low	4	156	Very Low	3
	Smith-Condon Crk.	14-07	22.9	Low	2	57.9	Low	2	232	Low	2
L. Nespelem River	Joe Moses	10-04	51.1	Mod.	4	152.8	Mod.	4	1834	Moderate	4
	L. L. Nespelem	10-05	31.6	Mod. Low	3	86	Mod. Low	3	3096	Mod. High	5
	Owhi Creek	10-01	54.6	Low	2	148	Low	2	592	Low	2
	Owhi Lake	10-06	23.6	Low	2	70.8	Low	2	1274	Moderate	3
	Poween	10-03	10.3	Very Low	1	29.9	Very Low	1	718	Mod. Low	3
	U. L. Nespelem	10-02	43.2	Low	2	127.4	Low	2	3440	Mod. High	5
Lost Creek	Hayden	12-06	20.8	Low	2	45.8	Low	2	824	Mod. Low	3
	Loony	12-02	26	Low	2	63.2	Low	2	758	Mod. Low	3
	Lower Lost	12-03	20.6	Low	2	55.2	Low	2	662	Mod. Low	3
	Moses Meadow	12-04	49.6	Mod.	4	125.5	Mod.	4	1004	Mod. Low	3
	Sheep	12-01	20.6	Low	2	49.2	Low	2	443	Low	2
	S. Fork Lost	12-05	16.3	Very Low	1	43.7	Very Low	1	1049	Mod. Low	3
	Upper Lost	12-07	29	Mod. Low	3	62.4	Low	2	749	Mod. Low	3
L. San Poil River	Alice	7-06	57.3	Mod.	4	159.9	Mod.	4	320	Low	2
	Brush	7-14	74.1	Mod High	5	211.2	High	6	3802	Mod. High	3
	Cache	7-17	69.4	Mod High	5	203.3	Mod High	5	7319	High	6
	Columbia River 22	7-22	53.1	Mod.	4	106.2	Mod. Low	3	425	Low	2
	Columbia River 23	7-23	77.5	Mod.	4	155	Mod. High	5	620	Mod. Low	3
	Columbia River 19	7-19	46.6	Mod.	4	110	Mod. Low	3	440	Low	2
	Columbia River 20	7-20	33.9	Mod. Low	3	78.3	Mod. Low	4	235	Low	2
	Columbia River 21	7-21	30	Mod. Low	3	64.2	Low	2	193	Very Low	1
	Copper	7-07	94	High	6	259.4	High	6	3113	Mod. High	5
	Cow #1	7-04	88.3	High	6	241.9	High	6	1451	Moderate	3
	Dick	7-10	80.2	High	6	222.8	High	6	2240	High	6
	Empire	7-15	74.2	High	5	211.5	High	6	3807	Mod. High	5
	Fortymile	7-02	62.9	Mod	4	188.1	Mod High	5	376	Low	2
	Iron	7-03	54.8	Mod.	4	162.2	Mod.	4	2920	Mod. High	5

RESOURCE MANAG. UNIT	WATERSHED MANAGEMENT UNIT	ID	INHERENT WATERSHED SENSITIVITY RATING			CURRENT INHERENT WATERSHED SENSITIVITY RATING			CURRENT MANAGED WATERSHED SENSITIVITY RATING		
			Index	Rating	Class	Index	Rating	Class	Index	Rating	Class
	Jack	7-13	83.9	High	6	232.4	High	6	6275	High	6
	John Tom	7-09	59.9	Mod.	4	167.1	Mod High	5	334	Low	2
	Lime	7-16	92.1	High	6	267.1	High	6	6410	High	6
	Louie #1	7-01	57.3	Mod.	4	169.6	Mod High	5	2714	Mod. High	5
	Lower San Poil	7-24	37.3	Mod. Low	3	84.3	Mod. Low	3	2673	Mod. High	5
	Manila	7-11	118.9	Extreme	7	329.4	Extreme	7	11858	Extreme	7
	McAllister	7-23	63	Mod High	5	186.5	Mod.	4	1119	Mod. Low	3
	Meadow	7-12	68.9	Mod High	5	189.5	Mod High	5	4548	High	6
	Silver	7-08	75.4	Mod High	5	213.4	High	6	1280	Moderate	4
Nespelem River	Armstrong Creek	9-09	25.6	Low	2	75.3	Mod. Low	3	452	Low	2
	Kinkaid Creek	9-02	25.8	Low	2	77.4	Mod. Low	3	3715	Mod. High	5
	Mill Creek #1	9-06	18.3	Low	2	48.3	Low	2	580	Low	2
	U. Nespelem River	9-01	43.2	Mod. Low	3	127.4	Mod.	4	3440	Mod. High	5
	L. Nespelem River	9-11	13.7	Very Low	1	34.9	Very Low	1	1256	Moderate	4
	North Star Creek	9-04	60.2	Mod.	4	155.3	Mod.	4	1242	Moderate	4
	Parmenter Creek	9-05	31.9	Mod. Low	3	91.9	Mod. Low	3	1654	Moderate	4
	Peel Creek	9-08	22.3	Low	2	66.9	Low	2	1606	Moderate	4
	Smith Creek	9-10	19	Low	2	54.2	Low	2	1951	Moderate	4
	Stepstone Creek	9-03	54.8	Mod.	4	143	Mod.	4	2288	Moderate	4
	Whitelaw Creel	9-07	44.4	Mod. Low	3	131.4	Mod.	4	1577	Moderate	4
Ninemile	Canteen Creek	4-09	112.7	Extreme	7	317.8	Extreme	7	10170	Extreme	7
	Columbia River 8	4-08	18.1	Low	2	41.8	Very Low	1	125	Very Low	1
	Cook Creek	4-14	83.7	High	6	251.1	High	6	2510	High	6
	Faye Creek	4-04	57.1	Mod.	4	171.3	Mod High	5	5482	High	6
	Gibson Creek	4-03	62.6	Mod	4	179	Mod High	5	2148	Moderate	4
	Jerred Creek	4-06	62.1	Mod	4	186.3	Mod High	5	745	Mod. Low	3
	Jones Creek	4-16	59.4	Mod.	4	178.2	Mod High	5	3208	Mod. High	5
	Klondyke Creek	4-01	119.4	Extreme	7	334.3	Extreme	7	4012	Extreme	7
	Little Ninemile Crk	4-10	111	Extreme	7	321.9	Extreme	7	7726	Extreme	7
	Lower Ninemile Crk	4-07	43.3	Mod. Low	3	111.7	Mod. Low	3	2681	Mod. High	5
	Middle Ninemile Crk	4-05	83.3	Mod High	5	247.4	High	6	5938	High	6

RESOURCE MANAG. UNIT	WATERSHED MANAGEMENT UNIT	ID	INHERENT WATERSHED SENSITIVITY RATING			CURRENT INHERENT WATERSHED SENSITIVITY RATING			CURRENT MANAGED WATERSHED SENSITIVITY RATING		
			Index	Rating	Class	Index	Rating	Class	Index	Rating	Class
	Olds Creek	4-13	114.9	Extreme	7	344.7	Extreme	7	2068	Extreme	7
	Pollock Creek	4-15	78.2	Mod High	5	234.6	High	6	2815	Mod. High	5
	Sclome Creek	4-12	61.2	Mod	4	183.6	Mod High	5	734	Mod. Low	3
	S. Fork Ninemile Crk	4-11	62.2	Mod	4	183.5	Mod High	5	2936	Mod. High	5
	Upper Ninemile Crk	4-17	53.1	Mod.	4	159.3	Mod.	4	7646	High	6
	Wells Creek	4-02	80.8	High	6	234.3	High	6	8435	Extreme	7
Omak	Camp Seven Creek	13-12	14.7	Very Low	1	43.1	Very Low	1	172	Very Low	1
	Clark Creek	13-08	18.7	Low	2	51.8	Low	2	311	Low	2
	Corkscrew Creek	13-13	22.3	Low	2	57.3	Low	2	917	Mod. Low	3
	Haley Creek	13-11	15.1	Very Low	1	43	Very Low	1	516	Low	2
	Lower. Omak Creek	13-14	21.4	Low	2	58.9	Low	2	942	Mod. Low	3
	Mill Creek #2	13-05	34.5	Mod. Low	3	93.2	Mod. Low	3	186	Very Low	1
	Mission Creek	13-10	24.9	Low	2	68.2	Low	2	818	Mod. Low	3
	Okanogan River #1	13-01	44.2	Mod. Low	4	113.2	Mod. Low	3	679	Mod. Low	3
	Okanogan River#2	13-02	18.6	Low	2	41.9	Very Low	1	1341	Moderate	4
	Stapaloop Creek	13-06	32.9	Mod. Low	3	83.6	Mod. Low	1	1338	Moderate	3
	Swimptkin Creek	13-07	19.5	Low	2	50.5	Low	2	909	Mod. Low	3
	Trail Creek	13-09	36.3	Mod. Low	3	86.4	Mod. Low	3	1037	Mod. Low	3
	Tunk Creek	13-04	44.7	Mod. Low	3	109.1	Mod. Low	3	109	Very Low	1
	Upper Omak Creek	13-15	16.2	Very Low	1	47.1	Low	2	1696	Moderate	3
	Wannacut Creek	13-03	32	Mod. Low	3	87	Mod. Low	3	1044	Mod. Low	3
SW Plateau	Cameron Lake	15-02	47.6	Mod.	4	142.8	Mod.	4	1142	Mod. Low	3
	Chicken Creek	15-14	9.9	Very Low	1	23.3	Very Low	1	280	Low	2
	Columbia River 26	15-26	13.3	Very Low	1	27.9	Very Low	1	446	Low	2
	Columbia River 27	15-27	6.8	Very Low	1	15	Very Low	1	240	Low	2
	Columbia River 28	15-28	10.8	Very Low	1	24	Very Low	1	192	Very Low	1
	Dan Canyon	15-13	10.8	Low	2	49.1	Low	2	98	Very Low	1
	Felix Creek	15-01	20.6	Low	2	51.3	Low	2	923	Mod. Low	3
	Long Lake	15-07	11.4	Very Low	1	34.2	Very Low	1	137	Very Low	1
	Okanogan River #3	15-03	8.6	Very Low	1	18.8	Very Low	1	602	Mod. Low	3
	Okanogan River #4	15-04	47.4	Mod.	4	101.9	Mod. Low	1	1630	Moderate	3
	Okanogan River #5	15-05	14.8	Very Low	1	30.5	Very Low	1	122	Very Low	1

RESOURCE MANAG. UNIT	WATERSHED MANAGEMENT UNIT	ID	INHERENT WATERSHED SENSITIVITY RATING			CURRENT INHERENT WATERSHED SENSITIVITY RATING			CURRENT MANAGED WATERSHED SENSITIVITY RATING		
			Index	Rating	Class	Index	Rating	Class	Index	Rating	Class
	Potholes	15-06	7.7	Very Low	1	23.1	Very Low	1	185	Very Low	1
	Salt Hill Creek	15-10	26.6	Mod. Low	3	79.8	Mod. Low	3	958	Mod. Low	5
	Soap Lake	15-09	51.9	Mod.	4	110	Mod. Low	3	716	Mod. Low	3
	South Plateau	15-11	5.7	Very Low	1	17.1	Very Low	1	68	Very Low	1
	Stubblefield Point	15-12	4.3	Very Low	1	12.9	Very Low	1	103	Very Low	1
	Tumwater Creek	15-08	13.3	Very Low	1	34.6	Very Low	1	69	Very Low	1
Twin Lakes	Beaver Dam Creek	2-07	176.7	Extreme	7	425.8	Extreme	7	13626	Extreme	7
	Columbia River 4	2-04	21.1	Low	2	43.9	Very Low	1	176	Very Low	1
	Cornstalk Creek	2-03	37.2	Mod. Low	3	110.9	Mod. Low	3	5523	High	6
	Granite Creek	2-06	94.8	High	6	255	High	6	9180	Extreme	7
	Lower Stranger Crk.	2-04	15.7	Very Low	1	35	Very Low	1	560	Low	2
	North Twin Lake	2-08	50.5	Mod.	4	144.4	Mod.	4	6931	High	6
	South Twin Lake	2-05	46.4	Mod.	4	139.2	Mod.	1	3341	Mod. High	5
	Stray Dog Canyon	2-02	22.1	Low	2	62.1	Low	2	1490	Moderate	4
	Upper Stranger Creek	2-09	21.3	Low	2	63.3	Low	2	2279	Moderate	4
Upper San Poil River	Anderson Creek	6-15	55.3	Mod.	4	158.7	Mod.	4	159	Very Low	1
	Bear Creek	6-14	67.2	Mod High	4	196.2	Mod High	1	392	Low	2
	Bridge Creek	6-09	82.5	Mod High	5	222.8	Mod. High	5	8021	Extreme	7
	Capoose Creek	6-14	38.8	Mod. Low	3	112.5	Mod. Low	3	4050	High	6
	Cub Creek	6-11	46.2	Mod.	4	136.3	Mod.	1	1090	Mod. Low	3
	Deadhorse Creek	6-07	58.6	Mod.	4	175.8	Mod. High	5	1582	Moderate	4
	Nineteenmile Creek	6-17	37.5	Mod. Low	3	112.5	Mod. Low	2	675	Mod. Low	3
	North Nanamkin Crk	6-13	55.4	Mod.	4	159	Mod.	4	2862	Mod. High	5
	Seventeenmile Creek	6-02	44	Mod.	3	111.8	Mod.	3	4277	High	6
	S. Fork 17-mile Crk.	6-03	52.6	Mod. Low	3	146.8	Mod. Low	4	2642	Mod. High	5
	South Nanamkin Crk	6-12	36	Mod. Low	4	107.6	Mod. Low	4	861	Mod. Low	3
	Tigger Creek	6-16	54.2	Mod.	3	145.8	Mod.	4	583	Low	2
	Thirteenmile Creek	6-01	56.9	Mod.	3	170.7	Mod High	5	341	Low	2
	Thirtymile Creek	6-08	69	Mod High	5	200.1	Mod High	5	4802	HIgh	6
	Twentyfivemile Crk.	6-06	71.2	Mod High	5	210	High	6	3780	Mod. High	5
	Twentyonemile Crk.	6-03	61.7	Mod.	4	164.1	Mod.	4	2954	Mod. High	5

RESOURCE MANAG. UNIT	WATERSHED MANAGEMENT UNIT	ID	INHERENT WATERSHED SENSITIVITY RATING			CURRENT INHERENT WATERSHED SENSITIVITY RATING			CURRENT MANAGED WATERSHED SENSITIVITY RATING		
			Index	Rating	Class	Index	Rating	Class	Index	Rating	Class
	Twentythreemile Crk	6-05	56.1	Mod.	4	168.3	Mod High	5	3636	Mod. High	5
	Upper San Poil River	6-18	46.3	Mod.	4	133.8	Mod.	4	2141	Moderate	4
West Fork San Poil R.	Bungalow Creek	8-03	30.9	Mod. Low	3	92.7	Mod. Low	3	93	Very Low	1
	Deerhorn Creek	8-06	80.2	Mod Low	3	222.8	Mod. Low	3	224	Low	2
	King Creek	8-07	39.2	Mod. Low	3	104.3	Mod. Low	3	3338	Mod. High	5
	Lime Creek #2	8-05	25.2	Low	2	75.6	Mod. Low	3	907	Mod. Low	3
	Lower Gold Creek	8-02	36	Mod. Low	4	108	Mod. Low	3	864	Mod. Low	3
	Lower West Fork	8-01	33.4	Mod. Low	3	100.2	Mod. Low	3	1804	Moderate	4
	Roaring Creek	8-09	71.6	Mod High	5	173.3	Mod High	5	693	Mod. Low	3
	Strawberry Creek	8-08	21.3	Low	2	62.4	Low	2	2246	Moderate	4
	Upper Gold Creek	8-04	35.4	Mod. Low	3	95.6	Mod. Low	3	4589	High	6
	Upper West Fork	8-10	44.5	Mod. Low	3	90.8	Mod. Low	3	726	Mod. Low	3
Wilmont	Columbia River #5	3-05	20.9	Low	2	46.6	Low	2	186	Very Low	1
	Columbia River #6	3-06	35.1	Mod. Low	3	87.4	Mod. Low	3	262	Low	2
	Columbia River #7	3-07	15.9	Very Low	1	36.4	Very Low	4	218	Low	2
	Coyote Creek #2	3-03	33.7	Mod. Low	3	98.4	Mod. Low	3	1181	Mod. Low	3
	Dry Creek	3-10	147	Extreme	7	408.7	Extreme	4	9809	Extreme	7
	Falls Creek	3-02	24.1	Low	2	69.9	Low	2	1887	Moderate	3
	Little Wilmont Creek	3-13	43.4	Mod. Low	3	129.8	Mod.	4	6230	High	6
	Lower Wilmont Crk.	3-09	43.5	Mod. Low	3	116.8	Mod. Low	4	2851	Mod. High	5
	Monaghan Creek	3-04	26.1	Mod. Low	3	73.1	Low	2	877	Mod. Low	4
	NezPerce Creek	3-01	27.3	Mod. Low	3	75.1	Mod. Low	4	3605	Mod. High	5
	Rock Creek	3-11	54.1	Mod.	4	158.5	Mod.	4	1902	Moderate	4
	Tree Forks Creek	3-12	29.3	Mod. Low	3	85.6	Mod. Low	3	2739	Mod. High	5
	Upper Wilmont Crk.	3-08	87.4	High	6	258.7	High	6	12418	Extreme	7

Table C-2. Summary of Colville Reservation Inherent Watershed, Current Inherent Watershed Sensitivity and Managed Watershed Sensitivity Ratings.

SENSITIVITY RATING	INHERENT WS SENSITIVITY			CURRENT INHERENT WS SENSITIVITY			MANAGED WATERSHED SENSITIVITY		
	% WS	Acres	% Reserv.	% WS	Acres	% Reserv.	% WS	Acres	% Reserv.
Extreme	4.78	64,750	4.75	4.78	55,854	4.09	6.70	106,921	7.85
High	6.70	81642	6.00	10.05	114,371	8.39	9.08	146,517	10.73
Moderately High	9.10	77,820	5.71	11.48	126574	9.28	14.35	258,752	18.99
Moderate	23.92	315,023	23.12	17.22	227,803	16.72	16.27	268,422	19.70
Moderately Low	25.84	333,840	24.50	25.89	341,633	25.07	25.36	291,097	21.36
Low	17.70	255,953	18.78	17.70	272,933	20.05	15.32	141,942	10.42
Very Low	11.96	233,644	17.15	12.92	223,504	16.40	12.92	149,221	10.95
TOTAL	100.00	1,362,672	100.00	100.00	1,362,672	100.00	100.00	1,362,672	100.00

APPENDIX D – WATERSHED MANAGEMENT UNIT CHARACTERISTICS

Table D-1. Colville Reservation Watersheds and Key Characteristics (From Hunner and Jones 1997).

RESOURCE MANAG. UNIT	WATERSHED MANAGEMENT UNIT	WMU ID #	AREA	BASE ELEV.	UPPER ELEV.	ASP	TREE CANOPY DENSITY - % (1998)				ROAD DENSITY	SSZ[1] ROADS	ROAD STREAM XINGS
			Acres	Feet	Feet		0-10	11-40	41-70	70-100	Mi./Sq Mi.	Miles	
Buffalo/ Swawilla	Buffalo Creek	11-06	4988	2420	4760	W	78	5	9	8	1.4	2.2	4
	Buffalo Lake	11-03	3759	2420	3220		100	0	0	0	1.1	0.3	1
	Seatons Grove	11-04	2806	980	2950	SW	100	0	0	0	2.7	3.1	10
	Coulee Dam	11-09	9463	980	2850	SW	100	0	0	0	3.2	5.3	18
	McGinnis Lake	11-05	2416	2380	4390		62	17	16	5	1.4	0.3	1
	Peter Dan	11-07	10202	980	4350	W	78	10	11	2	2.5	10.2	22
	Poker Joe	11-01	12147	980	2950	SW	100	0	0	0	2.4	7.3	19
	Rebecca Lake	11-02	2456	980	2950	SW	100	0	0	0	1.8	1.6	5
	Swawilla Basin	11-08	16825	1310	3980	SW	82	7	8	3	2.1	10.4	15
Hall Creek	Barnaby	1-04	9339	1310	6560	SE	27	12	41	20	4.1	11.0	19
	Cobbs	1-06	2053	1310	3030	E	40	19	36	5	3.5	3.1	6
	Columbia River 1	1-01	1527	1310	3280	E	40	20	29	11	2.2	1.4	3
	Columbia River 2	1-02	3307	1310	2460	E	16	15	54	15	3.2	0.0	0
	Columbia River 3	1-03	3141	1310	3280	E	15	18	50	18	4.1	0.0	0
	Grizzly	1-14	2132	2580	6360	NE	7	2	12	82	0.0	0.0	0
	John's Mountain	1-16	3167	2750	5620	NE	18	8	18	56	4.8	6.9	11
	Little Jim	1-05	2917	1310	3400	SE	10	6	47	37	5.5	4.6	6
	Lower Hall	1-07	19246	1310	5450	SE	23	14	35	28	4.6	23.6	73
	Lower Lynx	1-10	6707	1890	4880	E	11	10	31	48	4.8	8.7	18
	North Fork Hall	1-09	8552	2010	5000	SE	15	14	35	36	4.2	15.1	30
	Onion	1-08	2877	2170	5370	E	33	5	20	42	1.7	1.5	3
	Sitdown	1-15	11312	2300	6310	E	15	9	20	56	4.1	15.5	22
	Sleepy Hollow	1-12	972	2910	5290	S	36	2	28	34	3.1	1.6	3
	Stall	1-11	3184	2540	6560	S	15	4	22	58	4.2	5.2	11
	Upper Hall	1-13	11133	2300	6560	SE	10	6	27	57	2.7	15.3	26
	Upper Lynx	1-17	16562	2420	5660	E	8	6	19	67	2.8	14.8	32
	West Fork Hall	1-18	7315	3240	6360	NE	10	11	18	61	0.6	1.6	2
Hellgate	Brody	5-21	5993	1310	4310	S	27	25	39	8	2.0	4.6	4
	Columbia River 10	5-10	1546	1310	3120	E	22	33	11	4	2.4	0.0	0
	Columbia River 11	5-11	1425	1310	2990	E	20	40	36	4	2.6	0.0	0

RESOURCE MANAG. UNIT	WATERSHED MANAGEMENT UNIT	WMU ID #	AREA	BASE ELEV.	UPPER ELEV.	ASP	TREE CANOPY DENSITY - % (1998)				ROAD DENSITY	SSZ[1] ROADS	ROAD STREAM XINGS
			Acres	Feet	Feet		0-10	11-40	41-70	70-100	Mi./Sq Mi.	Miles	
	Columbia River 12	5-12	2399	1310	2580	E	44	32	23	1	1.2	0.5	1
	Columbia River 13	5-13	1063	1310	3940	S	37	44	21	7	2.6	0.9	1
	Columbia River 14	5-14	2423	1310	2870	S	13	12	12	3	0.3	0.0	0
	Columbia River 15	5-15	1843	1310	3120	W	83	11	5	1	2.3	2.3	4
	Columbia River 16	5-16	4762	1310	3770	W	30	29	24	9	1.5	0.9	1
	Columbia River 17	5-17	2218	1310	3490	S	83	10	7	0	1.3	0.9	3
	Columbia River 18	5-18	4626	1310	3530	SW	78	8	11	0	1.3	0.0	0
	Columbia River 19	5-19	1204	1310	2710	E	31	29	28	12	1.3	1.1	1
	Cottonwood	5-02	938	1310	2950	E	23	38	35	0	3.5	1.3	2
	Hellgate Canyon	5-22	1973	1310	3690	S	48	10	25	0	1.9	1.5	2
	Johnny-George	5-07	4025	1310	4060	ESE	29	36	33	2	1.0	2.8	5
	Louie Creek #2	5-06	836	1310	3900	E	31	24	36	0	1.1	0.0	0
	N. Fork Threemile	5-04	3889	1640	4260	SE	24	26	36	14	2.6	6.9	0
	Rattlesnake Draw	5-08	1630	1310	2870	S	44	35	21	0	2.1	1.5	3
	Redford Canyon	5-19	6058	1310	4350	SW	31	29	28	12	3.0	6.5	10
	Sixmile	5-01	7721	1310	4590	E	13	17	35	35	2.4	3.6	4
	S. Fork Threemile	5-05	3857	1640	4060	E	14	19	45	23	3.6	5.0	6
	Threemile	5-03	298	1310	1970	E	5	29	45	30	2.6	1.0	1
	Whitestone	5-20	2230	1640	4590	SW	19	24	35	22	0.7	0.0	0
Kartar	Beaverhouse	14-02	1681	980	3650	S	58	10	20	3	1.1	3.0	0
	Columbia River 24	14-24	6025	980	3400	S	88	5	6	1	1.0	2.1	7
	Columbia River 25	14-25	16592	980	3900	S	94	3	3	0	1.9	10.4	27
	Coyote #1	14-09	17366	980	4390	S	24	25	43	0	2.9	16.7	20
	Goose Flats	14-13	19534	980	3530		94	3	2	1	1.3	7.7	25
	Harrison	14-08	4312	1560	3940	S	44	21	29	6	1.4	2.9	4
	Kartar	14-06	13857	980	4100	SW	41	12	30	17	1.4	7.6	17
	Lost #2	14-10	3188	1680	3240	S	11	42	43	3	3.6	2.7	0
	Nason	14-05	8602	1150	4470	SW	37	29	33	2	1.9	9.5	23
	Noname	14-01	2767	980	2910	SE	98	2	1	0	0.7	0.1	0
	Omak Lake	14-12	28766	980	4020		92	4	3	1	1.0	15.3	41
	Poison Oak	14-03	2544	980	4220	SW	56	21	21	3	2.2	1.0	5
	Rattlesnake	14-04	2361	1070	4500	S	60	24	45	0	0.9	1.7	3

RESOURCE MANAG. UNIT	WATERSHED MANAGEMENT UNIT	WMU ID #	AREA	BASE ELEV.	UPPER ELEV.	ASP	TREE CANOPY DENSITY - % (1998)				ROAD DENSITY	SSZ[1] ROADS	ROAD STREAM XINGS
			Acres	Feet	Feet		0-10	11-40	41-70	70-100	Mi./Sq Mi.	Miles	
	Smith-Condon	14-07	5191	1270	3500	W	21	35	40	3	1.2	2.2	2
L. Nespelem River	Joe Moses	10-04	12875	1850	4450	NW	60	11	20	9	[illegible].7	12.0	12
	L. L. Nespelem	10-05	11296	1230	4350	W	88	3	7	3	2.6	10.6	17
	Owhi Creek	10-01	5111	2580	4240	SW	14	14	39	33	2.2	6.8	9
	Owhi Lake	10-06	3173	2580	2380	S	33	19	38	9	3.1	1.6	2
	Poween	10-03	2765	1890	2830	SW	100	8	8	0	3.6	2.1	9
	U. L. Nespelem	10-02	23971	2420	4220	S	48	12	26	13	3.1	19.9	38
Lost Creek	Haden	12-06	6570	3490	5660	SE	13	4	22	61	2.7	9.3	9
	Loony	12-02	4594	3200	5840	NW	24	18	37	21	2.7	3.2	9
	Lower Lost	12-03	9059	3080	5950	NE	30	19	34	16	2.3	4.6	8
	Moses Meadow	12-04	9394	3490	6720	N	4	7	29	60	1.7	3.0	7
	Sheep	12-01	1623	3240	5580	NW	16	11	34	38	2.4	2.1	3
	S. Fork Lost	12-05	3460	3490	4880	NE	14	19	29	44	3.0	2.1	6
	Upper Lost	12-07	7407	3440	5700	SE	14	8	30	47	2.3	5.2	5
L. San Poil River	Alice	7-06	2031	1390	3610	SW	23	29	28	20	0.7	1.8	2
	Brush	7-14	4078	1480	4350	E	18	12	41	29	2.0	5.8	9
	Cache	7-17	5031	1560	4050	E	9	14	54	24	3.4	7.7	11
	Columbia River 22	7-22	1817	1310	2770	E	58	22	17	3	4.1	0.0	9
	Columbia River 23	7-23	3943	1310	3160	E	77	11	8	3	1.9	1.1	3
	Columbia River 19	7-19	2509	1310	3450	W	91	3	3	2	1.9	0.8	2
	Columbia River 20	7-20	479	1310	2090	W	76	12	8	3	2.2	0.8	9
	Columbia River 21	7-21	614	1310	2380	W	68	15	12	5	2.5	0.0	9
	Copper	7-07	5752	1350	3750	SW	12	23	37	27	1.4	5.9	9
	Cow #1	7-04	776	1520	3320	W	27	24	24	27	1	0.8	2
	Dick	7-10	4397	1310	3770	W	18	21	31	30	0.6	0.2	1
	Empire	7-15	3104	1520	4350	E	35	45	20	0	2.8	4.7	8
	Fortymile	7-02	1678	1530	4060	W	17	27	38	32	0.3	0.0	1
	Iron	7-03	5919	1520	3980	W	13	18	33	36	1.1	6.8	11
	Jack	7-13	5427	1390	4260	E	8	24	40	29	2.1	7.3	14
	John Tom	7-09	4873	1310	3690	W	19	20	34	28	0.4	1.8	2

RESOURCE MANAG. UNIT	WATERSHED MANAGEMENT UNIT	WMU ID #	AREA	BASE ELEV.	UPPER ELEV.	ASP	TREE CANOPY DENSITY - % (1998)				ROAD DENSITY	SSZ[1] ROADS	ROAD STREAM XINGS
			Acres	Feet	Feet		0-10	11-40	41-70	70-100	Mi./Sq Mi.	Miles	
	Lime	7-16	2909	1560	4350	E	13	11	45	31	3.0	5.5	7
	Louie #1	7-01	6867	1640	4180	W	15	14	29	42	1.2	6.9	8
	Lower San Poil	7-24	9209	1310	3550	S	16	26	40	18	2.4	8.9	14
	Manila	7-11	13700	1310	4720	E	29	25	30	16	2.5	18.2	30
	McAllister	7-05	2071	1640	4060	SE	9	10	40	32	2.7	0.7	3
	Meadow	7-12	5116	1310	4700	E	13	16	42	29	3.9	6.4	14
	Silver	7-08	3373	1310	3610	W	29	18	27	25	1.6	0.0	4
Nespelem River	Armstrong	9-09	3815	1930	4550	SE	13	22	54	11	2.4	2.5	4
	Kinkaid	9-02	4693	2010	4430	WSW	16	16	40	28	3.6	14.3	27
	Mill #1	9-06	9080	1850	5290	SE	16	15	40	23	1.7	7.4	9
	U. Nespelem River	9-01	9035		4590	S	15	14	30	32	2.9	14.6	23
	L. Nespelem River	9-11	20932	980		SE	67	14	14	5	2.7	32.3	56
	North Star	9-04	7773	1950	6640	SE	11	14	43	32	1.8	6.2	4
	Parmenter	9-05	4370	1930	4670	SE	16	16	50	18	2.1	6.8	4
	Peel	9-08	1310	2010	4020	SE	8	10	66	17	3.0	2.0	8
	Smith	9-10	6736	1850	3320	SE	21	32	30	10	3.2	5.5	13
	Stepstone	9-03	12546	1970	6770	SE	7	8	40	45	1.5	10.6	15
	Whitelaw	9-07	4335	2050	4550	SE	10	13	55	22	2.4	4.8	5
Ninemile	Canteen	4-09	2410	1720	4650	E	10	13	37	40	4.2	5.2	9
	Columbia River 8	4-08	4173	1310	3200	SE	23	25	45	6	2.7	0.0	0
	Cook	4-14	4227	2170	3900	E	14	9	29	40	0.6	0.7	3
	Faye	4-04	2854	2170	4180	SW	4	6	26	63	3.1	11.1	9
	Gibson	4-03	2167	2340	4630	SE	3	8	34	55	5.0	3.4	4
	Jerred	4-06	3136	1890	3810	SW	12	17	42	29	1.2	2.8	3
	Jones	4-16	4038	2260	4180	SE	9	12	36	40	2.2	7.2	8
	Klondyke	4-01	3365	2460	5040	S	14	10	36	40	3.7	3.8	2
	Little Ninemile	4-10	3693	1310	4510	E	13	12	31	47	3.4	3.5	0
	Lower Ninemile	4-07	10308	1310	3610	SE	12	18	46	24	2.9	6.4	17
	Middle Ninemile	4-05	6663	1970	3810	SE	11	12	35	42	2.3	3.6	15
	Olds	4-13	2224	2050	3610	E	12	14	53	21	1.8	2.8	4

RESOURCE MANAG. UNIT	WATERSHED MANAGEMENT UNIT	WMU ID #	AREA	BASE ELEV.	UPPER ELEV.	ASP	TREE CANOPY DENSITY - % (1998)				ROAD DENSITY	SSZ[1] ROADS	ROAD STREAM XINGS
			Acres	Feet	Feet		0-10	11-40	41-70	70-100	Mi./Sq Mi.	Miles	
	Pollock	4-15	2592	2210	4060	E	4	5	30	60	1.7	4.6	7
	Sclome	4-12	4215	2380	3530	SE	16	13	37	34	1.3	2.8	4
	S. Fork Ninemile	4-11	14338	1850	4670	E	7	10	41	42	1.5	8.5	16
	Upper Ninemile	4-17	5952	2210	4020	S	6	5	32	57	2.5	22.1	21
	Wells	4-02	4108	2340	4670	SW	10	10	34	46	3.5	8.5	10
Omak	Camp Seven	13-12	3501	2460	4430	N	6	9	59	26	1.3	1.7	3
	Clark	13-08	4219	2540	4880	SW	13	28	47	11	2.5	1.6	4
	Corkscrew	13-13	5840	980	3160	N	100	0	0	0	1.0	7.3	17
	Haley	13-11	5019	2010	5100	SW	96	3	1	0	1.1	3.5	10
	L. Omak Creek	13-14	17659	840	4510	WNW		45 17	29	10	1.6	18.3	28
	Mill #2	13-05	3841	1930	5700	W	52	15	25	9	0.6	4.3	4
	Mission	13-10	7213	1150	4760	SW	100	0	0	0	0.5	8.5	10
	Okanogan #1	13-01	7119	860	4310	W	74	11	11	3	1.0	2.5	13
	Okanogan #2	13-02	4808	860	2910	W	100	0	0	0	4.1	4.1	16
	Stapaloop	13-06	10355	2460	5740	S	16	31	44	9	1.5	9.8	10
	Swimptkin	13-07	5817	2540	5620	S	16	28	44	20	2.5	4.6	11
	Trail	13-09	6823	2750	6720	SW	8	13	42	34	2.5	3.5	8
	Tunk	13-04	5759	3160	5700	N	13	8	45	34	0.5	0.5	2
	U. Omak Creek	13-15	25765	2460	5290	NW	11	19	48	22	2.7	25.9	61
	Wanacut	13-03	8934	860	5580	W	73	10	12	5	1.2	8.6	13
Southwest Plateau	Cameron Lake	15-02	4035	2460	3160		100	0	0	0	1.3	1.6	5
	Chicken	15-14	8484	820	2500	SW	100	0	0	0	1.6	5.0	10
	Columbia River 26	15-26	9034	980	2500	S	100	0	0	0	1.5	5.8	20
	Columbia River 27	15-27	15032	820	2500	S	100	0	0	0	1.1	4.8	19
	Columbia River 28	15-28	15980	820	2500	S	100	0	0	0	1.0	6.8	24
	Dan Canyon	15-13	9081	820	2620	W	100	0	0	0	0.8	2.9	8
	Felix	15-01	3405	820	3120	W	100	0	0	0	2.6	3.7	12
	Long Lake	15-07	8699	2170	2830		100	0	0	0	1.2	1.6	5
	Okanogan #3	15-03	9173	820	3080	W	100	0	0	0	3.0	5.6	21
	Okanogan #4	15-04	11862	820	2870	W	100	0	0	0	1.9	7.5	24

RESOURCE MANAG. UNIT	WATERSHED MANAGEMENT UNIT	WMU ID #	AREA	BASE ELEV.	UPPER ELEV.	ASP	TREE CANOPY DENSITY - % (1998)				ROAD DENSITY	SSZ[1] ROADS	ROAD STREAM XINGS
			Acres	Feet	Feet		0-10	11-40	41-70	70-100	Mi./Sq Mi.	Miles	
	Okanogan #5	15-05	6073	820	2540	W	100	0	0	0	1.6	1.2	5
	Potholes	15-06	13806	2420	2990		100	0	0	0	1.5	2.3	9
	Salt Hill	15-10	8672	2210	2910		100	0	0	0	1.3	2.5	10
	Soap Lake	15-09	14039	1190	2910		100	0	0	0	0.6	7.9	12
	South Plateau	15-11	21416	2340	2710		100	0	0	0	0.9	2.5	16
	Stubblefield Point	15-12	6008	2050	2460		100	0	0	0	1.6	2.1	7
	Tumwater	15-08	8462	980	2540	S	100	0	0	0	0.4	0.0	7
Twin Lakes	Beaver Dam	2-07	5995	2620	5450	SE	4	4	19	73	3.0	7.6	15
	Columbia River 4	2-04	6600	1310	2420	E	19	20	49	13	3.8	0.0	0
	Cornstalk	2-03	7086	1800	4140	E	18	11	42	31	5.4	7.9	21
	Granite	2-06	5923	2580	5410	E	5	3	21	71	4.5	8.3	10
	Lower Stranger	2-01	7659	1310	3140	E	35	22	32	11	3.5	3.5	0
	North Twin Lake	2-08	6468	2580	5130	S	18	7	35	40	5.4	12.2	29
	South Twin Lake	2-05	3110	2540	3940	NE	28	4	21	47	4.4	1.9	6
	Stray Dog Canyon	2-02	6136	1310	3240	SE	16	14	44	26	3.7	3.4	6
	Upper Stranger	2-09	10591	1800	4020	E	16	18	44	40	0.6	0.0	12
U. San Poil R.	Anderson	6-15	3560	1850	4280	E	14	16	38	32	0.1	0.3	3
	Bear	6-14	4248	1800	4760	E	18	19	41	21	0.6	1.2	4
	Bridge	6-09	20127	1720	5490	SW	13	9	26	52	2.2	22.7	29
	Capoose	6-10	3827	1640	3980	E	7	8	44	40	4.1	6.0	13
	Cub	6-11	1621	1720	3980	NE	11	18	40	39	1.9	2.8	1
	Deadhorse	6-07	3339	1740	3940	S	17	17	38	28	2.1	3.5	4
	Nineteenmile	6-17	2790	2050	3770	E	15	20	44	20	1.2	3.5	2
	North Nanamkin	6-13	10066	1760	4670	E	17	14	37	32	1.4	13.2	11
	Seventeenmile	6-02	12987	1930	5900	W	18	16	42	24	2.7	12.2	17
	S. Fork 17-mile	6-03	4446	2420	4900	W	18	18	36	29	1.9	3.3	10
	South Nanamkin	6-12	10637	1720	3980	NE	13	13	40	32	1.3	11.7	0
	Tigger Creek	6-16	2862	1890	4100	E	19	18	40	23	1.4	1.9	3
	Thirteenmile Creek	6-01	790	1930	4060	W	16	16	38	31	0.3	0.3	2
	Thirtymile Creek	6-08	15815	1730	5130	WSW	15	14	36	35	1.8	15.6	25

RESOURCE MANAG. UNIT	WATERSHED MANAGEMENT UNIT	WMU ID #	AREA	BASE ELEV.	UPPER ELEV.	ASP	TREE CANOPY DENSITY - % (1998)				ROAD DENSITY	SSZ[1] ROADS	ROAD STREAM XINGS
			Acres	Feet	Feet		0-10	11-40	41-70	70-100	Mi./Sq Mi.	Miles	
	Twentyfivemile	6-06	2927	1760	4720	W	18	27	35	20	2.0	3.3	6
	Twentyonemile	6-04	8573	1850	6000	W	14	14	37	35	2.5	11.5	9
	Twentythreemile	6-05	19787	1830	5740	W	16	12	31	40	2.1	10.5	20
	Upper San Poil	6-18	23711	1640	4060	S	22	20	38	21	1.8	18.5	28
West Fork San Poil R.	Bungalow	8-03	1201	2670	4390	NW	10	7	30	53	0.3	0.2	1
	Deerhorn	8-06	3252	2340	4900	SE	5	8	44	46	2.8	3.9	7
	King	8-07	2041	2580	5820	SE	11	13	44	32	3.4	4.8	6
	Lime #2	8-05	141	2130	3650	S	34	13	37	16	4.7	0.7	2
	Lower Gold	8-02	6731	2090	4180	NE	8	8	34	50	1.8	8.0	7
	Lower West Fork	8-01	7040	1970	4180	E	19	15	39	26	1.7	7.9	13
	Roaring	8-09	1979	2210	5820	NE	13	9	28	50	1.8	0.7	2
	Strawberry	8-08	4272	2710	5620	SE	9	9	38	44	5.0	9.0	14
	Upper Gold	8-04	13002	2670	5740	NE	9	8	38	45	3.2	2.1	35
	Upper West Fork	8-10	1448	3940	5580	SE	22	8	17	53	3.1	1.3	3
Wilmont	Columbia River #5	3-05	3320	1310	2970	E	26	24	41	9	3.5	8.0	6
	Columbia River #6	3-06	1173	1310	3240	SE	28	19	19	14	2.9	8.0	6
	Columbia River #7	3-07	3105	1310	3080	S	37	29	32	2	2.6	8.0	1
	Coyote #2	3-03	2295	1310	3770	E	14	8	31	47	2.3	4.1	4
	Dry	3-10	2203	2420	4630	S	10	10	25	55	3.2	5.1	7
	Falls	3-02	8723	1310	4060	E	20	9	30	40	2.4	9.5	14
	Little Wilmont	3-13	5936	1970	4650	SE	8	8	28	56	3.3	10.7	18
	Lower Wilmont	3-09	11961	1310	3770	SE	19	33	29	49	2.1	8.0	20
	Monaghan	3-04	2572	1310	3750	SE	19	19	39	23	1.6	3.0	8
	NezPerce	3-01	19057	1310	4060	SE	26	14	29	31	3.8	24.6	35
	Rock	3-11	758	2300	4400	E	13	9	26	52	3.8	2.0	2
	Tree Forks	3-12	1524	2130	4510	E	6	5	20	62	5.4	0.7	8
	Upper Wilmont	3-08	12629	1970	5000	S	7	8	31	55	4.5	34.7	50

[1] SSZ – Streamside Zone

Table D-2. Key Water Quality Characteristics of Reservation Streams and Lakes. (Hunner and Jones 1997 and Passmore 1998).

RES. MANAG. UNIT	WATERSHED MANAGEMENT UNIT Stream/Lake	WMU	PRECIP	STREAM LENGTH	STREAM DENSITY	SURFACE WATER CLASS	WATER BEN. USES	WATER QUALITY IMPAIRMENTS (See Code Key at End of Table)			
			Inches	Miles	Mi./Sq. Mi.			USE	POLLUT./ SOURCE	CAUSE	IMPACT
Buffalo/ Swawilla	Buffalo Creek	11-06	13	10.6	1.36	N	44, 93	42, 62, 82, 85, 86	4, 10, 23, 24, 32	53, 54, 55, 56, 57, 58	Moderate
	Seatons Grove	11-04	12	6.4	1.46	N					
	Coulee Dam	11-09	12	11.7	0.79	N					
	Peter Dan Creek	11-07	13	19.9	1.25	IV	90	62, 93, 82, 85	4, 10, 26, 30	55, 56, 52, 58	Moderate
	Poker Joe Creek	11-01	12	16.9	0.89	N	62	42, 93	3, 8, 14, 22	54, 55, 56, 57, 58	Moderate Low
	Buffalo Lake	11-03	13	5.3	0.90	LAKE	21, 44, 82, 90, 93, 99	42, 62	4, 6, 32	56, 57, 59	Mesotrophic
	McGinnis Lake	11-05	12	2.4	0.64	LAKE	21, 42, 44, 62, 82, 90, 93, 99		15		Mesotrophic
	Rebecca Lake	11-02	13	3.7	0.96	LAKE	21, 44, 62, 82, 90, 93, 99				
	Swawilla Basin	11-08	12	26.0	0.99	N					
Hall Creek	Barnaby Creek	1-14	23	12.9	0.88	II	21, 44, 62	82, 85, 86, 83, 90	1, 4, 9, 10, 26	51, 52, 53, 54, 56, 57, 58	Moderate
	Cobbs Creek	1-06	18	2.8	0.87	III	21, 44, 62, 93			55, 58	Moderate
	Columbia River #1	1-01	17	1.5	0.63	N					
	Columbia River #2	1-02	17	0.0	0.00	N					
	Columbia River #3	1-03	17	0.0	0.00	N					
	Grizzly Creek	1-14	24	3.5	1.05	III	21, 44, 62, 82, 85, 86, 93				Moderate
	John's Mtn. Creek	1-16	23	5.1	1.03	N	21, 44, 62, 93	82, 85, 86, 93	9, 10	52, 58	Moderate
	Little Jim Creek	1-05	18	3.3	0.72	III	21, 44, 62, 93				Moderate
	Lower Hall Creek	1-07	21	0.96	1.58	II	21, 44, 62	82, 85, 86, 90, 93	1, 4, 20, 25, 26, 32	51, 53, 54, 55, 56, 57, 58	Moderate
	Lower Lynx Creek	1-10	23	12.9	1.23	II	21, 44, 62, 93	82, 85, 86	1, 4, 10, 26	52, 53, 55, 56, 58	Moderate Low
	N. Fork Hall Creek	1-09	22	19.6	1.47	II	21, 44, 62, 93	82, 85, 86	2, 4, 9, 10	52, 56	Moderate
	Onion Creek	1-08	23	5.5	1.22	II	21, 44, 62, 82, 85, 86, 93			52	Moderate Low
	Sitdown Creek	1-15	27	21.6	1.22	III	21, 44, 62, 93	82, 85, 86, 93	4, 9, 10	52, 56, 58	Moderate
	Sleepy Hollow Crk	1-12	28	2.4	1.58	-	21, 44, 62, 93				Moderate Low

RES. MANAG. UNIT	WATERSHED MANAGEMENT UNIT Stream/Lake	WMU	PRECIP	STREAM LENGTH	STREAM DENSITY	SURFACE WATER CLASS	WATER BEN. USES	WATER QUALITY IMPAIRMENTS (See Code Key at End of Table)			
			Inches	Miles	Mi./Sq. Mi.			USE	POLLUT./ SOURCE	CAUSE	IMPACT
	Stall Creek	1-11	28	6.6	1.33	-	21, 44, 62, 93			58	Moderate Low
	Upper Hall Creek	1-13	23	28.5	1.64	II	21, 44, 62, 82, 85, 86, 93	82, 85, 86	4, 9, 10	52, 56	Moderate Low
	Upper Lynx Creek	1-17	25	33.7	1.30	II	21, 44, 62, 82, 85, 86, 93			55	Low
	West Fork Hall Crk.	1-18	28	10.7	0.94	I	21, 44, 62, 82, 85, 86, 93				Moderate
	Camille Lake					LAKE	21, 42, 62, 90, 93				Eutrophic
	Elbow Lake					LAKE	21, 44, 62, 93	42, 82, 90	4, 10	51,54	Mesotrophic
	LaFluer lake					LAKE	21, 44, 62, 82, 90, 93				Eutrophic
	Nicholas Lake					LAKE	21, 44, 62, 82, 90, 93				Mesotrophic
	Simpson Lakes					LAKE	21, 44, 62, 82, 90, 93				Lower – Eutro Upper – Meso
	Sugar Lake					LAKE	21, 44, 62, 82, 90, 93				Meso-Eutro
Hellgate	Brody Creek	5-21	12	7.5	0.80	N	21, 62, 93	85, 86	27	55	Moderate
	Columbia River 10	5-10	12	0.0	0.00	I					
	Columbia River 11	5-11	12	0.0	0.00	I					
	Columbia River 12	5-12	12	[illegible].0	1.63	I					
	Columbia River 13	5-13	12	2.7	0.00	I					
	Columbia River 14	5-14	12	0.0	0.00	I					
	Columbia River 15	5-15	12	3.7	1.29	I					
	Columbia River 16	5-16	12	1.6	0.22	I					
	Columbia River 17	5-17	12	2.5	0.72	I					
	Columbia River 18	5-18	12	0.0	0.00	I					
	Columbia River 19	5-19	12	1.4	0.89	I					
	Cottonwood	5-02	12	1.1	0.75	I					
	Hellgate Canyon Creek	5-22	12	4.0	1.29	N	21, 62, 93				Low
	Johnny-George Crk.	5-07	12	9.0	1.43	N	21, 62, 93	85, 86	27	55	Moderate

RES. MANAG. UNIT	WATERSHED MANAGEMENT UNIT Stream/Lake	WMU	PRECIP	STREAM LENGTH	STREAM DENSITY	SURFACE WATER CLASS	WATER BEN. USES	WATER QUALITY IMPAIRMENTS (See Code Key at End of Table)			
			Inches	Miles	Mi./Sq. Mi.			USE	POLLUT./ SOURCE	CAUSE	IMPACT
	Louie Creek #2	5-06	13	0.0	0.00	-					
	Rattlesnake Draw	5-08	12	2.9	1.14	-					
	Redford Canyon Creek	5-19	14	10.1	1.07	N	21, 62	93	9	52	Moderate Low
	Sixmile Creek	5-01	16	12.2	1.02	IV	21, 44, 62, 82	82, 85, 86, 93	9, 10, 27	51, 55, 56	Moderate Low
	N. Fork Threemile S. Fork Threemile	5-04 5-05	15 15	8.1 6.2	1.33 1.03	IV	21, 42, 62, 82, 93	86, 90	27	55, 56	Moderate
	Threemile Creek	5-03	13	1.2	2.58	IV	21, 44, 62, 82, 93	86, 90	27	55, 56	Moderate
	Whitestone Creek	5-20	15	2.4	0.69	-					
Kartar	Beaverhouse Creek	14-02	13	7.2	2.76	N	93, 82				Moderate Low
	Columbia River 24	14-24	12	8.0	1.11	I					
	Columbia River 25	14-25	12	33.3	1.35	I					
	Coyote Creek #1	14-09	16	21.2	0.78	II	21, 44, 93, 99	62, 82, 85, 93	4, 10, 31, 32	51, 52, 54, 55, 56, 58	Moderate
	Goose Flats	14-13	13	45.5	1.49	-					
	Harrison	14-08	14	7.0	0.87	-					
	Kartar Creek	14-06	15	35.5	1.64	III	21, 44, 62	42, 82, 93	2, 3, 4	51, 52, 55, 57, 58	Moderate
	Lost Creek #2	14-10	16	5.6	1.14	N	62, 93		29	55	Moderate Low
	Nason Creek	14-05	16	26.8	1.99	N	62, 93	42, 82	8, 22, 23	51, 52, 55, 56, 57	Moderate
	Noname Creek	14-01	12	11.0	2.58	II	62, 93	42, 82	8, 22, 23	51, 52, 55, 56, 57	High
	Omak Lake	14-12	13	86.1	1.91	-					
	Poison Oak Creek	14-03	14	8.7	2.19	N	90, 93				Moderate Low
	Rattlesnake Creek	14-04	14	8.9	2.45	N	90, 93				Moderate Low
	Smith-Condon Cr.	14-07	15	8.7	0.83	N	21, 42, 44, 62, 82, 93			55, 58	Moderate Low
	Big Goose Lake					LAKE	21	42, 62, 82, 90, 93	4, 6	50, 51, 54, 56, 57	Eutrophic

RES. MANAG. UNIT	WATERSHED MANAGEMENT UNIT Stream/Lake	WMU	PRECIP	STREAM LENGTH	STREAM DENSITY	SURFACE WATER CLASS	WATER BEN. USES	WATER QUALITY IMPAIRMENTS (See Code Key at End of Table)			
			Inches	Miles	Mi./Sq. Mi.			USE	POLLUT./ SOURCE	CAUSE	IMPACT
	Grant Lake					N	62, 90, 93				Meso-Eutrophic
	Omak Lake					SRW	21, 42, 44, 62, 82, 85, 93, 99	4	4	56	Saline-Meso
	Rat Lakes					N	62, 90	93	4	56	
L.Nespelem River	Joe Moses Creek	10-04	19	27.8	1.38	IV	21, 44, 62, 99	82, 85, 86, 93	4, 14, 32	55, 56, 58	Moderate
	L. L. Nespelem R.	10-05	16	18.6	1.05	II	21, 42, 44, 62, 93, 99	82, 93	1, 4, 9, 10, 14, 32	50, 51, 54, 56, 57, 58	Moderate
	Owhi Creek	10-01	18	12.8	1.60	N	21	21, 44, 62, 82, 85, 86	4, 10, 23, 32	50, 55, 56, 57	Moderate
	Owhi (Lake)	10-06	17	1.1	0.22	N	21, 44	62, 93, 99	4	50, 55	Moderate
	Poween Creek	10-03	15	3.9	0.90	N	21, 44, 62, 93, 99	82	4	51, 55	Moderate
	U. L. Nespelem R.	10-02	19	34.7	0.93	II	21, 42, 44, 62, 93, 99	82	4	50, 51, 54, 56, 58	Moderate
	Little Owhi Lake					SRW	1, 93				
	Owhi Lake					SRW	21, 42, 62, 82, 85, 93	85	4, 9, 10	50	Eutrophic
Lost Creek	Haden Creek	12-06	27	11.7	1.14	N	21, 42, 44, 62, 82, 99	85, 86, 93	4, 10	57	Moderate High
	Loony Creek	12-02	23	8.7	1.21	N	21, 42, 44, 62, 82, 93	86	10	55, 56	Low
	Lost Crk – Lower Upper – S. Fork	12-03 12-07 12-05	22 28 25	11.9 13.5 3.9	0.83 1.17 0.72	N	21, 42, 44, 82, 99	62, 85, 86, 93	4, 20, 23, 24, 32	56, 58	Moderate
	Moses Creek	12-04	26	14.1	0.96	N	21, 44, 62	82, 85, 86, 93	4, 10, 32	51, 55, 56	Moderate
	Sheep Creek	12-01	22	3.2	1.26	N	62, 90, 93	82, 86	29	55	Moderate Low
	Crawfish Lake					LAKE	21, 42, 44, 62, 82, 85	93	6	14	Pligo-Mesotrophic
L. San Poil River	Alice Creek	7-06	14	5.5	1.73	III	21, 44, 62, 85	93	9, 10	56	Moderate Low
	Brush Creek	7-14	19	8.4	1.32	III	21, 44, 62, 93	82, 85, 86	10, 20, 26	55	Moderate Low
	Cache Creek	7-17	16	9.8	1.24	III	21, 44, 93	62, 82, 85, 93	10, 13, 24, 26, 31	50, 55, 56, 57, 58	Moderate

RES. MANAG. UNIT	WATERSHED MANAGEMENT UNIT Stream/Lake	WMU	PRECIP	STREAM LENGTH	STREAM DENSITY	SURFACE WATER CLASS	WATER BEN. USES	WATER QUALITY IMPAIRMENTS (See Code Key at End of Table)			
			Inches	Miles	Mi./Sq. Mi.			USE	POLLUT./ SOURCE	CAUSE	IMPACT
	Columbia River 22	7-22	12	0.0	0.00	I					
	Columbia River 23	7-23	13	3.9	0.63	I					
	Columbia River 19	7-19	12	3.5	0.89	N					
	Columbia River 20	7-20	13	0.0	0.00	N					
	Columbia River 21	7-21	13	0.0	0.00	N					
	Copper Creek	7-07	15	11.5	1.28	III	21, 62, 90	85, 86, 93	8, 10, 32	52, 55, 56	Moderate Low
	Cow #1	7-04	13	1.6	1.32	N					
	Dick Creek	7-10	15	5.4	0.79	III	21, 62	90, 93	4, 10		Very Low
	Empire Creek	7-15	15	6.2	1.28	III	21, 62, 93	82, 85, 86	20, 26	56	Moderate
	Fortymile Creek	7-02	13	2.0	0.76	III	21, 62, 93				Low
	Iron Creek	7-03	16	10.4	1.12	III	21, 44, 62	62, 82, 85, 86, 93	9, 10	52, 56, 58	Moderate
	Jack Creek	7-13	16	12.2	1.44	III	21, 44, 62	82, 85, 86, 93	4, 14, 20, 26	50, 52, 55, 56, 58	Moderate Low
	John Tom Creek	7-09	15	8.0	1.04	III	21, 44, 62	82, 85, 86, 90, 93	9, 10, 20	50, 52, 54, 56	Moderate Low
	Lime Creek	7-16	15	6.1	1.34	III	21, 44, 62, 93	82, 85, 86	20, 26	56, 58	Moderate
	Louie Creek #1	7-01	17	6.9	0.65	III	21, 44, 62	82, 85, 86	10	56	Moderate Low
	Lower San Poil R.	7-24	13	17.0	1.18	I	1, 21, 42, 62, 82, 85, 86	93	10, 14, 23, 24	50, 54, 55, 56, 58	Moderate
	Manila Creek	7-11	15	30.9	1.44	III	21, 44	62, 82, 86, 93	10, 17, 26	50, 52, 53, 54, 55, 58	Moderate
	McAllister Creek	7-05	13	3.1	0.96	III	21, 44, 62, 93				Low
	Meadow Creek	7-12	16	13.8	1.73	III	82, 85, 90, 93	86		50, 58	Moderate Low
	Silver Creek	7-08	15	6.4	1.21	III	21, 44, 62	82, 85, 86, 90, 93	4, 9, 10, 26	52, 54, 56	Moderate
	Tolman Creek					N	21, 44, 62	90, 93	4, 5, 11		Moderate
	French John's Lake					N	21, 44, 82	42, 90	10	53	Mesotrophic
Nespelem River	Armstrong Creek	9-09	18	7.2	1.21	III	21, 44, 62	82, 85, 93	9, 14, 32	52, 55	Moderate
	Kinkaid Creek	9-02	18	14.4	2.23	IV	21, 44, 62	82, 85, 93, 99	4, 9, 10	52 54, 56, 57, 58	Moderate High

RES. MANAG. UNIT	WATERSHED MANAGEMENT UNIT Stream/Lake	WMU	PRECIP	STREAM LENGTH	STREAM DENSITY	SURFACE WATER CLASS	WATER BEN. USES	WATER QUALITY IMPAIRMENTS (See Code Key at End of Table)			
			Inches	Miles	Mi./Sq. Mi.			USE	POLLUT./ SOURCE	CAUSE	IMPACT
	Mill Creek #1	9-06	19	12.2	0.86	II	21, 44, 62, 82	93	4, 9, 10	50, 51, 54, 55, 57, 58	Moderate Low
	U. Nespelem River L. Nespelem River	9-01 9-11	17 20	20.2 56.1	1.43 1.72	I	21, 44, 62, 82	42, 85, 86, 93, 99	1, 4, 10, 32	50, 52, 53, 55, 56	Moderate
	North Star Creek	9-04	20	16.5	1.36	III	21, 44, 62, 82, 85, 86, 93	82	10, 32	52.56	Moderate
	Parmenter Creek	9-05	20	8.1	1.18	IV	21, 44, 62, 93	82, 93	4, 32	52, 55, 56	Moderate
	Peel Creek	9-08	18	3.3	1.61	IV	62, 90, 93				Moderate
	Smith Creek	9-10	17	8.6	0.81	I	21, 44, 62, 93	82, 85, 86	4, 10	52, 55, 56	Moderate
	Stepstone Creek	9-03	22	27.4	1.40	III	21, 44, 62, 82	85, 86, 93	1, 4, 9, 10	52, 55, 56	Moderate
	Whitelaw Creek	9-07	18	12.2	1.80	IV	21, 44, 62, 82, 93	85, 86	10	52, 58	Moderate
	Johnson Lake					LAKE	62, 90, 93	82	4	50, 54	Eutrophic
	Great Western Lake					LAKE	44, 62, 90, 93	82	4, 27	50, 54	-
Ninemile	Canteen Creek	4-09	20	5.1	1.35	I	21, 44, 62, 93	82, 85	9	52, 58	Moderate
	Columbia River #8	4-08	15	0.0	0.00	I					
	Cook Creek	4-14	22	7.4	1.18	I	21, 44, 62, 93	82, 85	10	52	Low
	Faye Creek	4-04	23	9.7	2.16	I	62, 93				Moderate
	Gibson Creek	4-03	23	3.5	1.00	I	62, 93			58	Moderate
	Jerred Creek	4-06	23	6.3	1.18	II	21, 44, 62, 93				Low
	Jones Creek	4-16	24	7.3	1.16	I	21, 44, 62, 93	82, 85	4, 10	50, 52, 55, 56, 58	Moderate
	Klondyke Creek	4-01	24	6.0	1.12	I	21, 44, 62, 93	82, 85	4, 10	52, 56, 58	Moderate
	Little Ninemile Cr	4-10	20	6.1	1.05	II	21, 44, 62, 93	82, 85	4, 10	52, 56, 58	Low
	Lower Ninemile Creek	4-07	28	25.9	1.62	II	21, 42, 44, 62, 93	82, 85	4, 10	50, 52, 54, 56, 58	Moderate Low
	Middle Ninemile Creek	4-15	22	19.0	1.85	II	21, 44, 62, 93	82, 85	4, 10	50, 52, 53, 54, 56, 58	Moderate High
	Olds Creek	4-13	23	3.6	1.03	I	21, 62, 93			58	Moderate
	Pollock Creek	4-15	24	6.0	1.48	N	21, 44, 62, 82, 85, 93	86	10	52, 56	Moderate
	Sclome Creek	4-12	21	7.8	1.18	I	21, 44, 62, 93	82, 85	4, 10	54, 55, 56	Moderate
	S. Fork Ninemile Creek	4-11	21	29.4	1.31	II	21, 44, 62, 93	82, 85	4, 10	52, 53, 54, 56	Low
	Upper Ninemile Cr	4-17	23	21.5	2.32	II	21, 44, 62, 93	82, 85	4, 10	52, 56, 58	Moderate High

RES. MANAG. UNIT	WATERSHED MANAGEMENT UNIT Stream/Lake	WMU	PRECIP	STREAM LENGTH	STREAM DENSITY	SURFACE WATER CLASS	WATER BEN. USES	WATER QUALITY IMPAIRMENTS (See Code Key at End of Table)			
			Inches	Miles	Mi./Sq. Mi.			USE	POLLUT./ SOURCE	CAUSE	IMPACT
	Wells Creek	4-02	23	9.9	1.52	I	21, 44, 62, 93	82, 85	4, 10	52	Moderate
Omak	Camp Seven Creek	13-12	18	9.5	1.74	N	21, 44, 62, 90, 93	86		58	Moderate Low
	Clark Creek	13-08	20	7.4	1.14	N	21, 42, 44, 62, 99	82, 85, 86, 93	4, 10	50, 52, 55, 56, 57, 58	Moderate Low
	Corkscrew Creek	13-13	12	15.2	1.67	N					
	Haley Creek	13-11	15	25.1	3.19	IV		44, 62, 90, 93	4, 24	50, 54, 55, 57, 58, 61	Moderate
	U. Omak Creek L. Omak Creek	13-15 13-14	18 14	50.3 76.8	1.25 2.81	II	21, 44, 62, 93	42,82, 85, 86, 93, 99	2, 4, 9, 10, 14	52, 54, 56, 57	Moderate
	Mill Creek #2	13-05	13	15.0	2.50	-					
	Mission Creek	13-10	14	9.5	0.83	IV	21, 44, 62, 93	42, 82, 93, 99	4, 8	52, 54, 56, 57	Moderate
	Okanogan R. #1	13-01	12	27.2	2.45	II					
	Okanogan R. #2	13-02	12	12.2	1.62	II					
	Stapaloop Creek	13-06	23	39.3	2.43	III	21, 44, 62, 93	42, 85, 85, 99	4, 10, 32	52, 53, 55, 56	Moderate
	Swimptkin Creek	13-07	22	10.8	1.19	III	21, 44, 62, 93	82, 85, 86	4, 10	52, 54, 55, 56, 58	Moderate Low
	Trail Creek	13-09	24	11.6	1.09	III	21, 44, 62, 93	82, 85, 86	4, 10	1100, 1600, 2500	Low
	Tunk Creek	13-04	25	21.6	2.40	N	21, 22, 62, 90, 93				Moderate Low
	Wannacut Creek	13-03	16	38.7	2.77	III	21, 44	42, 62, 82, 93, 99	1, 4, 12, 23	54, 55, 56, 57	Moderate
	Summit Lake					LAKE	21, 44, 62, 82, 90, 99	93	10	56	Mesa-Oligo
Southwest Plateau	Cameron	15-02	12	5.1	0.80	-					
	Chicken Creek	15-14	12	27.0	2.04	N		93	4	56	Moderate
	Columbia River 26	15-26	11	35.2	2.49	II					
	Columbia River 27	15-27	11	61.3	1.24	II					
	Columbia River 28	15-28	11	31.2	2.61	II					
	Dan Canyon Creek	15-13	12	40.4	2.85	N	93	93	13, 27	55	Moderate Low
	Felix	15-01	12	11.6	2.16	-					
	Long Lake	15-07	12	16.4	1.20	-					
	Okanogan R. #3	15-03	11	19.1	1.26	II					
	Okanogan R. #4	15-04	11	33.7	1.82	II					

RES. MANAG. UNIT	WATERSHED MANAGEMENT UNIT Stream/Lake	WMU	PRECIP	STREAM LENGTH	STREAM DENSITY	SURFACE WATER CLASS	WATER BEN. USES	WATER QUALITY IMPAIRMENTS (See Code Key at End of Table)			
			Inches	Miles	Mi./Sq. Mi.			USE	POLLUT./ SOURCE	CAUSE	IMPACT
	Okanogan R. #5	15-05	11	17.6	1.85	II					
	Potholes	15-06	12	11.5	0.53	-					
	Salt Hill	15-10	12	11.0	0.81	-					
	Soap Lake	15-09	12	48.6	2.22	-					
	South Plateau	15-11	12	28.2	0.84	-					
	Stubblefield Point	15-12	12	6.8	0.73	-					
	Tumwater Creek	15-08	12	4.6	0.35	N		62, 93	4, 29	55, 56	Moderate Low
	Soap Lake					SRW	42, 44, 62, 90, 93, 99	1	23	56	Saline-Meso-Eu.
	Duley Lake					N		82, 90, 93	4	52, 56	Eutrophic
	Little Goose Lake					LAKE	21, 62, 82, 93	62, 82	4	50, 52, 53, 56	Eutrophic
	Figure 8 Lake					N	90, 93				
	Penley Lake					SRW	90, 93	62	17, 18, 21	52, 56	Saline
	MacDonald Lake					N	90, 93				
	Freidlander Lake					N	90	93	4	56	
	Havian Lake					N	90	93	4	56	
	Long Lake					N	90	93	4	56	
	Rimrod Lake					N	93				
Twin Lakes	Beaver Dam Creek	2-07	24	15.8	1.69	II	21, 44, 62, 93	82, 85, 86	4, 10, 27	52, 53, 56	Moderate Low
	Columbia River #4	2-04	15	0.9	0.09	I					
	Cornstalk Creek	2-03	22	9.5	0.84	III	21, 44, 62, 82, 93, 99	82, 85, 86	4, 10	52, 58	Moderate
	Granite Creek	2-06	25	10.7	1.16	II	21, 44, 62, 93, 99	82, 85, 86	4, 10, 26	52, 54, 56	Moderate Low
	Lower Stranger Crk	2-01	20	14.5	1.20	II	21, 44, 62, 82, 83, 99	82, 85, 86	4, 10, 14, 25, 26, 27	52, 53, 54, 56	Moderate Low
	N. Twin Streams	2-08	23	12.3	1.08	N	21, 44, 62, 93	82, 85, 86	10, 28, 29	52, 53, 57	Moderate
	S. Twin Streams	2-05	23	2.9	0.46	N	62, 93	90	10, 14	52	Moderate Low
	Stray Dog Canyon	2-02	17	4.3	0.45	N		21, 44, 62, 82, 93		55	Moderate Low
	Upper Stranger Cr	2-09	22	13.0	0.79	II	21, 44, 62, 82, 93, 99	82, 85, 86	4, 10	52, 54	Moderate

RES. MANAG. UNIT	WATERSHED MANAGEMENT UNIT	WMU	PRECIP	STREAM LENGTH	STREAM DENSITY	SURFACE WATER CLASS	WATER BEN. USES	WATER QUALITY IMPAIRMENTS (See Code Key at End of Table)			
	Stream/Lake		Inches	Miles	Mi./Sq. Mi.			USE	POLLUT./ SOURCE	CAUSE	IMPACT
	North Twin Lake					SRW	21, 44, 62, 82, 85, 93, 99	42	10, 14, 19, 26	50, 52, 57, 59	Meso-Eutrophic
	South Twin Lake					SRW	21, 44, 62, 82, 85, 93, 99	42	10, 14, 19	50, 52, 59	Eu-mesotrophic
	Round Lake					LAKE	21, 44, 62, 82, 85, 93, 99	42	10, 26	50	Meso-Eutrophic
	Borgeau Lake					LAKE	21, 44, 62	82, 85, 93	4, 27	54	Mesotrophic
	Apex Lake					LAKE	21, 44, 62, 93	82, 85	27	54	Eutrophic
U. San Poil R.	Anderson Creek	6-15	16	6.4	1.14	III	21, 42, 62, 93	82, 85, 86	10, 26	54, 56, 58	Very Low
	Bear Creek	6-14	16	8.0	1.21	III	21, 44, 62, 93	82, 85, 86	26	56	Very Low
	Bridge Creek	6-09	20	35.4	1.16	III	44, 62	82, 85, 86, 93	4, 10, 56, 32	52, 54, 55, 56	Moderate
	Capoose Creek	6-10	14	7.2	1.20	III	21, 62, 93				Moderate
	Cub Creek	6-11	13	2.1	0.82	N	21, 62, 93				Moderate
	Deadhorse Creek	6-07	15	5.5	1.05	N	21, 62, 93				Moderate
	Nineteenmile Creek	6-17	15	5.8	1.32	III	61, 62, 93	82, 85, 86	10, 26	56	Moderate
	N. Nanamkin Crk.	6-13	17	19.5	1.22	III	21, 44, 62, 82, 85, 93	86	4, 10, 26, 31	54, 55, 56, 57	Moderate
	Seventeenmile Crk	6-02	20	20.7	1.02	III	21, 44, 62, 93	85, 86	10	52, 55	Moderate
	S. Fork 17-mile	6-03	19	5.4	0.77	III					
	S. Nanamkin Crk.	6-12	17	23.5	1.40	III	21, 44, 62, 82, 85, 93	86	4, 5, 6	54, 55, 56	Moderate
	Tigger Creek	6-16	15	6.3	1.40	-					
	Thirteenmile Crk.	6-01	15	2.0	1.62	II	82, 85, 86, 93			54, 58	Moderate
	Thirtymile Creek	6-08	19	29.4	1.18	II	21, 44, 62, 93	82, 85, 86	4, 10, 24	52, 56, 58	Moderate
	Twentyfivemile Cr	6-06	15	6.3	1.33	III	21, 44, 62, 93	82, 85, 86	10, 27	56	Very Low
	Twentyonemile Cr	6-04	20	13.4	1.00	III	21, 44, 62, 93	82, 85, 86	10	52, 56	Moderate
	Twentythreemile Creek	6-05	20	31.4	1.03	III	21, 44, 62, 93	82, 85, 86	10	56	Moderate
	Upper San Poil R.	6-18	13	42.4	1.14	I	21, 42, 62, 82, 85, 86, 93, 99	93	10, 26	50, 53, 54, 55, 56, 57	Very Low
	San Poil River at 13 Mile Creek					I	21, 42, 62, 82, 85, 86, 93, 99	42	4, 10, 26	50, 54, 55, 57, 58	Moderate
	Cody Lake					LAKE	21, 44, 62, 99	82, 85, 93	9, 10, 32	50, 52, 54, 56	Meso-Eutrophic

RES. MANAG. UNIT	WATERSHED MANAGEMENT UNIT Stream/Lake	WMU	PRECIP	STREAM LENGTH	STREAM DENSITY	SURFACE WATER CLASS	WATER BEN. USES	WATER QUALITY IMPAIRMENTS (See Code Key at End of Table)			
			Inches	Miles	Mi./Sq. Mi.			USE	POLLUT./ SOURCE	CAUSE	IMPACT
West Fork San Poil R.	Bungalow Creek	8-03	18	2.6	2.60	N	21, 62, 93	93	9		Moderate Low
	Deerhorn Creek	8-06	19	3.8	0.75	IV	21, 62, 93				Moderate Low
	King Creek	8-07	19	3.9	1.22	IV	21, 62, 93				Moderate
	Lime Creek #2	8-05	17	1.1	4.99	III					
	Lower Gold Creek	8-02	18	17.0	1.62	II	21, 44, 62, 82, 93, 99	82, 85, 86	4, 9, 10	52, 53, 54, 56, 58	Moderate
	Lower West Fork	8-01	15	13.3	1.21	I	21, 44, 62, 82, 93, 99	42, 93	4, 9, 32	52, 54, 55, 57	Moderate
	Roaring Creek	8-09	20	3.1	1.00	I	21, 62, 85, 93	82, 86	10	56	Very Low
	Strawberry Creek	8-08	19	9.1	1.36	III	21, 62, 85, 93			58	Moderate
	Upper Gold Creek	8-04	22	25.5	1.26	II	21, 44, 62, 82, 93, 99	82, 85, 86	4, 9	53, 54	Moderate
	Upper West Fork	8-10	21	2.9	1.28	I	21, 44, 62, 82, 93, 99	82, 85, 86	4, 9, 10	52, 53, 54, 56, 58	Moderate
	Gold Lake					LAKE	21, 44, 62, 82, 93, 99	1	10	51	Mesotrophic
Wilmont	Columbia River #5	3-05	14	0.9	0.17	I					
	Columbia River #6	3-06	13	0.0	0.00	I					
	Columbia River #7	3-07	14	1.7	0.34	I					
	Coyote Creek #2	3-03	16	3.4	0.97	II	62, 93				Moderate
	Dry Creek	3-10	23	5.6	1.62	I	62, 93		10	51, 56	Moderate
	Falls Creek	3-02	19	15.9	1.18	I	82, 85, 93	86	27	56	Moderate
	Little Wilmont Crk	3-13	21	12.6	1.36	II	21, 44, 62, 93	82, 85	10	52	Moderate
	Lower Wilmont Creek	3-09	18	20.4	1.10	II	21, 44, 62, 93	82, 85, 86	2, 4, 10, 14, 27	52, 53, 54, 56, 58	Moderate Low
	Monaghan	3-04	17	5.5	1.38	I					
	NezPerce Creek	3-01	20	34.3	1.16	III	21, 44, 62, 82, 85, 93	86	10, 27	50, 52, 53, 56, 58	Moderate Low
	Rock	3-11	22	2.1	1.76	I					
	Tree Forks	3-12	22	2.8	1.17	I					
	Upper Wilmont Cr	3-08	23	35.3	1.80	II	21, 44, 62, 93	82, 85, 86	10, 16	52	Moderate
	Fish Lake					LAKE	62, 90, 93	82	27	52, 54	Eutrophic

WATER QUALITY CODE KEY:

1. General Use
21. Fish Consumption (Public health)
42. Primary Contact Recreation
43. Secondary Contact
62. Aesthetic Enjoyment
82. Rearing, Harvesting and Other Fish Spawning
85. Salmonid Spawning
86. Salmonid and Other Fish Migration
90. Aquatic Life
93. Wildlife Habitat
99. Cultural and Traditional

CAUSE:

50. Urban Development
51. Agriculture, Unspecified
52. Non-irrigated Crop Production
53. Irrigated Crop Production
54. Grazing Livestock
55. Feedlots
56. Livestock Operations
57. Aquaculture
58. Forest Management
59. Road Construction/Maintenance
60. Land Development
61. Toxic Spills

STREAMS AND LAKE CLASSIFICATION:

Class I - Extraordinary
Class II – Excellent
Class III – Good
Class IV – Fair
Lake – Water quality meets or exceeds requirements for all or substantially all uses.
SRW – Water quality impaired by natural processes, mostly saline.
N – Not classified

POLLUTANT/SOURCE

1. pH
2. Siltation and Sediments
3. Dissolved Oxygen/Organic Enrichment
4. Thermal Modification
5. Flow Alteration
6. Habitat Alteration
7. Fecal Coliform/Other Pathogen Indicators
8. Animal Holding Management Areas
9. Forest management
10. Logging Roads
11. Turbidity
12. Construction, Unspecified
13. Highway/Road/Bridge Construction
14. Land Development
15. Urban Runoff Storm Sewers
16. Urban Development
17. Mining
18. Mine Tailings
19. Septic Tanks
20. Stream Modification
21. Dredging
22. Water Removal
23. Riparian Vegetation Removal
24. Streambank Modification/Destabilization
25. Drainage/Filling of Wetlands
26. Highway Maintenance and Runoff
27. Natural Sources
28. Recreation Activities
29. Non-point Source, Unspecified
30. Point and Non-point Sources Overall
31. Non-point Sources Overall
32. Removal of Beaver

APPENDIX E – PROPOSED HARVEST ACTIVITIES BY ALTERNATIVE

Table E-1. Acres Proposed for Harvest by Year, Alternative, PAG and Silvicultural Treatment on the Colville Reservation.

YEAR	REGENERATION HARVEST						INTERM							TOTAL					
	DFWM	DFCM	DFCD	GF	SF	Total	DFWM	DFCM	DFCD	GF	SF	PPWD	Total	DFWM	DFCM	DFCD	GF	SF	Total
Alternative 1																			
2000	1390	1909	80	261	43	3684	2927	2705	134	370	61	71	6269	4317	4614	214	632	104	9953
2001	1561	1874	1043	378	598	5436	3287	2655	1755	535	821	71	9124	4848	4529	2798	914	1401	14560
2002	815	1339	301	179	289	2924	1717	1897	507	254	410	25	4810	2532	3236	808	433	699	7734
2003	765	1731	405	411	31	3343	1610	2452	681	582	44	76	5445	2375	4184	1086	992	75	8788
2004	919	1771	304	339	289	3613	1934	2508	511	480	397	106	5937	2853	4279	815	819	677	9549
2005	1764	1683	499	354	466	4766	3713	2384	839	502	660	74	8172	5477	4067	1337	856	1126	12938
2006	1808	1764	731	847	442	5592	3806	2499	1229	1199	626	50	9410	5614	4264	1960	2046	1068	15002
2007	1229	1228	462	85	583	3587	2587	1740	777	121	826	56	6107	3816	2967	1240	206	1409	9695
2008	1285	1085	113	201	128	2913	2917	1538	190	285	181	44	5155	4303	2623	303	486	309	8068
2009	799	833	532	155	1394	3713	1682	1180	896	219	1975	152	6104	2482	2013	1428	374	3368	9817
2010	1176	1060	292	418	432	3378	2475	1502	491	592	613	78	5751	3651	2562	783	1010	1045	9129
2011	685	679	341	612	260	2577	1442	962	573	867	369	49	4261	2127	1641	914	1478	629	6838
2012	487	1139	607	271	1181	3684	1024	1614	1020	383	1674	171	5886	1511	2753	1627	654	2855	9571
2013	944	1331	487	589	375	3725	1987	1885	820	834	531	105	6160	2931	3216	1307	1422	905	9885
2014	847	2544	659	415	490	4954	2803	4759	1455	730	973	374	11092	3649	7303	2113	1144	1462	16046
Total	16573	21971	6857	5514	6975	57889	35911	32280	11877	7953	10159	1502	99684	52484	54251	18733	13468	17134	157573
Mean	1105	1465	457	368	785	3859	2394	2152	792	530	677	100	6646	3499	3617	1249	898	1142	10505
Alternative 2																			
2000	935	1343	58	196	32	2565	3598	3003	145	414	69	204	7432	4533	4346	203	610	101	9997
2001	1062	1323	755	283	435	3858	4083	2957	1889	598	917	229	10673	5145	4279	2644	881	1352	14531
2002	558	948	219	135	217	2077	2146	2120	548	284	458	59	5615	2704	3068	767	418	675	7692
2003	516	1223	293	308	23	2363	1984	2733	732	650	49	217	6366	2500	3956	1025	958	73	8729
2004	619	1253	221	254	210	2558	2382	2801	553	537	444	282	6998	3001	4055	774	791	654	9556
2005	1052	1088	337	265	349	3092	4045	2433	843	559	738	821	9439	5097	3521	1181	824	1087	12530
2006	1237	1249	531	635	331	3984	4757	2793	1328	1341	700	130	11049	5994	4043	1860	1976	1031	15034
2007	841	870	336	64	437	2548	3234	1944	841	135	923	151	7228	4075	2814	1177	199	1361	9776
2008	875	757	81	151	96	1961	3381	1692	204	319	202	231	6030	4257	2449	285	469	298	7991
2009	502	580	375	116	1045	2618	1944	1299	940	245	2207	452	7087	2446	1879	1315	361	3252	9705
2010	797	747	212	313	324	2395	3066	1670	531	662	684	202	6815	3863	2417	743	975	1009	9210
2011	442	470	241	451	192	1796	1704	1054	601	952	406	276	4993	2146	1524	842	1403	598	6789
2012	332	805	441	203	886	2667	1280	1804	1103	428	1871	452	6938	1612	2609	1544	631	2757	9605
2013	642	928	352	401	281	2605	2471	2075	881	947	593	357	7224	3113	3003	1233	1249	874	9829
2014	764	2213	595	362	467	4402	2940	4948	1487	765	987	487	11613	3704	7161	2082	1127	1455	16015
Total	11175	15798	5049	4137	5328	41488	43015	35325	12625	8735	11248	4552	115501	54191	51123	17674	12872	16576	156989
Mean	745	1053	337	276	355	2766	2868	2355	842	582	750	303	7700	3613	3408	1178	858	1105	10466
Alternative 3																			
2000	1237	1364	45	163	31	2840	2604	1932	75	231	44	41	4928	3841	3296	120	395	75	7768
2001	881	792	656	34	354	2717	1856	1122	1103	49	501	22	4652	2737	1913	1759	83	855	7369
2002	768	1265	276	179	289	2778	1617	1793	464	254	410	25	4563	2386	3058	740	433	699	7341
2003	779	1262	236	172	35	2485	1641	1788	397	243	50	31	4150	2420	3051	633	415	85	6635

YEAR	REGENERATION HARVEST						INTERM							TOTAL						
	DFWM	DFCM	DFCD	GF	SF	Total	DFWM	DFCM	DFCD	GF	SF	PPWD	Total	DFWM	DFCM	DFCD	GF	SF	Total
2004	1311	1010	637	75	291	3324	2761	1431	1071	100	412	38	5819	4072	2441	1708	181	703	9143
2005	1188	1014	322	297	458	3281	2502	1437	542	421	649	53	5605	3691	2451	865	719	1108	8886
2006	981	1130	189	847	518	3565	2065	1601	317	1199	593	49	5825	3046	2732	505	2046	1011	9389
2007	1081	811	287	85	147	2411	2276	1150	482	121	207	14	4250	3357	1961	769	206	354	6661
2008	1074	750	60	170	539	2181	2261	1062	100	241	181	37	3883	3335	1812	160	411	209	6065
2009	799	539	388	5	539	2268	1681	763	652	7	763	39	3904	2479	1301	1040	11	1302	6173
2010	796	700	207	211	344	2259	1676	992	348	299	488	43	3846	2472	1692	555	511	832	6105
2011	892	906	484	660	260	3202	1877	1283	814	935	369	52	5331	2769	2189	1299	1595	629	8533
2012	863	1904	747	22	544	4079	2322	3442	1493	46	943	233	8485	3185	5346	2240	68	1492	12564
2013	857	961	473	418	373	3082	1804	1362	795	592	529	71	5152	2661	2323	1268	1010	992	8234
2014	559	1828	316	398	261	3361	1226	2610	549	564	396	111	5456	1784	4438	865	961	657	8816
Total	14066.1	16235.6	5321	3737	4473	43833	30168	23767	9205	5309	6541	859.4	75849	44234	40003	14527	9046	11014	119683
Mean	938	1082	355	249	298	2922	2011	1585	614	354	436	57	5057	2949	2667	968	603	734	7979
Alternative																			
2000	0	692	19	183	3	898	4317	3922	195	449	181	71	9055	4317	4614	214	632	104	9953
2001	0	679	252	265	42	1238	4848	3850	2546	649	1359	71	13322	4848	4529	2798	914	1401	14560
2002	0	485	73	126	21	705	2532	2750	736	308	679	25	7029	2532	3236	808	433	699	7734
2003	0	628	98	288	2	1015	2375	3556	988	705	73	76	7773	2375	4184	1086	992	75	8788
2004	0	642	73	238	20	973	2853	3637	742	582	657	106	8576	2853	4279	815	819	677	9549
2005	0	610	120	248	34	1013	5477	3457	1217	608	1093	71	11925	5477	4067	1337	856	1126	12938
2006	0	640	176	593	32	1441	5614	3624	1783	1453	1036	50	13560	5614	4264	1960	2046	1068	15002
2007	0	445	112	60	42	659	3816	2522	1128	146	1367	56	9036	3816	2967	1240	206	1409	9695
2008	0	393	27	141	9	571	4303	2230	276	345	299	44	7497	4302	2623	303	486	309	8068
2009	0	302	129	108	101	640	2482	1711	1299	265	3267	152	9177	2482	2013	1428	374	3368	9817
2010	0	384	71	293	31	779	3651	2178	712	717	1013	78	8350	3651	2562	783	1010	1045	9129
2011	0	246	82	429	19	776	2127	1395	832	1049	611	49	6062	2127	1641	914	1478	629	6838
2012	0	413	146	190	86	835	1511	2340	1481	464	2770	171	8736	1511	2753	1627	654	2855	9571
2013	0	482	118	413	27	1040	2931	2733	1190	1010	878	105	8846	2931	3216	1307	1422	905	9886
2014	0	1095	190	332	44	1661	3649	6208	1923	813	1418	374	14385	3649	7303	2113	1144	1462	16046
Total	0	8138	1686	3906	514	14244	52484	46114	17047	9562	16620	1502	143330	52484	54251	18733	13468	17134	157573
Mean	0	543	112	260	34	950	3499	3074	1137	637	1108	100	9555	3499	3617	1249	898	1142	10505
Alternative 5																			
2000	2029	4014	117	367	66	6593	2288	600	96	265	39	71	3360	4317	4614	214	632	104	9953
2001	2278	3941	1539	530	883	9170	2569	589	1259	384	518	71	5390	4847	4529	2798	914	1401	14560
2002	1190	2815	445	241	441	5142	1342	421	364	182	259	25	2593	2532	3236	808	433	699	7734
2003	1116	3640	597	575	47	5976	1259	544	489	417	28	78	2812	2375	4184	1086	992	75	8788
2004	1341	3723	448	475	427	6414	1512	556	367	344	251	106	3136	2853	4279	815	819	677	9549
2005	2574	3538	735	497	710	8055	2903	529	602	360	417	71	4883	5477	4067	1337	856	1126	12938
2006	2639	3709	1078	1187	673	9286	2975	554	882	859	395	50	5716	5614	4264	1960	2046	1068	15002
2007	1794	2582	682	119	888	6064	2023	386	558	87	521	58	3630	3816	2967	1240	206	1409	9695
2008	2022	2282	167	282	194	4948	2280	341	137	204	114	44	3120	4303	2623	303	486	309	8068
2009	1166	1751	785	217	2122	6042	1315	262	643	157	1246	152	3775	2482	2013	1428	374	3368	9817
2010	1716	2229	431	586	658	5620	1935	333	352	424	387	78	3509	3651	2562	783	1010	1045	9129

YEAR	REGENERATION HARVEST						INTERM						TOTAL						
	DFWM	DFCM	DFCD	GF	SF	Total	DFWM	DFCM	DFCD	GF	SF	PPWD	Total	DFWM	DFCM	DFCD	GF	SF	Total
2011	1000	1428	503	857	397	4184	1127	213	411	621	233	49	2654	2127	1641	914	1478	629	6838
2012	710	2395	895	379	1799	6178	801	358	732	275	1066	171	3393	1511	2753	1627	654	2855	9571
2013	1377	2798	719	825	570	6289	1553	418	588	597	335	105	3596	2931	3216	1307	1422	905	9886
2014	1715	6354	1162	664	921	10816	1934	949	951	481	541	374	5230	3649	7303	2113	1144	1462	16046
Total	24668	47199	10303	7811	10795	100775	27817	7053	8430	5656	6340	1502	56798	52485	54251	18733	13468	17134	157573
Mean	1645	3147	687	521	720	6718	1855	470	562	377	423	100	3787	3499	3617	1249	898	1142	10505
Alternative 6																			
2000	1805	2867	66	229	47	5015	2036	429	54	166	28	41	2753	3841	3296	120	395	75	7768
2001	1321	1709	984	48	539	4601	1490	255	805	35	317	22	2924	2811	1964	1790	83	855	7525
2002	1121	2660	407	251	441	4880	1264	397	333	182	259	25	2461	2386	3058	740	433	699	7341
2003	1229	2932	381	243	63	4847	1385	438	312	176	37	31	2378	2614	3370	693	418	99	7225
2004	1914	2123	940	105	443	5525	2158	317	769	76	260	38	3618	4072	2441	1708	181	703	9143
2005	1643	1854	443	415	689	5044	1853	277	362	301	405	53	3251	3496	2131	805	716	1093	8295
2006	1133	2650	269	665	768	5485	1278	396	220	481	451	55	2881	2412	3046	489	1146	1219	8366
2007	1680	2528	277	937	218	5639	1894	378	226	678	128	65	3369	3574	2905	503	1615	346	9008
2008	2138	1856	436	245	200	4875	2411	277	357	178	117	37	3377	4549	2134	793	423	317	8253
2009	1182	1899	813	0	1582	5476	1333	284	665	0	929	120	3331	2514	2183	1478	0	2511	8808
2010	1801	1559	520	335	485	4701	2031	233	426	243	285	22	3239	3832	1792	946	578	770	7940
2011	1301	1904	714	925	397	5242	1467	285	584	670	233	52	3291	2769	2189	1249	1595	629	8533
2012	714	3879	961	0	503	6057	805	580	787	0	295	217	2683	1519	4459	1748	0	798	8741
2013	1251	2021	697	586	568	5123	1410	302	571	424	334	71	3111	2661	2323	1268	1010	902	8234
2014	773	3789	433	558	319	5872	872	566	354	404	199	109	2504	1645	4355	787	961	518	8376
Total	21006	36231	8342	5542	7260	78381	23688	5414	6825	4013	4276	958	45174	44693	41645	15167	9555	11536	123556
Mean	1400	2415	556	369	484	5225	1597	361	455	267	285	64	3012	2980	2776	1011	637	769	8237

Table E-2. Volume (MMBF) Proposed for Harvest by Year, Alternative, PAG and Silvicultural Treatment on the Reservation.

YEAR	REGENERATION HARVEST						INTERM							TOTAL					
	DFWM	DFCM	DFCD	GF	SF	Total	DFWM	DFCM	DFCD	GF	SF	PPWD	Total	DFWM	DFCM	DFCD	GF	SF	Total
Alternative 1																			
2000	14.0	23.5	0.8	3.7	0.6	42.6	15.2	9.2	0.4	1.1	0.2	0.2	26.3	29.2	32.7	1.2	4.8	0.8	68.9
2001	15.8	23.1	10.4	5.3	7.6	62.2	17.1	9.0	4.7	1.6	3.2	0.2	35.8	32.9	32.1	15.1	6.9	10.8	96.0
2002	8.2	16.5	3.0	2.5	3.8	34.0	8.9	6.4	1.4	0.8	1.6	0.1	19.2	17.1	22.9	4.4	3.3	5.4	53.2
2003	7.7	21.3	4.1	5.7	0.3	39.2	8.4	8.3	1.8	1.7	0.2	0.2	20.6	16.1	29.6	5.9	7.4	4.6	59.8
2004	9.3	21.8	3.0	0.7	3.7	32.5	10.1	8.5	1.4	1.4	1.5	0.3	23.2	19.4	30.3	4.4	6.1	5.2	65.7
2005	17.8	20.7	5.0	5.0	6.1	54.6	19.3	8.1	2.3	1.5	2.6	0.2	34.0	37.1	28.8	7.3	6.5	8.7	88.6
2006	18.3	21.7	7.3	11.9	5.8	65.0	19.8	8.5	3.3	3.6	2.4	0.2	37.8	38.1	30.2	10.6	15.5	8.2	102.8
2007	12.4	15.1	4.6	1.2	7.6	40.9	13.5	5.9	2.1	0.7	3.2	0.2	25.3	25.9	21.0	6.7	1.6	10.8	66.2
2008	14.0	13.4	1.1	2.8	1.7	33.0	15.2	5.2	0.5	0.9	0.7	0.1	22.6	29.2	18.6	1.6	3.7	2.4	55.6
2009	8.1	10.2	5.3	2.2	18.3	44.1	8.7	4.0	2.4	0.7	7.7	0.5	24.0	16.8	14.2	7.7	2.9	26.0	68.1
2010	11.9	13.0	2.9	5.9	5.7	39.4	12.9	15.1	1.3	1.8	2.4	0.2	23.7	24.8	18.1	4.2	7.7	8.1	63.1
2011	6.9	8.4	3.4	8.6	3.4	30.7	7.5	3.3	1.5	2.6	1.4	0.1	16.4	14.4	11.7	4.9	11.2	4.8	47.1
2012	4.9	14.0	6.1	3.8	15.5	44.3	5.3	5.5	2.8	1.1	6.5	0.5	21.7	10.2	19.5	8.9	4.9	22.0	66.0
2013	9.5	16.4	4.9	8.2	4.9	43.9	10.3	6.4	2.2	2.5	2.1	0.3	23.8	19.8	22.8	7.1	10.7	7.0	67.7
2014	8.5	31.3	6.6	5.8	6.4	58.6	14.6	16.2	3.9	2.2	3.8	1.1	41.8	23.1	47.5	10.5	8.0	10.2	100.4
Total	167.3	270.4	68.5	77.3	91.5	675.0	186.8	109.6	32.0	23.9	39.5	4.4	396.2	354.1	380.0	100.5	101.2	131.0	1071.2
Mean	11.2	18.0	4.6	5.2	6.1	45.0	12.5	7.3	2.1	1.6	2.6	0.3	26.4	23.6	25.3	6.7	6.7	8.7	71.4
Alternative 2																			
2000	9.4	16.5	0.6	2.7	0.4	29.6	18.7	10.2	0.4	1.3	0.3	0.6	31.6	28.1	26.7	1.0	3.1	0.7	61.2
2001	10.7	16.3	7.6	4.0	5.7	44.3	21.2	10.1	5.1	1.8	4.6	9.7	42.5	31.9	26.4	12.7	5.8	9.3	86.8
2002	5.6	11.7	2.2	1.9	2.8	24.2	11.2	7.2	1.5	0.9	1.8	0.2	22.8	16.8	18.9	3.7	2.8	4.6	47.0
2003	5.2	15.0	2.9	4.3	0.3	27.7	10.3	9.3	2.0	2.2	0.2	0.7	24.7	15.5	24.3	4.9	6.5	0.5	52.4
2004	6.3	15.4	2.2	3.6	2.8	30.3	12.4	9.5	1.8	1.7	1.7	0.8	27.9	18.7	24.9	4.0	5.3	4.5	58.2
2005	10.6	13.4	3.4	3.7	4.6	35.7	21.0	8.3	2.3	1.9	2.9	2.5	38.9	31.6	21.7	5.7	5.6	7.5	74.6
2006	12.5	15.4	5.3	8.9	4.3	46.4	24.7	9.5	3.6	4.6	2.7	0.2	45.5	37.2	24.9	8.9	13.5	7.0	91.9
2007	8.5	10.7	3.4	0.9	5.7	29.2	16.8	6.6	2.3	0.5	3.6	0.2	30.3	25.3	17.3	5.7	1.4	9.3	59.5
2008	8.8	9.3	0.8	2.1	1.3	22.3	17.6	5.8	0.5	1.0	0.8	0.7	26.4	26.4	15.1	1.3	3.1	2.1	48.7
2009	5.1	7.4	3.8	1.6	13.7	31.3	10.1	4.4	2.5	0.7	8.6	1.4	27.7	15.2	11.5	6.3	2.3	22.3	59.0
2010	8.1	9.2	2.1	4.3	4.2	28.0	15.9	5.7	1.4	2.3	2.7	0.6	28.6	24.0	14.9	3.5	6.7	6.9	56.6
2011	4.5	5.8	2.4	6.3	2.5	21.5	8.9	3.6	1.6	3.2	1.6	0.8	19.7	13.4	9.4	4.0	9.3	4.1	41.2
2012	3.4	9.9	4.4	2.8	11.6	32.1	6.7	6.1	3.0	1.3	7.3	1.4	25.8	10.1	16.0	7.4	4.1	18.9	57.9
2013	6.5	11.5	3.5	5.6	5.7	30.7	12.8	7.1	2.4	2.9	2.3	1.1	28.6	19.3	18.5	5.9	8.5	6.0	59.3
2014	7.7	27.2	5.9	5.1	6.1	52.0	15.3	16.8	3.0	2.6	3.8	1.5	44.0	23.0	44.0	9.9	7.7	9.9	96.0
Total	112.9	194.3	50.5	57.9	69.7	485.3	223.6	120.2	34.4	29.0	43.9	13.9	465.0	336.5	314.5	84.9	86.9	113.6	953.1
Mean	7.5	13.0	3.4	3.9	4.6	32.4	14.9	8.0	2.3	1.9	2.9	0.9	31.0	22.4	21.0	5.7	5.8	7.6	63.4
Alternative 3																			
2000	12.5	16.8	0.4	2.3	0.7	32.4	13.5	6.6	0.2	0.7	0.2	0.1	21.3	26.0	23.4	0.6	3.0	0.6	53.7
2001	8.9	9.7	6.6	0.5	4.6	30.3	9.6	3.8	3.0	0.1	2.0	0.1	18.6	18.5	13.5	9.6	0.6	6.6	48.9
2002	7.8	15.6	2.8	2.5	3.8	32.5	8.4	6.1	1.3	0.8	1.6	0.1	18.3	16.2	21.7	4.1	3.3	5.4	50.8
2003	7.9	15.5	2.4	2.4	0.5	28.7	8.5	6.1	1.1	0.7	0.2	0.1	16.7	16.4	21.6	3.5	3.1	0.7	45.4

YEAR	REGENERATION HARVEST						INTERM							TOTAL					
	DFWM	DFCM	DFCD	GF	SF	Total	DFWM	DFCM	DFCD	GF	SF	PPWD	Total	DFWM	DFCM	DFCD	GF	SF	Total
2004	13.2	12.4	6.4	1.8	3.0	36.8	14.4	4.9	2.9	0.3	1.6	0.1	24.2	27.6	17.3	9.3	1.3	5.4	61.0
2005	12.0	12.5	3.2	4.2	6.0	37.9	13.0	4.9	1.5	1.3	2.5	0.2	23.4	25.0	17.4	3.7	5.5	8.5	61.3
2006	9.9	13.9	1.9	11.9	5.5	43.1	10.7	5.4	0.9	3.6	2.3	0.1	23.0	20.6	19.3	2.8	15.5	7.8	66.1
2007	10.9	10.0	2.9	1.2	1.9	26.9	11.8	3.9	1.3	0.4	0.8	0.0	18.2	22.7	13.9	4.2	1.6	2.7	45.1
2008	10.8	9.2	0.6	2.4	1.7	24.7	11.9	3.6	0.3	0.7	0.7	0.1	17.2	22.6	12.8	0.9	3.1	2.4	41.9
2009	8.1	6.6	3.9	0.1	7.1	25.8	8.7	2.6	1.8	0.0	3.0	0.1	16.2	16.8	9.2	5.7	0.1	10.1	42.0
2010	8.0	8.6	2.1	3.0	4.5	26.2	8.7	3.4	0.9	0.9	1.9	0.1	15.9	16.7	12.8	3.0	3.9	6.4	42.1
2011	9.0	11.1	4.8	9.2	3.4	37.5	9.8	4.4	2.2	2.8	1.4	0.2	20.8	18.8	15.5	7.0	2.0	4.8	58.3
2012	8.7	23.4	7.5	0.3	7.1	47.0	12.1	11.7	4.0	0.1	3.7	0.7	32.3	20.8	35.1	11.5	0.3	10.8	79.3
2013	8.7	11.8	4.7	5.9	4.9	36.0	9.4	4.6	2.1	1.8	2.1	0.2	20.2	18.1	16.4	6.8	7.7	7.8	56.2
2014	5.6	22.5	3.2	5.6	3.4	0.3	6.4	8.9	1.5	1.7	1.5	0.3	20.3	12.0	31.4	4.7	7.3	4.9	60.6
Total	142.0	199.6	53.4	52.5	58.6	506.1	156.8	80.9	25.0	15.9	25.5	2.5	306.6	298.8	280.5	78.4	68.4	84.1	818.7
Mean	9.5	13.3	3.6	3.5	4.0	33.7	10.5	5.3	1.7	1.1	1.7	0.2	20.4	19.0	18.7	5.2	4.0	5.6	54.6
Alternative 4																			
2000	0.0	8.5	0.2	2.6	0.0	1.5	22.4	13.3	0.5	1.3	0.4	0.2	38.1	22.4	21.8	0.7	3.9	0.3	49.4
2001	0.0	8.4	2.5	3.7	0.6	15.2	25.2	13.1	6.9	1.0	5.3	0.2	52.6	25.2	21.5	9.4	5.6	5.9	67.8
2002	0.0	6.0	0.7	1.8	0.3	8.8	13.2	9.4	2.0	0.9	2.6	0.1	28.2	13.2	15.4	2.7	2.7	2.9	37.0
2003	0.0	7.7	1.0	4.0	0.0	12.7	12.4	12.1	2.7	2.1	0.3	0.2	29.8	12.4	19.8	3.7	6.1	0.3	42.5
2004	0.0	7.9	0.7	3.3	0.3	12.2	14.8	12.4	2.0	1.7	2.6	0.3	33.8	14.8	20.3	2.7	5.0	2.9	46.0
2005	0.0	7.5	1.2	3.5	0.4	12.6	28.5	11.8	3.3	1.8	3.5	0.2	49.9	28.5	19.3	4.5	5.3	4.7	62.5
2006	0.0	7.9	1.0	8.3	0.4	18.4	29.2	12.4	4.8	4.3	4.0	0.2	54.9	29.2	20.2	6.6	12.7	4.4	73.3
2007	0.0	5.5	1.1	0.8	8.6	8.0	19.8	8.6	3.0	0.4	5.3	0.2	37.3	19.8	14.1	4.1	1.4	5.9	45.3
2008	0.0	4.8	0.3	2.9	0.1	7.2	22.4	7.6	0.7	1.0	1.2	0.1	33.0	22.4	12.4	1.0	4.0	1.3	40.2
2009	0.0	3.7	1.3	1.5	1.3	7.8	12.9	5.8	3.5	0.8	2.7	0.5	36.2	12.9	9.5	4.8	2.3	14.0	44.0
2010	0.0	4.7	0.7	0.1	0.3	9.9	19.0	7.9	1.0	2.2	4.0	0.2	34.7	19.0	12.1	2.0	6.3	4.4	44.6
2011	0.0	3.0	0.8	6.8	0.2	10.0	11.8	4.7	2.2	3.1	2.4	0.1	23.6	11.1	7.7	3.0	0.1	2.6	33.6
2012	0.0	5.1	1.5	2.7	1.1	10.4	7.9	0.9	3.0	1.3	10.8	8.5	32.6	7.9	13.1	5.5	3.1	11.9	43.0
2013	0.0	5.9	1.2	5.8	0.3	13.3	15.2	9.4	3.2	3.0	3.4	0.3	34.4	15.2	15.2	4.4	0.0	3.8	47.7
2014	0.0	13.5	1.0	4.6	0.6	20.6	19.0	21.1	5.2	2.3	5.5	1.1	54.4	19.0	34.6	4.1	7.1	6.1	75.0
Total	0.0	100.1	16.9	54.7	0.7	178.4	272.9	156.8	46.0	28.7	64.8	4.5	573.7	272.9	256.9	62.9	83.4	71.6	751.9
Mean	0.0	6.7	1.1	3.6	0.3	11.9	18.2	10.5	3.1	1.9	4.3	0.3	38.2	18.2	17.1	4.2	5.6	4.8	50.1
Alternative 5																			
2000	20.5	49.4	1.2	5.1	0.9	77.1	11.9	2.0	0.3	0.8	0.2	0.2	15.4	32.4	51.4	1.5	5.9	1.1	92.5
2001	23.0	48.5	15.4	7.4	11.6	105.9	13.4	2.0	3.0	1.2	2.0	0.2	22.2	36.4	50.5	18.8	8.6	13.6	128.1
2002	12.0	34.6	4.4	3.5	5.8	60.3	7.0	1.4	1.0	0.5	1.0	0.1	11.0	19.0	36.0	5.4	4.0	6.8	71.3
2003	11.3	44.8	6.0	8.1	0.0	70.8	6.5	1.8	1.3	1.3	0.1	0.2	11.2	17.8	46.6	7.3	9.4	0.7	82.0
2004	13.5	45.8	4.5	0.7	5.6	76.1	7.9	1.9	1.0	4.0	1.0	0.3	13.1	21.4	47.7	5.5	7.7	6.6	89.2
2005	26.0	43.5	7.4	7.3	0.3	93.2	15.1	1.8	1.6	1.1	1.6	0.2	21.4	41.1	45.3	9.0	8.1	10.9	114.6
2006	26.7	45.6	10.8	16.6	8.8	108.5	15.5	1.0	2.4	2.6	1.5	0.2	24.1	42.2	47.5	13.2	19.2	10.3	132.6
2007	18.1	31.8	6.8	1.7	11.6	70.8	10.5	1.3	1.5	0.3	2.0	0.2	15.8	28.6	33.1	8.3	2.0	13.6	85.8
2008	20.4	28.1	1.7	3.9	2.5	56.6	11.8	1.2	0.4	0.6	0.3	0.1	14.6	32.3	29.3	2.1	4.5	2.9	71.2
2009	11.8	21.5	7.9	3.0	27.8	72.0	6.8	0.9	1.7	0.5	4.9	0.5	15.3	18.6	22.4	9.6	3.5	32.7	87.3
2010	17.3	27.4	4.3	8.2	8.6	65.8	10.1	1.1	1.0	1.3	1.5	0.2	15.2	27.4	28.5	5.3	9.5	10.1	81.0

YEAR	REGENERATION HARVEST						INTERM							TOTAL					
	DFWM	DFCM	DFCD	GF	SF	Total	DFWM	DFCM	DFCD	GF	SF	PPWD	Total	DFWM	DFCM	DFCD	GF	SF	Total
2011	10.1	17.6	5.0	12.0	5.2	49.9	5.9	0.7	1.1	1.9	0.9	0.1	10.6	16.0	18.3	6.1	13.9	6.1	60.5
2012	7.2	29.5	8.9	5.3	23.6	74.5	4.2	1.2	2.0	0.8	4.1	0.5	12.8	11.4	30.7	10.9	0.1	27.7	87.3
2013	13.9	34.4	7.2	11.5	7.5	74.5	8.1	1.0	1.6	1.8	1.3	0.3	14.5	22.0	35.8	8.8	3.5	8.8	89.0
2014	17.3	78.1	11.6	9.3	12.1	128.5	10.1	3.2	2.6	1.3	2.1	1.1	20.5	27.4	81.4	14.2	10.7	14.2	149.0
Total	249.1	580.5	103.0	109.4	141.5	1183.5	144.6	24.0	22.8	17.0	24.7	4.5	237.6	393.8	604.5	125.8	126.3	166.1	1421.4
Mean	16.6	38.7	6.9	7.3	9.4	78.9	9.6	1.6	1.5	1.1	1.6	0.3	15.8	26.3	40.3	8.4	8.4	11.1	94.8
Alternative 6																			
2000	18.2	35.3	0.7	3.2	0.6	58.0	10.6	1.5	0.1	0.5	0.1	0.1	12.9	28.8	36.8	0.8	3.7	0.7	70.9
2001	13.3	21.0	9.8	0.7	7.1	51.9	7.7	0.9	2.2	0.1	1.2	0.1	12.2	21.0	21.9	12.0	0.8	8.3	64.1
2002	11.3	32.7	4.1	3.5	5.8	57.4	6.6	1.3	0.9	0.5	1.8	0.1	14.5	17.9	34.1	5.0	4.0	6.8	67.9
2003	12.4	36.1	3.8	3.4	0.8	56.5	7.2	1.5	0.8	0.5	0.1	0.1	10.2	19.6	37.6	4.6	3.9	0.9	66.7
2004	19.3	26.1	9.4	1.5	5.8	62.1	11.2	1.1	2.1	0.2	1.0	0.1	15.7	30.5	27.2	11.5	1.7	6.8	77.8
2005	16.6	22.8	4.4	5.8	9.0	58.6	9.6	0.9	1.0	0.9	1.6	0.2	14.2	26.2	23.7	5.4	6.7	10.6	72.8
2006	11.4	32.6	2.7	9.3	10.1	66.1	6.6	1.3	0.6	1.3	1.8	0.2	11.9	18.0	33.9	3.3	10.7	11.9	78.0
2007	17.0	31.1	2.8	13.1	2.9	66.9	9.8	1.3	0.6	2.0	0.5	0.2	14.4	26.8	32.4	3.4	15.1	3.4	81.3
2008	21.6	22.8	4.4	3.4	2.6	54.8	12.5	0.9	1.0	0.5	0.5	0.1	15.5	34.1	23.7	5.4	3.9	3.1	70.3
2009	11.9	23.4	8.1	0.0	20.7	64.1	6.9	1.0	1.8	0.0	3.6	0.4	13.7	18.8	24.4	9.9	0.0	24.3	77.8
2010	18.2	19.2	5.2	4.7	6.4	53.7	10.6	0.9	1.1	0.7	1.1	0.1	14.4	28.8	20.0	6.3	5.4	7.5	68.1
2011	13.1	23.4	7.1	13.0	5.2	61.8	7.6	1.0	1.6	2.0	0.9	0.2	13.3	20.7	24.4	8.7	15.0	6.1	75.1
2012	7.2	47.7	9.6	0.0	6.6	71.1	4.2	5.0	2.1	0.0	1.2	0.7	10.1	11.4	49.7	11.7	0.0	7.8	81.2
2013	12.6	24.9	7.0	8.2	7.4	60.1	7.3	1.0	1.5	1.3	1.3	0.2	12.6	19.9	25.9	8.5	9.5	8.7	72.7
2014	7.8	46.6	4.3	7.8	4.2	70.7	4.5	1.0	1.0	1.2	0.8	0.3	9.7	12.3	48.5	5.3	0.0	5.0	80.4
Total	211.9	445.7	83.4	77.6	95.2	913.8	122.9	18.5	18.4	11.8	16.7	3.1	191.3	334.8	464.2	101.8	89.4	111.9	1105.1
Mean	14.1	29.7	5.6	5.2	6.3	60.9	8.2	1.2	1.2	0.8	1.1	0.2	12.8	22.3	30.9	6.8	6.0	7.5	73.7