ENVIRONMENTAL STATEMENT

DRAFT

SIERRA PACIFIC POWER COMPANY
230-345 KV TRANSMISSION LINE
OREANA, NEVADA TO HUNT, IDAHO

AUGUST 1976

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
NEVADA STATE OFFICE

DEPARTMENT OF THE INTERIOR

DRAFT
ENVIRONMENTAL STATEMENT

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230/345 KV TRANSMISSION LINE
OREANA, NEVADA TO HUNT, IDAHO

Prepared by

BUREAU OF LAND MANAGEMENT
DEPARTMENT OF THE INTERIOR

State Director, Nevada State Office

SUMMARY

Draft (x) Final ( ) Environmental Statement

Department of the Interior, Bureau of Land Management

1. Type of Action: Administrative (x) Legislative ( )

2. Brief Description of Action: The proposed action is the construction of a 230/345 kv transmission line from Oreana, Nevada to Hunt, Idaho, across private and national resource lands; total distance involved is between 286 and 360 miles, depending on route selected. The proposed action includes the construction of one substation, upgrading two other substations, and the construction of new access roads and trails as needed.

3. Summary of Environmental Impacts: The proposed action will result in:

   - an increment of damage to the soil and vegetation of between 547 and 843 acres, depending on route.
   - disruption of wildlife habitat (including the aquatic habitat) along the length of the transmission line.
   - disruption of the visual and recreation resource values in sensitive areas along the length of the line.
   - impacts to the social-economic structure of the study area.

4. Alternatives Considered:

   a. Alternate methods of construction (including use of helicopters).
   b. Alternative rights-of-way.
   c. No action alternative.

5. Comments Have Been Requested from the Following:

   See Attached List.

6. Date Draft Statement Made Available to CEQ and the Public:

Federal Agencies

Department of the Interior
- Bureau of Reclamation
- Bureau of Outdoor Recreation
- Fish and Wildlife Service
- National Park Service
- Bureau of Indian Affairs
- Bonneville Power Administration

Department of Agriculture
- Forest Service
- Soil Conservation Service

Army Corps of Engineers
Environmental Protection Agency
Energy Research and Development Administration
Federal Aviation Administration
Federal Power Commission

State Agencies

Idaho Department of Water Resources
Idaho Department of Parks and Recreation
Idaho Fish and Game Department
Idaho Department of Public Lands
Idaho Department of Transportation
Idaho Public Utility Commission
Office of the Governor, State of Nevada, (Nevada State Clearinghouse).

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DESCRIPTION OF THE PROPOSED ACTION

INTRODUCTION

Sierra Pacific Power Company (incorporated in Nevada) has filed an application with the Federal Government to construct a 230/345 kilovolt (kv) electrical transmission line. The proposed right-of-way would extend across private and national resource lands in a generally northeast direction from the Tracy electrical substation near Reno, Nevada, to the Hunt electrical substation near Twin Falls, Idaho. The Department of the Interior, Bureau of Land Management (BLM), has been assigned the responsibility of preparing the required environmental studies (Environmental Analysis Record - EARs, and/or Environmental Statements - ESs).

The Nevada State Office of the BLM has been delegated the responsibility of conducting the required environmental studies for the proposed right-of-way (or rights-of-way): (1) this document, an environmental statement (ES) covering the segment of the proposed line extending from Oreana, Nevada, to Hunt, Idaho, (2) an environmental analysis record (EAR) for the first 90 miles of the proposal covering the Tracy to Oreana, Nevada, segment of the line, and (3) an environmental statement (ES) on the proposed Valmy 500 megawatt (Mw) electrical power generating station and associated transmission lines. The rationale for evaluating the proposal in three separate parts is outlined in Appendix A, p. 200 .

FEDERAL ACTIONS

The Bureau of Land Management action under consideration in this statement is a grant of right-of-way across Federal lands to permit construction of an electrical power transmission line. Prior to a decision to approve, disapprove, or defer action on the request for the right-of-way, two supporting documents must be prepared by the BLM. These are (1) an environmental statement pursuant to Section 102(2)(C) of the National Environmental Policy Act of 1969 (NEPA), and (2) a Land Report pursuant to BLM Manual 2063, which will make recommendations to management and outline courses of action for the specific realty transaction involved (in this instance, a right-of-way).

SUMMARY OF PERTINENT EVENTS AND OF THE FORMAL APPLICATIONS RECEIVED

Sierra Pacific Power Company formally notified the BLM of the proposed power transmission project by letter addressed to the Director of BLM on April 26, 1973.

On August 2, 1974, Sierra Pacific Power Company filed an application with the Bureau of Indian Affairs (BIA) for a transmission line right-of-way across the Pyramid Lake Indian Reservation. The Reservation is within the Tracy-to-Oreana segment of the proposed project.

On January 31, 1975, the company filed a formal letter of application with the Nevada State Office, BLM. This application, consisting of maps for the first 158 miles from Tracy Substation to Valmy, Nevada (and structure plans), was incomplete. On April 4, 1975, the company submitted the required environmental assessment for the entire right-of-way from Tracy, Nevada, to Hunt, Idaho, and on July 8, 1975, the right-of-way application within Nevada was completed with the submission of a right-of-way map for the Valmy to Idaho state line segment.

On September 30, 1975, the application was amended to consider the Tracy to Oreana portion and the Oreana to Hunt portion as separate, but related, rights-of-way.

On October 10, 1975, Idaho Power Company submitted to the Idaho State Office, BLM, a letter of intent to file a right-of-way and a map of the proposed right-of-way from Idaho-Nevada state line to the Hunt Substation near Twin Falls, Idaho.

FORMAL APPLICATION EXPECTED

Idaho Power Company will file the formal right-of-way application for the line in Idaho at the completion of this ES; its deferral of action may save the effort and cost of surveying a transmission right-of-way that may prove environmentally less desirable than the route selected subsequent to this ES.

FEDERAL AGENCIES JURISDICTIONAL RESPONSIBILITIES

BUREAU OF LAND MANAGEMENT (BLM)

BLM has the lead responsibility to prepare the ES and to complete any realty action (right-of-way) affecting Federal lands.

BUREAU OF RECLAMATION

Bureau of Reclamation serves as the agency responsible for re-viewing the power marketing aspects of the proposed right-of-way and has jurisdiction over certain withdrawn lands.

ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION (ERDA)

ERDA has responsibility to consider right-of-way location and use stipulations for any portions that may cross the Leach Hot Springs Withdrawal (N-7957).

ARMY CORPS OF ENGINEERS (CORPS)

The Corps of Engineers is charged with administration of Section 404 of the Federal Water Pollution Control Act (FWPCA). Section 404 of that act (33 USC 1344) requires a permit be obtained from the Corps prior to the discharge of any dredged or fill material into navigable water. Transmission line construction activities at crossing locations on the Humboldt and Snake Rivers may require a permit from the Corps.

NATIONAL ADVISORY COUNCIL ON HISTORIC PRESERVATION

The Council is authorized to review and comment upon activities licensed by the Federal Government which will have an effect upon properties listed in the National Register of Historic Places. To be adequate, the statement should show compliance with Section 106 of the National Historic Preservation Act of 1966, compliance with Executive Order 11593, and contact with the State Historic Preservation Officer.

BUREAU OF OUTDOOR RECREATION

The Bureau of Outdoor Recreation must be consulted regarding possible impacts to present or proposed projects under the Land and Water Conservation Fund Act and potential impacts to rivers designated or proposed for designation under the Wild and Scenic Rivers Act.

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Consultation with EPA is required to determine compliance of the project impacts with Section 309 of the Clean Air Act.

FEDERAL AVIATION ADMINISTRATION (FAA)

FAA criteria, as listed in AC 70/7460-2F, sets the maximum height above ground or water level for transmission line conductors and tower height-distance relationships in the vicinity of airports. These criteria should not be exceeded by any of the proposed corridors.

U.S. FISH AND WILDLIFE SERVICE (F&WS)

The U.S. Fish and Wildlife Service has been contacted in relation to the proposed right-of-way corridors. Consultation with the Fish and Wildlife Service is necessary to meet the standards and requirements as directed in the Fish and Wildlife Coordination Act (which also requires consultation with the appropriate state fish and game agencies), the Endangered Species Act, and the Bald Eagle Protection Act.

NATIONAL PARK SERVICE

The National Park Service has the responsibility for maintaining "The National Register of Historic Places." This register was consulted, and presently contains no sites along the corridors being considered.

STATE ACTIONS INVOLVED

NEVADA

The Utility Environmental Protection Act of 1971 requires submission of facility plans for review by the Nevada State Environmental Commission and the various state agencies. The Nevada Public Service Commission coordinates the state review through the State Clearinghouse and issues or denies the utility construction permit. On uly 11, 1975, the Nevada Public Service Commission issued an order which grants a permit to Sierra Pacific Power Company for the construction of the 230 kv transmission line from the Tracy Power Substation to the Nevada-Idaho state line near Jackpot, Nevada. (This line has the capability of being upgraded to 345 kv.)

IDAHO

Among Idaho State agencies, the Idaho State Clearinghouse coordinates review of development plans. The Idaho Public Utilities Commission issues or denies the utility construction permit. No permit has been issued to date.

LIST OF STATE JURISDICTIONAL RESPONSIBILITIES OVER THE APPLICANT

Formal applications required and filed, or expected to be filed:

PUBLIC SERVICE/UTILITIES COMMISSION CONSTRUCTION PERMIT

Nevada:	Filed 4/4/75	Approved 7/11/75
Idaho:	Filed ______	Approved ______

HIGHWAY CROSSING OR ACCESS PERMITS

Nevada State Highway Department: Filed ____________
Idaho State Dept. of Transportation: Filed ____________

SNAKE RIVER AND SALMON FALLS RIVER CANYON CROSSINGS

Idaho Division of Water Administration permits:
Filed: ____________________
Idaho Department of Transportation, Aeronautical Board:
Filed: ____________________

LOCAL ACTION INVOLVED

County planning boards review the proposed right-of-way and development for compliance with county planning and zoning classification. These planning boards are afforded another opportunity for review when this ES is provided for their review and comment. The power companies contacted the county boards during October-November 1974, to present their proposed construction, answer questions, and receive comments.

APPLICANT'S PROPOSED ACTION

PURPOSE

The purpose of the proposed powerline from Tracy to Hunt is: (1) to transmit additional power to satisfy the present and projected agricultural, mining, industrial, and urban demands within the Sierra Pacific service area serving approximately 314,000 people; (2) to satisfy the obligations of Certificates of Convenience and Necessity granted by the State of Nevada; (3) to provide a connection system through Idaho Power for reliable power for the future; (4) to insure an emergency power supply path from interconnected neighbor utility companies (Utah Power and Light and Idaho Power), in the event of a large generator or transmission line failure within the Sierra Pacific Power grid system; and (5) to provide increased system reliability within the Sierra Pacific Power system through "looped" power feed (two possible supply routes) for the Lovelock District, while also providing this benefit for the Elko, Nevada, area should Idaho Power Company or Wells Rural Electric Co. (which presently supplies power within the Elko area) find it desirable to tap this transmission line to provide additional electrical power. (See Transmission Line Interties Map, p. 24 .)

Power demands indicating the need for constructing a 230 kv transmission line, and subsequent upgrading to a 345 kv transmission line, are outlined in the Social-Economic sections of Chapter II, p.77

DESCRIPTION AND LOCATION OF COMPONENTS

CORRIDOR DESCRIPTION

The applicant's proposed route is shown on the Study Area Map, p. 7 , and is identified as the O'Neil Basin Corridor. Each corridor considered in this statement is a strip of land two miles wide in which a 140-foot-wide right-of-way may be surveyed and granted.

O'Neil Basin Corridor: The O'Neil Basin Corridor originates at the Oreana substation, 15 miles northeast of Lovelock, Nevada, and extends northeast to the site of the proposed North Valmy coal-fired generating plant. Continuing northeasterly, the corridor intersects State Highway 51 about 40 road miles north of Elko. The corridor continues northeast, intersecting the Nevada-Idaho state line about six miles west of Jackpot. The corridor then continues toward the northeast, intersecting U.S. Highway 93 about eight miles north of the state line. Continuing northeast to a point three miles east of Rock Creek, the corridor then extends due north to the Hunt substation, which is about 11 miles northeast of Twin Falls, Idaho.

Highway Corridor: The Highway Corridor originates at the Oreana substation and extends in a northeasterly direction, paralleling Interstate 80 to a point where it intersects the O'Neil Basin Corridor five miles west of Valmy. The Highway Corridor then coincides with the O'Neil Basin Corridor to the site of the proposed North Valmy coal-fired plant, then roughly parallels Interstate 80 to a point six miles southwest of Elko. The corridor then crosses the highway and the Humboldt River southwest of Elko and roughly parallels the highway to the Wells substation, one mile west of Wells, Nevada.

The corridor continues in a northerly direction, paralleling U.S. Highway 93 to a point on the state line about two miles west of Jackpot. The corridor continues to a point six miles west of Rogerson, Idaho, then turns northeast and intersects the O'Neil Basin Corridor at a point five miles east of Hollister. The Highway Corridor then coincides with the O'Neil Basin Corridor to the Hunt substation. This corridor generally coincides with existing powerline rights-of-way.

Adobe Range Corridor: The Adobe Range Corridor coincides with the O'Neil Basin Corridor from the Oreana substation to the site of the proposed North Valmy coal-fired plant. The Adobe Range Corridor then coincides with the Highway Corridor to the base of Stony Point five miles northeast of Battle Mountain. The Adobe Range Corridor then extends northeast crossing State Highway 51 about 13 road miles north of Elko, continuing northeast to a


UNITED STATES
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OREANA-HUNT TRANSMISSION LINE
1976
O'NEIL BASIN CORRIDOR
HIGHWAY CORRIDOR
ADOBE RANGE CORRIDOR
METROPOLIS CORRIDOR
HUNT SUBSTATION
VALMY SUBSTATION
OREANA SUBSTATION
IDAHO
NEVADA
UTAH
NEVADA
JEROME
TWIN FALLS
HUMBOLDT
PERSHING
LANDER
EUREKA
ELKO
Jerome
Buhl
TWIN FALLS
Eden
Kimberly
Castle Ford
Hub Butte
Hollister
Rogerson
Elk Butte
SAWTOOTH NATIONAL FOREST
SHOSHONE BASIN
Jackpot
Contact
Wilkins
Melandco
Tecoma
Wells
Cobre
Oasis
Deeth
Halleck
ELKO
Tobar
Arthur
Lamoille
Lee
Carlin
Palisade
Beowawe
Dunphy
Battle Mountain
Valmy
Golconda
WINNEMUCCA
Rose Creek
Cosgrove
Imlay
Mill City
Humboldt
Rye Patch
Oreana
Woolsey
Lovelock
Orovada
Paradise
Midas
Tuscarora
North Fork
Charleston
Wild Horse
Jarbidge
Red House
HUMBOLDT NATIONAL FOREST
INDEPENDENCE MOUNTAINS
TUSCARORA MOUNTAINS
RUBY MOUNTAINS
ADOBE RANGE
FISH CREEK MOUNTAINS
SHOSHONE
MAP AREA
IDAHO
NEVADA
MILES
KILOMETERS
0 10 20 30
0 10 20 30

point five miles north-northwest of Wilkins, where it intersects the Highway Corridor, and parallels that corridor to the Hunt Substation.

Metropolis Corridor: The Metropolis Corridor coincides with the O'Neil Basin Corridor from the Oreana substation to the site of the proposed North Valmy coal-fired plant. The Metropolis Corridor then coincides with the Highway Corridor to a point six miles southwest of Elko, extending from that point along the east flank of the Adobe Range to a location three miles west of the North Fork of the Humboldt River, where it intersects the Adobe Range Corridor. The Metropolis Corridor then coincides with the Adobe Range Corridor to Hunt substation.

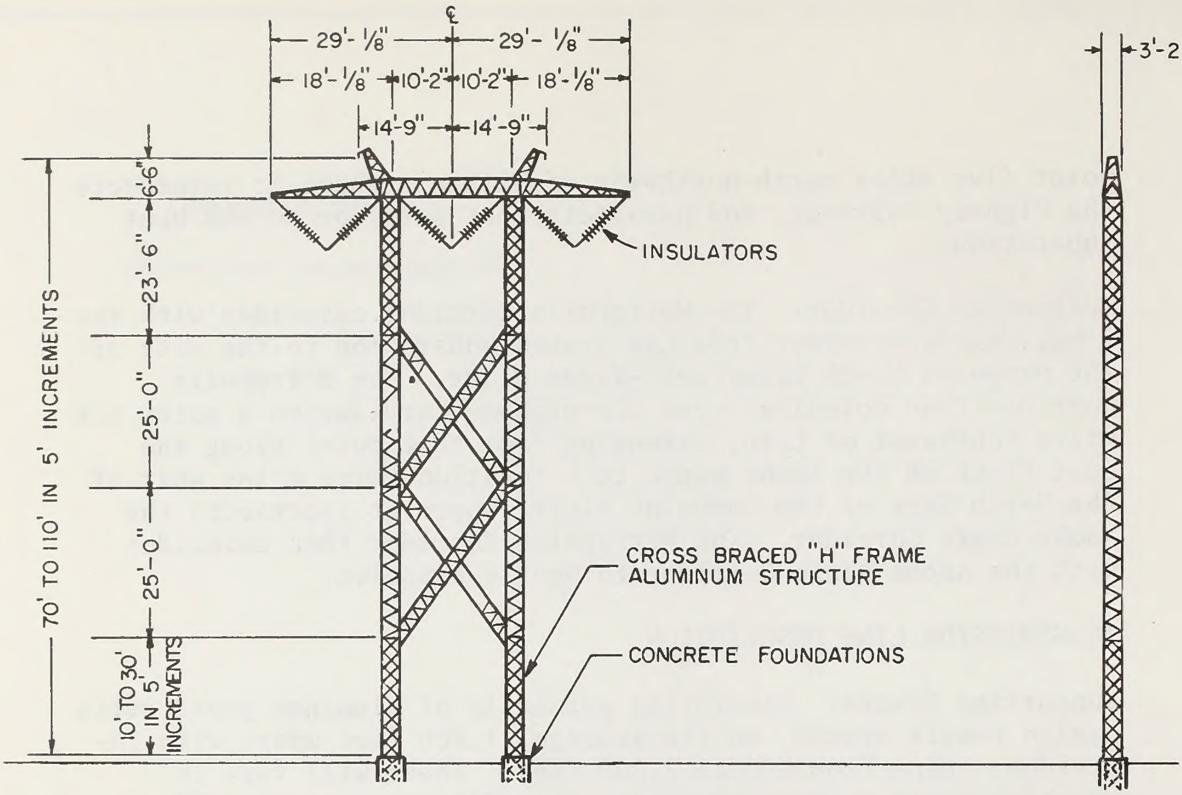
TRANSMISSION LINE DESCRIPTION

Supporting Towers: Consisting primarily of aluminum guyed delta design towers spaced, on the average, 1,200 feet apart with individual spans from 600 to 2,500 feet. These will vary in height from 60 feet to 121 feet, depending on terrain. The National Electric Safety Code states that the conductor can be no less than 32 feet from the ground, 34 feet from a road bed, and 45 feet from railroad surfaces; therefore, exact height of the towers will be governed by the safety requirements for conductor clearance. A few self-supporting delta design towers may be used in rugged terrain or in other appropriate areas such as agricultural lands and end tower location at a substation in Nevada. Within the Idaho portion of the line the self-supporting, cross-braced "H" frame tower structure may be used within agricultural areas. (Refer to Figure I-1, p. 10 , for tower design details.)

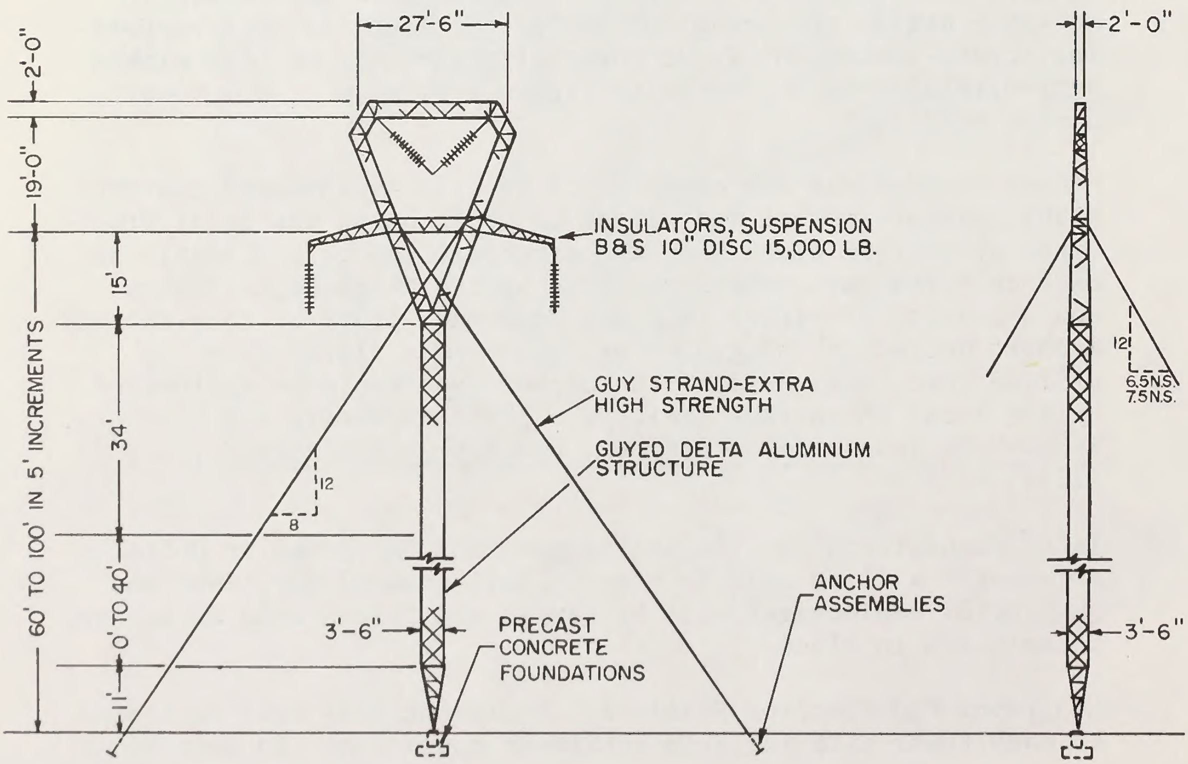
"Tower foundations are expected to be steel-reinforced concrete slabs, either precast and placed in holes below the local frost line, or cast in place when the structure can rest directly on bedrock. The guy anchors required by the Guyed Delta Towers would consist of either imbedded dead-man (plate or cone-shaped) anchors buried in the ground or anchor rods placed in holes drilled into rock. Use of the anchor type would be influenced by the local subsurface geology." (SE&A Engineers and Planners, Tracy-Hunt Transmission Project, Environmental Analysis, p. III-4, 1975.)

Tower foundations for the self-supporting "H" Frame or Delta structures will be cast in place. Soil removed for tower and guy anchor emplacement will be tamped and filled when towers and anchors are in place.

Equipment Pads/Tension Stations: Equipment pads will be needed at each tower site for safe equipment operation. In most areas



CROSS BRACED "H" FRAME TOWER



GUYED DELTA TOWER

FIG. I-1 TYPICAL TRANSMISSION LINE TOWERS these will consist of an area cleared of brush on which a crane may raise the tower and/or a backhoe may prepare footing or anchor sites. Where terrain is steep, or the surface is rough, a level, smooth pad will be required, except where location is environmentally sensitive, in which case non-conventional means will be used to set towers. Equipment pads will generally be a maximum of 15 feet by 30 feet for a crane and backhoe. Tension stations will be located at a two to three mile interval to facilitate installation of the conductor by tensioner and puller vehicles. The area involved will be approximately 0.02 acres per site along the centerline.

Access: Access along the line for material delivery and equipment movement is essential. The power company prefers using existing roads where these are available. Where roads do not exist and road construction is mutually approved by contractor and Authorized Officer, such roads will be constructed as necessary. Access between towers will not require bladed trails except over steep, rough terrain or where heavy brush interferes with safe vehicle operation. Number of miles of new road cannot be determined accurately at this time; however, the estimated miles required are shown on Table I-1, p. 12 . The estimates were determined through map inspection, taking into consideration the topography and existing road networks.

Natural vegetation in the proposed right-of-way, access roads, and trails would be cleared only to satisfy constructional and operational safety requirements. The applicant has stated that any indiscriminate removal of topsoil and natural vegetation would not be allowed. Disturbed areas would be restored to their natural condition, insofar as practicable, by water barring, scarifying, leveling, or other approved practices. Topsoil could be replaced and stabilized, as necessary, when large areas of dirt are removed.

Transmission Line: The transmission line will consist of six aluminum conductors about one inch in diameter, and will be designed to operate as a single circuit, three-phase alternating current of 230 kv phase to phase, a nominal voltage of 133 kv phase to ground. It would also have the capability of being converted to a nominal voltage of 345 kv phase to phase (nominal voltage of 199 kv phase to ground) by adding insulated spacer bars and necessary insulators for each phase conductor beneath the existing conductors.

SUBSTATIONS

The Valmy Substation is proposed for construction west of Valmy, Nevada, near the site of the proposed North Valmy generating station. The location is northeast of Treaty Hill in T. 35 N.,

Table I-1

Summary of Land Requirements and Surface Disturbance (in acres)

	O'Neil 8asin Corridor Oreana-Valmy	Valmy-Stateline	Stateline-Hunt	Total	Highway Corridor Oreana-Valmy	Valmy-Stateline	Stateline-Hunt	Total
1. Total Miles of Right-of-way (R/W) Corridor	73.5	153.5	59	286	103	197	60	360
2. Total Area within Right-of-way (140' wide acres)	1247.3	2604.8	1001.2	4853.3	1747.9	3343.0	1018.2	6109.1
3. Access Needs - Est.								
a. Access to corridor	96.97	321.21	12.12	430.3	--	33.94	--	33.94
b. 8etween towers-only center line	89.09	186.06	71.52	346.67	124.85	238.79	72.73	436.37
4. Site Construction								
a. Tower Sites	5.37	11.21	4.31	20.89	7.52	14.38	4.38	26.28
b. Crane pad	0.83	2.74	0.10	3.67	--	0.29	--	0.29
c. Tension Station	0.67	1.41	0.54	2.62	0.95	1.81	0.55	3.31
d. Storage Yards*	8.4	17.54	6.74	32.68	11.77	22.5	6.86	41.13
	(9.77)	(22.09)	(6.91)	(38.77)	(0)	(22.99)	(0)	(22.99)
e. Substations								
Valmy	5.74	--	--	5.74	5.74	--	--	5.74
Hunt	--	--	0.56	0.56	--	--	0.56	0.56
5. Total Surface Disturbance w/o helicopter (3 & 4)	207.07	540.17	95.89	843.13	150.83	311.72	85.08	547.63
w/helicopter (3b & 4a, d, e)	(109.97)	(219.36)	.(83.3)	(412.63)	(--)	(276.16)	(--)	(276.16)

	Adobe Range Corridor Oreana-Valmy	Valmy-Stateline	Stateline-Hunt	Total	Metropolis Corridor Oreana-Valmy	Valmy-Stateline	Stateline-Hunt	Total
1. Total Miles of Right-of-way (R/W) Corridor	73.5	181.5	60	315	73.5	188.5	60	322
2. Total Area within Right-of-way (140' wide acres)	1247.3	3080.0	1018.2	5345.5	1247.3	3198.8	1018.2	5464.3
3. Access Needs - Est.								
a. Access to corridor	96.97	166.67	--	263.64	96.97	83.03	--	180.0
b. 8etween towers-only center line	89.09	220.0	72.73	381.82	89.09	228.48	72.73	390.3
4. Site Construction								
a. Tower Sites	5.37	13.25	4.38	23.0	5.37	13.76	4.38	23.51
b. Crane pad	0.83	1.42	--	2.25	0.83	0.71	--	1.54
c. Tension Station	0.67	1.67	0.55	2.89	0.67	1.73	0.55	2.95
d. Storage Yards*	8.4	20.7	6.86	35.96	8.4	21.54	6.86	36.8
	(9.77)	(23.1)	(0)	(32.87)	(9.77)	(22.72)	(0)	(32.49)
e. Substations								
Valmy	5.74	--	--	5.74	5.74	--	--	5.74
Hunt	--	--	0.56	0.56	--	--	0.56	0.56
5. Total Surface Disturbance w/o helicopter (3 & 4)	207.07	423.7	85.08	715.85	207.07	349.25	85.08	641.40
w/helicopter (3b & 4a, d, e)	(109.97)	(256.35)	(--)	(366.32)	(109.97)	(264.96)	(--)	(374.93)

Given or Known
140' R/W - 16.96 ac/mi.
Centerline access trail = 10' wide = 1.21 ac/mi.
Towers 4.6/mile average.
Storage Yards - 35 mi. interval 4 ac/ea. average
Tension Station - 2 mile interval 20' X 40' = 0.02 ac/ea.
Tower Sites - 0.15 acres each

Crane Pad - .01 acres each-rough terrain only

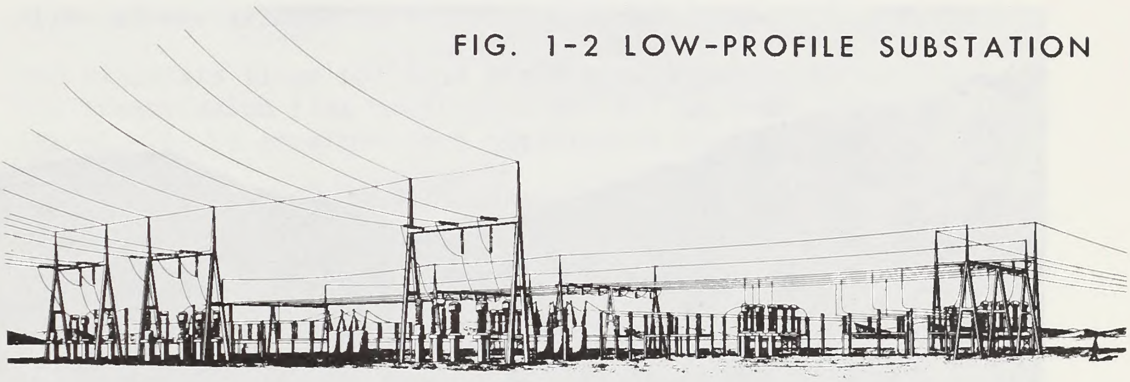
Substations
Valmy - 500' X 500' (5.74 ac)
Hunt Addition - 110' X 220' (0.56 ac)
* Storage yard requirements if using helicopter (in parenthesis)

R. 43 E., sec. 28, NW1/4SW1/4, Mount Diablo Meridian, Humboldt County, Nevada (see Study Area Map, p. 7).

The function of this substation will be to provide a point of interconnection for the company's northeast system and would provide a loop feed (double and electrical supply path) for the system as well as a tie point for the imported Utah power.

The proposed substation will initially measure 500 feet square; however, the site will be expanded to accommodate the need for two additional proposed 230 kv lines that are associated with the proposed North Valmy generator site. The substation site will be enclosed by a chain link fence and will be designed as a minimum silhouette structure, meaning it will be less than 50 feet high. (See Figure I-2, below.)

FIG. 1-2 LOW-PROFILE SUBSTATION



Courtesy of Bureau of Reclamation

The substation will contain equipment necessary for the automated control, electrical compensation, and the transmission of electrical power. The substation will contain two 230 kv and two 120 kv terminals with necessary circuit breakers, shunt reactors, series capacitors, transformers and related control, metering and communication facilities. The substation will be linked with control equipment at other substations via facilities that utilize the powerline as a land communication line. It will also be constructed to allow expansion for use as a 230 kv switching station for future company powerlines.

The existing Hunt, Idaho substation (see Study Area Map, p. 7). will serve as the eastern terminal because the site has a direct 230 kv tie to the Idaho Power interconnected transmission system. The location near Eden, Idaho, is T. 9 S., R. 19 E., sec. 21, NW1/4NE1/4, Boise Meridian, Jerome County, Idaho.

In order to accommodate the proposed transmission line connection, the site will require modifications that include: (1) land area of 110 feet by 220 feet extended from the northwest corner of the site; (2) topping the existing low profile 230 kv equipment; (3) installing two air brake switches and one power circuit breaker; and (4) installing a transmission line and tower to match existing end towers.

The Oreana substation, an existing 120 kv facility, will be the terminal point for the Tracy to Oreana transmission line (see Photograph below. The function of this substation will be to provide a point of interconnection for distribution of additional electrical power. When Intertie #2 is completed and energized, the Oreana substation will be by-passed.

Existing 120 kv substation, Oreana, Nevada.

STORAGE AND STAGING AREAS

Material storage yards will be required approximately 30 to 50 miles apart in the route vicinity. These will be located near paved or high quality dirt roads for transportation requirements and at company facilities or near occupied residences for theft prevention. About 4 acres will be required at each yard to allow space for material off-loading, classifying, sorting, storage, loading, and equipment storage. Numerous trips will be necessary to and from these areas and there will be significant equipment activity (primarily forklifts and trucks) on each site.

Construction sites would be maintained in a sanitary condition at all times, and all garbage, refuse, and liquid waste at these sites will be regularly disposed of in an appropriate manner.

Areas for storage of flammable liquids will be properly designed to retain liquids if accidental spills should occur.

LAND REQUIREMENTS

Table I-1, p. 12 reflects the summary of general land requirements and surface disturbance associated with the proposed powerline construction for a given corridor segment. The actual area permanently required for the many facilities of the project will be somewhat less than reflected in the table. For example, except for primary access, the roads will be rehabilitated following construction; and temporary storage yards will be rehabilitated by water barring, leveling, scarifying, or other approved practices when no longer required. The free-standing structures proposed for cropland or steep terrain areas will require only 100 square feet (0.002 Ac.) and 0.03 percent of the right-of-way area.

New materials sites for sand and gravel will not be required for the transmission line construction. All concrete materials or gravel will be obtained from established commercial operations.

No material sites for sand and gravel to be used on access roads have been anticipated. Selection of the line route considers access roads established by the county or state. In most cases, these existing roads are not graveled.

COMMUNICATIONS SYSTEMS

The company proposes using "powerline carrier communication" (a radio signal induced onto a phase line and transmitted along the line to a receiving station in a manner similar to telephone conversation) for line control, telemetering, and voice communication. The transmitter-receiver facilities will not require special areas but will utilize part of the proposed substation area or existing company facilities.

CONSTRUCTION SCHEDULE AND IMPLEMENTATION STAGES

In order that a transmission path will be available to meet contract purchase agreements, the company proposes to start construction of all substations and the transmission line during the fall of 1976. The present power purchase contract with Utah Power and Light Company is for taking delivery of an additional 100 Mw by October 1977. (Presently, 50 Mw flows over the Fort Churchill to Sigurd, Utah, intertie.) The Utah Power Company will be prepared to deliver 100 Mw at Hunt, Idaho, during 1977. The remaining 50 Mw of the contracted total of 200 Mw will be available during 1978.

The applicant's estimated construction time frame for each corridor segment is based upon an optimum construction rate of 28 miles per month, as shown on Table I-2, below. A more realistic estimate based on actual previous construction times is shown on Table III-7, p. 139 .

Table I-2
Construction Time Requirements

Corridor	Distance	Construction Time
O'Neil Basin Corridor		
Oreana to Valmy	73.5 miles	3 months
Valmy to Stateline	153.5 miles	5 months
Stateline to Hunt	59.0 miles	2 months
Total	286.0 miles	10 months
Highway Corridor		
Oreana to Valmy	103.0 miles	4 months
Valmy to Stateline	197.0 miles	7 months
Stateline to Hunt	60.0 miles	2 months
Total	360.0 miles	13 months
Adobe Range Corridor		
Oreana to Valmy	73.5 miles	3 months
Valmy to Stateline	181.5 miles	6 months
Stateline to Hunt	60.0 miles	2 months
Total	315.0 miles	11 months
Metropolis Corridor		
Oreana to Valmy	73.5 miles	3 months
Valmy to Stateline	188.5 miles	7 months
Stateline to Hunt	60.0 miles	2 months
Total	322.0 miles	12 months

Construction of the substation will occur concurrently with the construction of the power transmission lines. Actual construction time may vary due to season of the year, wildlife migration and seasonally critical habitat, use of more than one construction crew, etc.

PRELIMINARY RIGHT-OF-WAY STUDIES

Following contract negotiations to secure a source of power and completion of the company's environmental constraint study to select a practical corridor, preliminary field surveys were conducted to lay out the centerline, locate primary engineering control points and section corners, and conduct an archeological survey along the proposed alignment. Field operations were conducted utilizing two pickup trucks and a helicopter. Should an alternative corridor prove more desirable for environmental protection reasons, the company will study the alternative corridor for a preferred alignment, conduct field searches for primary engineering control points (section corners, USGS geodetic bench marks, etc.), and survey to tie the preliminary transmission line turn points to the established land surveys. Equipment, methods, and materials will be similar to those described above.

RIGHT-OF-WAY LAYOUT AND SURVEYS

Once a right-of-way is granted the company will refine the preliminary study and conduct a more detailed archeologiçal survey of the route. (The archeological survey was done, and reports published, for the O'Neil Basin Corridor prior to filing the right-of-way application.) It plans to employ small survey crews to locate tower sites along the approved route. Also, there may be additional site visits for archeological salvage purposes or tower site relocation to reduce conflict with other land uses. Following the final survey, engineering design for the sites will be completed to allow planning for tower height, type of tower footing, guy installations, etc.

RIGHT-OF-WAY ACQUISITION

Land required for the proposed transmission line right-of-way on private lands will be acquired in the form of an easement subject to use stipulations. The respective land owner will be paid just compensation based upon either an appraisal (for public lands) or by a negiotiated settlement (for private lands) satisfactory to both parties. Condemnation of private property may be necessary when satisfactory settlement cannot be secured.

Land required for substation sites will be purchased from the land owner for the company's exclusive development and use. Table III-9, p.142 reflects percent of private land ownership by corridor segment.

CONSTRUCTION SEQUENCE AND TECHNIQUES

Substation Construction: An area 500 feet by 500 feet (5.74 Ac.) will be required for the Valmy Substation (Study Area Map, p. 7), and an area 110 feet by 220 feet (0.56 acres) will be required) for the Hunt substation addition. The sites will be cleared of all vegetation using a grading blade, motor-grader or large bulldozer, and covered with a 6-inch layer of crushed gravel. For safety and security reasons, the boundary will be fenced with an eight-foot chain link fence. A considerable amount of construction activity will occur on the site to prepare concrete foundations and to install the various pieces of electrical equipment described previously.

Access Improvement or Construction: One criterion in the company's selection of the proposed route was the availability of adequate access adjacent to, or in close proximity of the route.

New access roads will be required for sections of the line that do not parallel existing roads or where direct access is difficult because of terrain features. These roads will be sized and routed to minimize damage to the existing terrain and vegetation. The roads will follow or be located to follow, land contours and will avoid creating erosion or visual problems to the maximum extent possible. Many of these roads may be required not only for construction but also for line operation and maintenance access.

Equipment required for this phase of construction will include large bulldozers, motor-graders, service trucks, and crew transportation vehicles (pickup trucks).

Storage and Staging Areas: Storage areas will be cleared of brush and smoothed for a level work area where materials can be classified, sorted and stored for distribution to assembly sites or tower sites.

All construction materials and related litter and miscellaneous debris, including uprooted natural vegetation, would be removed from the construction sites and disposed of in an approved manner. The applicant has stated that burning of brush, debris, or other materials would not be permitted.

Equipment use of these areas will include: motor-grader, heavy trucks, forklifts, and small trucks (or light trucks).

Tower Site Preparation and Installation: During the tower installation phase, a small pickup, an air compressor, and a backhoe machine or auger truck, either wheeled or track-driven, will usually be the only equipment driven to the tower site to install the tower footing and guy anchors. Where terrain requirements indicate, tower footings should be cast in place; three- to five-yard capacity concrete trucks will service the tower site.

Where terrain is steep, access spurs and equipment pads will be necessary to afford safe operation of equipment during tower site preparation and subsequent construction.

Components will be delivered to the tower site for construction by a skilled crew. This will involve two pickup trucks and a medium-sized boom-equipped truck, or tracked type vehicle and large 44,000 lb. gross weight transport trucks and trailers.

This crew will set the tower in its permanent location. In the case of the cross-braced "H" frame tower or the self-supporting delta tower, the crew will require a concrete truck for pouredin-place footings and will also backfill and pack the soil around each tower.

The operations will require a small crew using a mobile crane and two or three pickup trucks. For the guyed tower, the crew will also use a compressor, tampers, and a small end-loading tractor.

> "Towers can be erected by using a helicopter. The normal procedure when utilizing helicopters is to establish staging areas along the line route at about 10-mile intervals. The framing material for 10 miles of line is then delivered to the staging area and towers are assembled by the framing crews. Each tower is then transported to its individual site by the helicopter where a ground crew of 10 to 15 men install it at its permanent location. The ground crew will use from three to five pickup trucks for transportation.
>
> This method eliminates the necessity of delivering the tower components and some construction equipment to each site and assembling a tower at each site. Therefore, it reduces the amount of on-site construction activity. However, this method does not eliminate the necessity for providing access to each tower site for other construction operations and does require staging areas at 10-mile intervals along the route. The method also creates an element of risk (safety of working crew) not associated with normal ground construction procedures." (SE&A Engineers, Tracy-Hunt Transmission Project, U.P.& L. Intertie No. 2, Environmental Analysis, p. III-10, April 1975.)

Unless otherwise specified, helicopter construction methods are at the option of the contractor.

Conductor Installation: Conductors are installed with a tensioner and a puller. The tensioner consists of a large trailer loaded with two to six reels of conductor and a braking device. The puller is a large machine, powered by gas or diesel fuel, with three permanent reels containing about two to three miles of steel wire rope on each reel. The puller is located about two or three miles ahead of the tensioner and in line with the towers.

> "To install the conductor, the ends of the wire rope from the puller are pulled towards the tensioner 2 miles away and threaded through sheaves (pulley-like

mechanisms) installed on each tower. A vehicle traveling the right-of-way centerline is needed to provide the power because the three steel-wire ropes are too heavy to be pulled out for 2 miles by manpower alone, although in some locations manpower may be used over short distances. Each of the three reels of conductor is attached to a reel of steel wire rope and as the pulling machine begins to reel in the wire, it also installs the conductor. This operation is repeated along the route at intervals of about 2 miles for the entire length of the line. The conductor-stringing operation usually requires a crew of 10 to 15 men and three to five pickups, a medium-sized materials truck, a large truck or trailer for the tensioner, and another large truck. When the aluminum conductors have been installed and pulled to the proper sag and tension, a clipping crew permanently attaches the conductors to the insulators by removing the stringing sheaves and installing clamping hardware. This crew will use two pickup trucks in the course of their duty." (SE&A Environmental Analysis, p. III-11, April 1975.)

Line Energizing: Upon completing inspection of the constructed line and electrical facilities, the power system is energized by attaching leads at the power substations and closing power circuit breakers. This phase requires close coordination between the intertied utilities to prevent electrical equipment damage or failure.

Cleanup and Restoration: "Cleanup and site restoration will be started when the construction crews have completed a section of the line. Debris will be disposed of in an approved manner and the restoration crew will install water bars along any permanent roads that have been constructed." (SE&A Environmental Analysis p. V-16, 17, April 1975.

All roads, trails, and disturbed areas no longer needed for line operation and maintenance will be obliterated, and rehabilitated to restore the natural ground contour, wherever feasible. Fertilizers, insecticides, etc. are not planned to be used in the rehabilitation. Where soil and climate are favorable, disturbed areas will be seeded to re-establish a vegetative cover in as short a period of time as possible.

Conversion and Operation at 345 kv: Should the requirement develop, the transmission line and substations may be upgraded to carry a larger energy load (up to 250 Mw) at 345 kv in order to provide more capacity. The substations will require modification to accommodate the 345 kv facilities and interconnect the higher voltage with the company's existing system. Equipment will include a 345 kv terminal, and associated air switches, circuit breakers, transformers, and electrical control facilities.

The transmission line may be up-graded by adding additional insulators.

SOURCE OF CONSTRUCTION MATERIALS

The utility companies have contracted with Kaiser Aluminum Company for the tower structures and Alcoa Aluminum Company for the conductor. Other construction items - shield cable, insulators, anchors, guy cables, etc. - will be purchased from various electrical supply companies. The concrete for tower bases will be purchased from ready-mix concrete firms in the vicinity of the line route.

WORK FORCE

The construction force will vary from approximately 30 people during the early stages to as many as 150 people during full construction activity. (See Table III-7, p.139, Estimated Time Needed For Construction.)

The crews employed in constructing the transmission intertie will be residing at available commercial facilities in towns along the route. The type, number, and size of crews are listed below.

Type of Crew	Number of Crews	Size of Crews
Access crews	1	2 men
Foundation preparation and installation	1-3	4 men
Anchor crew	1-3	4 men
Material delivery	1	5 men
Tower Assembly	1-3	8 men
Erection crew	1-2	6 men
Stringing crew	1	15 men
Clean-up crew	1-2	5 men

INTERRELATIONSHIPS WITH OTHER PROJECTS

SIERRA PACIFIC POWER COMPANY

Northwestern Nevada's electrical energy demands are presently being supplied by Sierra Pacific power generation of 566 Mw, contract supply interties with Pacific Gas and Electric Company for 108 Mw, and the intertie No. 1 with Utah Power and Light for 50 Mw.

The Tracy to Oreana 230/345 kv transmission line, to provide an interm power route to the Lovelock, Nevada, vicinity, was separated from the entire Tracy to Hunt intertie No. 2 and addressed under a separate environmental analysis. The completion of the Tracy to Hunt intertie No. 2 with Utah Power and Light through Idaho Power Company will bring 150 Mw of additional power to the Sierra Pacific Power system. It will also create a path for possible transactions with an additional utility company, Idaho Power Company.

The proposed transmission system, Tracy to Hunt intertie, is planned to be interconnected with the Company's proposed Valmy coal-fired generation station. The projects involve separate facilities in point of time and source of power; however, as a total they are related as in any component of a system. Additional 230/345 kv transmission lines are proposed to originate from the Valmy coal-fired generation station parallel to the subject line to Reno, and from Valmy south to Austin to interconnect with intertie No. 1 from Utah.

The proposed transmission intertie and future Valmy coal-fired generation units No. 1 and 2 will meet the company's projected electrical supply capacity needs for about the next 10 years. Beyond that time frame, no firm plans have been made; however, should present growth trends continue, additional electrical supply capacity will be required in the service area.

OTHER POWER INTERRELATIONSHIPS

The three peripheral companies, Utah Power and Light, Idaho Power, and Pacific Gas and Electric, are intertied with Western companies forming the Western Systems Coordinating Council (the regional utility council, consisting of electrical utilities, functions to establish guidelines for system design adequacy to insure dependability of the region's electrical supply system, and coordinates power supply and use).

Sierra Pacific Power Company has agreed to allow Idaho Power Company to tap the intertie No. 2 line to supply its Nevada customers (in Elko County). Also, Sierra Pacific Power Company has agreed, in a public hearing, to negotiate in good faith with Wells Rural Electric Corporation concerning a tap on intertie No. 2, should they so desire.

OTHER AGENCY INTERRELATIONSHIPS

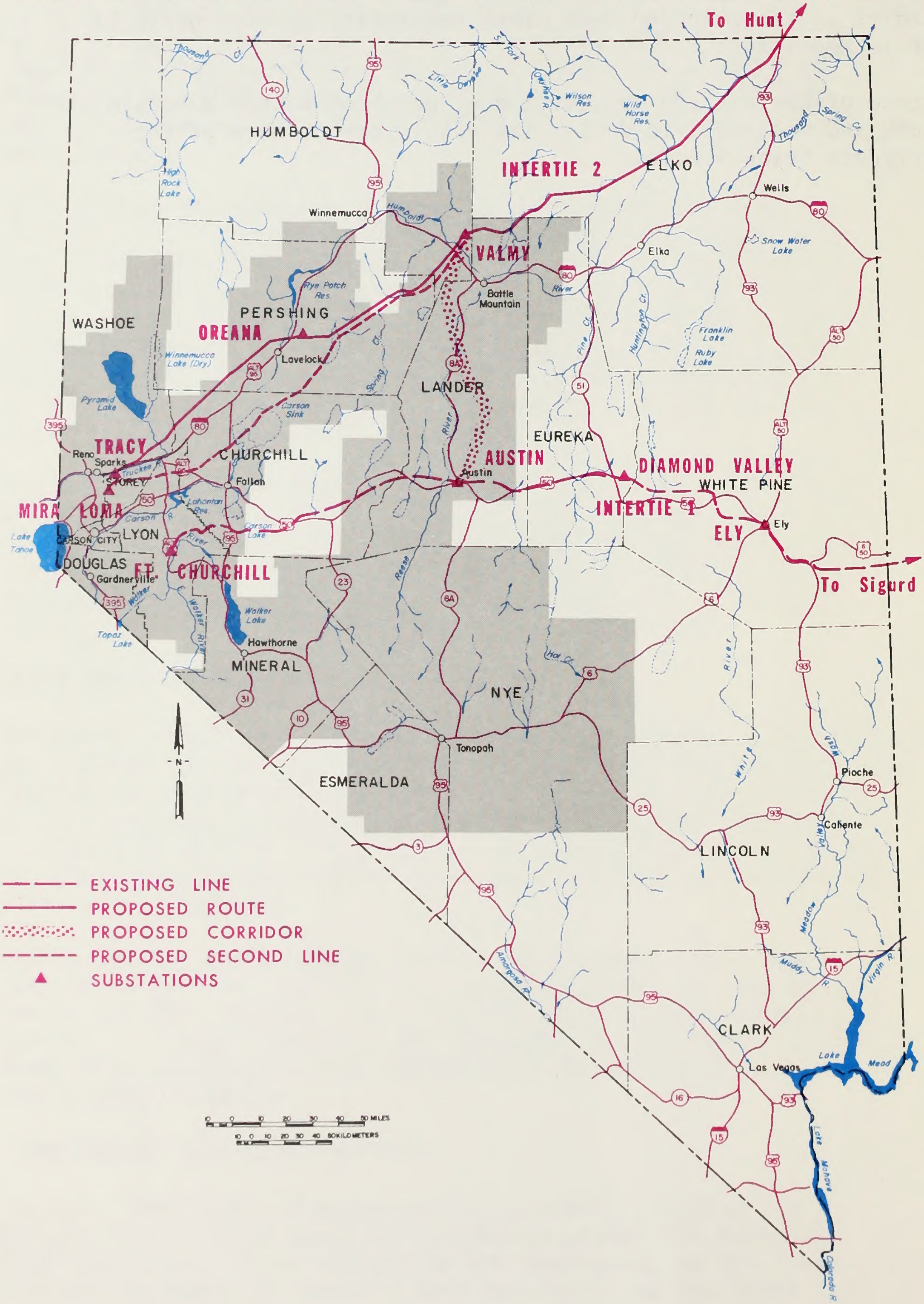
The U.S. Army Corps of Engineers is currently studying the feasibility of three proposed reservoirs within the Humboldt River drainage. These include Hylton Reservoir, on the South Fork of the Humboldt; Devil's Gate Reservoir, on the North Fork of the Humboldt; and Vista reservoir on the Mary's River.

The Battle Mountain Fair and Recreation Board is sponsoring studies on the proposed Rock Creek Reservoir, located north of Battle Mountain.

Bureau of Reclamation project lands, north of Battle Mountain and south and east of Twin Falls, lie within one or more of the corridors being studied.

SIERRA PACIFIC POWER COMPANY

EXISTING AND PROPOSED TRANSMISSION LINES



II

DESCRIPTION OF THE ENVIRONMENT

II

DESCRIPTION OF THE ENVIRONMENT

INTRODUCTION

The following is a description of the environment as it presently exists; description is based on an analysis of the environment on an area basis, rather than on a line description basis. The area described varies in width from about 3 miles to over 50 miles and extends from the vicinity of Oreana, Nevada, in the Humboldt River Drainage to Hunt, Idaho, in the Snake River Drainage.

The description of the social and economic aspects of the existing environment required the inclusion of Sierra Pacific Power Company's service area as shown on the Transmission Line Interties Map, p. 24 , and the Service Area Map, p. 80

CLIMATE

The region between Lovelock, Nevada, and Twin Falls, Idaho, lying within the Great Basin physiographic province has a middle latitude desert and steppe climate. The controlling factors on the weather include: latitude, elevation of the landscape, topographical features, global wind patterns, and seasons of the year.

Three prevailing air masses affect the region. In the summer, high-pressure cells move southward and the Great Basin is covered with warm, dry air. During winter, a Canadian high-pressure cell becomes the source of continental polar air masses. The third air mass, (which operates year-round) originates over the Pacific Ocean and moves over the Sierra Nevada Mountains where the air mass loses its moisture as it ascends the western slope. As it descends the eastern slope, the air is warmed. The warm, dry air then moves easterly across Nevada and southern Idaho.

Precipitation is highly variable (see Table II-1 p. 26), occurring mostly as snowfall in winter, as rain in spring, and as thunderstorms in the summer. There are 10 to 30 thunderstorm days each year. The thunderstorms are sporadic and frequently torrential in nature.

The heat from the desert floors and the high winds contribute to the evaporation rate. Relatively high evaporation (40 to 50 inches per year) occurs during the summer when temperatures are highest.

TABLE II-1
PRECIPITATION AND TEMPERATURE TABLE

Data extracted from published records of the National Weather Service, snow surveys of the U.S. Department of Agriculture, and measurements made by the Nevada Department of Conservation and Natural Resources.

STATION NAME	LAT.	LONG.	ELEV.	TYPE OF DATA	YEARS OF RECORD	SUMMARY OF DATA AVE. ANNUAL	MAX. ANNUAL	MIN. ANNUAL
Arthur 5 NW	40°47'	115°11'	6,280	precip.	56	14.87	23.63	6.42
Battle Mtn.	40°38'	116°56'	4,515	precip.	92	6.70	14.03	2.40
				temp.	44	48.8	53.0	45.3
Beowawe	40°36'	116°29'	4,695	precip.	86	6.65	14.92	2.17
				temp.	44	48.0	52.4	45.3
Deeth	41°04'	115°17'	5,343	precip.	12	10.20	19.00	5.97
				temp.	13	43.4	45.3	41.2
Elko	40°50'	115°47'	5,075	precip.	94	8.74	18.94	0.94
				temp.	44	45.6	49.1	43.0
Jacks Creek Pass	41°33'	116°00'	7,725	precip.	15	32.00	41.46	22.48
Lamoille	40°41'	115°28'	6,290	precip.	58	17.14	29.16	8.60
				temp.	44	44.9	50.4	42.7
Lovelock	40°11'	118°28'	3,977	precip.	70	4.88	11.93	0.85
				temp.	44	51.6	54.6	48.1
Mala Vista Ranch	41°19'	115°15'	5,585	precip.	22	9.64	15.83	6.57
				temp.	25	43.2	45.4	41.0
Midas 4 SE	41°12'	116°44'	5,200	precip.	11	9.26	15.02	6.17
Rye Patch Dam	40°28'	118°18'	4,135	precip.	28	7.15	12.48	3.26
				temp.	28	50.6	53.4	47.7
Wells	41°07'	114°58'	5,633	precip.	58	9.76	18.51	3.40
				temp.	25	44.7	46.5	41.8
Twin Falls	42°35'	114°28'	3,770	precip.	30	9.11	13.67	3.79
				temp.	30	49.7	51.6	47.4

Precipitation is given in inches. Temperature is given in degrees Fahrenheit. Nevada data is taken from "Hydrologic Reconnaissance of the Humboldt River Basin, Nevada", pp. 78-79. Twin Falls data is taken from National Weather Service records at Boise, Idaho.

Clear skies and low humidity permit a wide diurnal temperature fluctuation. Heat absorbed by the ground during the day is quickly radiated into the clear skies at night. Temperatures can vary from

30 to as much as 70 degrees Fahrenheit during a 24-hour period. Maximum temperatures on a summer afternoon may reach or exceed 100 Fahrenheit (F.) with summer night minima near 40 F. in the higher elevations. Most of the ground surface is frozen during an average winter--the depth of frozen ground depending on the elevation of the area and the severity of the winter.

The average growing season (number of days between the last killing frost in the spring and the first killing frost in the fall) ranges between 80 and 140 days in the Nevada portion of the study area. Some higher elevations have less than 80 frost-free days per year.

At the lower elevations in the Twin Falls region (below 4,300 feet in elevation), frost-free days range from 110-180 days; at elevations greater than 5,000 feet, the growing season is less than 80 days. The growing season is generally between May 10 and September 30.

Temperature inversions occur frequently throughout the study area. Air, cooled at night through contact with the cold, radiating surfaces of the valley floors, increases in depth and forms a surface inversion (dense, cold air flowing down slopes and gathering in the valleys). The maximum depth of the inversion is reached in the middle of the night. After sunrise, upper layers warm before the surface, thereby trapping colder air near the surface and preventing upward mixing of near-surface atmospheric pollutants. Calm, windless conditions allow this situation to persist, thereby causing air pollution buildup until dissipation by wind occurs. Since study area is generally very windy, air pollution through inversion build-up is not a serious problem. Winds at the ground surface are strongest during the mid-afternoon. Nights are not as windy, which is one of the factors resulting in the rapid nighttime cooling of the surface air. The area receives high, gusty winds during localized storms.

AIR QUALITY

The study area is sparsely populated and generally undeveloped. The scattered population centers are not large enough to generate significant quantities of air pollutants. Periodic sampling for nitrogen oxides and sulfur dioxide carried out by the Nevada State Air Quality Office has indicated the levels are too low to warrant establishing monitoring stations. In addition, there are no measurable levels of photochemical oxidants in the study area. In fact, the largest source of pollutants over most of the area is naturally generated particulate matter from dust storms. Although these storms are intermittent, the particulate matter generated by them often exceeds state and national air quality standards (see Appendix B, p. 205). The State Air Quality Office operates monitoring stations for total suspended particulate (TSP) in the study area at Lovelock, Winnemucca, and Battle Mountain.

The Environmental Protection Agency issued regulations in late 1974 for the establishment of air quality classes for total suspended particulates (TSP) and sulfur dioxide (SO_2). Initially, all areas were placed in Class II (areas in which deterioration normally accompanying moderate, well-controlled growth would be considered insignificant) with the provision that states could reclassify any area as appropriate. To date, none of the areas within the State of Nevada have been officially redesignated. No air quality maintenance areas or air quality maintenance plans have been established in the study area.

In addition to natural sources of pollutants in the area, there are some man-made sources. Transmission lines cause electrons to be emitted from the surrounding air (corona discharge) and also cause the formation of certain pollutants such as ozone and nitrogen oxides (corona effluents). This level of emissions from powerlines is considered insignificant (Final ES, Tucson Gas and Electric Transmission Line Corridor, 1975). Other sources include industry, mining, and automobiles. Although there is limited data on these sources, none are considered to detract significantly from the generally good air quality of the region.

WATER

Water bodies in the area include two major rivers, the Humboldt and the Snake, and numerous small rivers and creeks, including Marys River, North Fork of the Humboldt, Maggie Creek, and Salmon Falls Creek. Some smaller creeks are dry part of the year, while others flow year-long and support riparian vegetation.

Some of the reservoirs in the area include: Bishop Creek (north of Wells), Willow Creek (northeast of Battle Mountain), Rye Patch (north of Oreana), Wild Horse (on Nevada State Highway 51), Wilson Lake, Murtaugh Lake (both east of Twin Falls), and Salmon Creek Reservoir (west of Rogerson, Idaho). There are four proposed reservoir sites: Rock Creek (north of Battle Mountain), Hylton (on the South Fork of the Humboldt), Devil's Gate (on the North Fork of the Humboldt), and Vista (on Marys River). Refer to the Recreation Management Map, p. 69 for locations of proposed reservoirs.

Stream flooding and sheet flooding (overland flow) commonly occur in the area due to short-term, high-intensity thunderstorms in the summer and snow melt in the spring. Flooding furnishes sufficient erosive power to move large amounts of soil and rock downslope. Flooding potential is increased by the scattered, thin vegetative cover which allows rainfall runoff to attain sufficient overland velocity to move substantial amounts of soil downslope.

Most of the study area lies within the Humboldt River basin, this area having an average annual precipitation of 10 inches, or 9.4 million acre-feet of water. The process by which water is lost back to the atmosphere, (evapotranspiration) is estimated to be 9.3 million acre-feet annually within the basin. Only 10 percent of the precipitation ever becomes runoff or infiltrates into the ground water reservoirs (the largest of which lie within the alluvium of the valleys and flood plains). In turn, much of this runoff and ground water recharge is ultimately lost to evapotranspiration. The remaining 90 percent of the precipitation is lost directly to evapotranspiration, never entering the stream systems or the ground water reservoirs.

The Idaho portion of the study area drains into the Snake River, or into Salmon Falls Creek which discharges into the Snake River. Most of the Snake River water is diverted into canals during the irrigation season and is used for agricultural purposes.

Water uses in Idaho include: domestic water usage (mostly from ground water sources), maintenance of livestock, irrigation (utilizing ground water and surface water), fishing, and production of electrical power along the Snake River.

Water uses in Nevada include: domestic usage, recreation, maintenance of livestock and irrigation of cropland areas.

Table II-2 p.30 , gives the average discharge in acre-feet per year (and the flow in cubic feet per second) at some active gaging stations along the Humboldt River, Marys River, North Fork of the Humboldt, and Salmon Falls Creek.

TABLE II-2

AVERAGE RIVER AND STREAM DISCHARGE

STATION NAME	LOCATION	PERIOD OF RECORD	AVERAGE DISCHARGE
Humboldt River near Rye Patch	Lat. 40°28' Long. 118°18'	60 years	146,300 acre-ft/yr (202 cfs)
Humboldt River near Imlay	Lat. 40°41' Long. 118°12'	35 years	143,500 acre-ft/yr (198 cfs)
Humboldt River at Battle Mountain	Lat. 40°40' Long. 116°55'	32 years	243,400 acre-ft/yr (336 cfs)
Humboldt River near Elko	Lat. 40°56' Long. 115°38'	37 years	171,700 acre-ft/yr (237 cfs)
N. Fork Humboldt at Devil's Gate	Lat. 41°11' Long. 115°29'	39 years	53,610 acre-ft/yr (74.0 cfs)
Marys River above Hot Springs Creek	Lat. 41°15' Long. 115°15'	31 years	44,850 acre-ft/yr (61.9 cfs)
Salmon Falls Creek near San Jacinto	Lat. 41°56' Long. 114°41'	62 years	99,980 acre-ft/yr (138 cfs)

cfs = cubic feet per second

Data was compiled from "Water Resources Data for Nevada", 1974, prepared by U.S. Geological Survey.

Water quality data is not generally available except along the larger waterways. Of special interest are the dissolved solids content (the total concentrations of chemical constituents dissolved in the water) and the suspended sediment discharge (particles suspended in the water), both measured in tons per day. At the Humboldt River gaging station near Rye Patch, the dissolved solids ranged from 27.9 to 39.1 tons per day between November 1973, and March 1974, and ranged from 259 to 877 tons per day between April and September 1974. The suspended sediment discharge was 3.1 tons per day when measured at that station in January 1974.

The suspended sediment discharge was measured at the Humboldt River gaging station near Imlay during January 1974 (1.2 tons per day), April 1974 (1140 tons per day), and July 1974 (86 tons per day). These dissolved solids and suspended sediment discharges are moderate when compared to those found in other rivers in the western United States.

Pesticides are in use on the croplands of south-central Idaho and on the croplands of the study area in Nevada. A small portion of these various pesticides are carried from these lands by runoff waters back into the larger waterway system. Quantification data on concentrations and possible effects of these pesticides on the water quality is not available for the study area at this time.

TOPOGRAPHY

The Nevada portion of the study area lies within the Great Basin (where all drainage leads to closed interior basins) and has the typical Basin and Range topography: elongated mountain ranges trend in a northerly direction and are separated by intervening valleys. The area is drained by the Humboldt River which flows west, ultimately discharging into the Humboldt Sink.

Near the Idaho border, the Basin and Range topography of the Great Basin merges with the Columbia Intermontane Province. All drainage in the southern Idaho portion of the study area is northward into the Snake River or into Salmon Falls Creek which discharges into the Snake River.

Most of the valleys in the Nevada portion of the area lie between 5,000 and 6,000 feet above sea level. The valleys near the Humboldt River have elevations below 5,000 feet.

The Idaho portion of the study area consists of plains in the vicinity of U.S. Highway 93, with alluvial fans east of Hollister area. Hilly uplands comprise the south end of Salmon Falls Creek. Salmon Falls Creek, with canyon-like topography, is sometimes as low as 400 feet below the elevation of the nearby plain.

To review the generalized terrain features of the study area, refer to the Study Area Map, p. 7 , and also see Chapter III, p. 112 , Topography.

GEOLOGY & MINERAL RESOURCES

GEOLOGY

The generalized geology of the study area consists of sedimentary rocks of the Paleozoic Era (230 to 600 million years ago) covered by volcanic and sedimentary rocks of the Tertiary Period (approximately 3 to 70 million years ago). Alluvium has formed stream channel deposits, flood plains, stream terraces, and alluvial fans.

Tertiary volcanics -- rhyolite flows, tuffs, and breccias, as well as some basalts -- comprise much of the exposed bedrock in the study area. Talus slopes (angular broken rock fragments at the base of a cliff face) commonly occur in the study area. Tertiary sedimentary deposits of the Humboldt formation (unconsolidated gravels, silts, and sands, and poorly consolidated conglomerates and sandstone) are interbedded with the tertiary volcanics.

The higher elevations in the southern Idaho portion of the area consist of volcanics of silicic composition in the forms of tuff, welded ash, and lava flows. Younger basalt has flowed over some of these rocks at lower elevations and to the north. Salmon Falls Creek and the Snake River have eroded canyons in the volcanic rock.

For specific locations, refer to the Generalized Geology Map, p. 33

MINERAL RESOURCES

Most of the mineralization in the Nevada portion of the study area consists of metallic ore deposits related to igneous bodies of rock. Deposits in sedimentary carbonate rocks (such as limestone) include gold-silver, lead-silver, lead-zinc-silver, manganese-nickel, and antimony. Some deposits of gold and copper occur in shale and chert. Silver-lead veins often occur in volcanic rock. Gold-silver deposits are also associated with igneous intrusives (such as granodiorite). Deposits of barite ($BaSO_4$), used by the oil companies in drilling muds, can be found in a 50- to 75-mile-wide northeast-trending barite belt which extends across northern Lander County into Elko County.

Some geothermal potential exists in the area, most notably near Beowawe, although there has not yet been any commercial development for the production of electrical power.

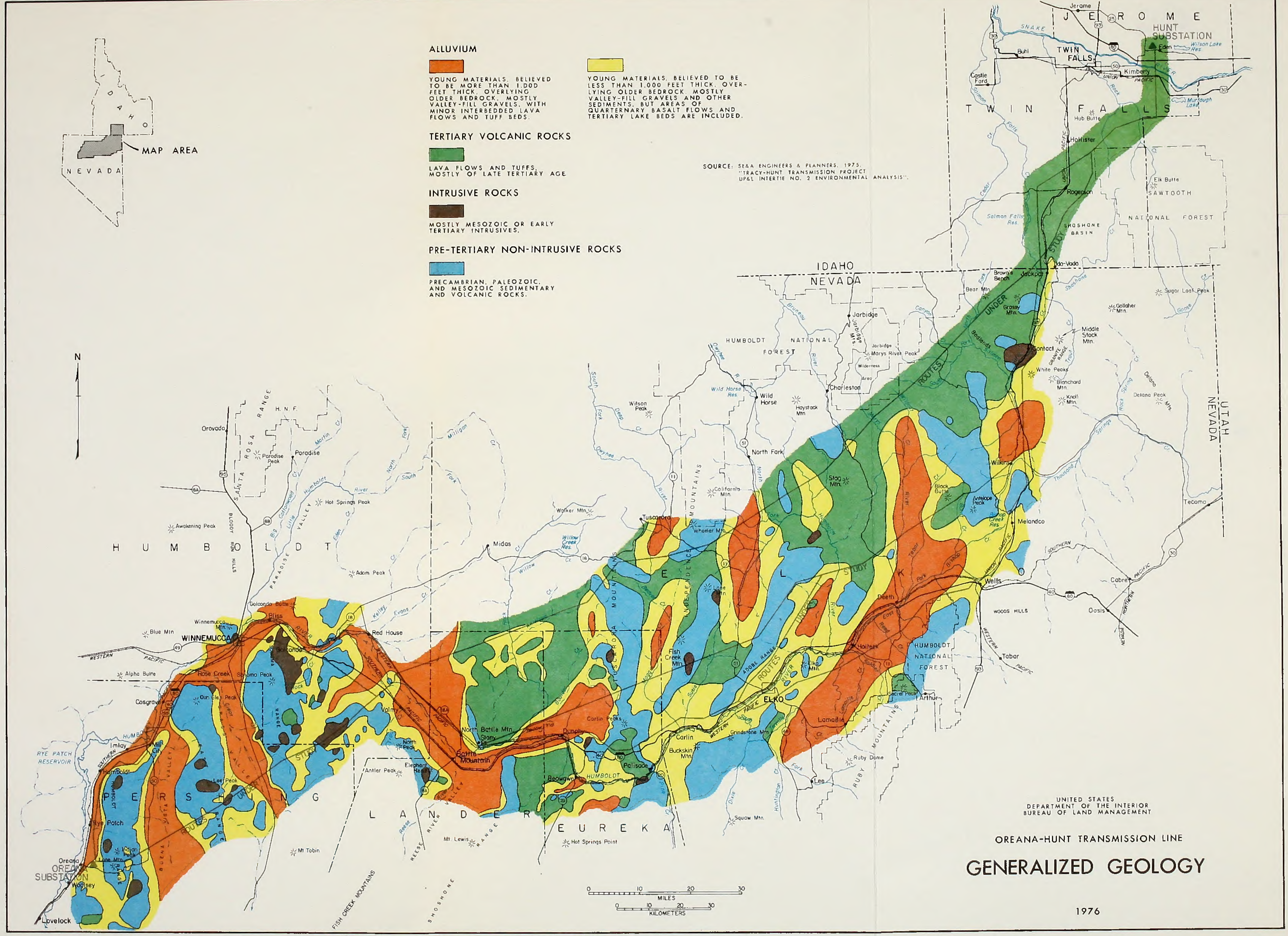
In the southern Idaho portion of the study area, only sand and gravel occur in significant concentrations as to be economically valuable.

GEOLOGIC HAZARDS (SEISMICITY)

The portion of the study area west of Battle Mountain passes through seismic zone 3, denoting possible major damage from earthquakes. The area east of Battle Mountain in Nevada and extending into Idaho is seismic zone 2, denoting possible moderate earthquake damage.

The most seismically active areas are in western Nevada and include the Stillwater Range, Tobin Range, Clan-Alpine Range, Fairview Peak, Excelsior Mountains, and Gabbs Valley Range. Earthquakes with epicenters in these areas may be felt in portions of the study area.

Block faulting, (the movement of large blocks of the earth's crust along fault lines) is responsible for earthquakes within the Basin


ALLUVIUM
YOUNG MATERIALS, BELIEVED TO BE MORE THAN 1,000 FEET THICK, OVERLYING OLDER BEDROCK. MOSTLY VALLEY-FILL GRAVELS, WITH MINOR INTERBEDDED LAVA FLOWS AND TUFF BEDS.
YOUNG MATERIALS, BELIEVED TO BE LESS THAN 1,000 FEET THICK, OVERLYING OLDER BEDROCK. MOSTLY VALLEY-FILL GRAVELS AND OTHER SEDIMENTS, BUT AREAS OF QUARTERNARY BASALT FLOWS AND TERTIARY LAKE BEDS ARE INCLUDED.
TERTIARY VOLCANIC ROCKS
LAVA FLOWS AND TUFFS, MOSTLY OF LATE TERTIARY AGE
INTRUSIVE ROCKS
MOSTLY MESOZOIC OR EARLY TERTIARY INTRUSIVES.
PRE-TERTIARY NON-INTRUSIVE ROCKS
PRECAMBRIAN, PALEOZOIC, AND MESOZOIC SEDIMENTARY AND VOLCANIC ROCKS.
SOURCE: SE&A ENGINEERS & PLANNERS, 1975. "TRACY-HUNT TRANSMISSION PROJECT UP&L INTERTIE NO. 2 ENVIRONMENTAL ANALYSIS".
IDAHO
NEVADA
MAP AREA
N
IDAHO
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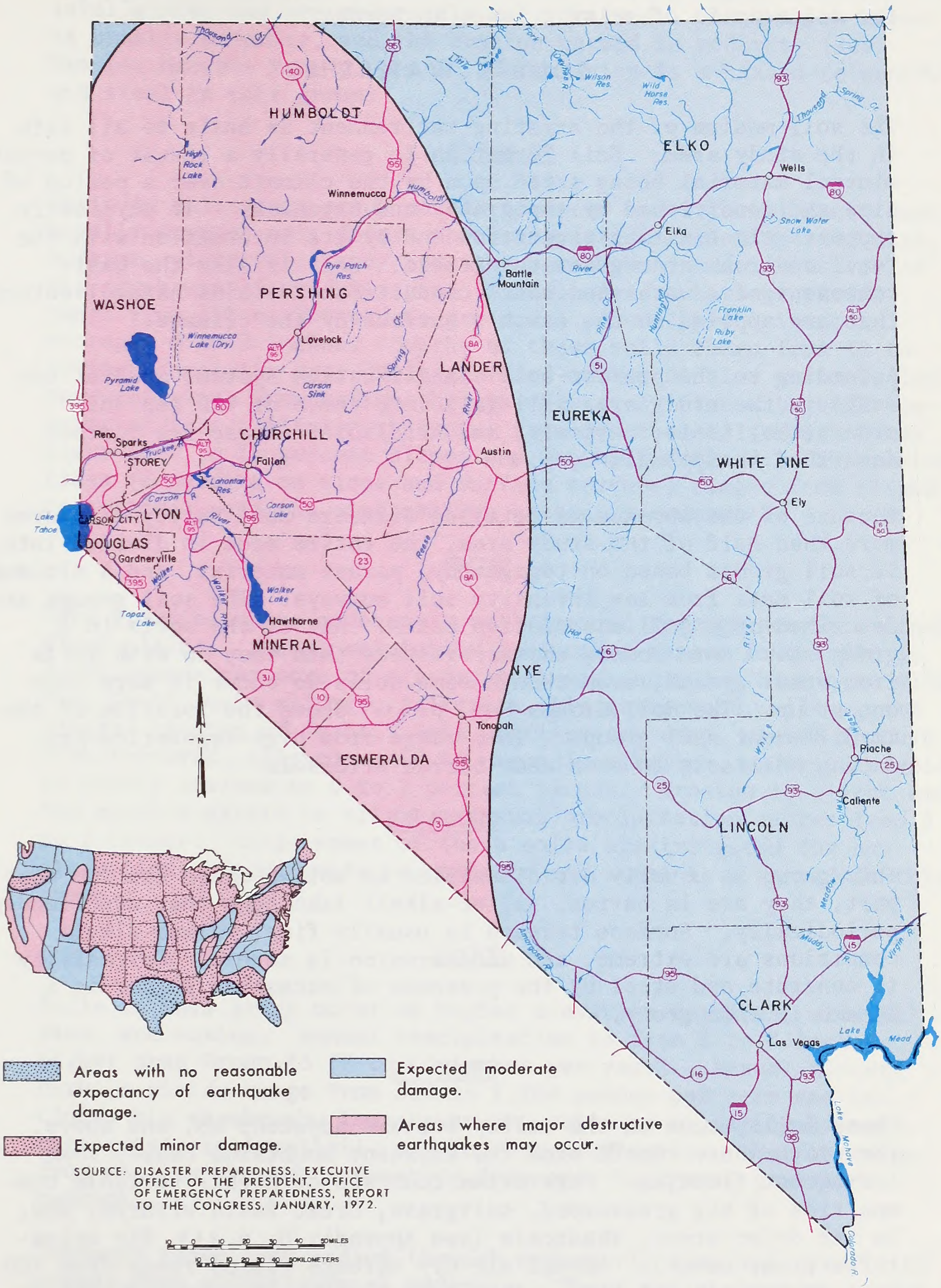
UTAH
NEVADA
JEROME
TWIN FALLS
HUMBOLDT
ELKO
PERSHING
LANDER
EUREKA
HUNT SUBSTATION
OREANA SUBSTATION
WINNEMUCCA
ELKO
Battle Mountain
Wells
Lovelock
Jackpot
Carlin
UNDER STUDY ROUTES
HUMBOLDT NATIONAL FOREST
SAWTOOTH NATIONAL FOREST
0 10 20 30
MILES
0 10 20 30
KILOMETERS
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREANA-HUNT TRANSMISSION LINE
GENERALIZED GEOLOGY
1976

SEISMIC RISK



Areas with no reasonable expectancy of earthquake damage.	Expected moderate damage.
Expected minor damage.	Areas where major destructive earthquakes may occur.

SOURCE: DISASTER PREPAREDNESS, EXECUTIVE OFFICE OF THE PRESIDENT, OFFICE OF EMERGENCY PREPAREDNESS, REPORT TO THE CONGRESS, JANUARY, 1972.

and Range topography, and has continued since early Tertiary time (almost 70 million years). Refer to the Seismic Risk Map, p. for delineation of seismic zones in Nevada.

SOILS & WATERSHED

The soil medium of the existing environment is basic to all life in the study area. Soil formation is generally a result of parent mineral material being acted upon by the climate over a period of time and conditioned by topography and organisms. It physically supports the existing vegetation and by its interaction with the total environment regenerates itself. Soil is also the basic component of a watershed which conducts and detains natural waters that are applied to the earth's surface by the climate.

According to the present soil classification system, most of the soils in the study area will fall into three of the ten soil orders, Mollisols, Entisols, and Aridisols. These are further described in Appendix C, p. 211 .

Because of the absence of detailed Standard Soil Survey data over more than half of the study area, the entire area is divided into 12 soil groups based on topography, parent material, and a minimum of soil data from low intensity soil surveys. The soil groups are described on a soil association basis. All of the soils in a group share more common characteristics than they do with soils from other groups, even though some soils do occur in more than one group. The Soil Groups Map, p. 41 shows the location of the 12 different soil groups. They range from high-vegetation-producing Mollisols to some near-barren Aridisols.

GROUP #1

This group is usually not classified as soil because for the most part, they are in barren, saline-alkali lake beds that are flooded periodically. Surface texture is usually fine, saline-alkali conditions are extreme, and wind erosion is severe. Corrosivity to concrete and steel by the presence of excessive sulfur is a hazard in this group.

GROUP #2

These soils occur on the valley bottoms adjacent to, and above, the playa where runoff from the adjacent mountains causes some infrequent flooding. Vegetation consists of highly variable communities of big greasewood, saltgrass, Great Basin wildrye, and, in the drier areas, shadscale (see Appendix D, p. 215 for scientific plant names). Annual air-dry herbage yields range from 400 to 1,000 pounds per acre. Annual precipitation ranges from 6 to 8 inches. Some of these soils have been placed under irrigation for producing hay. These soils are deep, medium through finely textured, slightly to strongly alkaline. They occur on near-level slopes and are moderately well drained. The erosion class is usually moderate, and the erosion hazard is moderate (see Erosion Hazards Map, p. 43). Corrosivity is a hazard to concrete and steel in this group.

GROUP #3

Soils in this group occur on old terraces and alluvial fans, and usually support salt desert shrub vegetation including shadscale, budsage, winterfat, spiny hopsage, horsebrush, and inclusions of big sagebrush along drainages. Annual air-dry herbage yields range from 150 to 200 pounds per acre. Annual precipitation averages 6 to 7 inches. Depths of these soils range from 12 to 20 inches usually over duripans (hard-silica dioxide accumulation); textures range from medium through moderately fine with high contents of silt. Alkalinity ranges from moderate to strong. They occur on 0 to 15 percent slopes and are well drained. The erosion class (depending on slope and surface texture) ranges from slight to critical, and the wind erosion hazard is moderate.

GROUP #4

This group occupies moderately well drained through poorly drained flood plains. Annual vegetation production ranges from 1,000 to 3,000 pounds per acre of air-dry herbage, including bluejoint wildrye, Great Basin wildrye, saltgrass, big greasewood, willow, and several species of forbs. Soil profiles are deep, coarse through fine-textured, slightly acid to strongly alkaline, moderately well to poorly drained on 0 to 2 percent slopes. Erosion is slight and the erosion hazard is slight. Annual precipitation ranges from 6 to 8 inches. Large areas of these soils are irrigated for hay production. Corrosivity to concrete and steel is a hazard in this group.

GROUP #5

Soils in this group occur on higher elevation terraces, alluvial fans, and basins. Annual precipitation is from 2 to 4 inches higher than Group #3 (7 to 11 inches per year). Annual air-dry herbage yields range from 500 to 1,200 pounds per acre and includes big sagebrush, low sagebrush, yellowbrush, spiny hopsage, cheatgrass, squirreltail, and Thurber needlegrass. Depths range from shallow through moderately deep over hardpans, gravel, or bedrock.

Textures range from medium through moderately fine and alkalinity ranges from slight through moderate. These soils occur on slopes of about 2 to 15 percent and are well drained. Present erosion conditions are slight to moderate, and erosion hazard is moderate. Most of these soils are used for spring and fall rangeland, and some can be seeded to dryland perennial grass.

GROUP #6

These soils occur on upland terraces, alluvial fans and low foothills where annual precipitation is about 12 inches per year. Vegetation consists primarily of low sagebrush, big sagebrush, antelope bitterbrush, yellowbrush, Sandberg bluegrass, Idaho fescue, and others. Annual air-dry herbage yields range from 500 pounds per acre on the low sagebrush communities to 1,500 pounds per acre on the big sagebrush communities.

Soil depths range from shallow over silica hardpan and claypan in the low sagebrush areas to moderately deep and deep for the big sagebrush areas. Textures range from medium to fine, and alkalinity is neutral. These soils occur on slopes from 2 to 15 percent and are well drained. Erosion is moderate on most areas, and the erosion hazard is moderate. Most of these soils support a large part of the summer grazing industry in the region.

GROUP #7

This group occurs on dry upland terraces where annual precipitation is about 8 inches per year and soil carbonates and hardpans are common. Vegetation consists of plant communities dominated by black sagebrush on the shallower soils and big sagebrush on the deeper soils. Annual air-dry herbage yields range from 350 pounds per acre on the shallow soils to about 750 pounds on the deeper soils. Textures are medium to moderately fine, alkalinity is moderate, drainage is good, and slopes range from 2 to 30 percent. Erosion is moderate in most areas, and erosion hazard is moderate.

GROUP #8

These soils occur on old lava plains and alluvial fans that have been covered to varying depths by wind-transported soil particles known as loess. Group #8 soils are high-producing agricultural land when within reach of irrigation facilities. The original vegetation was composed of communities of big sagebrush and perennial grass. These soils are moderately deep over volcanic flow rock and are medium to moderately fine textured. Alkalinity is slight to moderate because of the presence of calcium carbonate weathering from the basaltic parent material. They occur on slopes ranging from 2 to 8 percent and are well drained. Erosion is slight to moderate depending on present use and vegetative cover, and the erosion hazard is moderate. Most of these soils support irrigated agriculture in southern Idaho.

GROUP #9

These soils occur on moderately steep and steep (16 to 51 percent) slope mountains , primarily along the southern flank of the region. This group differs from the other two mountainous groups (#10 and 11) by having less annual precipitation than the other groups, and differs in geologic material from #11, in that the granodiorites are usually absent in Group #9. Most of the geologic material in this group is mixed basic igneous, metamorphic, and sedimentary material where Group #11 is primarily granitic.

Vegetation is highly variable and, like the majority of soils in this region, this group supports primarily sagebrush and its associated plant species. Total annual air-dry herbage yields range from less than 100 pounds per acre on shallow gravelly soils to more than 3,000 pounds per acre on deeper soils. Annual precipitation ranges from 10 to 15 inches. Soil depths range from 6 inches over bedrock on some high elevation ridges to more than 60 inches on some steep canyon side slopes. Textures range from medium to fine, depending on soil parent material. These soils are neutral to slightly acid, except where limestone-derived, occur in small inclusions, and pH runs as high as 8.2, or moderately alkaline. Group #9 soils are well drained, erosion ranges from slight to severe depending on slope, soil texture, and past treatment. Erosion hazard is severe. These soils are primarily used for summer grazing by livestock.

GROUP #10

This group of soils occurs on the highest elevations, and consequently receives the most annual precipitation. This group yields more vegetation per acre than any other group except #4, where perennial water table effect is coincidental with high vegetative yields. Yields in this group range from about 400 pounds on shallow wind-swept ridges to 2,500 pounds per acre on deeper soils in basins and canyon side slopes. Soil textures range from medium to moderately fine, and very fine on some volcanic material. Soil reaction is slightly acid to neutral, drainage is good, and slopes range from 4 percent on ridge tops to 70 percent on canyon side slopes.

Erosion ranges from stable on some mountain meadows to severe along most perennial drainages, and erosion hazard is severe. Annual precipitation ranges with elevation from 12 to 25 inches. These soils are the primary watersheds of the region. The vegetation they support is used mainly by mule deer and livestock during the growing season.

GROUP #11

This mountainous group occurs in minor amounts in the region and in two larger areas near the Nevada-Idaho border and near Wells, Nevada. It differs from Group #10 in that the soil parent material is granitic intrusive that helps develop coarse textured soils. They absorb water much faster than the normal finer textured soils. This characteristic usually induces higher yields of vegetation if the soil depth is sufficient for adequate water retention. Soils in this group are similar to those in Groups #9 and #10 in many respects, but soil textures are coarse and moderately coarse compared to finer textures on Groups #9 and #10.

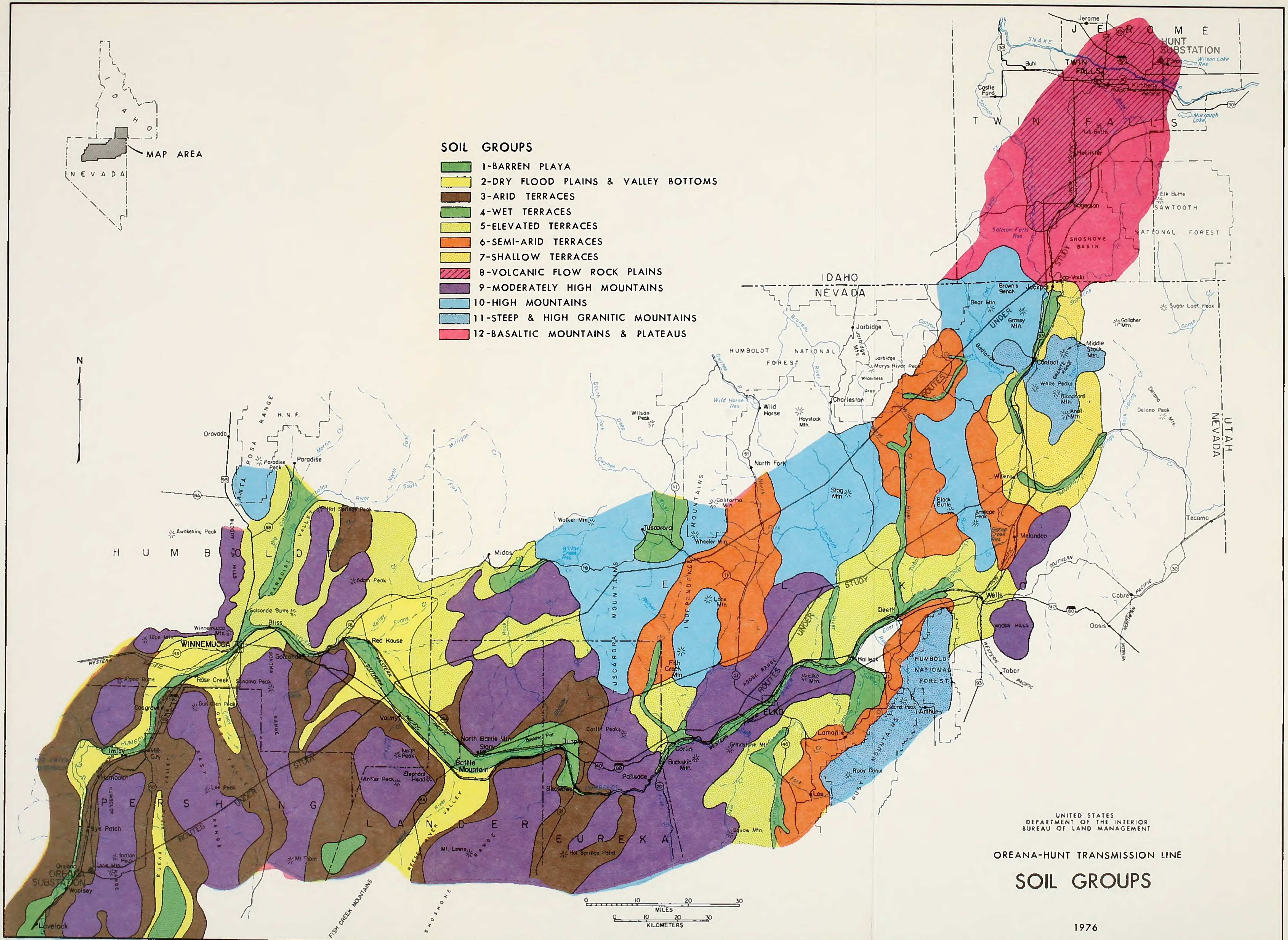
Erosion is less on Group #11 because the water is absorbed into the soil faster. Most of the soil taxonomic units are similar to those in Group #10, except the subsoil textures fall into the loamy and coarse families. Slopes range from 4 to 70 percent and drainage is adequate. Annual precipitation ranges from 10 to 20 inches. Erosion is slight to severe, and erosion hazard is severe. These soils are primarily used for summer grazing by livestock and mule deer.

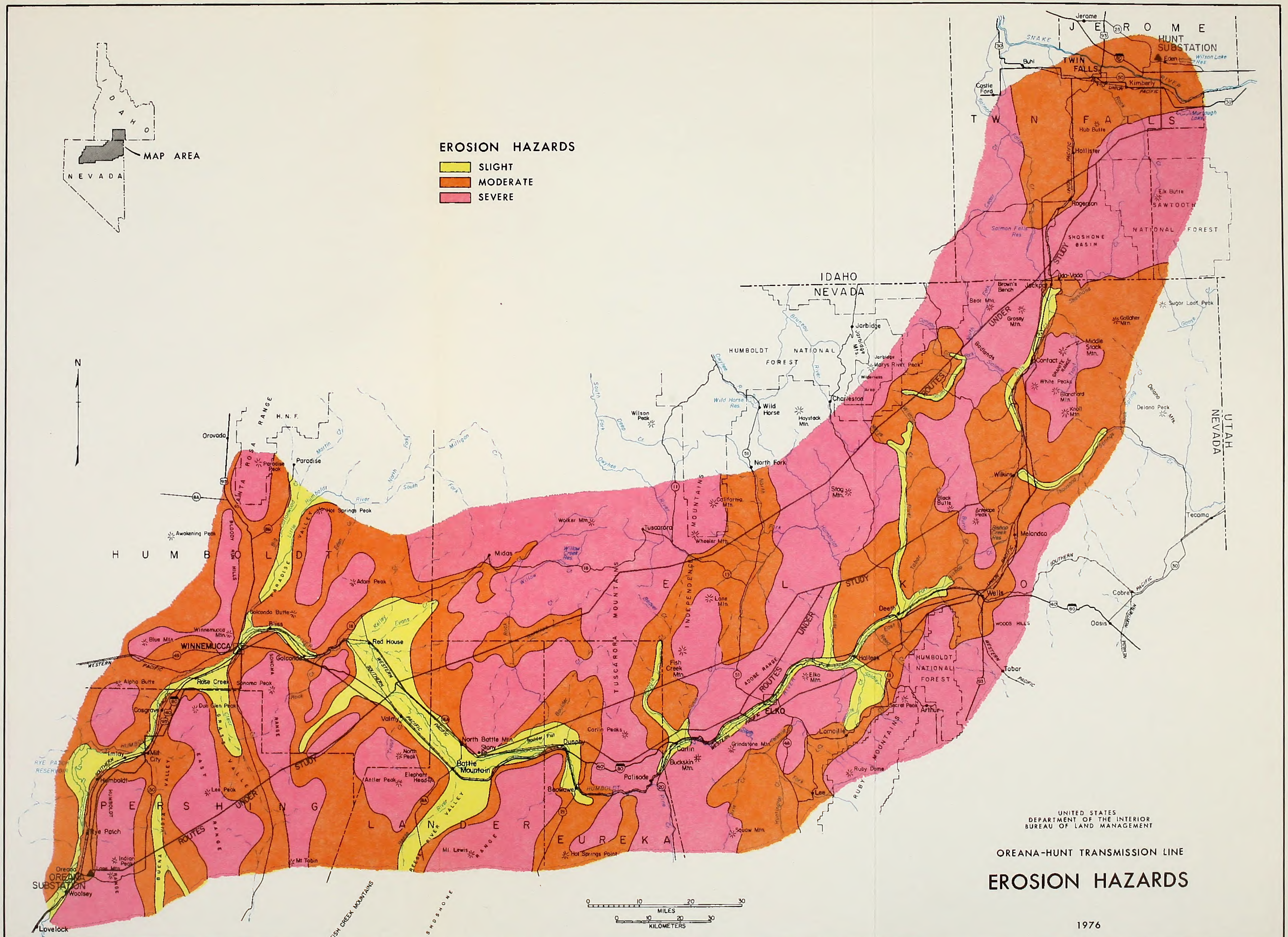
GROUP #12

This area occurs in southern Idaho on an old volcanic plain adjacent to Group #8 soils that are primarily used for farming. These soils are highly variable and for the most part unidentified, ranging from shallow (over bedrock and duripan) to deep alluvials along the drainages and in basins. The shallow soils occur on ridges and near rock outcrops. They are medium through fine textured, neutral to mildly alkaline, and occur on slopes ranging from 16 to 51 percent. They are well drained and fertile. Average annual air-dry herbage yields range from 300 to over 1,000 pounds per acre, depending on soil depth. The native vegetation consists primarily of big sagebrush, low sagebrush, bluebunch wheatgrass, Thurber's needlegrass, cheatgrass and Sandberg bluegrass. Rock outcrops and stony surfaces are common. Erosion ranges from slight to moderate and erosion hazard is severe. The area is used primarily by mule deer and livestock during the growing season.

VEGETATION

The study area includes a number of vegetative types ranging from salt desert shrub at the lower elevations to mountain shrub and aspen at the higher elevations. (See Vegetation Map, p. .) Most of the area, however, is covered by the northern desert shrub type characterized by sagebrush species, occasional crested wheatgrass seedings are interspersed among the vegetative types.


MAP AREA
IDAHO
NEVADA
SOIL GROUPS
1-BARREN PLAYA
2-DRY FLOOD PLAINS & VALLEY BOTTOMS
3-ARID TERRACES
4-WET TERRACES
5-ELEVATED TERRACES
6-SEMI-ARID TERRACES
7-SHALLOW TERRACES
8-VOLCANIC FLOW ROCK PLAINS
9-MODERATELY HIGH MOUNTAINS
10-HIGH MOUNTAINS
11-STEEP & HIGH GRANITIC MOUNTAINS
12-BASALTIC MOUNTAINS & PLATEAUS
HUNT SUBSTATION
TWIN FALLS
JEROME
SAWTOOTH NATIONAL FOREST
HUMBOLDT NATIONAL FOREST
UTAH NEVADA
HUMBOLDT
ELKO
PERSHING
LANDER
EUREKA
WINNEMUCCA
OREANA SUBSTATION
Lovelock
Battle Mountain
Wells
STUDY UNDER ROUTES
MILES
KILOMETERS
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREANA-HUNT TRANSMISSION LINE
SOIL GROUPS
1976


EROSION HAZARDS
SLIGHT
MODERATE
SEVERE
MAP AREA
IDAHO
NEVADA
N
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREANA-HUNT TRANSMISSION LINE
EROSION HAZARDS
1976
MILES
KILOMETERS
HUNT SUBSTATION
OREANA SUBSTATION
TWIN FALLS
JEROME
HUMBOLDT
PERSHING
LANDER
EUREKA
ELKO
WINNEMUCCA
Battle Mountain
Lovelock
Wells
UTAH
NEVADA
STUDY UNDER ROUTES
HUMBOLDT NATIONAL FOREST
SAWTOOTH NATIONAL FOREST

Scattered agricultural areas are also found in the region, especially in the Idaho portion. These are described in the Land Use Section, p. 60. Appendix D, p. 215 lists some of the characteristic plants of the various vegetative types in the area.

A list of endangered and threatened plants of Nevada was published in the Federal Register of July 1, 1975, and is currently being revised. On recommendation of the University of Nevada, the Northern Nevada Native Plant Society (NNNPS) was consulted in regard to threatened and endangered plant species. The NNNPS surveys within the state are limited, and have not covered the area in question. According to the NNNPS, if any of the listed plants do occur in the area they are probably restricted to the mountainous portions.

Following is a discussion of vegetative types and communities in the study area. Although discussed separately, vegetative communities frequently overlap or are intermingled, with some species found in several of the communities. This information was derived from field investigations, BLM District resource inventories, and reports such as those prepared by Forest, Range and Watershed Consultants, Inc. (see Bibliography). Capabilities for revegetation are briefly mentioned, and are covered in more detail in Appendix E., p. 221 .

SALT DESERT SHRUB

BIG GREASEWOOD COMMUNITY

This community is found on the flood plains along the Humboldt River and in other areas frequently associated with a higher water table (18-36 inches). Although most often found in these areas, big greasewood can also be found in areas where the water table is deeper (in excess of 5 feet).

Shadscale is a co-dominant species in this community where the water table is deeper, but where the water table is close to the soil surface, big saltbrush, rubber rabbitbrush, and saltgrass increase in abundance. Other species also occur, but in smaller numbers.

Revegetation of this community is difficult largely due to the adverse soil conditions and arid climate (Rollins, et al, 1968).

Typical salt desert shrub vegetative type. Boulder Flat Valley, near Battle Mountain, Nevada.

SHADSCALE COMMUNITY

This community is found on alluvial fans along the toe slopes of the mountain ranges in the study area generally from Oreana to Beowawe. Two specific areas are the Buena Vista Valley and Grass Valley.

Several associations of plant species are found in this community, such as shadscale/budsage and dryland greasewood/shadscale. Cheatgrass is the most abundant species in the understory. A number of additional shrubs and grasses, as well as forbs, are found scattered in small numbers. The annual weed halogeton frequently invades areas where the soil has been disturbed.

Revegetation of this community is difficult to impossible, the most limiting factor being the arid climate of the area (Bleak, et al, 1965).

NORTHERN DESERT SHRUB

BIG SAGEBRUSH COMMUNITY

A major portion of the study area (generally the area east of the Humboldt County line) falls in the big sagebrush community. This community is diverse, occurring on flood plains, terraces, ridges, and mountain slopes.

The associated vegetation varies with the location and growing conditions, and includes (in separate associations) bluebunch wheatgrass, cheatgrass, rubber rabbitbrush, yellowbrush/sandberg bluegrass, and Idaho fescue. Other shrubs and grasses are found unevenly distributed in small numbers. Revegetation of this community can be fairly easy using standard revegetation techniques.

Northern desert shrub type - big sagebrush in the foreground. O'Neil Basin area, Nevada.

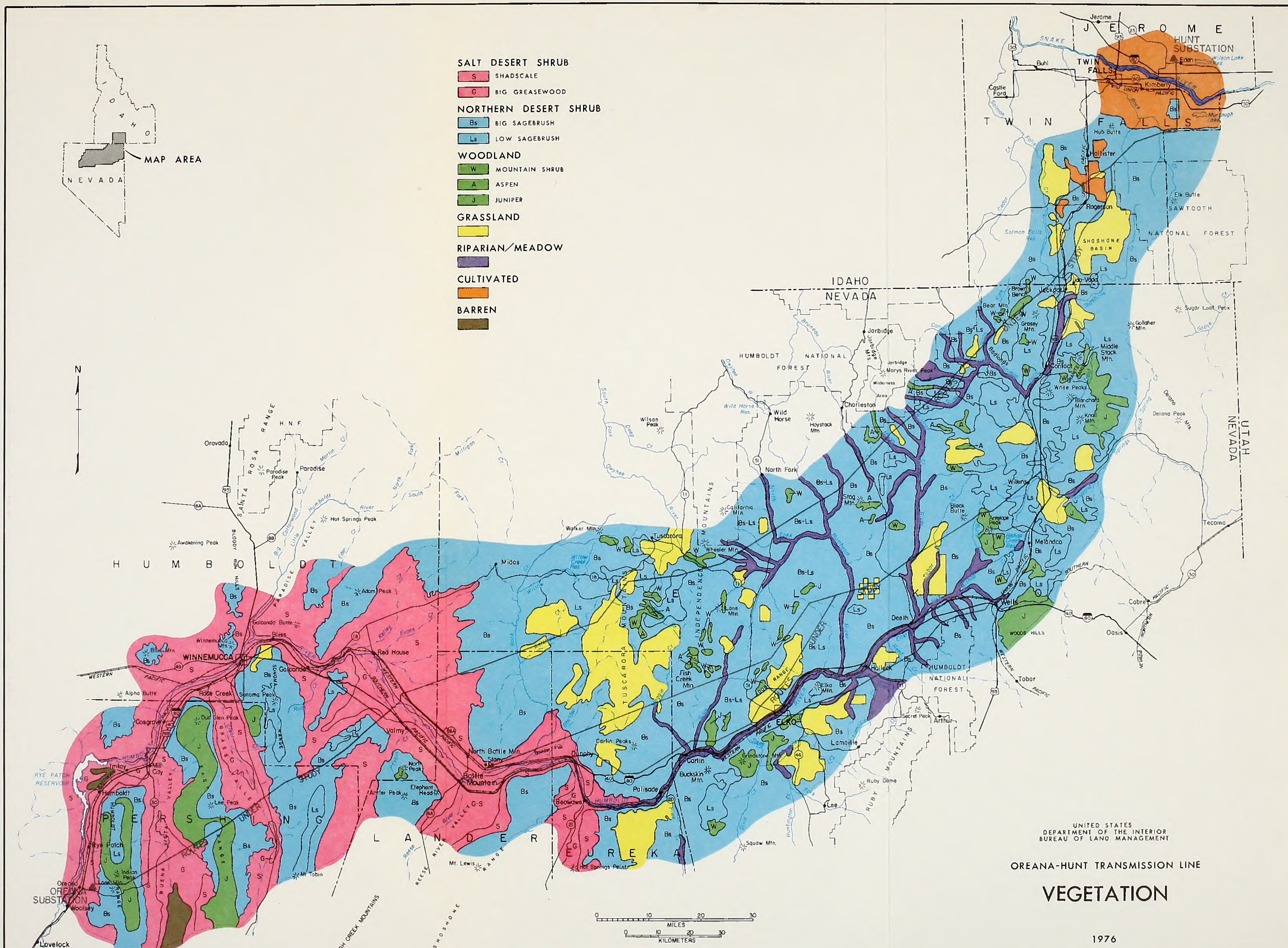
LOW SAGEBRUSH COMMUNITY

The low sagebrush community is found at the higher elevations on ridges, mountain slopes, and some alluvial fans. It is often dispersed with the big sagebrush community, although the low sagebrush type typically is found on shallower, rockier, and finer textured soils. Other shrubs are found in small numbers, and a large number of forbs are scattered throughout the community. Revegetation of the low sagebrush community can be moderately difficult, depending on soil, slope, and stoniness.

Northern desert shrub - low sage in the foreground. Scattered mountain shrub type and aspen in the background. Brown's Bench near the Nevada-Idaho line.

MEADOW/RIPARIAN COMMUNITY

The meadow/riparian community is found along creeks, river bottom drainages, and flood plains. For the most part, the community lines the waterways in narrow strips from a few feet wide up to 3 miles wide. In some areas bordering the salt desert shrub type, it intermingles with the big greasewood community. Willow and Wood's rose are common shrubs in the community, with an understory of meadow grasses, rushes, sedges and numerous forbs. Revegetation of the meadow/riparian community is fairly easy.


SALT DESERT SHRUB
S SHADSCALE
G BIG GREASEWOOD
NORTHERN DESERT SHRUB
Bs BIG SAGEBRUSH
Ls LOW SAGEBRUSH
WOODLAND
W MOUNTAIN SHRUB
A ASPEN
J JUNIPER
GRASSLAND
RIPARIAN/MEADOW
CULTIVATED
BARREN
IDAHO
NEVADA
MAP AREA
N
IDAHO
NEVADA
UTAH
NEVADA
HUNT SUBSTATION
OREANA SUBSTATION
WINNEMUCCA
ELKO
TWIN FALLS
Lovelock
Battle Mountain
Wells
Carlin
Jerome
Rogerson
Hollister
Jackpot
Contact
Golconda
Valmy
Dunphy
Beowawe
Palisade
Imlay
Humboldt
Rye Patch
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UNITED STATES
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OREANA-HUNT TRANSMISSION LINE
VEGETATION
1976

A portion of the Humboldt River near Elko, Nevada, showing the riparian habitat.

WOODLAND

JUNIPER COMMUNITY

The Juniper community occurs extensively on the Humboldt and East Ranges and in scattered patches in the rest of the study area. The dominant species is Utah juniper and occurs throughout the community. Big sagebrush and yellowbrush are abundant in the shrub layer, with other shrubs occurring in varying amounts. Because of the steep slopes and/or cheatgrass, this community may be fairly hard to revegetate.

MOUNTAIN SHRUB COMMUNITY

Mountainous portions of the study area, from the Tuscarora mountains eastward, contain patches of mountain shrubs such as curlleaf mountain mahogany, bitterbrush, serviceberry, and snowbrush. Big sagebrush is also common. Other shrubs, grasses, and forbs also occur in small numbers. Revegetation of this community can be fairly successful using standard revegetation techniques, when topography permits.

ASPEN COMMUNITY

Aspen occurs in small patches throughout high mountainous basins and along water courses in the region primarily east of the Tuscaroras. Most of the mountain shrubs are also found scattered in varying amounts throughout the aspen community. Slender wheatgrass is usually one of the most abundant grasses although a variety of other grasses and forbs are also found, unless the site has been overgrazed. Portions of this community may be fairly easily revegetated depending on slope and soil conditions.

Aspen (foreground) and mountain shrubs (middleground) overlooking the O'Neil Basin area of Nevada.

WILDLIFE

The study area contains a wide diversity of wildlife including mammals, birds, amphibians, reptiles, and fish. (See Appendix F, p. 231 .) Wildlife habitat is closely aligned with the vegetative zones discussed in the previous section. However, many wildlife species range into two or more vegetative types and several plant communities. Few species are so specific as to be completely dependent on a single vegetative type.

TERRESTRIAL

Significant populations of mule deer exist throughout the study area, being seasonally abundant in most of the mountainous areas.

The north-south oriented mountain ranges typical of the Great Basin and much of the eastern portions of this area serve as migration routes for many thousands of mule deer which winter on the lower elevational ranges. Mule deer migration within Elko County is very complex and is characterized by movement corridors of 40 to 60 miles between summer ranges and critical winter ranges, with some movement corridors exceeding 100 miles. Deer migration on the western portion of the study area, west of Battle Mountain, involves merely an elevational movement by season. This area takes in the Humboldt, East, Sonoma, Tobin, and Buffalo Mountain ranges.

Mule deer summer ranges in Elko County, Nevada and Twin Falls County, Idaho include the Tuscarora Mountains, Independence Mountains, Jarbidge Mountains, Stag Mountain, Snake Range, Upper O'Neil Basin, Brown's Bench, and the South Hills.

Mule deer commonly concentrate in winter ranges which are normally restricted in size by topography and snow depth. Mule deer winter use on these areas has been reported to exceed 100 deer-use days per acre. (1 deer-use day = one deer subsisting for one day.) The critical mule deer wintering areas are typified by big sagebrush - black sagebrush - bitterbrush associations. These areas include the Adobe Range, Sheep Creek Range, Cortez Mountains, south portions of the Tuscarora Range, Elko - Carlin Hills, East Humboldt Range, Wood Hills, Ellen D, and the Granite Mountains near Contact, including the lower portion of O'Neil Basin and the lower elevational portion of the South Hills. (See Big Game and Fisheries Map, p. 55 .)

Antelope inhabit the valleys, foothills, and benchlands of the east portion of the study area. Critical ranges, (shown on Big Game and Fisheries Map) include the traditional kidding grounds visited by the females each year and the winter ranges which may be more or less restrictive dependent on the snow depth. Preferred antelope habitat is a diversity of vegetative types of native ranges having a preponderance of low-growing plants. Important kidding and summer habitat include the Tabor Creek Flat; the Snake Range and benchland; the O'Neil Basin - Brown's Bench, west of Jackpot; and the Brown's Bench to Shoshone Basin in Idaho.

Important mountain lion habitats are rough mountainous areas during the summer months and rough or juniper-covered foothills during the winter months. The mountain lion depends heavily on mule deer for food during much of the year and will follow the migrating deer herds. Known mountain lion habitats include the Humboldt, East, and East Humboldt Ranges, and the O'Neil Basin.

Predatory mammals common within the subject area are the coyote, bobcat, badger, weasel, and mink. The mink is closely associated with aquatic habitat and is found in significant numbers adjacent to streams and reservoir areas.

Several of the less common mammals within the area are the red fox, found in the Snake River drainage; the kit fox, found west of Battle Mountain; the raccoon and otter, found in the Humboldt and Snake River drainage; and the striped and spotted skunk which are sparsely distributed throughout the area.

A wide variety of small mammals are distributed in the various habitats of the study area. Common small mammals include ground squirrels, mice, pocket gophers, shrews, porcupine, cottontail and pigmy rabbits, and blacktailed jackrabbits. These animals provide a significant portion of the prey species base (food supply) for the predatory mammals, birds, and reptiles.

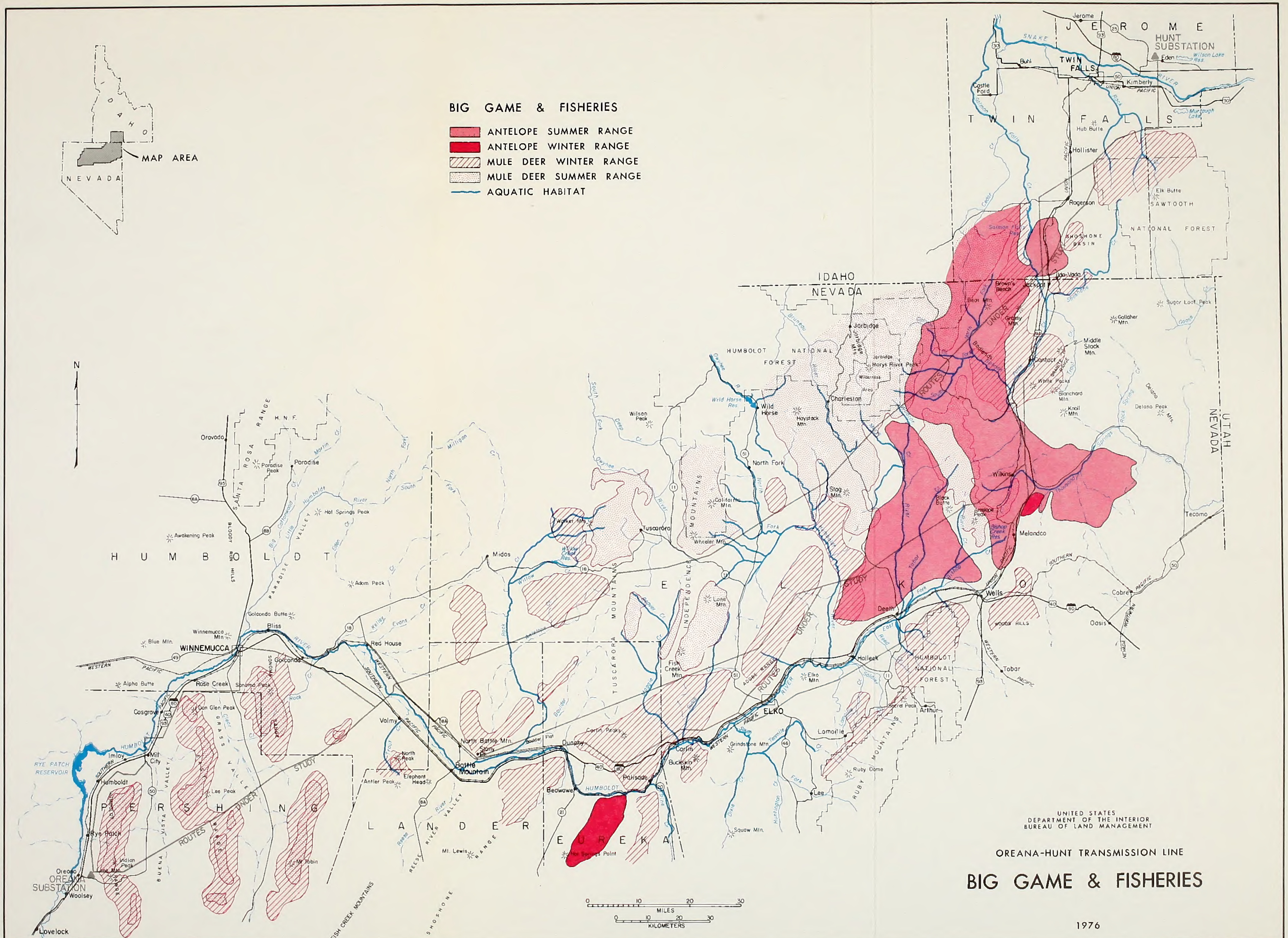
The passerine songbirds are the largest group of birds in the area and the most common species are the horned lark, western bluebird, and sage sparrow. Game birds include sage grouse, blue and ruffed grouse, chukar and Hungarian partridge, California quail, and mourning dove.

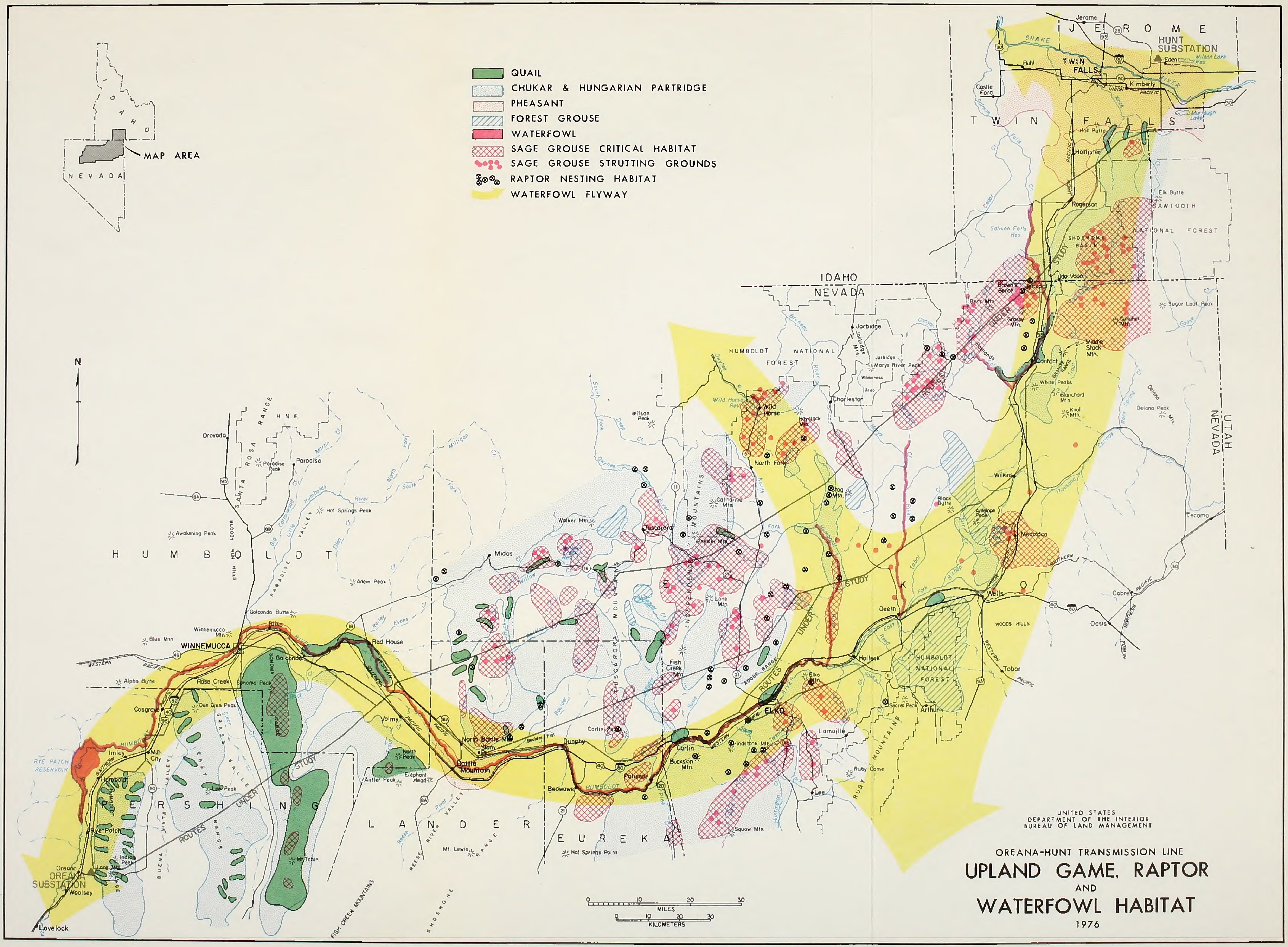
Critical habitat for sage grouse include the nesting complexes (generally in a 3 to 5 mile radius from the strutting grounds which are the focal point for breeding), sagebrush covered wintering areas, and the meadow complexes utilized for summer brood habitat. Because sagegrouse are so closely aligned to sagebrush vegetative areas, crucial habitat is extensive throughout the upper valleys and upland areas from the Sonoma and Tobin Ranges on the southwest, to the northern foothills of the South Hills in Idaho on the northeast.

Crucial habitat for chukar, Hungarian partridge, and California quail is associated with permanent water sources. Mourning doves are widely dispersed throughout the area; however, concentration areas are in the vicinity of available water and small grain producing agricultural areas. Blue and ruffed grouse within the area have a very limited distribution and are associated with the quaking aspen and mountain brush vegetation. Habitat areas for blue grouse include the Tuscarora Range, Stag Mountain, Snake Mountains, and the East Humboldt Range, while the ruffed grouse are found only on the northern portion of the East Humboldt Range.

Scavenger birds include the magpie, crow, raven, and turkey vulture and are distributed throughout the entire area, being most commonly found near ranching and agricultural areas.

Several species of raptors (birds of prey) are common to the study area. These include the red-tailed hawk, ferruginous hawk, golden eagle, great-horned owl, burrowing owl, and short-eared owl, all of which nest in the study area. Some of these species also winter in the area, along with such migrants as the bald eagle,


BIG GAME & FISHERIES
ANTELOPE SUMMER RANGE
ANTELOPE WINTER RANGE
MULE DEER WINTER RANGE
MULE DEER SUMMER RANGE
AQUATIC HABITAT
MAP AREA
IDAHO
NEVADA
N
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREANA-HUNT TRANSMISSION LINE
BIG GAME & FISHERIES
1976
MILES
KILOMETERS
HUNT SUBSTATION
OREANA SUBSTATION
WINNEMUCCA
ELKO
TWIN FALLS
Lovelock
Wells
Battle Mountain


QUAIL
CHUKAR & HUNGARIAN PARTRIDGE
PHEASANT
FOREST GROUSE
WATERFOWL
SAGE GROUSE CRITICAL HABITAT
SAGE GROUSE STRUTTING GROUNDS
RAPTOR NESTING HABITAT
WATERFOWL FLYWAY
MAP AREA
IDAHO
NEVADA
UTAH
HUNT SUBSTATION
OREANA SUBSTATION
TWIN FALLS
WINNEMUCCA
ELKO
HUMBOLDT
PERSHING
LANDER
EUREKA
ELKO
JEROME
STUDY ROUTES UNDER STUDY
MILES
KILOMETERS
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREANA-HUNT TRANSMISSION LINE
UPLAND GAME, RAPTOR
AND
WATERFOWL HABITAT
1976

osprey, and rough-legged hawk. The peregrine falcon (an endangered species) has been sighted in the study area.

Raptor nesting sites are concentrated in the vicinity of riparian or aquatic habitat and those areas of moderate to high rodent and rabbit (prey species) population densities. Wintering concentrations of the larger raptors are found in those areas supporting rabbit populations. Crucial raptor and upland game habitat is shown on the Upland Game and Raptor Habitat Map, p. 57).

AQUATIC

The study area provides a variety of aquatic habitat such as wet meadows, ponds, reservoirs, and streams for a variety of species including fishes, invertebrates, waterfowl, amphibious and water-associated mammals.

The Snake and Humboldt River drainages provide important habitat for the aquatic-associated mammals. Migratory waterfowl within the Pacific flyway utilize the Snake and Humboldt drainages during Fall and Spring migrations. More than half a million waterfowl travel Nevada's migration routes annually while substantially larger numbers move through the Snake Drainage. Significant numbers of waterfowl, shorebirds, and marsh birds nest within or adjacent to the aquatic habitat throughout the area. Migration routes and nesting habitat are indicated on the Upland Game and Raptor Map, p. 57 .

Stream habitat quality varies widely over the area, population and species numbers being dependent on this water quality. Salmon Falls Creek drainage within the Snake system provides excellent trout and salmon habitat on the upper portion of the stream and reservoir. Stream habitat quality of the Lower Salmon Falls Creek and that part of the Snake River within the area is seriously affected by major water flow withdrawals for agricultural purposes.

The Humboldt system has good to excellent trout habitat only in the upper portions. The middle and lower portions of the system are deteriorating rapidly due to natural and man-made causes, and support introduced warm-water game fish species along with carp and other rough-fish species. Fisheries habitat is shown on the Big Game and Fisheries Map, p. 55 . Fish species inhabitating the various streams and the habitat quality of the streams within the major systems are listed in Appendix F, p. 231 .

THREATENED AND ENDANGERED SPECIES

The American peregrine falcon, Falco peregrinus anatum, is occasionaly sighted within the area and is listed as an endangered species in the Endangered Species Act of 1973. The Lahontan cutthroat trout, Salmo clarki henshawi, was listed as of June 16, 1975, as a threatened species and is found within the Humboldt drainage.

The State of Nevada Board of Fish and Game Commissioners has classified the peregrine falcon as an endangered species within the State of Nevada, while the spotted bat, Enderma maculatum, is classified as a rare species. See Appendix F, p. 231, for a listing of protected wildlife species within Nevada.

HUMAN ASPECTS OF THE ENVIRONMENT

LAND USES AND OWNERSHIP

LAND CHARACTERISTICS

The lands within the study are characterized by checkerboard ownership (See the Land Status Map, p. 61) and are currently being used for a variety of purposes including extensive livestock grazing and crop production, fish and wildlife habitat, outdoor recreation, mining, transportation, and utility systems. The controlling factors on use of the lands are topography, climate, vegetation, and soil properties. Livestock grazing and outdoor recreation are at their peak during the spring, summer, and fall. Except for wildlife habitat and mining activity purposes, most of the area receives little use during the winter months.

AGRICULTURE

Agricultural activities are important within some portions of the study area. Meadow hay, alfalfa seed, alfalfa hay, and some feed grains are grown in northern Nevada. In south-central Idaho, potato crop production and processing is of great importance to the local economies of the area, especially Jerome County. (See Table H-1, p. 252 .) Other crops produced in this region include corn, beans, sugar beets, peas, grains, and hay. About 85 percent of all garden bean seed production originates from this portion of Idaho. In the Winnemucca area, potato crop production and processing is becoming increasingly important as additional land is being put into production. At the present time over 10,000 acres are producing potatoes which are being processed locally in Winnemucca. Additionally, water has been appropriated by the Nevada Department of Water Resources which will more than double current potato production. Specifically these new areas are:

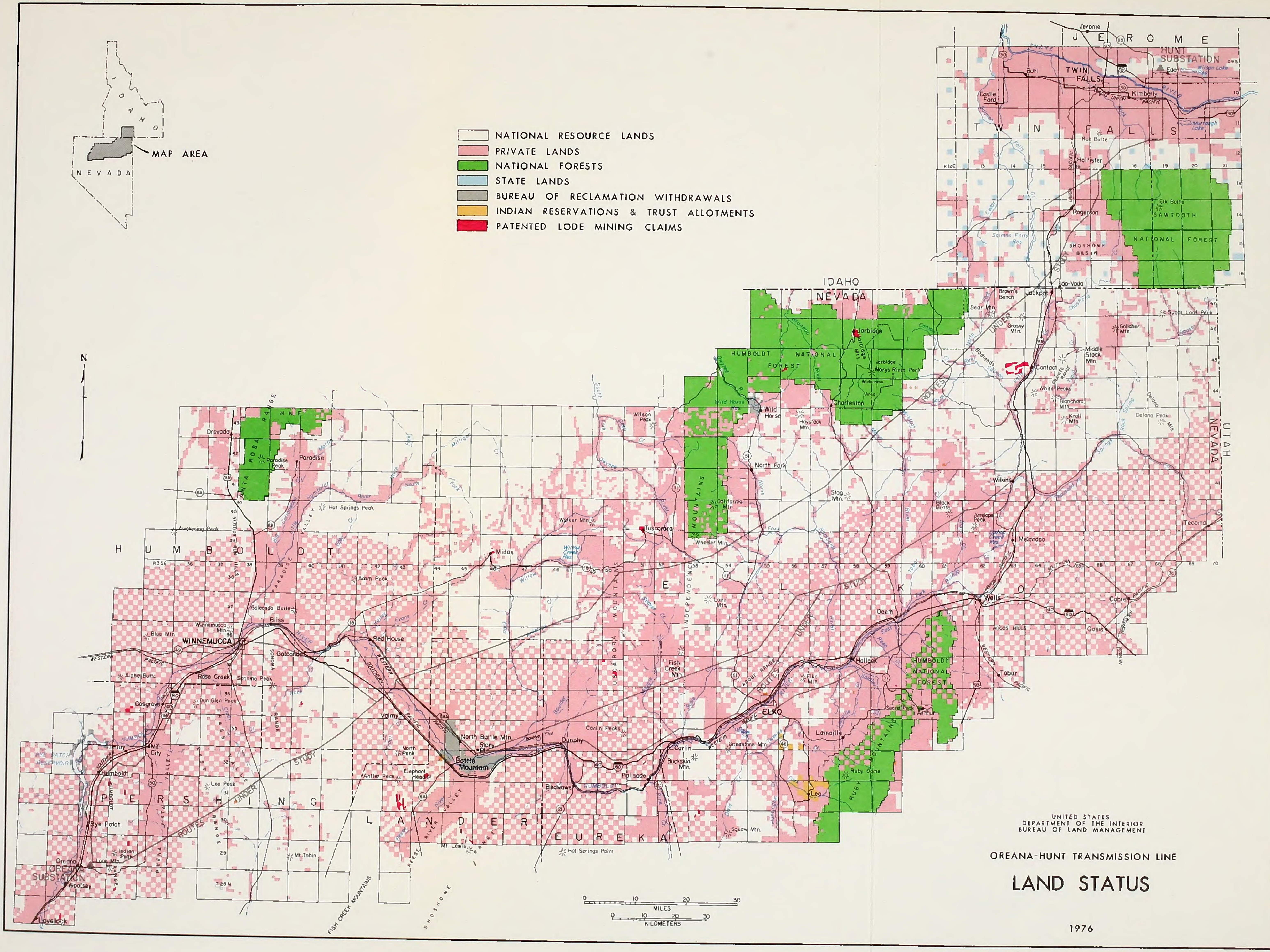

NATIONAL RESOURCE LANDS
PRIVATE LANDS
NATIONAL FORESTS
STATE LANDS
BUREAU OF RECLAMATION WITHDRAWALS
INDIAN RESERVATIONS & TRUST ALLOTMENTS
PATENTED LODE MINING CLAIMS
IDAHO
NEVADA
MAP AREA
N
JEROME
HUNT SUBSTATION
TWIN FALLS
SAWTOOTH NATIONAL FOREST
HUMBOLDT NATIONAL FOREST
IDAHO
NEVADA
UTAH
NEVADA
HUMBOLDT
ELKO
PERSHING
LANDER
EUREKA
WINNEMUCCA
ELKO
Battle Mountain
OREANA SUBSTATION
Lovelock
Wells
STUDY ROUTES UNDER
0 10 20 30
MILES
0 10 20 30
KILOMETERS
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREANA-HUNT TRANSMISSION LINE
LAND STATUS
1976

TABLE II-3 LOVELOCK DISTRICT IRRIGATED AGRICULTURE POTENTIAL 1/

Hydrographic Area 2/	County	Irrigable Acres 3/	Perennial yield in AF/Y (Water) 4/	Land for irrigation based on perennial yield (Acres) 5/	Land irrigated in 1969 (Acres) 6/	Additional land for irrigation (Acres) 7/	Electrical power required (Kilowatts) 8/	Estimated private land in area (Percent) 9/
61	Eureka	44,000	30,000	15,000	5,745	9,255	9,070	86
54	Eureka/Lander	55,000	16,000	8,000	1,800	6,200	6,076	18
55	Lander	24,000	4,000	2,000	1,200	800	784	08
64	Humboldt/Lander	45,000	36,000	18,000	11,680	6,320	6,193	26
59	Lander	55,000	10,000	5,000	800	4,200	4,116	37
131	Pershing/Lander	40,000	8,000	4,000	640	3,360	3,293	03
65	Pershing/Humboldt	15,500	36,000	18,000	420	17,580	17,228	70
130	Pershing	9,000	3,000	1,500	100	1,400	1,372	06
132	Pershing	2,900	500	250	30	220	216	02
128	Pershing	38,000	15,000	7,500	0	7,500	7,350	01
129	Pershing	56,000	10,000	5,000	1,200	3,800	3,724	23
72	Pershing	65,000	3,000	1,500	400	1,100	1,078	32
73	Pershing	12,000	43,000	21,500	31,000	--	--	--
TOTAL		461,400	214,500	107,250	55,015	61,735	60,500	--

1/ Lovelock District is the northeast portion of Sierra Pacific's service area, comprising parts of Humboldt, Pershing, Lander and Eureka counties.

2/ Nevada has been divided into 14 hydrographic regions and basins by the Nevada Division of Water Resources and the U.S. Geological Survey to compile water resource and use information. These regions are also subdivided into 232 hydrographic areas (valleys) for more detailed study. The hydrographic areas delineated above are pertinent to our study area.

3/ Irrigable acres as defined in this study area are those soils that have slight to severe limitations that reduce the choice of crops, and are located in 100-200 day freeze-free zones.

4/ Perennial yield is the amount of groundwater which can be removed from a hydrographic area each year without depleting the groundwater reservoir. Above figures represent "Undesignated" valleys.

5/ Land available for irrigation is based on a estimated per acre crop water consumption by county and crop. For example; in our study area an estimated 2 acre feet is the crop consumptive water requirement. Therefore, column 4 ÷ 2 = land available for irrigation.

6/ See Appendix B "Irrigable land by hydrographic area for Nevada", forecast for the future - agriculture, Report No. 8, Division of Water Resources, Carson City, Nevada.

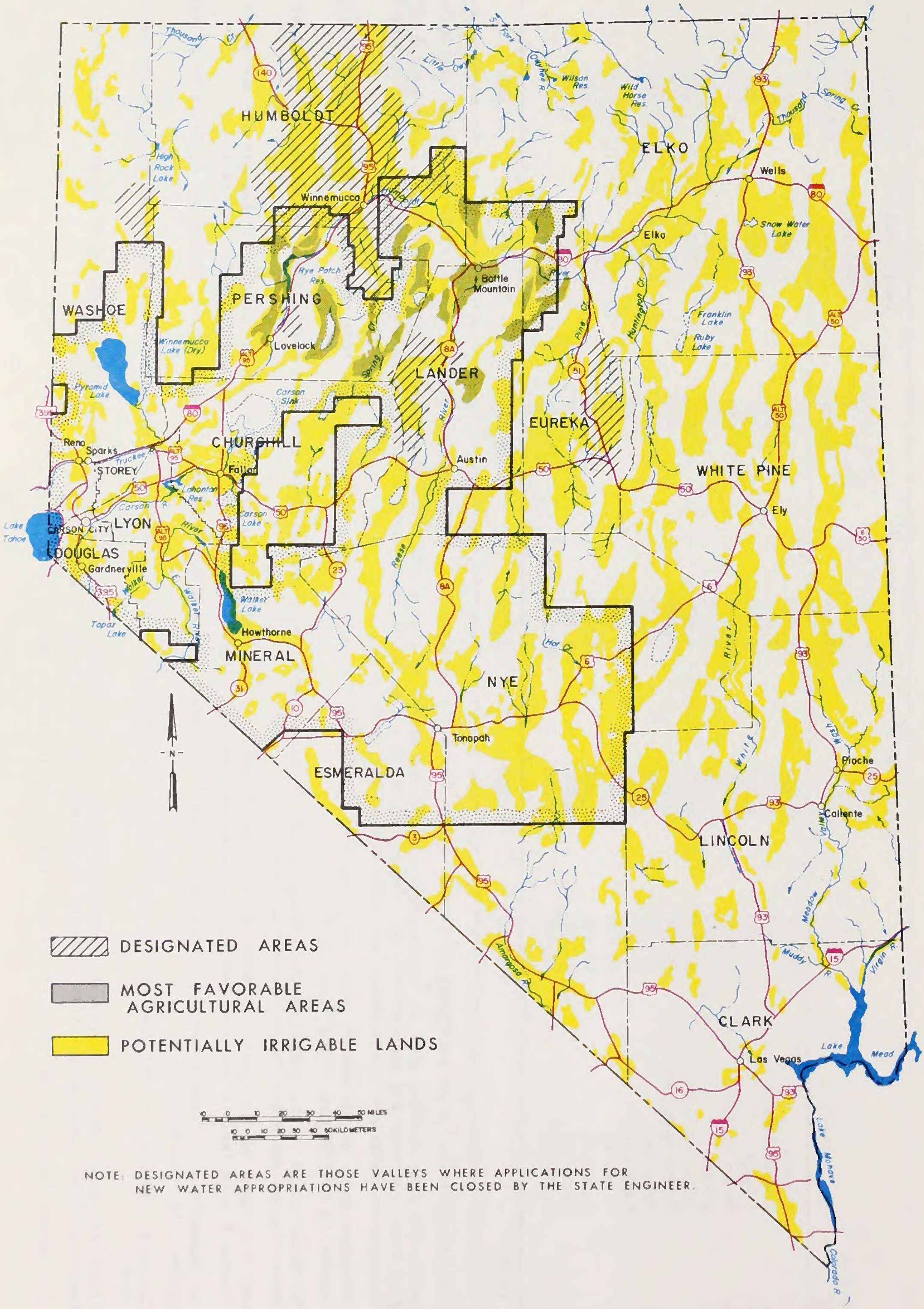
7/ Column 5 - Column 6 = that land that is additionally available for irrigation based on crop water requirements and undesignated valley perennial yield.

8/ Electrical power demands determined from existing power requirements found on a extensive farming operation in the Winnemucca area. This operation requires 17,000 horsepower, which converts to .98 kilowatts per acre. Thus column 7x.98 = column 8.

9/ This column indicates the ratio of private land to public land in column 3.

LOVELOCK DISTRICT

IRRIGATED AGRICULTURAL POTENTIAL



NOTE: DESIGNATED AREAS ARE THOSE VALLEYS WHERE APPLICATIONS FOR NEW WATER APPROPRIATIONS HAVE BEEN CLOSED BY THE STATE ENGINEER.

Area	Acres	County
Upper Silver State Valley	2,240	Humboldt
Eden Valley	1,544	Humboldt
Imlay Area	3,840	Pershing
North Battle Mountain Area	3,520	Lander
Total	11,144	

First-year potato field southwest of Winnemucca, Nevada, in Silver State Valley. (Note sprinkler irrigation system.)

Irrigated agriculture potential within the north-eastern portions of Sierra-Pacific's service area has been illustrated on the Agricultural Potential Map, p. 64. These delineations were constrained by (1) water availability (undesignated valley), (2) soil types, (3) temperature zones, and (4) perennial yield. Tabulated data as presented in Table II-3, p. 63, indicates that this potential is considerable. Based on the above constraints, an estimated additional 61,000 acres are available for irrigation if 100 percent of the perennial yield is utilized. When a 50 percent utilization of perennial yield is calculated, a conservative estimate of 30,000 acres of new agricultural land is potentially available.

LIVESTOCK GRAZING

Livestock grazing is important to the total economy within the study area. Forage conditions range from very poor to moderate. All national resource lands under BLM administration are covered by grazing allotments. More than 25 percent of the livestock industry of northern Nevada is dependent upon BLM-administered lands (total forage consummed). The livestock industry based within the study area in Idaho is less dependent upon BLM lands due to the higher percentage of privately owned lands used for grazing and agriculture.

MINERAL ACTIVITIES

Mining activity is fairly important to the local economies within the study area. Roughly 10 percent of the total personal income in the northern Nevada area is derived from mining operations. The only mining activity in the southern Idaho portion of the study area is the extraction of sand and gravel. Although mining produces a small part of the communities' total personal income, it should be noted that mineral products are basic resources required in almost all other sectors of economic activity.

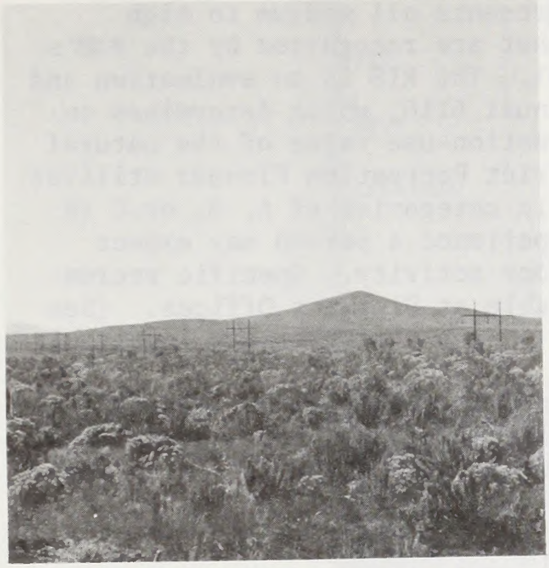
TRANSPORTATION

Major transportation routes in the Nevada portion of the study area include Interstate 80, U.S. Highways 93 and 95, and State Highways 50, 51 and 11. Routes in Idaho include Interstate 80 North, U.S. Highways 93 and 30, and State Highways 50, 74, and 25. Interior roads of varying quality provide access within the study area. (The Study Area Map, p. 7 shows the transportation net.)

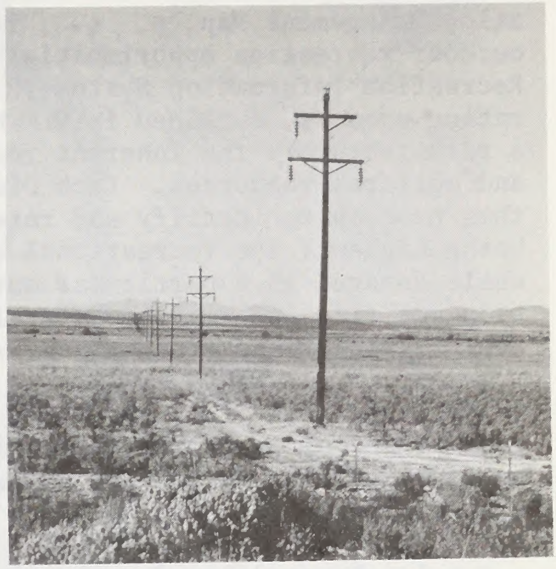
The Southern Pacific, Western Pacific, and Union Pacific railroads are located within the study area. The Southern Pacific and Western Pacific railroads roughly parallel each other and follow the Humboldt River and Interstate 80 between Winnemucca and Wells. An abandoned Union Pacific Railroad track follows U.S. Highway 93 from Wells north into the Twin Falls area. A Union Pacific line crosses the Snake River Valley, north of the Snake River, with a spur line south of the Snake River through Twin Falls.

UTILITIES

Sierra Pacific Power Company's Tracy generating plant, located in the Truckee Canyon, provides electrical service via numerous distribution lines extending west and east from the plant to Reno, Carson City, Lake Tahoe, Lovelock, Fernley, Winnemucca, and Battle Mountain. The Reno-Carson City-Lake Tahoe area and the Lovelock



Existing 138 kv transmission line on the Highway Corridor as it traverses native range 25 miles north of Wells, Nevada.



Existing 138 kv transmission line on the Highway Corridot traversing a crested wheat seeding 15 miles east of Elko, Nevada.

District are the major load centers within Sierra-Pacific's service area, the former representing 78 percent of the total load requirement.

The main supplier of power to the northeastern Nevada area is Idaho Power Company which provides power to the Nevada Power Company servicing Elko. Under a recent agreement, Wells Rural Electric (a Rural Electrification Association cooperative servicing the city of Wells, Nevada, and rural customers) is receiving all of its power from the Bonneville Power Administration. This power comes to Wells Rural Electric via Idaho Power Company.

Southwest Gas Corporation owns a natural gas pipeline that crosses northern Nevada in a northeasterly to southwesterly direction, passing close to Oreana.

RECREATION

In this portion of northern Nevada and southern Idaho a wide range of recreation opportunities exist. This is, for the most part, directly related to the variety in topography, moisture, vegetation, and wildlife in the study area. Most of the recreation activities are associated with water and/or mountainous terrain.

A regional breakdown of the recreation values shown on the Recreation Management Map, p. 69 , represents all medium to high outdoor recreation opportunities that are recognized by the BLM's Recreation Information System (RIS). The RIS is an evaluation and rating process, outlined in BLM Manual 6110, which determines on a relative scale the inherent recreation-use value of the natural and cultural resources. Each District Recreation Planner utilizes this process to identify and rate in categories of A, B, or C (A being highest) the recreational experience a person may expect while engaged in a particular outdoor activity. Specific recreation activity information is available at District Offices. (See the District Boundaries Map, p. 71 , for the Districts involved).

In this analysis, the recreation map was developed to identify concentrations of recreation activity. This has been accomplished by consolidating recreation opportunities into the following general headings:

1) Water Related activities
2) Non-water Related activities
3) Winter Sports
4) Sightseeing
5) Primitive values

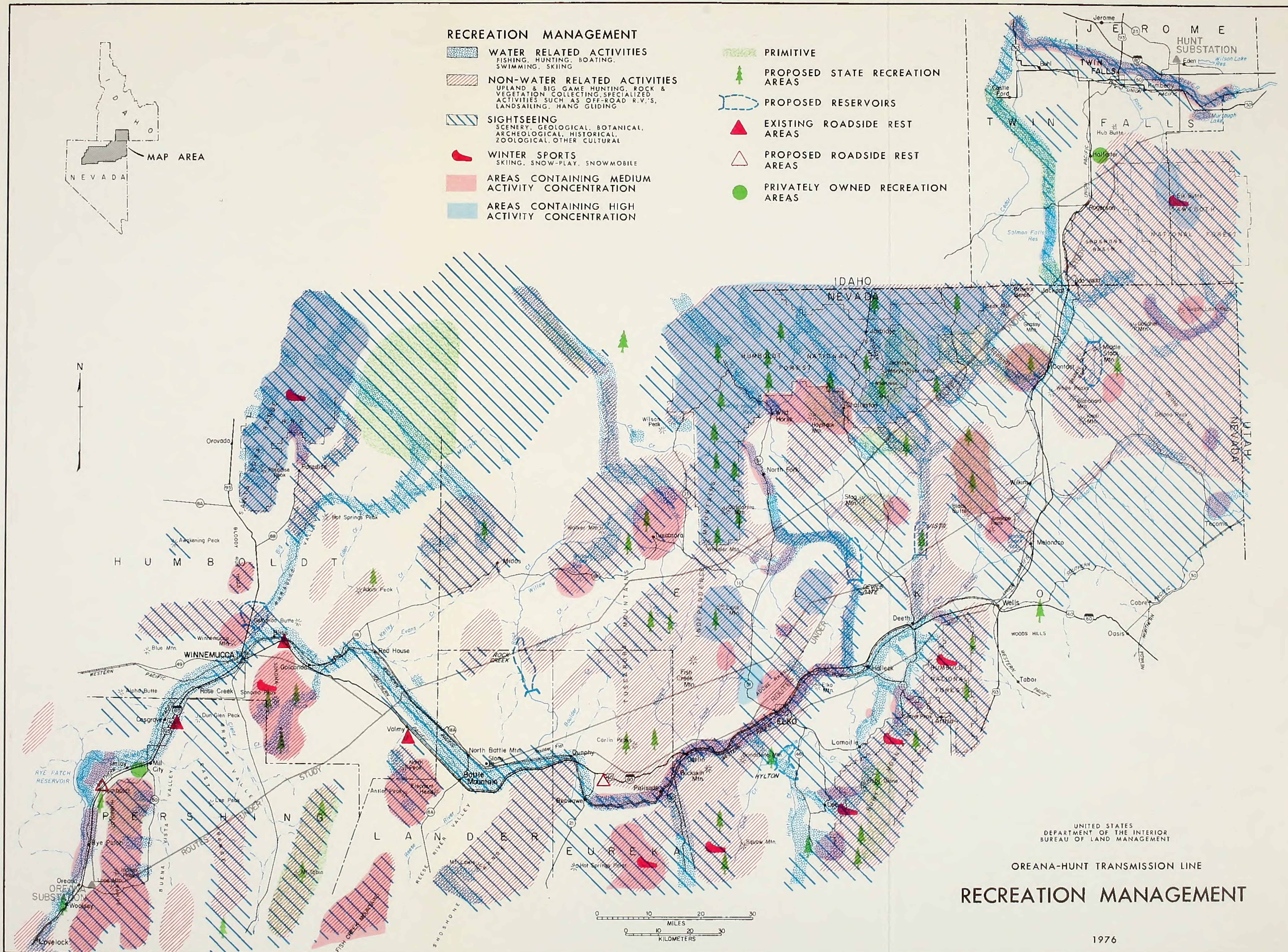
A discussion of the five headings and their related activities within the subject area follows. Refer to the Recreation Management Map, p. 69 for the specific locations discussed under each heading.

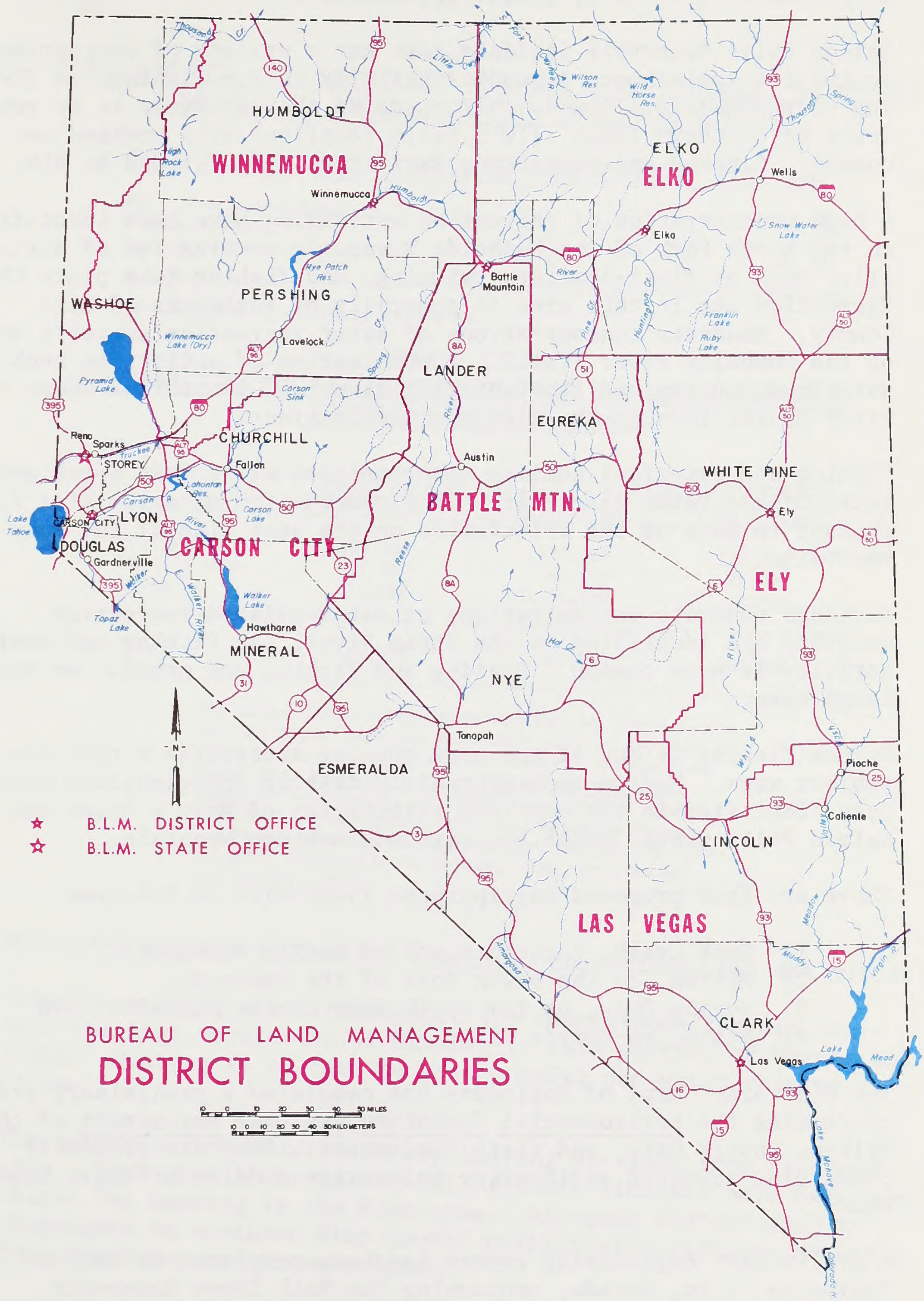
WATER RELATED ACTIVITIES (fishing, waterfowl hunting, swimming, boating, and skiing)

Rye Patch and Wildhorse Reservoirs show a high concentration of water related activities. All the above activities are common in both reservoirs, with use occurring by both Nevada residents and out-of-state residents.

The Nevada State Parks Service reports 90,302 visitor days at Rye Patch for the year 1975 (one visitor day = one visitor for a 12-hour day). State Parks visitor observations indicate a majority of day use on weekend days by Nevada residents. Weekday use is mostly from out-of-staters who are traveling along Interstate 80 and who wish to camp overnight.

Vacation-time use (a destination-oriented recreation activity) is more common at Wildhorse Reservoir. The best record of use at Wildhorse is by the Nevada Department of Fish and Game. They report 102,000 angler days (one angler day = one person fishing any part of the day). The California State Parks report deficiencies in outdoor recreation areas in their state (California State Comprehensive Outdoor Recreation Plan). This supports the observation that the majority of out-of-state use at Wildhorse Reservoir comes from California.


RECREATION MANAGEMENT
WATER RELATED ACTIVITIES
FISHING, HUNTING, BOATING, SWIMMING, SKIING
NON-WATER RELATED ACTIVITIES
UPLAND & BIG GAME HUNTING, ROCK & VEGETATION COLLECTING, SPECIALIZED ACTIVITIES SUCH AS OFF-ROAD R.V.'S, LANDSAILING, HANG GLIDING
SIGHTSEEING
SCENERY, GEOLOGICAL, BOTANICAL, ARCHEOLOGICAL, HISTORICAL, ZOOLOGICAL, OTHER CULTURAL
WINTER SPORTS
SKIING, SNOW-PLAY, SNOWMOBILE
AREAS CONTAINING MEDIUM ACTIVITY CONCENTRATION
AREAS CONTAINING HIGH ACTIVITY CONCENTRATION
PRIMITIVE
PROPOSED STATE RECREATION AREAS
PROPOSED RESERVOIRS
EXISTING ROADSIDE REST AREAS
PROPOSED ROADSIDE REST AREAS
PRIVATELY OWNED RECREATION AREAS
IDAHO
NEVADA
MAP AREA
HUMBOLDT
PERSHING
LANDER
EUREKA
ELKO
JEROME
TWIN FALLS
HUNT SUBSTATION
OREANA SUBSTATION
WINNEMUCCA
ELKO
MILES
KILOMETERS
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREANA-HUNT TRANSMISSION LINE
RECREATION MANAGEMENT
1976


WINNEMUCCA
ELKO
BATTLE MTN.
CARSON CITY
ELY
LAS VEGAS
HUMBOLDT
PERSHING
WASHOE
CHURCHILL
STOREY
LYON
CARSON CITY
DOUGLAS
MINERAL
ESMERALDA
LANDER
EUREKA
NYE
WHITE PINE
LINCOLN
CLARK
Winnemucca
Battle Mountain
Elko
Wells
Lovelock
Reno
Sparks
Fallon
Austin
Ely
Gardnerville
Hawthorne
Tonopah
Pioche
Caliente
Las Vegas
Pyramid Lake
Lake Tahoe
Walker Lake
Lake Mead
Lake Mohave
★ B.L.M. DISTRICT OFFICE
☆ B.L.M. STATE OFFICE
N
BUREAU OF LAND MANAGEMENT
DISTRICT BOUNDARIES
50 MILES
50 KILOMETERS

Camping and picnic facilities are provided by the Nevada State Park Service at Rye Patch. A combined effort of private and BLM campgrounds is found at Wildhorse Reservoir.

Salmon Falls Reservoir in Idaho also has a variety of recreation activities available. A popular activity is ice fishing, as fishing year-round is allowed. Major use of the reservoir is by residents of southern Idaho, (Twin Falls locality) with weekend use common. Camping and picnicking facilities are provided by BLM.

A high concentration of recreation activities have been identified on the North Fork of the Humboldt River. A combination of activities such as float-boating, swimming, and fishing take place there. Recreation use in this area is generally by residents of Elko County. Moderate concentrations of water recreation activity occur on the Humboldt River itself. A combination of activities such as waterfowl hunting and float-boating have been identified where the river passes through the Elko and Carlin areas.

Fishing and waterfowl hunting opportunities exist just north and south of Rye Patch Reservoir. This combination of activities is present in many of the tributaries on the west side of the Ruby Mountains.

Although moderate concentrations of water-related recreation activity are identified on the Snake River, the fishing and hunting activity is more common. Boating and fishing are popular on Murtaugh Lake.

Stream fishing is one of the more popular activities within the subject area. Medium to high quality fishing opportunities have been identified in the upstream tributaries of Mary's River and Salmon Falls Creek, south and east of Jarbidge Mountain.

There are four proposed multipurpose reservoirs in the area:

1) Rock Creek, located north of Battle Mountain;
2) Hylton, on the south fork of the Humboldt;
3) Devils Gate, on the north fork of the Humboldt; and
4) Vista, on Mary's River

The U.S. Army Corps of Engineers has completed a preliminary draft concerning the Environmental Inventory and Base Assessment of the Hylton, Devils Gate, and Vista Reservoirs. They are presently conducting advanced engineering and design studies of those reservoirs.

A preliminary engineering report has been completed by Chilton Engineers, Elko, Nevada, concerning the Rock Creek Reservoir. This project is sponsored by the Battle Mountain Fair and Recreation Board. Matching funds from the State of Nevada are being requested by the Board for the preparation of an environmental and social-economic study. A target date for construction of Rock Creek Reservoir is the fall of 1977.

TABLE II-4a

TOTAL VISITOR-DAY PROJECTIONS FOR THE UPPER HUMBOLDT RESERVOIR PROJECT BY AREAS OF ORIGIN (BASE PROTECTION)

Origin	Percent of Total in 1985	1985
Elko County Residents	25.5	42,099
Nevada Residents 1/	48.3	79,731
Out-of-State Residents	26.2	43,249

1/ Excluding Elko County residents.

TABLE II-4b

TOTAL VISITOR-DAY PROJECTIONS FOR THE UPPER HUMBOLDT RESERVOIR PROJECT, 1985

Reservoir	Annual Rate of Increase in Per Capita Visitation: Zero Percent	One Percent	Five Percent
Hylton	109,880	127,600	228,400
Devil's Gate	41,300	47,900	85,900
Vista	13,899	16,100	28,900
Total	165,079	191,600	343,200

The above tables illustrate visitor-day projections for the Upper Humboldt Reservoir project (Hylton, Devil's Gate, and Vista Reservoirs). Information taken from Recreation Use of the Proposed Upper Humboldt Reservoirs, an unpublished report from the Division of Agricultural and Resource Economics Cooperative Extension Service, College of Agriculture, University of Nevada, Reno, written by Don Beeler, 1972.

NON-WATER RELATED ACTIVITIES (hunting, collecting, ORV Activities)

Numerous hunting camps throughout the mountainous terrain indicate the high popularity of hunting in this portion of Nevada and Idaho. Hunting is by far the most popular non-water related activity.

The entire region receives heavy hunting pressure from the Reno area. Each year thousands of out-of-state licenses have been purchased for hunting in the Elko area. Big game hunters seem to congregate in northern Elko County particularly Jarbidge Mountain, Stag Mountain, and Brown's Bench.

Upland game hunting is also popular. Upland game hunting seasons are longer than big game seasons, and allow the hunter more freedom to select outgoing dates. Therefore, heavy upland game hunter concentration in a particular area is not as common as it is with big game hunting.

Collecting areas are more specifically identified than hunting or specialized activities. Therefore, the concentrations of non-water related recreation, as identified on the recreation map, are definite indicators of high-quality collecting sites, rather than hunting or specialized activity sites.

Rock and mineral shops are found in most of the communities in the study area. Heavy weekend and summer vacation collecting pressure has been recorded from rock and mineral clubs out of Reno, Susanville, and Twin Falls. Two areas, one surrounding the town of Tuscarora and one around Willow Creek Reservoir, show concentrations of both collecting and hunting. Areas identified with high concentrations of collecting activities are Lone Mountain west of Highway 51, and Double Mountain west of the North Fork of the Humboldt River. A large collecting area is also identified due north of Elko.

Off-road vehicles (ORV's) are popular throughout the entire area, with four-wheel drive clubs found in most communities. ORV events are planned in areas that are a short driving distance from population centers. There are areas where it has been recommended ORV use should be closed or restricted. For the most part these areas are identified under primitive values, p. 77.

WINTER SPORTS (skiing, snowmobiling)

Few winter sports locations in the study area have been identified. This is not necessarily due to the lack of winter snow, but rather to the lack of participants. The people outside the small local communities of Nevada who frequent the subject area for summertime activities are not drawn to the subject area for winter sports activities.

The only established ski area within the study area is in the Sawtooth National Forest. It is supported by the Twin Falls and Burley, Idaho, localities. The smaller local communities of Nevada are too small to make commercial winter sports areas profitable even though the interest is there. Residents of the smaller Nevada communities do have locally popular winter sports areas. A significant number own snowmobiles, and weekend snowmobile outings are common. (See Table II-5, below). Elko residents prefer the Adobe Summit locality on Highway 51. Hinkey Summit, north of Paradise Valley, and Water Canyon, south of Winnemucca, are popular areas for the residents of Winnemucca. The activities in these areas include skiing, sledding, and snowmobiling.

TABLE II-5

RECREATION EQUIPMENT AND VEHICLES OWNED BY HOUSEHOLDS IN N.E. NEVADA

Equipment	Percent Owning
Tent Trailer	7
Travel Trailer	11
Camper	22
Camping Equipment	59
Hunting Equipment	68
Fishing Equipment	78
Motorboat	16
Boat Trailer	11
Non-Motorboat	6
Snowmobile	8
Snowshoes	6
Golfing Equipment	13
Outdoor Games Equipment	45
Horse	27
Other	19
Vehicles	
2-Wheel Drive Pickup	39
4-Wheel Drive Pickup	35
Motorcycle	19
Station Wagon	15
Dune Buggy	2
Van or Bus	4
Bicycle	49

The information in Table II-5 was provided by the Nevada State Parks from the 1976 State Comprehensive Outdoor Recreation Plan (SCORP 76). The final plan is not completed; however, some preliminary results of a random sample phone questionnaire have been compiled. These results are judged to be reasonably accurate with only minor, if any, changes in the final report. Nevada State Parks report their findings by region. Region #5 (communities of Carlin, Elko, and Wells) and #6 (communities of Lovelock, Winnemucca, and Battle Mountain) have been combined to illustrate recreation equipment and vehicles owned by percent of total household units questioned.

SIGHTSEEING (scenic, geological, botanical, zoological, archeological and historical)

Sightseeing is recognized as one of our nation's most popular activities. All lands have scenic values, some of higher quality than others. All BLM lands and adjacent private land have been rated for their inherent scenic quality, in accordance with the above premise.

Uniqueness, variety, and harmony are the key factors analyzed in rating scenic quality. The major factor that usually detracts from the natural setting is intrusions. Intrusions are usually associated with human activities such roads, rock quarries, mining scars, powerlines, and fences. Scenery rated moderate to high-class in this part of Nevada and Idaho is typically associated with mountainous terrain characterized by lakes and/or streams. All the moderate to high sightseeing areas are shown on the Recreation Management Map, p. 69 .

Geological and botanical sightseeing areas are associated with the unique or rare land and rock formations and plant types of the region, these areas also having educational and scientific interest. Zoological sightseeing areas are typified by rare sightings of wildlife, sightings of a variety of species, or areas where animal herds or bands roam. Historical and archeological sightseeing by their nature involve more specific site identification of antiquities that have potential for interpretation to the general public. Locations within the study unit that have concentrations of sightseeing opportunities are listed below:

Humboldt Range: Located east of Oreana, this range is rated as having moderate to high scenic quality even though roads and mining scars detract from it. The mining in this locality is historic, and mining camps, roads, and rails possess significant historical sightseeing value. The Sacramento Canyon area contains handbuilt stonewalls of archeological significance, both for general sightseeing and for scientific/historical study.

Humboldt River: Located generally along the major travel route of I-80, the river provides a wide range of sightseeing opportunities. The overall scenic quality is high, as the winding nature of the old river provides a moist green belt to the otherwise dry desert valley. In some areas, scenic quality has been interrupted by the introduction of highways, railroads, and overhead transmission lines - this is particularly the case with the stretch of river from Beowawe upstream to its confluence with the North Fork tributary. The geological sightseeing value of this stretch of river remains high.

Owyhee Desert: Identified for zoological values, particularly wild horse observations.

Haystack Mountain: A variety of sightseeing opportunities are identified in this area including scenery, geological, and botanical study.

Salmon Falls Creek (below the reservoir): This unique rock gorge has such high geological sightseeing values that plans are being made for special designation of the area.

PRIMITIVE VALUES

Those areas identified as having primitive values are generally rated high in scenic quality; they have a variety of wildlife, and a sense of remoteness with a few noticeable man-made intrusions. One area identified on the recreation map has been officially designated as a wilderness area. This is the Jarbidge Wilderness area in the Humboldt National Forest. The remaining lands are special consideration areas which need to be protected for their primitive character. Those identified through the BLM planning process may be withdrawn and officially designated as nationally recognized primitive areas.

Following are locations within the study area that have been identified for their primitive values:

- Star Peak of the Humboldt Range east of Oreana
- Tobin Range approximately 30 miles due south of Winnemucca
- Rough Hills of Haystack Mountain due south of Jarbidge Mountain
- Stag Mountain west of the Marys River
- Head waters of the Marys River
- Snake Range east of the Marys River
- Canyon Creek at the head waters of Salmon Falls Creek
- Badlands of the Salmon west of Highway 93
- Salmon Falls River north of Salmon Falls Reservoir

The Recreation Management Map, p. 69, also identifies present and potential roadside rest stops, privately owned recreation areas, and areas identified by the States of Nevada and Idaho for potential acquisition as state recreation areas when acquisition monies become available.

ECONOMIC AND SOCIAL CHARACTERISTICS

The area considered in this section covers 14 Nevada counties and two Southern Idaho counties. See the Critical Growth and Demand Areas Map, p. 79, and Table II-6, p. 78, showing the organizational structure and type of analysis by county grouping.

TABLE II-6
ORGANIZATIONAL STRUCTURE AND TYPE OF ANALYSIS BY COUNTY GROUPING

Study Area Urban 1/	Study Area Rural 1/	Electrical Path Area 2/	Water Resource Subarea 1604 3/	Water Resource Subarea 1605 3/	PSA 46 B 4/
Washoe	Humboldt	Elko	Elko	Washoe	Washoe
Carson City	Pershing	Twin Falls	Humboldt	Storey	Carson City
Douglas	Churchill	Jerome	Pershing	Churchill	Douglas
Storey	Lyon		Lander	Mineral	Storey
	Mineral		Eureka	Lyon	Lyon
	Nye			Douglas	Churchill
	Lander			Carson City	Pershing
	Esmeralda				Humboldt
	Eureka				Lander
					Eureka
					Mineral
					Esmeralda
					Nye

1/ Study Area by county grouping delineates Sierra Pacific Power Co. service area, and conforms to the Federal Power Commission's power supply area (PSA 46 B). Population and employment, assessed valuations analyzed.

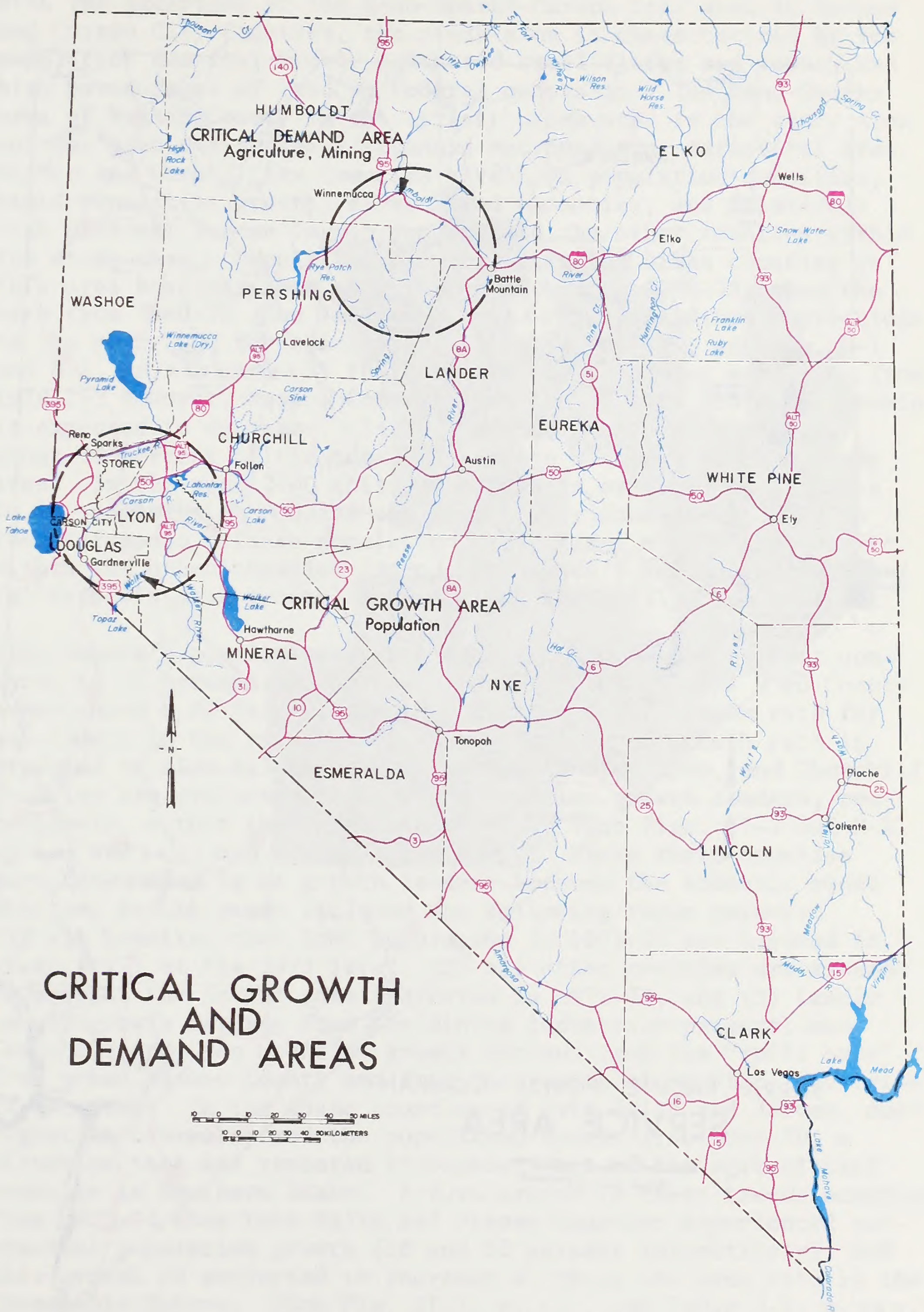
2/ Electrical Part Area are those counties providing the bridge for the power line right-of-way. Population, employment, income, assessed valuation analyzed. Twin Falls, Jerome are Idaho counties.

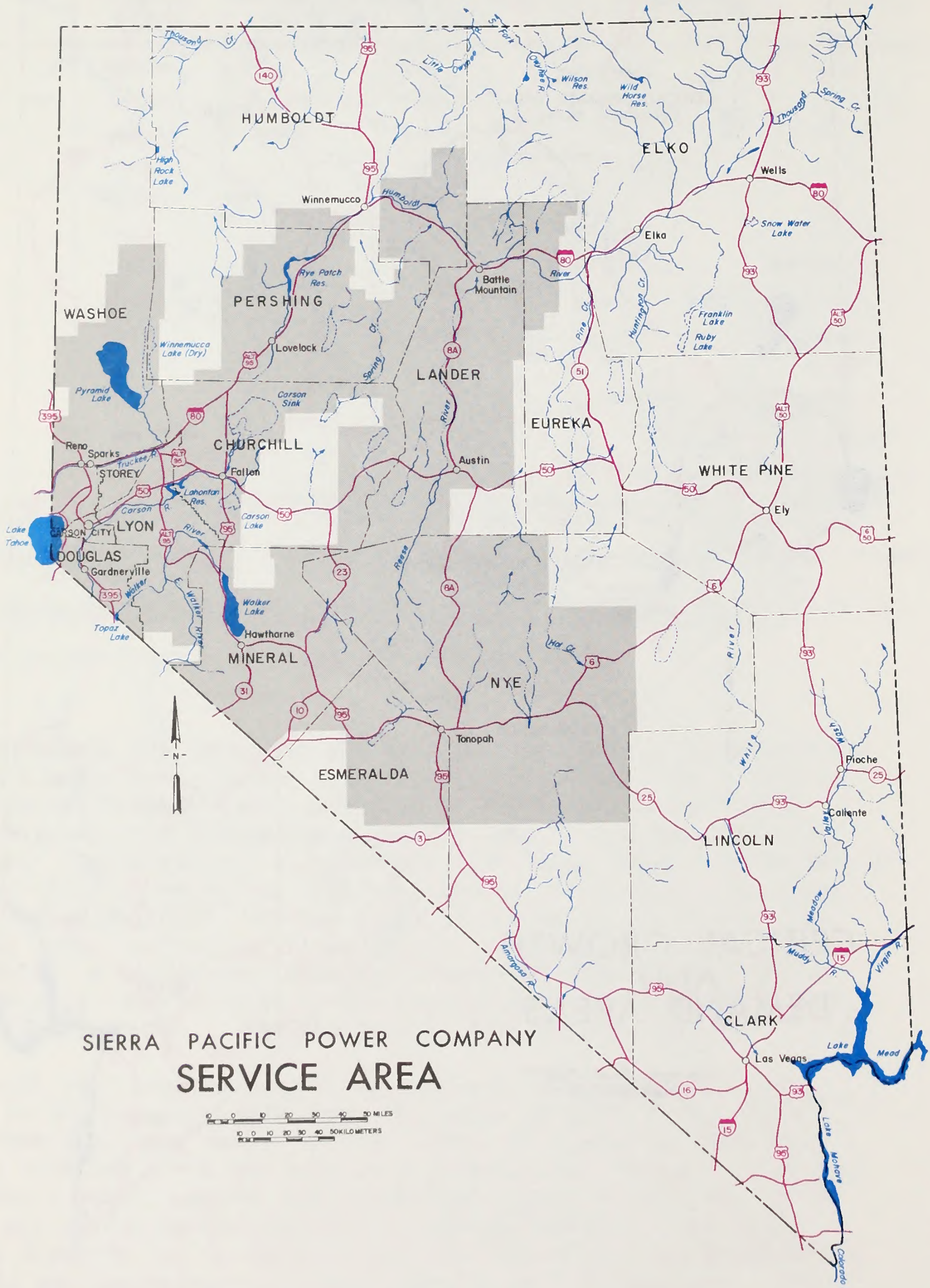
3/ Water Resource Subarea 1604, 1605 contains those counties delineated by the U.S. Water Resources Council and closely conforms to those counties in Sierra Pacific's service area. Income and income projections analyzed.

4/ PSA 46 B area identifies electric energy growth patterns in the impact area.

The rationale for analyzing the economic and social characteristics of this broad area, rather than limiting the study area to the actual route, is that upon completion of the proposed electrical transmission line (including a separate short line from Tracy to Oreana), Sierra Pacific's connection with Idaho Power's transmission system will be completed. This will bring 150 megawatts of power into Sierra Pacific's service area, particularly to the Reno-Sparks area, the primary "load center" within this service area. Therefore, a larger area than the actual route would be affected economically and socially by the transmission line and is included in this discussion. (See the Service Area Map, p. 80.)

Although the counties comprising Sierra Pacific's service area will be the primary study area, the areas of Elko County, Nevada, and Twin Falls and Jerome County, Idaho, will also be analyzed. These counties serve not only as a geographical "bridge" to Sierra Pacific's "load" center, but electrical demand in Elko County is fast out-stripping the capacity of Nevada Power Co., and Wells Rural Electric Co. (a rural electrical cooperative) to provide reliable and continuous electrical service to its customers. (Both of these companies are customers of the Idaho Power Co.)


CRITICAL GROWTH AND DEMAND AREAS
CRITICAL DEMAND AREA
Agriculture, Mining
CRITICAL GROWTH AREA
Population
HUMBOLDT
ELKO
WASHOE
PERSHING
LANDER
CHURCHILL
EUREKA
WHITE PINE
STOREY
LYON
CARSON CITY
DOUGLAS
MINERAL
NYE
ESMERALDA
LINCOLN
CLARK
Winnemucca
Battle Mountain
Elko
Wells
Lovelock
Reno
Sparks
Fallon
Austin
Ely
Gardnerville
Hawthorne
Tonopah
Pioche
Caliente
Los Vegas
Pyramid Lake
Winnemucca Lake (Dry)
Lake Tahoe
Walker Lake
Topaz Lake
Lahontan Res.
Rye Patch Res.
Carson Sink
Carson Lake
High Rock Lake
Wilson Res.
Wild Horse Res.
Snow Water Lake
Franklin Lake
Ruby Lake
Lake Mead
Lake Mohave
Colorado R.
Virgin R.
Muddy R.
Amargosa R.
Humboldt
Truckee R.
Carson R.
Walker River
Reese River
MILES
KILOMETERS

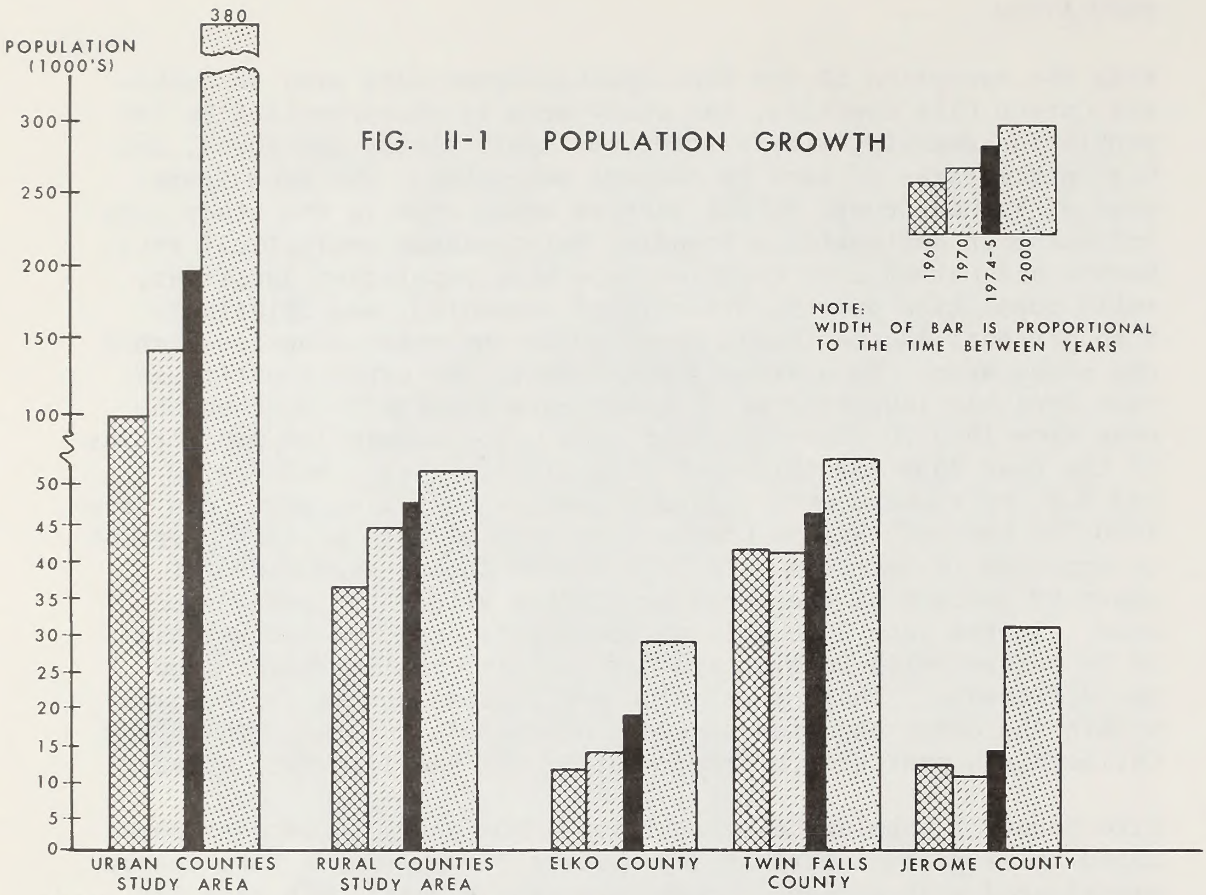


SIERRA PACIFIC POWER COMPANY
SERVICE AREA

POPULATION

With the exception of the Reno-Sparks-Carson City area in Washoe and Carson City Counties, the study area is characterized by low population density, widely scattered small cities and towns, and high percentages of land in Federal ownership. The Reno-Sparks area of Washoe County is the largest urban area in the study area and has been designated a standard metropolitan statistical area. Washoe and Carson City Counties have high population densities, rapid population growth, diversified economies, and relatively high personal income levels compared to the other counties within the study area. Population growth within the urban counties in this area has increased at a faster rate from 1970-75, than the rate from 1960-70 (See Table H-2, p.253). Population projections to the year 2000 for this area (Fig. II-1, p. 82, and Fig. H-1 and H-2, pp.256 and 257) indicate similar trends as were seen from 1970-75; however, Washoe County's portion of this projected growth is expected to decrease. In 1975 Washoe County accounted for about 80 percent of the total population within the urban study area. In the year 2000 this percentage is expected to decrease to 74 percent with Douglas and Carson City Counties picking up the difference. These population projections assume that growth within the urban counties depends on Nevada's internal growth and California's past growth, representing the spilling-over effect.

Elko County's population growth from 1960-70 was 16 percent compared to 71 percent for Nevada; however, from 1970-75 Elko County experienced a 35 percent growth rate, the highest such rate for any county in the rural study area. This rapid growth rate is expected to slow by the year 2000 when Lander, Lyon, and Churchill Counties are projected to be the population growth leaders, respectively, within the rural study area. (See Figs. II-1 and H-2, pp.82 and 257, and Table H-2, p.253.) These three counties were determined to be growth leaders because the economic model utilized in the study included the following three points: (1) all counties that lost population in 1971-73 are assumed to stand still at the 1973 level, (2) all other counties are assumed to grow at the actual rate indicated in 1971-73, and (3) Lander county growth derives from the mining industries present, and Churchill and Lyon Counties growth derives from the "spill over" from urban Washoe County and from the growth of service industries in the area. In the Idaho counties of Twin Falls and Jerome, out-migration characterized the population trends from 1960-70, a situation that was repeated throughout most of the agricultural counties in Southern Idaho. A turn-around in these trends occurred from 1970-74 when Twin Falls and Jerome Counties experienced substantial population growth (10 and 32 percent respectively), and this growth is projected to increase at about the same rate in the forseeable future. (See Fig. II-1, p. 82, and Table H-2, p.253.)



SOURCE: 1970 Census of Population, Number of Inhabitants, Nevada, April 1971, U. S. Department of Commerce, Bureau of Census, Population Division; Building Bridges To Work, Nevada Employment Security Department, March 1975, Manpower Information and Research Section.

Population Projections For The Year 2000 developed by S.F. Chu, Bureau of Business and Economic Research, University of Nevada, Reno, March 1975.

Population projections for the year 2000 for Twin Falls and Jerome County, Idaho based on the rate of growth in those counties 1970-4 and projected to 2000.

Important to any discussion on population growth is the direction of net migration patterns. Intercensal population estimates since 1970 signify a reversal in the migration patterns between the Pacific Coast states and the Northern Rocky Mountain States. (U.S.D.I.-BLM, Environmental Analysis Record for the Agricultural Development Program, January 1976.) Whether these changes are due to sudden shifts in economic opportunities or inspired by major modifications in values with regard to urban society and the natural environment is not clear. (Western Wire Rural Development Center, "Rural Population Growth more than Transient Fad," December 1975.) However, in Nevada a study of new residents has indicated "economic opportunities" and high "quality of life" were the primary attractive features for migrating to the state. ("Nevada Immigration Income and Quality of Life," Nevada Business Review, October 1974.)

A demographic analysis of the new developments yields two conclusions: First, the magnitude of the change is comprehensive. Where four out of the nine rural counties within the study area in Nevada, and the two Idaho counties experienced net out-migration in the decade 1960-70 (USDI-BLM, Economic Profile for the State of Nevada, June 1974), all of the counties (with the exception of Nye and Esmeralda Counties) have received substantial growth since 1970, especially Humboldt, Pershing, Elko, Twin Falls, and Jerome Counties. Secondly, the greatest current population pressure is occurring in suburban communities in the Reno area. This fact is supported by the growth in surface area in square miles of the city of Reno and immediate surrounding areas:

	Square Miles 1960	Square Miles 1970
Reno	11.7	30.3
Sparks	2.7	5.4
Sun Valley	--	1.9

(The effect of population trends on energy demand are discussed in CH. III, Population, p. 134.)

Employment (urban) - Employment within the urban grouping of counties is rather diversified. The Reno-Sparks area supports a population base which is primarily tourist-service oriented. Although tourism employment is the area's major sector, it is the secondary industries of construction, manufacturing, and transportation that are experiencing a growth rate (1970-74) higher than both the state and national averages. (See Fig. II-2, and II-3, pp. 84, indicating industrial sector growth rates, and Fig. H-3, H-4, pp. 258 and 259 illustrating a sector-by-sector analysis of employment by county.) In general this analysis shows the relationship between population growth and the growth of the construction, manufacturing, and transportation sectors in the urban counties within the study area. Accordingly, for the immediate future, it can be expected that employment in secondary industries will continue to increase, due primarily to projected population growth. (Bureau of Business and Economic Research, An Econometric Model for the State of Nevada, December 1974.)

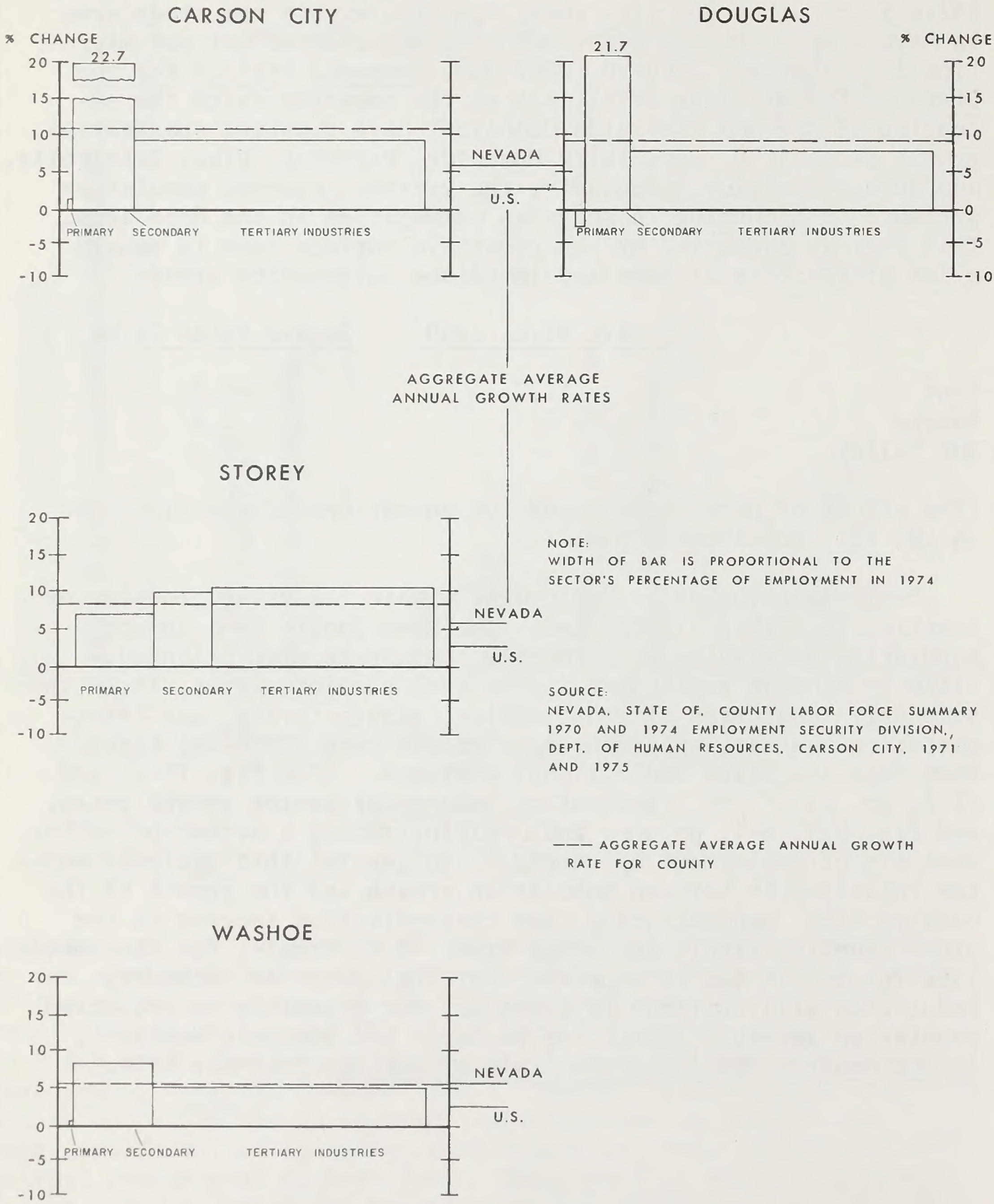


FIG. II-2 URBAN COUNTIES
CHANGE OF EMPLOYMENT BY INDUSTRIAL GROUPS

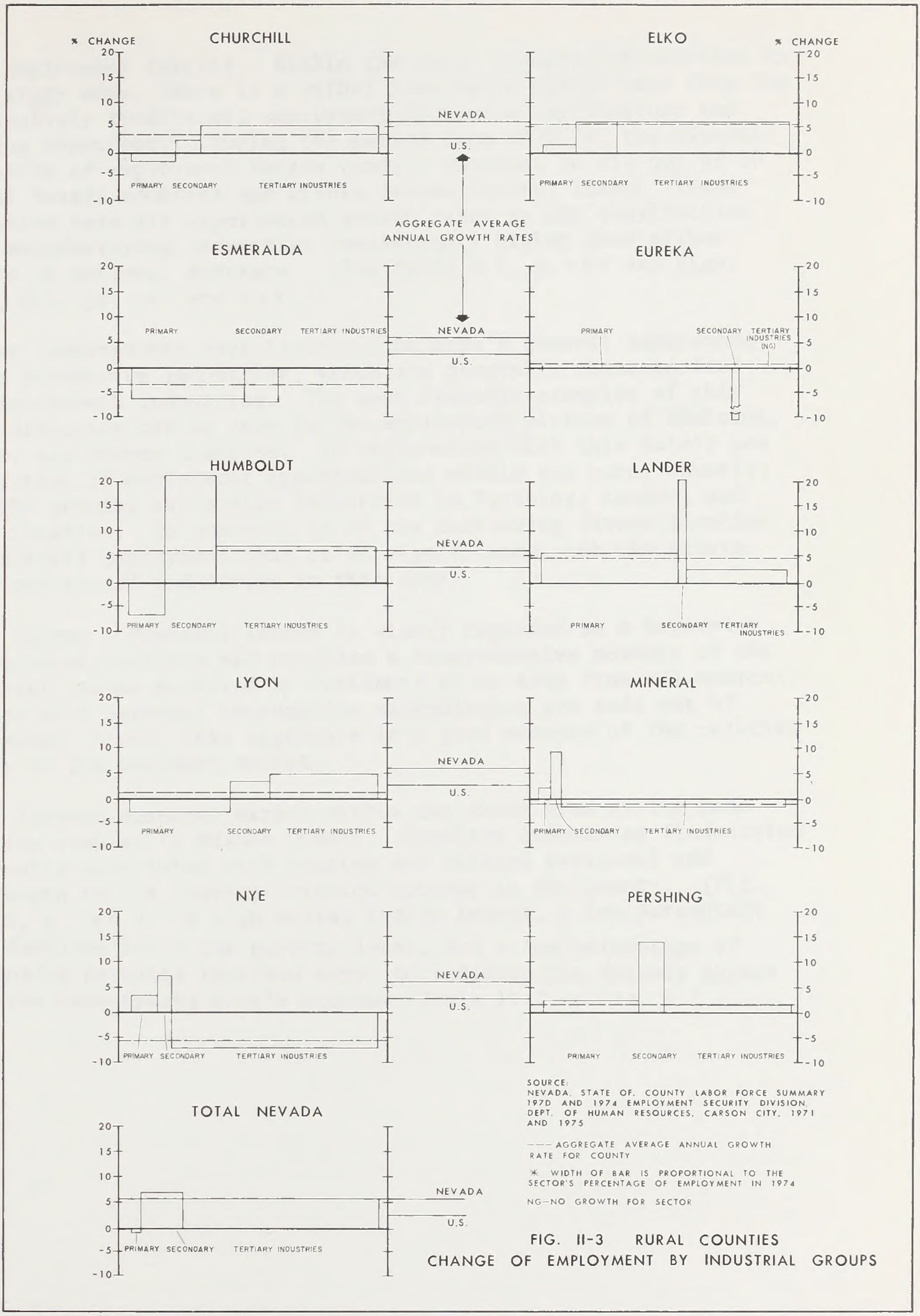


FIG. II-3 RURAL COUNTIES
CHANGE OF EMPLOYMENT BY INDUSTRIAL GROUPS

Employment (rural) - Within the rural grouping of counties in the study area, there is a rather remarkable change away from the exclusively traditional employment picture of agriculture and mining dependency. During the period from 1970-74, the diversification of employment became readily apparent in six out of 10 rural Nevada counties and within Jerome County, Idaho. These counties have all experienced growth rates in the construction and manufacturing industries considerably higher than either state or national averages. (See Table H-1, p. 252 and Figs. H-3, H-4, pp. 258 and 259.)

These developments have lessened the area's general dependence upon extractive industries, which are generally characterized as low-growth industries. The most dramatic examples of this new direction can be seen in the employment picture of Humboldt, Elko, and Jerome Counties. In conjunction with this fairly new direction of employment opportunities within the rural counties is the growing extractive industries in Pershing, Lander, and Nye Counties. In general, it is the continuing diversification of overall employment that is of significance, not the growth of traditional industries in this area.

Income - Personal income is widely regarded as a barometer of economic welfare and provides a comprehensive measure of the current income received by residents of an area from all sources. Since most personal consumption expenditures are made out of personal income, this aggregate is a good measure of the relative size of the consumer market.

The largest consumer market within the study area is the Reno-Sparks complex in Washoe County. Tertiary industries (industries normally associated with tourism and related services) add strength to the tourist-oriented economy in the county. (Fig. II-2, p. 84). A high median family income, a low percentage of families below the poverty level, and a low percentage of transfer payments received serve to indicate the dynamic aspect of the Reno-Sparks area's economy (Table II-7, p. 86 .)

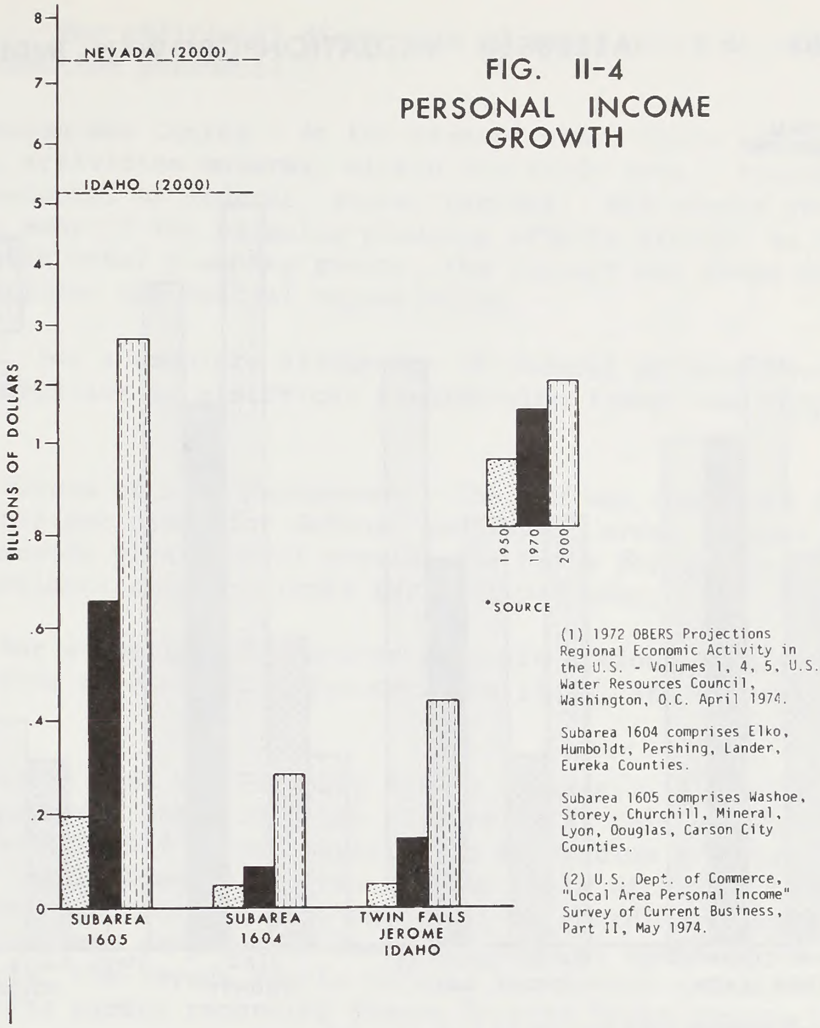
TABLE II-7

GROWTH OF PERSONAL INCOME AND AVERAGE ANNUAL PERCENT GROWTH BY NEVADA AND IDAHO COUNTIES 1969-72 (Millions of Dollars)

County	1969	1972	Average Annual % Growth	Per Capita Income 1972
Urban	Millions $	Millions $	%	$
Washoe	537	744	11.48	5,703
Carson City	60	91	14.89	4,564
Douglas	38	53	11.73	6,246
Storey	3	4	10.06	6,032
Rural				
Humboldt	24	30	7.72	4,718
Pershing	13	17	9.35	6,616
Churchill	31	43	11.52	3,710
Lyon	27	35	9.04	3,694
Mineral	26	31	6.04	4,650
Nye	17	15	-4.09	3,208
Lander	10	13	9.14	5,630
Eureka	6	7	5.27	8,696
Esmeralda	1	-	-	
Elko	60	82	10.97	5,616
Idaho				
Twin Falls	137	185	10.53	4,127
Jerome	32	43	10.35	3,673
U. S.	746.44	935.35	7.81	4,492

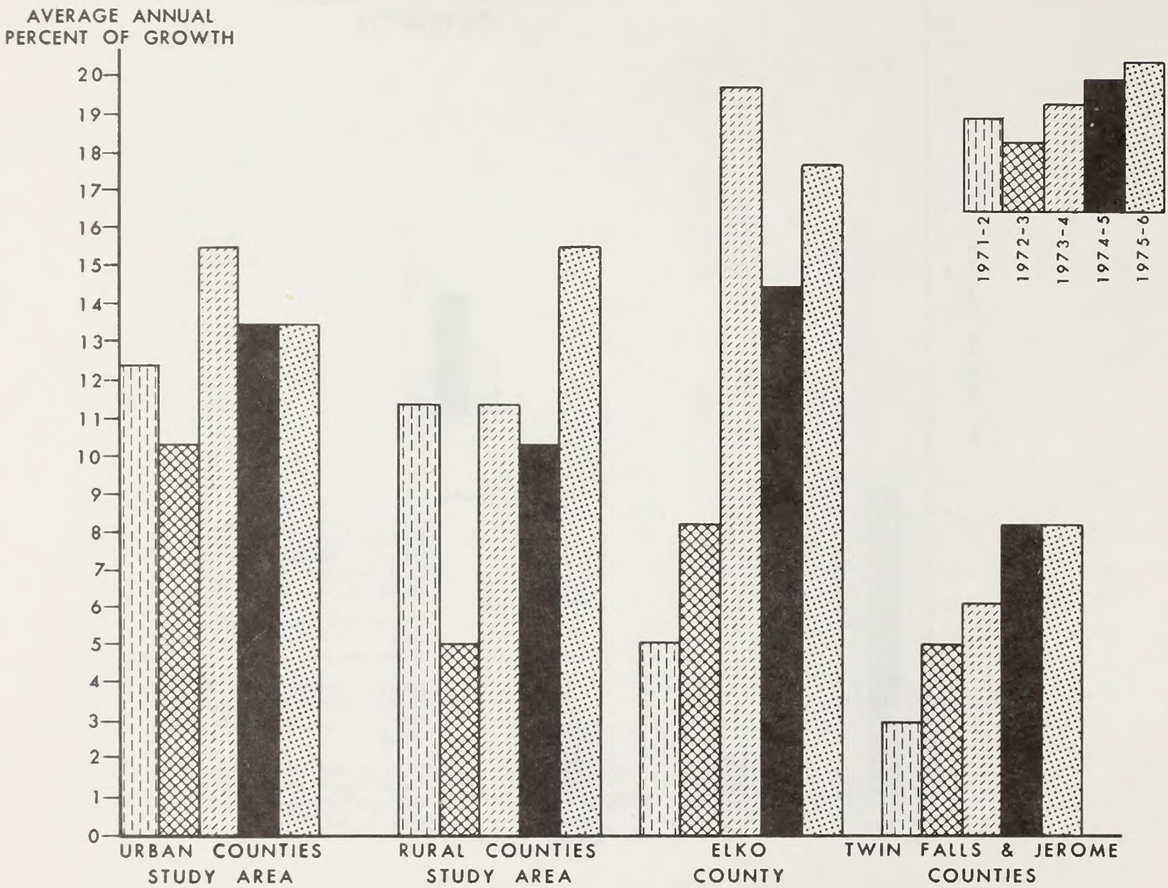
Source: U.S. Dept. of Commerce, "Local Area Personal Income", Survey of Current Business, Part II, May 1974.

The rural grouping of counties are also experiencing a healthy annual growth rate in personal income, especially in Churchill and Elko Counties in Nevada, and the two Idaho counties of Twin Falls and Jerome. In Jerome County, the appearance of light industry has given the area new potential for this kind of growth. (See Fig. II-4, p. 87 , reflecting "area" comparisons in growth of personal income projected to the year 2000.)



Public Tax Base - Another indicator of growth in an area is the average annual percentage growth of total assessed valuation. (Local Government Red Book-Fiscal Years 1971-76.) Although the urban counties within our study area contain larger amounts of taxable real property in comparison to the rural counties, it is the annual percentage growth in total assessed valuation that reflects the strength of revenues generated by that increase. Fig. II-5, p. 88 , shows that generated revenues in Elko County have been increasing at a faster rate than any area grouping currently under study. Although at the present time there are no projections as to future growth of total assessed valuation for the study area as a whole. Elko county plans a nine percent increase in its ad valorem (property tax) rate during the 1976-77 fiscal year. (See Table H-3, p. 254.)

FIG. II-5 ASSESSED VALUATION-GROWTH INDICATOR



SOURCE:

Local Government Red Book and Ad Valorem Tax Rates Budget Summaries for Nevada Local Governments, Fiscal Years 1971-6. Idaho data obtained through personal contact with Local Tax Commission Twin Falls and Jerome Counties.

1) A value of "0" indicates no growth.

Housing - Although the quality and quantity of housing is one indicator of social well-being, the availability of motel units is particularly important in this study due to the highly mobile nature of the construction crews involved in building an electrical transmission line. The following is a list of available motel units by town:

Winnemucca	Battle Mountain	Elko	Wells	Jackpot
700	119	1,200	221	200

Except for the town of Jackpot, Nevada, which is expanding its tourist-oriented economy and plans an additional 100-unit motel by 1977, no additional motel construction is expected in the forseeable future in the above mentioned areas. (Refer to CH. III,

p. 137 for additional discussion of motel units as related to construction personnel.)

Planning and Zoning - At the present time, there are varied planning activities underway within the study area. Planning is being conducted by federal, state, regional, and county groups. Although many of the on-going planning efforts attempt to coordinate with other planning groups, the variety and scope of the work precludes any central organization.

Federal: For a complete discussion of federal actions involving the construction of electrical transmission lines, see Chapter I, p. 1 .

Bureau of Land Management - The BLM has completed a number of multiple-use plans for defined geographic areas. These management framework plans (MFPs) provide the basis for actions to manage national resource lands for multiple uses.

State: For a complete discussion of state actions involving the construction of electrical transmission lines, see Chapter I, p. 4 .

State Land Use Planning Agency (Nevada) - Although Nevada has not passed a state land use plan to date, this agency was created by the 1973 Nevada Legislature to develop a workable land use plan and management program for the State of Nevada. One of the present functions of this agency is to coordinate state review of major actions proposed by state and federal agencies in Nevada. For example, the Nevada Public Service Commission coordinated with the planning agency regarding Sierra Pacific Power Company's application to construct a 230 kv transmission line from Tracy power station to the Nevada-Idaho state line near Jackpot, Nevada. On July 11, 1975, the Nevada Public Service Commission issued the construction permit.

Public Utilities Commission (Idaho) - This agency coordinates review of utility development plans among Idaho state agencies and approves those plans through issuance of a permit. No permit has been issued to date.

Counties and Local Government: Of the four counties within the urban study area, all have a planning and/or zoning commission, and there are overlapping regional governments such as the Carson River Basin Council of Governments; Tahoe Regional Planning Agency; Washoe Council of Governments; and Washoe County Regional Planning Commission of Reno, Sparks, and Washoe County.

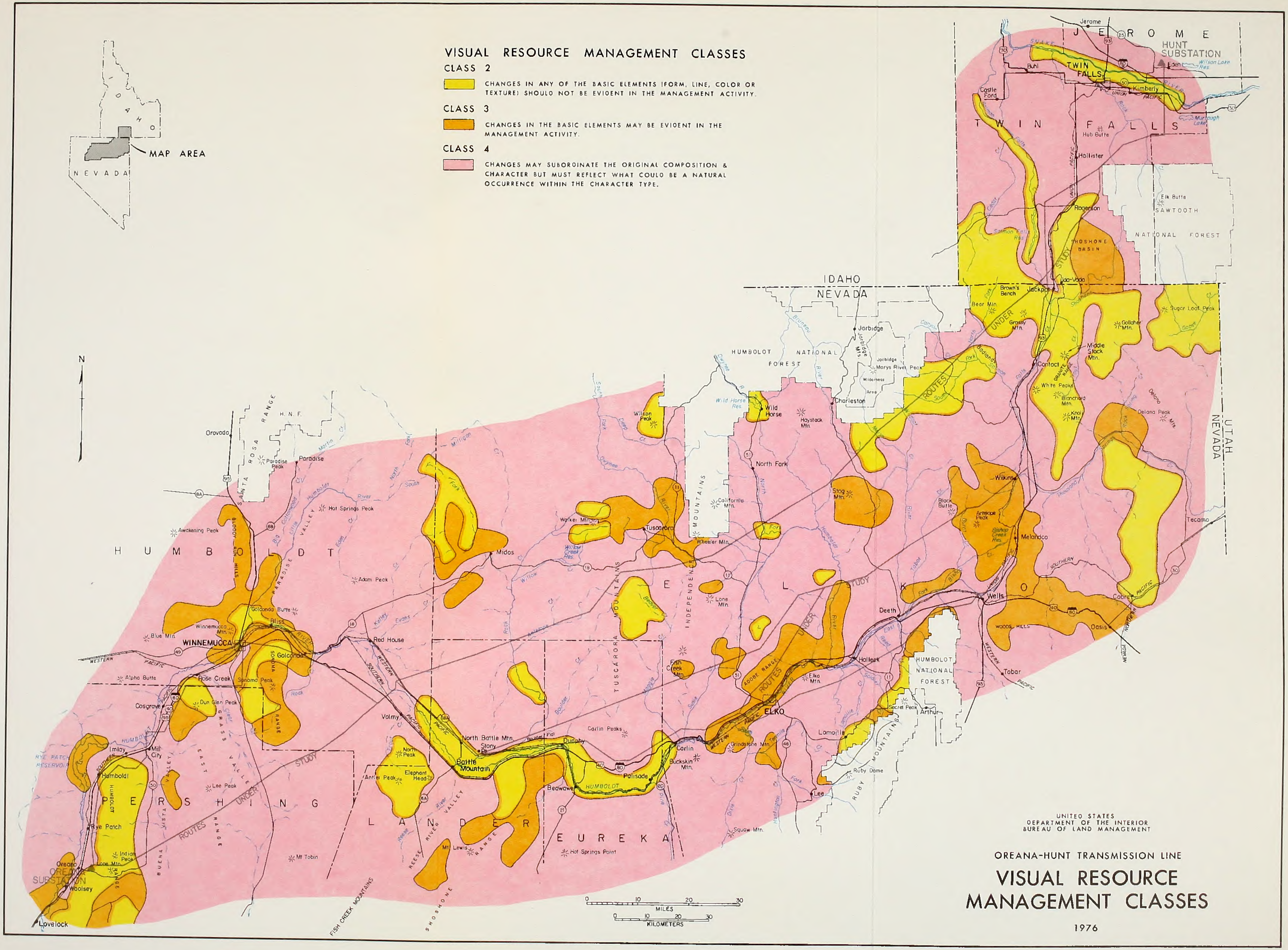
In the 10 counties within the rural study area in Nevada, there is one regional planning agency, the Central Nevada Resource Development Authority, established in 1969. Its planning area includes Esmeralda County and portions of Eureka, Lander, and Nye Counties. At the present time a preliminary comprehensive plan has been completed. The counties within this area have all completed subdivision ordinances: Lander has a zoning plan, while Eureka and Lander Counties have completed a master plan and general land use plan, respectively; Elko County has a zoning and subdivision ordinance and master plan; Humboldt County has completed a master plan, zoning and subdivision ordinances; while Pershing County has a subdivision ordinance only. Although local plans, ordinances, and zoning serve to indicate community concern with population density control and commercial development, there is little effect on population growth within the study area. At the present time transmission line proposals are reviewed by local governments only as to compliance with zoning regulations. Open space zoning in Elko County allows the construction of transmission lines without specifically addressing the specific routing (corridors). The Nevada State Planning Agency is currently studying the feasibility of corridor selection as a means of effectively routing interstate transmission line projects, however the study is only in the preliminary stages. (Directory of Local Planning Organizations - Nevada, May 1975.)

The state of Idaho has recognized five comprehensive planning agencies representing the state's six planning regions. The area involved in this study is Region IV, South Idaho Resource Planning and Development Association, which covers Twin Falls and Jerome Counties. Only one county, Twin Falls, has a completed zoning ordinance and a comprehensive land use plan.

In general, county planning boards review right-of-way proposals for compliance with county zoning classification. No formal applications to county planning boards have been required of the utility companies in either Idaho or Nevada. However, in Nevada, Sierra Pacific Power Co. has been in informal contact with county planning boards concerning their transmission line plans.

Attitudes and Expectations: - Local - In this unsettled period when people have become increasingly aware that resources are finite, there has been a more serious re-examination of values and public policies than has been witnessed for many years.

Attitudes toward the establishment of transmission lines are governed primarily by the impact of the line on current and future land uses. Since the traverse of the proposed electrical transmission line crosses lands predominantly devoted to livestock grazing (97 percent, Nevada, 82 percent, Idaho), attitudes of the rural citizenry toward the action have been negligible. This has


VISUAL RESOURCE MANAGEMENT CLASSES
CLASS 2
CHANGES IN ANY OF THE BASIC ELEMENTS (FORM, LINE, COLOR OR TEXTURE) SHOULD NOT BE EVIDENT IN THE MANAGEMENT ACTIVITY.
CLASS 3
CHANGES IN THE BASIC ELEMENTS MAY BE EVIDENT IN THE MANAGEMENT ACTIVITY.
CLASS 4
CHANGES MAY SUBORDINATE THE ORIGINAL COMPOSITION & CHARACTER BUT MUST REFLECT WHAT COULD BE A NATURAL OCCURRENCE WITHIN THE CHARACTER TYPE.
IDAHO
NEVADA
MAP AREA
N
JEROME
HUNT SUBSTATION
TWIN FALLS
IDAHO
NEVADA
UTAH NEVADA
HUMBOLDT NATIONAL FOREST
SAWTOOTH NATIONAL FOREST
HUMBOLDT
ELKO
PERSHING
LANDER
EUREKA
WINNEMUCCA
Battle Mountain
ELKO
Wells
Lovelock
OREANA SUBSTATION
STUDY ROUTES UNDER
0 10 20 30
MILES
0 10 20 30
KILOMETERS
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREANA-HUNT TRANSMISSION LINE
VISUAL RESOURCE MANAGEMENT CLASSES
1976

been well illustrated by the extremely small turnouts at public meetings conducted by the applicant in the various rural communities in central and northeast Nevada.

Regional - Although there is no documentation available concerning attitudes or expectations of powerline development regionally, it can be assured that continuous and reliable power (i.e., additional power as required) is an expectation taken for granted by residents whether they are local residents residing in both small and large communities or in large regional, economically interdependent areas.

VISUAL RESOURCE

The visual resource of the landscape can be identified as the unique combination of visual features: land surface, vegetation, and structures; as they relate to the four basic elements of form, line, color, and texture.

In the study area, five landscape character types have been identified:

* Basin/range type
* High desert plateau type
* Mountain type
* Agricultural type
* Foothill type

Based on the Visual Resource Inventory and Evaluation System as explained in BLM Manual 6300, visual resource management classes have been identified in the subject area. The analysis from which these classes have been taken appears in Appendix I, p. 263, of this document. It is suggested that this analysis be reviewed in order to understand the basic premises, criteria, and methodology of the Visual Resource Inventory and Evaluation System.

The classes identified are as follows:

CLASS II

Class II areas are highly significant visual resource zones primarily due to their high sensitivity and scenic level values. In the subject area, those areas designated as Class II and delineated on the Visual Resource Map, p. 91 are:

* A portion of the West Humboldt Range as it extends along the east side of Alternate Route 95 from Lovelock to the Mill City turnoff.

* An area of the Dunn-Glenn Peak area encompassing several square miles approximately 12 miles southwest of Winnemucca.

* Portions of the Sonoma Peak area directly south of Winnemucca, and several square miles on either side of Highway 95 as it extends north out of Winnemucca.

* Several square miles of the Battle Mountain Range, including North Peak, Antler Peak, and Elephant Head, directly southwest of Battle Mountain.

* Approximately 50 miles along the Humboldt River, starting northwest of Battle Mountain and extending to Carlin.

* Approximately 30 square miles along Rock Creek, directly above Boulder Flat on the north side of Interstate 80.

* Several square miles associated with the South Fork of the Little Humboldt River to the northwest of Midas.

* Approximately 50 square miles in the Beaver Creek area of the Tuscarora Mountains north of Carlin.

* Two smaller areas in the northern Tuscarora Mountains directly west of the town of Tuscarora.

* Several miles along the South Fork of the Owyhee River extending from the Idaho border and crossing the ninth standard parallel.

* Thirty square miles, starting at the terminus of State Route 11 in the Wilson Peak area adjacent to the Humboldt National Forest.

* Approximately 15 square miles adjacent to the Humboldt National Forest and the southern boundary of the Duck Valley Indian Reservation below the town of Owyhee.

* An area surrounding the community of Wild Horse adjacent to the National Forest.

* Several square miles surrounding, and to the east of, the community of Lamoille and adjacent to the Humboldt National Forest.

* An area of approximately 200 square miles to the south and east of the Jarbidge Wilderness Area on National Forest land.

* A strip of land approximately 8 miles wide and 30 miles long south of Delano Peak and to the west of Thousand Spring Creek.

* Several hundred square miles in the northeastern portion of the study area extending from Knoll Mountain, Blanchard Mountain

and the White Peak's area in the Granite Range north toward and including Middle Stack Mountain, Grassy Mountain, and Bear Mountain, crossing into and including several square miles of southern Idaho. This area also extends to the east along the Idaho-Nevada border, including Gollaher Mountain, Sugar Loaf Peak, to the Utah border.

* Approximately 35 miles of the Salmon Falls Creek area from Castle Ford on the north to an area approximately 8 miles above Jackpot, Nevada.

* A strip of land along the east side of Highway 93 from just below the Nevada-Idaho border north through Jackpot and Ida-Vada, terminating at Rogerson, Idaho.

* Approximately 25 miles along the Snake River Canyon from an area north of Buhl to an area just above Murtaugh Lake.

CLASS III

Class III areas, although not as critical as Class II in terms of sensitivity level and scenic quality, are still considered moderately significant because of their important visual resource values. Class III areas are as follows:

* Several units around the community of Lovelock, each one including several square miles.

* An area encompassing approximately the upper two-thirds of the Rye Patch Reservoir.

* Several square miles to the south of Dunn-Glenn Peak.

* Several square miles on either side of the community of Winnemucca north along the Bloody Run Hills and south into the Sonoma Range.

* Fifty square miles in the Fish Creek Mountains at the southwestern point of the Reese River Valley.

* Several square miles in the Shoshone Range in to separate parcels south of the community of Battle Mountain.

* Two separate areas to the west and southwest of the community of Midas.

* Approximately 90 square miles in the area surrounding the community of Tuscarora.

* Approximately 25 square miles on either side of Interstate 80 starting just north of Buckskin Mountain, continuing through Elko including part of the Adobe Range and extending north up the Humboldt River drainage.

* About 70 square miles surrounding the Stagg Mountain area directly north of the Interstate above Deeth.

* Several smaller parcels in the area southeast of Elko, adjacent to and to the west of the Humboldt National Forest.

* Several hundred acres north and east of Wells, Nevada, including the Antelope Peak area north of Wells, Wood's Hills to the south and east of Wells, and the community of Oasis on either side of Interstate 80.

* An area comprising approximately 45 square miles directly to the west of the Delano Mountains.

* Approximately 110 square miles just north of the Nevada-Idaho border in between Highway 93 and the Sawtooth National Forest commonly referred to as the Shoshone Basin.

CLASS IV

The majority of the study area is included in Visual Resource Class IV. This class, with lower sensitivity and scenic values, can be described as generally being broad, flat expanses of lower elevation country with little variation in topographic, vegetative or water features and generally lacking the contrast in the basic elements of form, line, color, and texture evident in the other visual classes.

HISTORICAL/ARCHEOLOGICAL VALUES

Intensive occupation of this part of the Great Basin began about 11,000 years ago and was based on available marshland resources around ancient lakes. A generalized adaptation to a semi-arid environment based on exploitation of seeds, roots, berries, and wildlife evolved. Late pre-historic peoples, the Paiutes and Shoshones, are thought to have radiated into the northern Great Basin about AD 1000, replacing earlier populations.

The earliest exploration in this area was by fur trappers, who were active during the 1830s. A major immigrant trail, the Humboldt River Route, was established by the 1840s. It provided access to virtually the entire length of the Humboldt River, beginning just east of Elko and extending west to the Humboldt Sink. American settlement of the northern Great Basin began with mining camps, founded in the early 1860s; the first transcontinental railroad passed through the area in the late 1860s. Later, farming and ranching stimulated further settlement.

Known archeological and historical information is identified on the Cultural Resources Map, p. 99 . Blocks of archeological information on the map are based on completed surveys in that locality. The void areas do not necessarily represent a lack of cultural material, they are an indiciation of where surveys are lacking. Specific historical/archeological information is available at BLM District Offices (see the District Boundaries Map, p. 71 .

Archeological reconnaissance of one corridor (O'Neil Basin) was completed in three parts. Parts I and II were surveyed by the Central Division of the Nevada Archeological Survey (report on file Nevada State Museum, BLM District Offices, and Sierra Pacific Power Company), and Part III by Idaho State University, Department of Anthropology and Museum (report on file, Idaho State University; BLM State Offices, Reno and Boise; and Idaho Power Company).

Part I totals 160 miles from Tracy to Valmy, Nevada. The first 90-mile segment (Tracy to Oreana) was analyzed by BLM in the Tracy to Oreana Environmental Analysis Record (EAR).

Part II totals 150+ miles on line from Valmy, Nevada, to 1/4 mile east of Jackpot, Nevada (3.2 miles south of the Idaho border).

Part III totals 55 miles from that point on line 3.2 miles south of the Idaho/Nevada border to the Hunt substation in Idaho.

Except for a 27-mile segment that is unsurveyed due to a relocation of the original right-of-way (see Cultural Resources Map, p. 99), all parts have undergone archeological reconnaissance along the right-of-way, and sites subject to direct or indirect impact by the project have been recorded and evaluated.

In Parts I and II, a systematic collection of archeological specimens from the surface of the smaller fragile pattern sites has been completed by the Nevada Archeological Surveys (NAS). NAS has made specific recommendations for the preservation of archeological/historical values by strategic placement of construction.

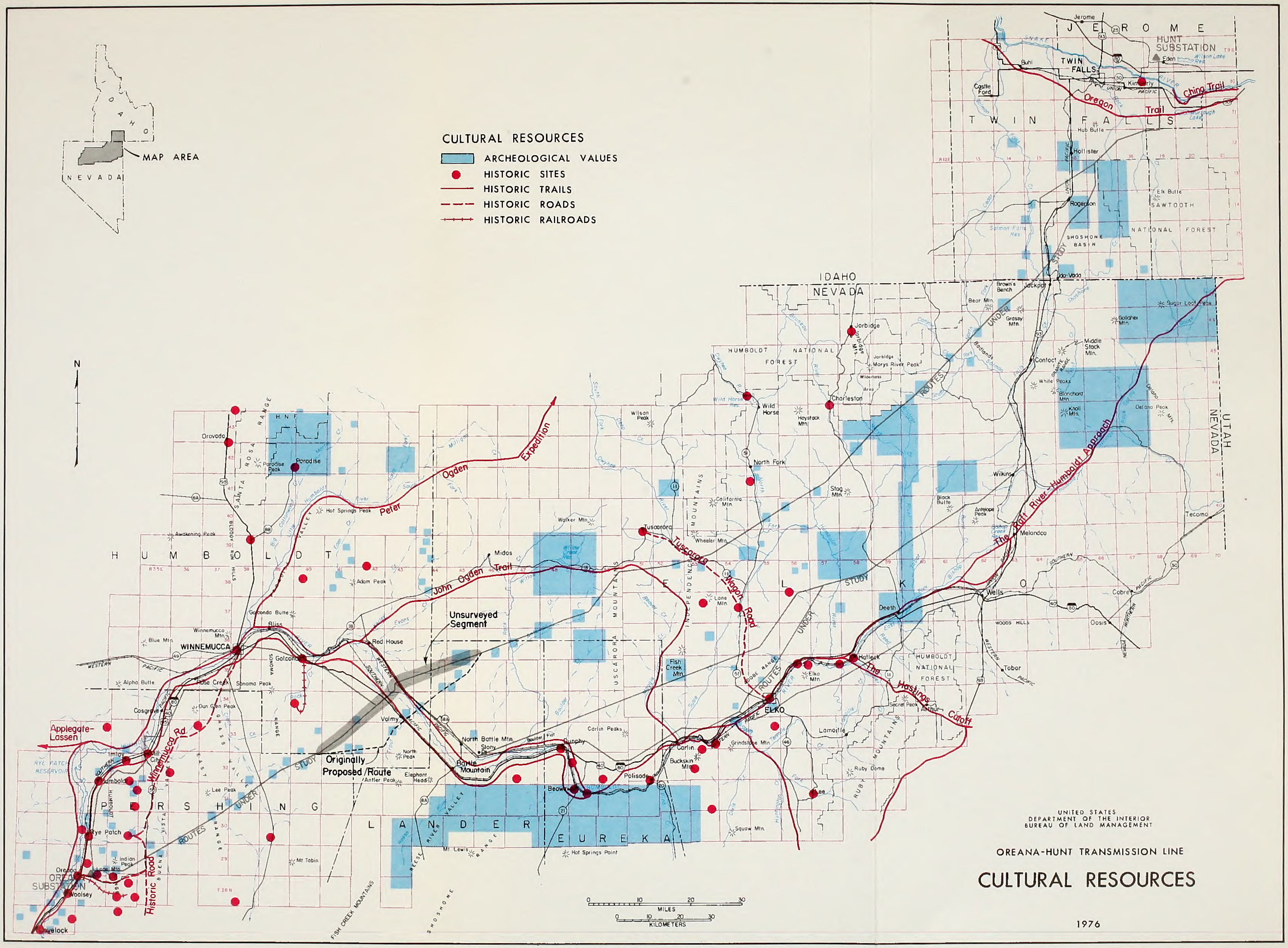
Appropriate measures to preserve scientific, historical, and archeological information has not been completed in Part III; however, Idaho State University has current recommendations for cultural protection if the proposed right-of-way is granted.

A total of 151 historical and archeological sites have been located along the O'Neil Basin Corridor. An intensive cultural reconnaissance on the other corridors has not yet been performed. The probable occurrence of the number, type, and significance of sites in the Adobe Metropolis Corridors would be the same as those in the O'Neil Basin Corridor. A much higher occurrence is expected along the Highway Corridor, due to the presence of the Humboldt River. (Mary Rusco, NAS, see attached letter in Appendix J, p. 277). The Humboldt River was a reliable water and food resource, and its terrace and older flood plains are the location of many semi-permanent base camps occupied for at least the past 5,000 years. At the time of Anglo-American entry this valley supported one of the densest of northern Great Basin aboriginal populations. In addition, it was the location of historic trails and some of the earliest settlements in Northern Nevada.

In accordance with procedures outlined in 36 CFR 800.4, "The National Register of Historic Places through March 2, 1976" was consulted. There were no sites listed on the National Register that are in direct or indirect danger of the proposed or alternative routes.

The state Historic Preservation Plan of May 1975, was consulted, and no sites currently being considered for National Register nomination by the State of Nevada will be affected by any of the corridor proposals.

Efforts have been initiated to determine if any sites listed on the Idaho State Historic Preservation Plan will be affected by any of the corridors.



CULTURAL RESOURCES
ARCHEOLOGICAL VALUES
HISTORIC SITES
HISTORIC TRAILS
HISTORIC ROADS
HISTORIC RAILROADS
IDAHO
NEVADA
MAP AREA
N
HUNT SUBSTATION
TWIN FALLS
JEROME
Oregon Trail
Chino Trail
SAWTOOTH NATIONAL FOREST
IDAHO
NEVADA
UTAH
NEVADA
HUMBOLDT NATIONAL FOREST
Jarbidge
Jackpot
Wells
ELKO
Elko
Carlin
Winnemucca
WINNEMUCCA
Golconda
Battle Mountain
Lovelock
OREANA SUBSTATION
HUMBOLDT
PERSHING
LANDER
EUREKA
Peter Ogden Expedition
John Ogden Trail
Tuscarora Wagon Road
The Salt River Humboldt Approach
The Hastings Cutoff
Applegate-Lassen
Winnemucca Rd.
Historic Road
Unsurveyed Segment
Originally Proposed Route
STUDY ROUTES UNDER
MILES
KILOMETERS
0
10
20
30
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREANA-HUNT TRANSMISSION LINE
CULTURAL RESOURCES
1976

HAZARDS

There are a number of man-made and natural features that are inherently hazardous to health and safety within the study area. Because these are numerous and scattered throughout the study area, no attempt has been made to identify every specific site. Briefly summarized below are the types of hazards that commonly occur:

The most obvious man-made hazards include: highways, unimproved roads, railroads, industrial sites, communications and electrical lines and related facilities, mining activity, fences, operation of ranch and farm equipment, and the potential for hunting accidents.

The most obvious natural hazards include: climatic extremes (heat, cold, drought, storms), natural hot springs, rangeland fires, cliffs, lakes, rivers, and the potential for flash floods, rock slides, and earthquakes. The study area lies within seismic zones 2 and 3 where there is a potential for moderate to major structural damage resulting from earthquakes.

ECOLOGICAL INTERRELATIONSHIPS

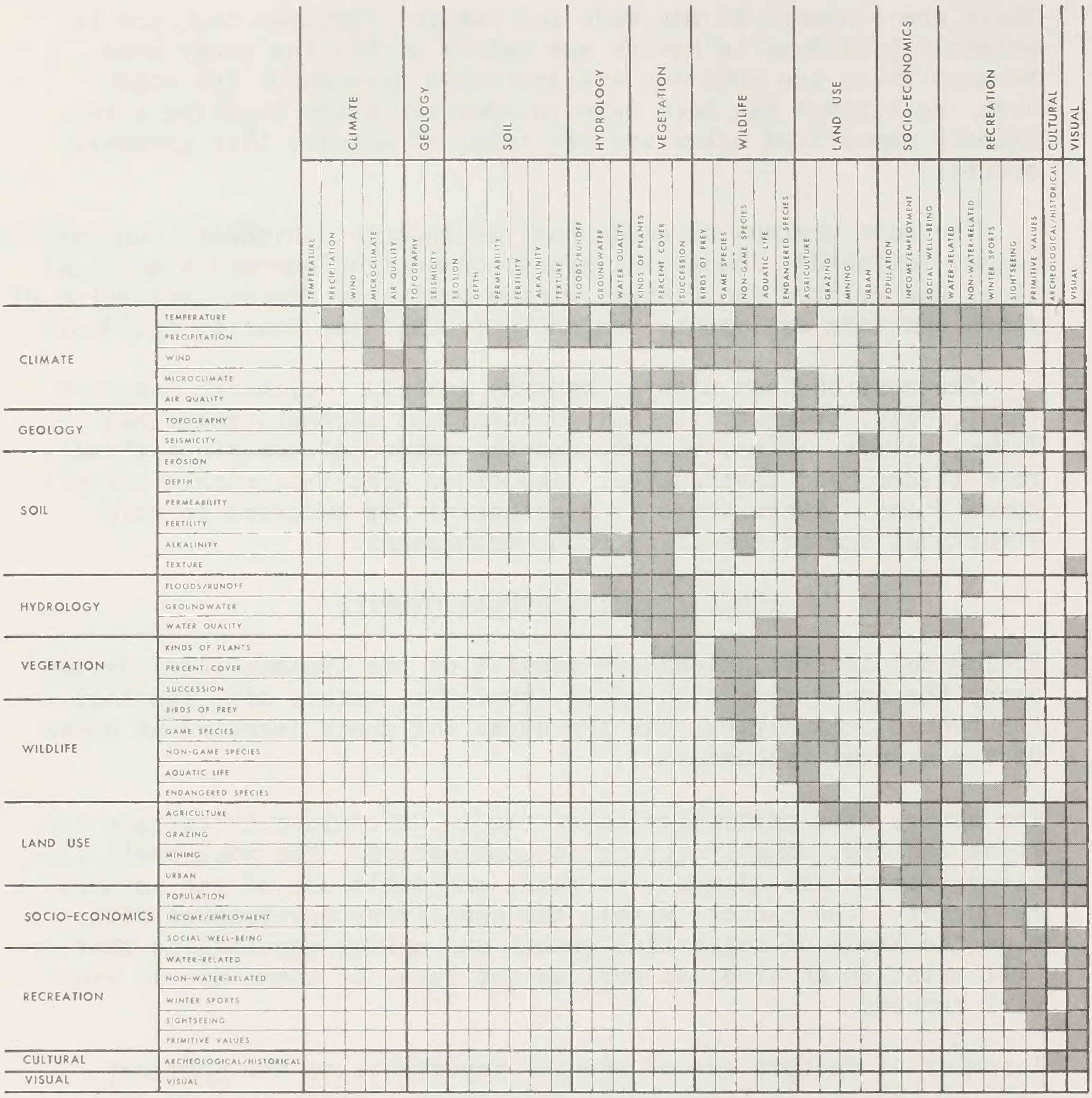
Ecological interrelationships consist of the dynamic interactions among the non-living components (sunlight, water, air, and soil), the biotic communities, and the human influence (mankind as users of the natural resources).

The nature of a particular ecosystem is determined by certain limiting factors, usually acting in combination. The most basic limiting factors are climate, terrain, and man's use of the natural resources. The factors within the non-living environment determine the kinds of vegetative growth and animal populations that will exist in an area, as well as the level of human use an area will receive.

A number of factors are of special importance to the nutrient cycling process in terrestrial ecosystems. These include soil structure, surface and subsurface hydrology, vegetative development, animal territoriality and migration, and predator-prey relationships. These factors are related in a multi-dimensional way, and any disturbance to one important link in the web may result in a disturbance throughout the entire web. The human influence and demands on natural resources significantly affect the naturally occurring components of an ecosystem.

The following matrix, Fig. II-6, is a two-dimensional representation of the key interrelationships that exist between the living and non-living components of the environment.

FIG. II-6 KEY ECOLOGICAL INTERRELATIONSHIPS



The interrelationships were identified through an interdisciplinary team discussion, centering on the ecological conditions specific to the study area. The environmental components were divided into 11 major headings, under which specific factors were listed. The headings and factors are listed on both axes of the matrix, forming columns and rows. At the intersection between any given column and row it is shown whether or not a key ecological interrelationship exists between the two selected factors. For example, there is a key interrelationship between erosion (under the Soil heading) and aquatic life (under Wildlife). There is only a limited interrelationship between birds of prey (Wildlife) and groundwater (Hydrology), therefore this does not show in the matrix. Although elements specific to the study area were evaluated in the interdisciplinary discussion, for the sake of brevity and clarity they were not included in the matrix.

The following discussion will elaborate on some of the key interrelationships shown in the matrix. The interrelationships that exist in the study area will also be related to the limiting factors that are at work.

One of the examples found on the matrix shows key interrelationships between soil erosion and other non-living factors such as precipitation, wind, air quality, floods/runoff, and water quality. These two-dimensional matrix representations are fundamental in illustrating the multi-dimensional nature of the relationships in the environment. The soils and erosion conditions interrelate with the vegetative communities, and wildlife, and land uses, as do the hydrologic and climatic factors.

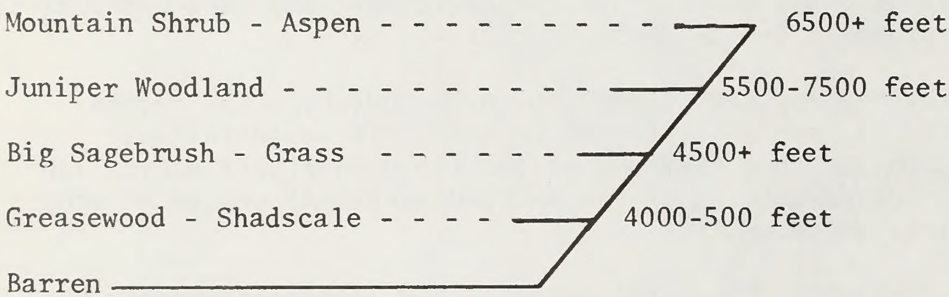
These relationships are interwoven to include even the recreational uses an area is likely to receive. It is therefore, important to remember that use of the two dimensional matrix can lead to an understanding of the multi-dimensional system of ecological interrelationships.

As another example, the matrix shows a key interrelationship between vegetation and wildlife. The percent of vegetative cover, kinds of plants, and plant succession directly affect game, nongame, and endangered species. Wildlife and livestock depend on vegetation for food and cover. Some animal species have specific vegetative requirements. Sage grouse, for instance, need sagebrush for winter cover, nesting cover, and food, meadows for brood rearing areas, and open, low-vegetated areas for strutting and breeding grounds. On the other hand, other animals (such as coyotes) are adaptable to a wide variety of conditions.

Within the study area, severe climatic conditions are the greatest limiting factors. Low, erratic precipitation, high wind velocities, and high summer temperatures (causing high evaporation rates) exert constraints, limiting vegetative production. Sparse vegetation will not support large animal populations. The diversity of animal life is directly related to the diversity of the vegetative community. For example, salt desert shrub communities support fewer and less diverse animal populations than other vegetative types in the area.

The basic biotic community of the study area is the cold desert biome. Eight m jor vegetative communities occur within the study area (see vegetation section, and Figure II-7, p. 104 .) Historically, perennial grasses made up a significant part of the cold desert biome's vegetation. Overgrazing, fire (both man-induced and natural), and climatic changes have reduced the abundance of desirable vegetative species. The process of natural revegetation or successional recovery on deteriorated lands may take decades to again reach climax. (As applied to desert species, "climax" is any plant growth situation which perpetuates itself on an undisturbed site.) When dominant species and their understory communities are disturbed and plant succession is set back, less palatable plants, such as sagebrush, increase in number. With further deterioration, invaders such as cheatgrass and/or halogeton will generally become established.

FIGURE II-7
ELEVATION RELATIONSHIPS OF MAJOR PLANT COMMUNITIES WITHIN STUDY AREA



Because of the delicate ecological balance existing in the cold desert biome, many plant and animal species are highly specific as to what conditions they can successfully tolerate. Saline and alkaline conditions of the soil and water are strong limiting factors for plant growth.

The matrix also shows an interrelationship between stream flow, groundwater, and vegetative growth, particularly riparian and aquatic vegetation. Riparian vegetation requires that groundwater be close to the surface. Riparian areas are preferred habitat for many animal and bird species and are natural wildlife trails through areas surrounded by less vegetative cover. Aquatic vegetation typically includes both emergent and submergent forms. The emergent vegetation of the Humboldt and Toulon marshes is primarily narrow-leaved cattail and alkali bulrush. The submergent marsh vegetation consists of sago pondweed, muskgrass, and widgeon grass.

The streams, ponds, and marshes are essential rest stops for many of the birds of the Pacific Flyway. These waters serve as a resident waterfowl, shorebird, marsh bird, and fish-producing habitat, providing food and aquatic vegetation. These aquatic habitats are suitable areas for fishing and duck hunting.

The aquatic community consists of cold-water streams (which support cold-water fishes) and streams that were cold-water, but have since been degraded by sedimentation and removal of over-hanging stream bank vegetation (which shades the water), resulting in increased water temperatures. The degraded streams, or portions thereof, support introduced warm-water fishes. The lower reaches of the Humboldt once held native populations of cutthroat trout, which have been replaced by introduced warm-water species, including carp and catfish.

The effects of human presence have been felt in all portions of the study area. The following uses prevail: off-road vehicle use, hunting, fishing, camping, livestock grazing, utility corridors, railroad tracks, highways, unimproved dirt roads, water projects, and some cultivation. All of these uses affect the visual experience, one of the most important aspects of quality of the human environment.

The study area, with its vast expanse and native beauty, fulfills many of the needs of urban residents. They satisfy their recreational expectations by enjoying nature's beauty and fulfilling their need to escape temporarily from urban problems.

There are key interrelationships among population, income, social well-being, and recreational activities. As population and income increase, the pressures increase on undeveloped and developed recreation areas.

Recreational activities are also affected by land use. If an area is used for agriculture, heavy grazing, or mining, recreational pursuits would be restricted if the land is privately owned. Whether or not land areas are restricted, developed lands lessen the primitive experience that many recreationists seek when hunting, camping, hiking, or fishing in the back country.

The matrix shows some key interrelationships between many environmental factors and human use of the study area. The surface disturbance caused by off-road vehicles and over-grazing by livestock has destroyed much vegetative cover, causing erosion in some areas and invasion of weedy species in others. As a result of erosion, many streams have been degraded by sediment deposits, at least at their lower reaches where water flows at slower velocities. This degradation has reduced water quality and has affected the aquatic habitats (for example, relatively clean gravel is needed for fish to spawn successfully). Over-grazing of stream bank vegetation has increased water temperatures, killing off cold-water fishes. The reduction of vegetative cover, in allowing increased wind erosion, has caused some of the more fertile soils to be blown away, exposing the hard desert pavement in some areas. Desert pavement is not conducive to re-seeding or natural revegetation. Wind erosion also causes a fugitive dust problem. Where soil composition is suitable for revegetation, limited precipitation and high daytime soil temperatures (which can occur during the growing season) often prevent revegetation of a disturbed area.

The human activity within the study area is of considerable importance because the human presence disrupts many links within the ecosystem, whether on a short-term or long-term basis. The quality of the human environment is dependent upon the harmonious functioning of the ecological interrelationships in the natural environment.

FUTURE ENVIRONMENT WITHOUT THE PROPOSED ACTION

The economic life of the proposed power transmission project is expected to be about 50 years. Without the proposal, the previously indicated projected population and economic growth rates within Sierra Pacific Power Company's service area may not be realized during a short-term period of inadequate electrical power supply. An alternate transmission line route or a new source of electrical power would be developed to satisfy the increasing demand. Without the proposal, the company will fail to meet its required reliability by about 1978 and will be unable to supply the current projected power demand by about 1980.

Factors other than electrical power supply may limit population and economic growth within the company's service area. These factors could include availability of water, water quality, sewage disposal, land usage (planning and zoning), and changing public attitudes toward growth.

Increased use of lands for irrigated agriculture will continue without the project, but at a much slower rate. Without the proposal, alternate power sources such as small capacity gas turbines or diesel engines would be used on a local basis. This would require use of fuel and would create unquantifiable amounts of additional localized air pollution.

Limited water resources within groundwater basins would eventually restrict any increased use of land within the service area for irrigated agriculture over and above 30,000 acres, based on 50 percent utilization of perennial yield of the groundwater aquifer. (See Chapter II, Agriculture, p. 60 and Chapter III, p. 122.) Providing power to new mining and/or processing facilities would likewise be delayed without the proposal until additional power generation or transmission lines are completed.

Without the proposal, the potential for the towns of Elko and Wells to tap an existing transmission line in Elko County, outside of Sierra Pacific Power Company's service area, will not be available. The Elko and Wells areas are expected to require additional electrical power by 1980 (see discussion on Utilities, Chapter III, p.129,) which would then necessitate an alternate source of additional power or power transmission.

Without the project, the future environmental components within the described corridors would not be affected except by natural causes or other outside agents not associated with the proposal. Alternate proposals to provide additional electrical power supplies would cause yet-to-be determined impacts.

III

ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

III

ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

INTRODUCTION

Adverse and beneficial impacts described within this section are those impacts which may occur to the existing environment if Sierra Pacific Power Company's proposed transmission line construction from Oreana, Nevada, to Hunt, Idaho, is undertaken.

Potential impacts are discussed and described in relation to the four corridors previously outlined in Chapter I. For the purposes of this analysis each corridor is comprised of a 2-mile wide route within which a transmission line right-of-way may be granted. Potential impacts include the following:

(a) those which occur as direct impacts within the corridors;
(b) those impacts which may occur outside the corridor but within the general region between Oreana, Nevada, and Hunt, Idaho;
(c) those impacts on the social-economic structure within the general area defined as the Sierra Pacific Power Company's service area;
(d) secondary impacts downstream on the Humboldt River and the Humboldt and Toulon Marshes.

CLIMATE

The climate of the study area would not be impacted by the construction or operation of an electrical transmission line. However, climate has influence on other impacts which are important considerations: soil erosion, removal of vegetation, and subsequent revegetation. These relationships and potential damage to the transmission line during climatic phenomena will be discussed under the appropriate headings.

AIR QUALITY

Impacts on air quality will be similar, regardless of the corridor being considered. These impacts include dust production, vehicular emissions during construction, and corona effects and fugitive dust generation after completion of the project.

PARTICULATE MATTER

Considerable quantities of particulate matter are likely to be produced from tower site clearing operations and tower construction, road improvements, new access construction, and general vehicular traffic along unpaved roads. Since the line will be built in successive segments, dust generation during the construction phase will be intermittent and restricted to access roads and that portion of the line under construction at the time. When the line is upgraded from 230 kv to 345 kv, the problem of dust generation due to construction will reoccur, although to a lesser degree. Although potentially intense in localized areas during periods of construction, dust production is not expected to be a major problem.

Fugitive dust production on disturbed areas following construction is a different matter. Here, the impact can be considered as a long-term effect over much of the length of the powerline. Wind-caused dust pollution is already a problem in portions of the study area (see Climate Section of CH. II, p. 25 , and Appendix B, p. 205), and further surface disturbance can only add to the problem. Improvement and construction of access roads will undoubtedly draw general vehicular traffic to the area, further aggravating the dust situation. Besides the health hazard associated with adverse levels of suspended particulate matter, a coating of dust on vegetation reduces the vigor and productivity of the affected plants. Further disturbance of the soil at the time the line is upgraded will also contribute to the long-term problem of fugitive dust.

VEHICULAR EMISSIONS

Monitored data for vehicular emissions is not available for the study area. However, exhaust emissions from construction vehicles are expected to be insignificant due to the limited number of vehicles which would be operating in any area at a particular time; additionally, frequent winds will quickly disperse those emissions that are produced, and the air sheds in the region are large, encompassing thousands of acres.

CORONA EFFECTS

Corona effects are produced by high voltage overhead transmission lines when the surrounding air is ionized, forming ozone and nitrogen oxides. Recently conducted intensive studies have shown no measureable quantities of these substances at ground level near transmission lines up to 765 kv. (USDI, BLM, RALI Report, September 1975, pp. III-45, 49, and 50.)

WATER

Some stream pollution would result from powerline construction activities wherever the line crosses live streams. During the summer, fall, and winter months the live streams of the area normally have suspended sediment concentrations of less than 1,000 ppm. Construction vehicle activity at stream crossings could increase the suspended sediment concentrations to levels approaching 5,000 ppm. During the spring months, flows are higher and the suspended sediment concentrations are greater than 1,000 ppm; construction activities at live stream crossings could increase the figure to 10,000 ppm. These increased sediment loads are not harmful to fish populations over the short-term. The immediate adverse impacts would be limited to approximately a one-day duration at each crossing, but impacts due to erosion or siltation could continue until revegetation occurs. The number of significant live stream crossings varies by corridor: the O'Neil Basin Corridor has 21 live stream crossings; the Highway Corridor, 22; the Adobe Range Corridor, 13; and the Metropolis Corridor, 16.

Equipment service sites located adjacent to live streams could result in gas, oil, and human wastes being deposited through surface flow or seepage. Because the area occupied for equipment service would be small, and only temporarily used, the impact of these contaminants on water resources would be minor. Erosion at these sites could continue after the sites had been abandoned.

All four corridors cross many intermittent streams, the number of which (as with live streams) varies according to roughness of the terrain. The adverse impacts caused by construction activities at these crossings would be minor. Distrubed soil and debris may be carried by run-off water to nearby drainages. The impacts of construction at intermittent stream crossings would be considered minor because of the existing high level of natural debris build-up and siltation, and the infrequency of surface runoff during most of the year.

Construction and operational activities adjacent to waterways may locally impact water quality. Unconsolidated fill materials could block drainages, and the removal of ground cover next to drainage channels would increase the dissolved solids and sediment concentrations during periods of streamflow. This impact would be greater when easily eroded soils are located next to waterways. Any large disturbance to channel bottoms could alter the stream courses to some extent.

Maintenance of the transmission line would require vehicle access to the tower sites. Turbidity and sediment load in nearby streams could temporarily increase as a result of surface disturbance during maintenance operations and disturbance caused when the line is upgraded to 345 kv. (See the Erosion Hazards Map, p. 43 .)

The Adobe Range and Metropolis Corridors may conflict with a proposed Corps of Engineers dam site and reservoir in one location (personal communciation with Mr. Arnold Stokes, U.S. Army Corps of Engineers, Sacramento Office, on March 19, 1976). Approval has been given for a dam and reservoir to be constructed on Marys River in T. 39N., R. 59E., Sec. 24 and extending into T. 39N., R. 60E., Sec. 19. The project is scheduled for construction within 10 to 15 years.

Secondary impacts on water quantity and quality would occur because of the increased power availability and usage of that power once the transmission line is constructed. Any community expansion would provide additional consumers of the available surface waters and groundwaters. Waters would be used to a greater extent for recreational purposes. Community expansion and agricultural irrigation would also impact the water quality by increasing the amounts of organic matter, sediments, bacteria, salts, pesticides, fertilizers, oil, and grease that would be introduced into the surface waters and groundwaters. Although the transmission line would not directly cause community expansion, the line would enhance conditions allowing for future expansion by providing additional electrical power. Secondary impacts on water quality and associated biota that may result from increased irrigation is discussed under Ecological Interrelationships, p. 151 .

TOPOGRAPHY

Construction of an electrical transmission line within any of the four corridors would not impact the topography in a significant way. Construction of access roads, tower pads, and storage and staging areas would require minor alteration of the topography along the right-of-way. Roads and pads would require construction cuts and fills to provide level areas for assemblage of material, erection of towers, and vehicle travel. Sierra Pacific Power Company plans to make maximum use of existing roads. New roads 20 feet wide will have to be constructed in areas near the right-of-way that currently have no access. (See Table I-1, p. 12 .) These disturbances to the surface environment would be better termed as impacts to soil, vegetation, and visual resource rather than to such a macroscopic feature as topography.

Because construction activities on steep slopes cause more severe environmental impacts, it is important to note the degree of relief of the corridors relative to each other. The O'Neil

Corridor has the greatest amount of steep terrain, followed by the Adobe Range, the Metropolis, and the Highway Corridor, in that order.

GEOLOGY

Construction of an electrical transmission line within any of the four corridors would have minimal impact on the geologic structure itself. Much of the construction would take place along alluvium-filled valleys where the bedrock is not exposed.

MINERAL RESOURCES

Construction of the transmission line would have little impact on known mineral values or on current mining activity. Surface mining exploration activity in any mining area in the vicinity of the right-of-way could be temporarily halted while the transmission towers were being set in place and the transmission lines were being strung and tensioned through the mining area.

None of the four corridors passes through any operating open pit mining locations. If a valuable mineral deposit conducive to open pit mining methods should be discovered in the immediate location of the transmission line after it were in place, a relocation of the transmission towers around the proposed pit site would be necessary to accommodate open pit mining operations.

Transmission line location through an area of underground mining operations would not pose problems because shafts, tunnels, and above-ground tailings can be located to avoid direct conflict with the transmission line without restricting mining operations.

SOILS & WATERSHED

Disturbance of the soil profile by the proposed project will create more adverse impact to the environment, either directly or indirectly, than any other activity. The proposed construction operations will include increased use of existing unmaintained roads, construction of new access roads to the right-of-way and on the right-of-way, building of storage yards, tower base areas, and miscellaneous other areas. (See Table III-1, p. 114 for projected estimates of soil disturbance on each soil group by a 10-foot wide road within the right-of-way on each corridor, and Table III-2, p. 115 for estimates of total possible acreage of soil disturbance for the entire project by corridor.)

Following construction, permanent access roads will be needed for maintenance of the line and for new construction in the near future (upgrading of the line), which tends to increase public access to remote areas.

Table III-1
SOIL GROUP - TRANSMISSION LINE CORRIDOR RELATIONSHIP

Soil Group	O'Neil Basin			Highway Corridor			Adobe Range Corridor			Metropolis Corridor			Erosion Hazard
	% of Line	Distance (Miles)	Road Acres 1/	% of Line	Distance (Miles)	Road Acres 1/	% of Line	Distance (Miles)	Road Acres 1/	% of Line	Distance (Miles)	Road Acres 1/	
1*	--	--	--	--	--	--	--	--	--	--	--	--	Severe
2	2	6	7	3	11	13	2	6	7	2	6	7	Moderate
3	8	22	24	20	72	87	10	31	38	9	29	35	Moderate
4	1	3	4	13	47	57	9	28	34	13	42	51	Slight
5	8	22	27	5	19	23	12	37	45	7	23	28	Moderate
6	16	46	56	11	38	46	8	25	30	5	16	19	Moderate
7	--	--	--	6	23	28	7	22	27	7	23	28	Moderate
8	4	11	13	11	38	46	12	37	45	11	36	44	Moderate
9	23	67	81	19	68	82	17	56	68	29	93	113	Severe
10	21	60	73	5	18	22	15	48	58	9	29	45	Severe
11	--	--	--	1	4	5	2	6	7	2	6	7	Severe
12	17	49	59	6	22	27	6	19	23	6	19	23	Severe
Totals	100%	286	347	100%	360	436	100%	315	382	100%	322	390	

1/ Acreage determination: 10 ft. wide road on right-of-way @ 1.21 acres/mile, rounded off.
* No figures are shown for Soil Group 1 because none of the proposed corridors cross this group, although the group is present in the study area.

Damage to topsoil by vehicle movement is the primary projected adverse impact and will vary among soil types. In the lower elevation areas in soil groups 2, 3, 5, and 7 natural rehabilitation will be slower because of the drier climate. (See Chapter II, Soils, p. 36 .) Once the topsoil has been disturbed in these areas where natural plant succession is slow, scars left by machinery will remain for decades. These soils have been developing at a very slow rate for several thousand years, and most of the surfaces contain silt and very fine sands that are easily eroded by wind and water when they are dislodged. They range in depth from 8 to 24 inches. (See the Soil Groups Map, p. 41 .) Soil displacement in the lower rainfall areas will not entail as much vegetation disturbance per mile as in the higher precipitation areas, such as occur in the O'Neil Basin Corridor, but the damage will be just as permanent and wind erosion loss will be significant.

Soil in the higher rainfall areas (groups 6, 8, 9, 10, 11, and 12) will be more subject to water eroison than those in drier areas because of the effects of more precipitation on steeper slopes, but they would rehabilitate faster if erosion control measures were successful. Soil surface depth ranges are about the same as in the drier areas and would be damaged equally by vehicle travel, but would not be displaced as severely by wind action.

Table III-2

ANTICIPATED SOIL DISTURBANCE BY CORRIDOR

	Acres			
	O'Neil Basin	Highway Corridor	Adobe Corridor	Metropolis Corridor
1/ Total acres in right-of-way	4853	6109	5346	5464
Access				
New roads (20 ft. wide)				
Out of right-of-way	430	34	264	180
Road along right-of-way (10 ft. wide)	347	436	382	390
Total	777	470	646	570
Site disturbance requirements Other than roads	66	77	70	71
Total Acres	843	547	715	641
Total Miles	286	360	315	322

1/ Right-of-way = 140 ft. X $\frac{5280 \text{ ft./mi.}}{43560 \text{ sq. ft./acre}}$

= 16.9 acres/mile

16.9 acres/mile X total distance = total acres in ROW

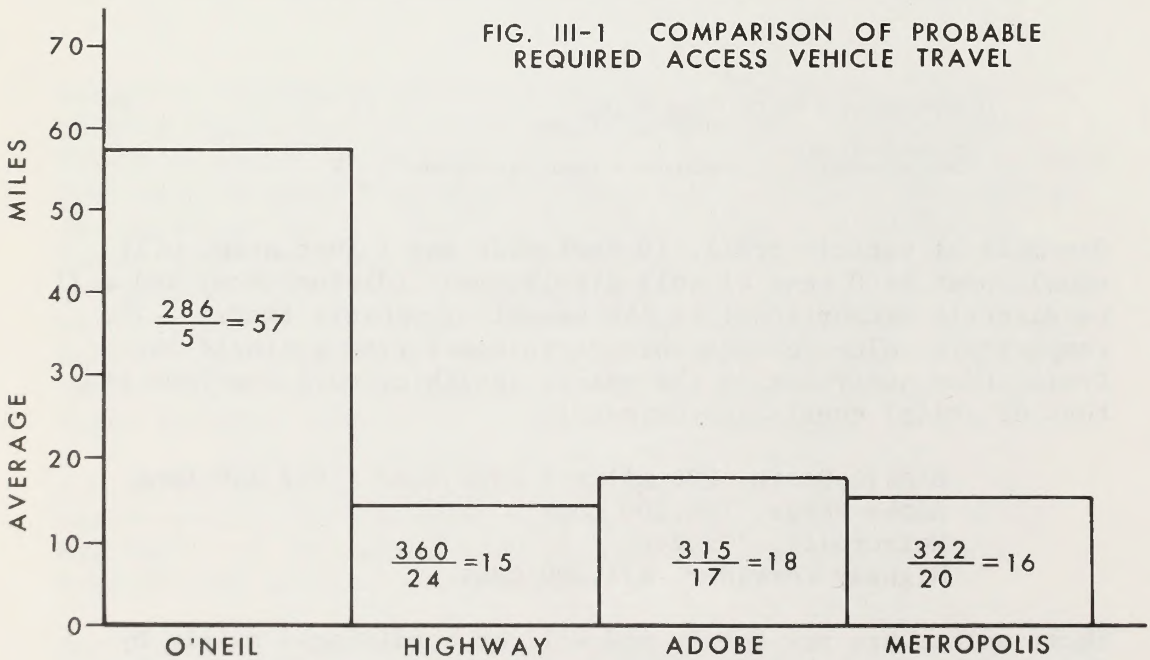
One mile of vehicle trail, 10 feet wide and 1 foot deep, will equal about 2420 tons of soil displacement (disturbance) and will be directly proportional to the amount of vehicle travel. The comparative values of possible disturbance from a single-lane trail under heavy use on the entire length of each corridor (in tons of soils) equals approximately:

O'Neil Basin, 286 miles X 2420 tons = 692,120 tons
Adobe Range, 762,300 tons
Metropolis, 779,240
Highway Corridor, 871,200 tons

These values are raw totals and will be conditioned mainly by the distances of each corridor from present access points, including railroads, highways, and gravel roads. They are placed here only to indicate the comparison of possible soil displacement among corridors.

In summary, the most adverse impacts to soils will be construction and use of access and right-of-way roads and trails. It can be seen from the Soil Groups Map, p. 41 , that the greater the distance from the Highway Corridor, where the railroads and freeway exist, the more miles of access roads will be required for the project. The following bargraph (Figure III-1) illustrates the comparative ratios of total miles to supply points for each corridor, and by inference, the soil disturbance on access roads on each right-of-way. It can be readily seen that even though the O'Neil Basin Corridor is the shortest, and entails the least soil disturbance from a one-road right-of-way standpoint, the actual soil disturbance would be greater because of the distance from supply points. The three remaining corridors have about the same ratios because of their proximity to the main railroad and freeway systems. These ratios are not exact comparisons because of the variable concept of a supply point. They do, however, clearly demonstrate the access requirement relationship based entirely on distances from supply points. Using the O'Neil Basin Corridor as an example, it is 286 miles long with five main supply points, and the ratio is 286 ÷ 5 = 57 average miles between supply points. The volume of the bar on the graph indicates required unmaintained road travel. These ratios are relative indexes of the amount of soil disturbance from the total travel that will be required over the same sections of road to complete the job.

FIG. III-1 COMPARISON OF PROBABLE REQUIRED ACCESS VEHICLE TRAVEL



NOTE:
VEHICLE TRAVEL ON UNMAINTAINED ROADS FOR EACH CORRIDOR DEVELOPED BY THE RATIO OF DISTANCE IN MILES OF EACH CORRIDOR DIVIDED BY THE AVERAGE NUMBER OF SUPPLY POINTS PER CORRIDOR.

Tables III-1 and III-2, pp. 112 and 113, and Figure III-1, p. 114, illustrate that the O'Neil Basin Corridor (the shortest) entails approximately 347 acres of right-of-way disturbance as compared to 436 acres on the Highway Corridor (the longest). Table III-2 shows the total corridor soil disturbance as being approximately 843 acres for the O'Neil Basin Corridor and 547 acres for the Highway Corridor.

The difference is higher due primarily to the additional requirements for access roads on the O'Neil Basin Corridor. Figure III-1, p. 114, substantiates this large difference by application of the distance and supply point ratio: 57 miles between supply points on the O'Neil Basin Corridor and 15 miles for the Highway Corridor.

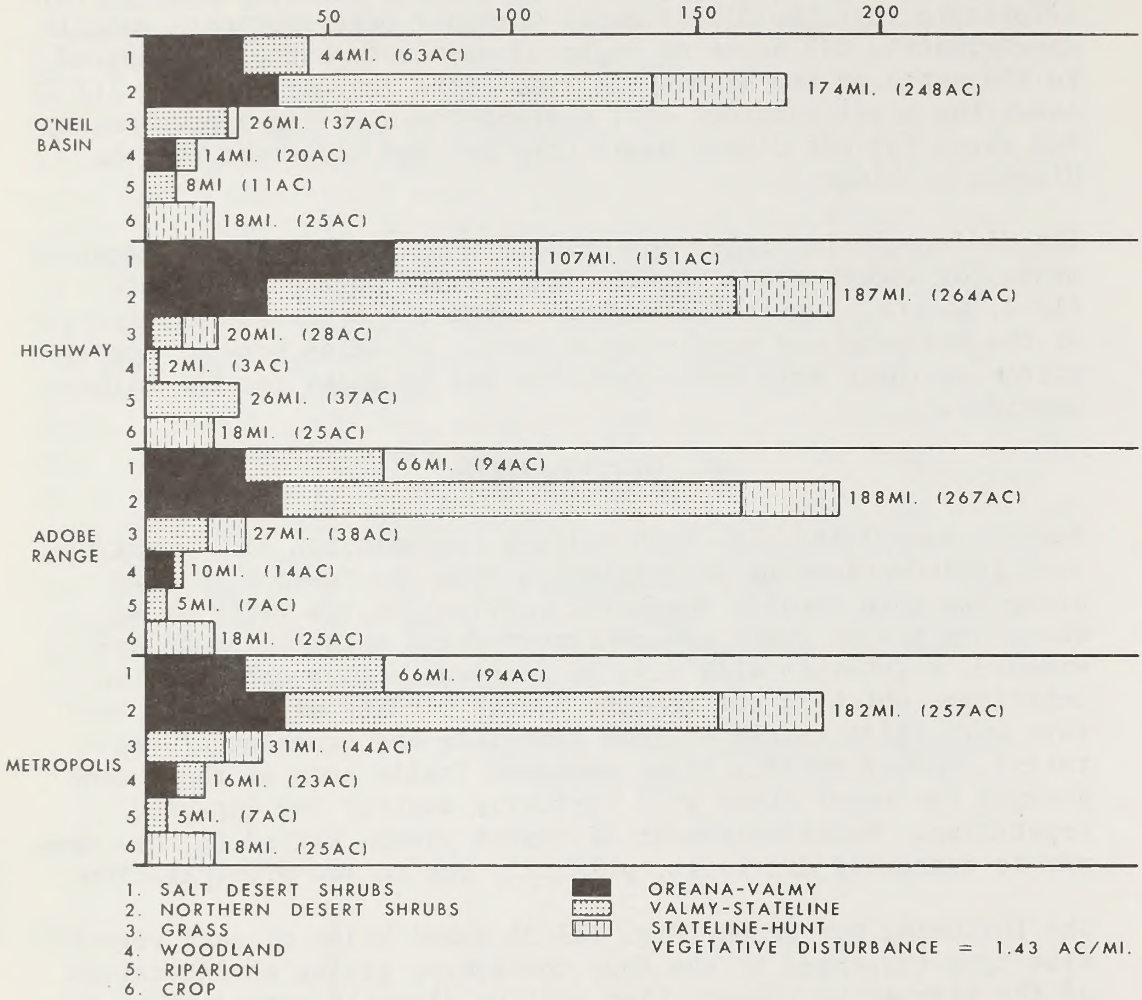
VEGETATION

Impacts associated with high-voltage transmission line construction include clearing of vegetation from the tower sites and along the more densely vegetated portions of the right-of-way. Where new access roads are constructed and existing roads are widened, vegetation will also be removed. Other construction activities which do not require actual blading of the soil surface will still result in some trampling and crushing of vegetation. Heavy traffic along unbladed trails such as those connecting the tower sites will virtually destroy the impacted vegetation. Reestablishment of desert shrubs killed in this manner is extremely difficult, primarily due to low precipitation.

The following bar graph (Fig. III-2) shows miles of each vegetative type traversed by the four corridors, giving an indication of the vegetative impacts that will be directly sustained along the corridors themselves. Also indicated after each bar is the estimated acreage of disturbance in each vegetative type due to tower sites, tension stations, and the trail between towers. This estimated vegetative disturbance is 1.43 acres per line mile.

Much more difficult to assess, and in many cases of equal or higher importance, is the disturbance which would result from new access construction and improvement of existing access. The actual disturbance cannot be accurately assessed at this time because precise location of access needs is not known.

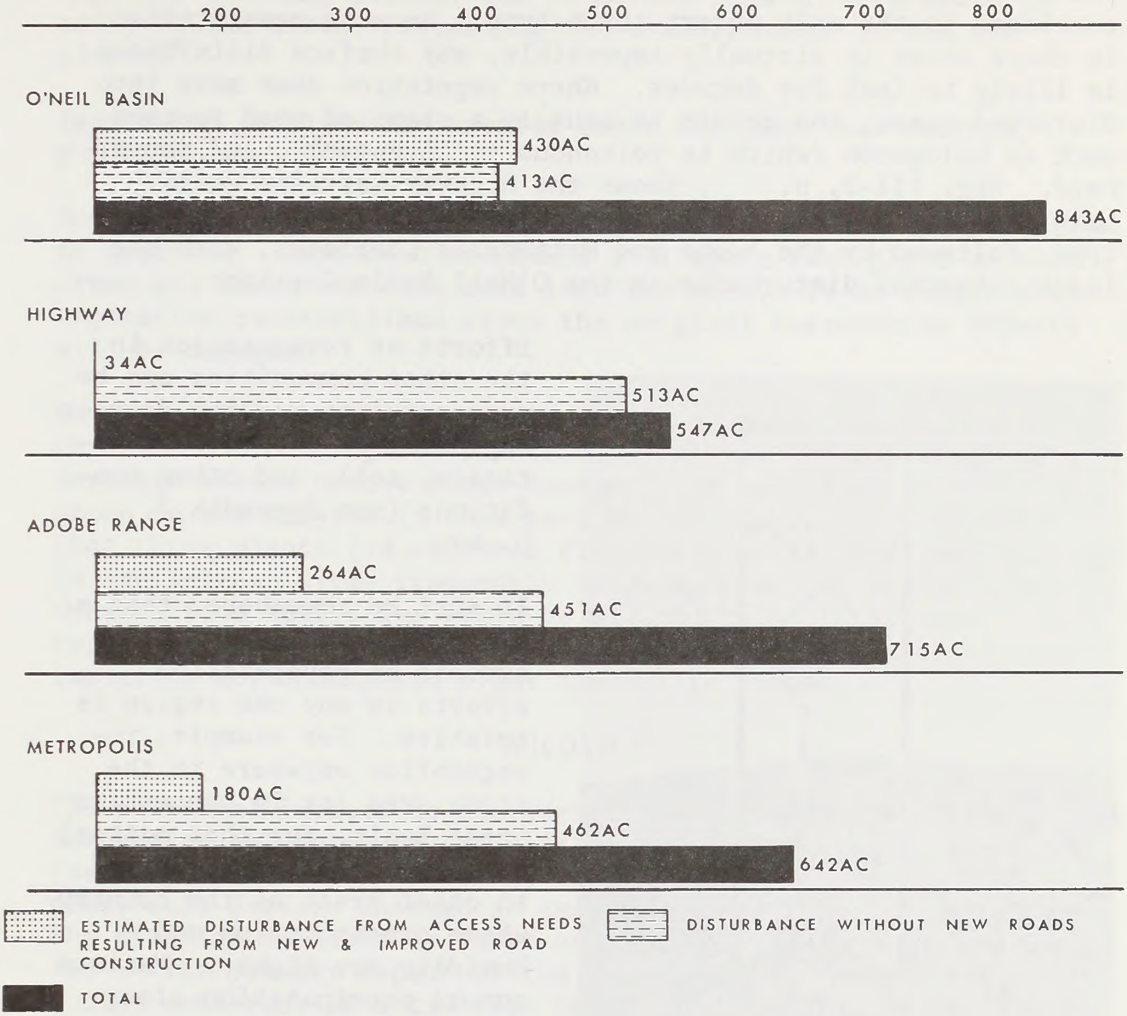
FIG. III-2 MILES IN EACH VEGETATIVE TYPE BY CORRIDOR



However, an estimate can be made, and is shown in Table I-1, item 3a, p. 12. Since access needs will be restricted to rough terrain areas, most of the resulting disturbance will be in the northern desert shrub type (mountain shrub and aspen communities are quite spotty and could be readily avoided). Figure III-3, p. 119, shows a comparison of estimated disturbance resulting from access needs (new and improved road construction), versus estimated disturbance without considering access requirements. It can be seen that access requirements could add considerably to the total area disturbed. Further, revegetation is difficult in steep terrain areas, increasing the possibility for erosion to occur before the vegetative cover has been reestablished.

In the woodland vegetative type, small numbers of trees in the juniper community will have to be removed from the right-of-way

FIG. III-3 VEGETATIVE TYPE DISTURBANCE WITH & WITHOUT NEW ACCESS ROAD REQUIREMENTS



within any of the four corridors. The same is not necessarily true of the aspen community, which is scattered sufficiently so that the trees themselves could be avoided.

The riparian community typically occurs in narrow strips along drainages; therefore, the extent of impacts would be dependent on the angle at which the transmission line crosses these areas. The impacts would be considerably greater if the right-of-way crosses obliquely rather than perpendicularly, across the riparian communities.

Two opposing factors need to be considered in assessing impacts to the riparian vegetative type. On the one hand, wet meadow/ streambank vegetation can be fairly successfully rehabilitated. On the other hand, damage from heavy equipment activity in these areas can be severe.

The most sensitive vegetative type traversed by any of the corridors is the salt desert shrub type. Because revegetation in these areas is virtually impossible, any surface disturbance is likely to last for decades. Where vegetation does move into disturbed areas, the result is usually a stand of weed species such as halogeton (which is poisonous to livestock), and pepperweed. Fig. III-2, p. , shows the Highway Corridor would have the most potential disturbance in the salt desert shrub type, followed by the Adobe and Metropolis Corridors, with the least potential disturbance in the O'Neil Basin Corridor.

Typical disturbance resulting from transmission line construction in northern Nevada. Cross-braced H-frame towers traversing northern desert shrub type. (Sigurd, Utah to Ft. Churchill, Nevada 230 kv transmission line.)

Efforts at revegetation in the other communities can be successful to varying degrees depending on slope, precipitation, soil, and other conditions (see Appendix E, p. 221 .)

It must be remembered that a discussion dealing with the success of revegetation efforts in any one region is relative. For example, revegetation anywhere in the study area (or in the entire Great Basin, for that matter) would be diffiuclt compared to other areas of the country where precipitation and humidity are higher. Maximum annual precipitation along any of the corridors is less than 20 inches, with average precipitation levels even lower. Therefore, a statement that revegetation is "fairly easy" should be considered with this relativity in mind.

One of the problems associated with revegetation occurs where cheatgrass is abundant. Revegetation techniques in these areas are less successful due to the competitive nature of the grass; usually, the cheatgrass instead of the more desirable perennial species spreads into the disturbed areas. Another problem occurs in areas where livestock graze. Tender new plants are generally more desirable forage than the existing plants. and livestock tend to congregate in newly seeded areas, preventing the establishment of the new plants.

Impacts to cropland are treated under the Land Uses section, p. 124.

Some of the impacts mentioned above will recur when the powerline is upgraded. Surface disturbance will again take place as work crews and their vehicles move into the area. It is likely that vegetation reestablished since the original restoration efforts will be damaged.

No definitive data is available on the possible existence of threatened or endangered plants along any of the corridors The Northern Nevada Native Plant Society, the most knowledgable group on the subject in this part of the state, has indicated that these plants (as reported from other areas) most often occur in mountainous areas frequently in rocky crevices and canyons. Construction activities would be planned to avoid areas of rugged terrain as much as possible; therefore, the possibility of impacting any endangered plant species is remote.

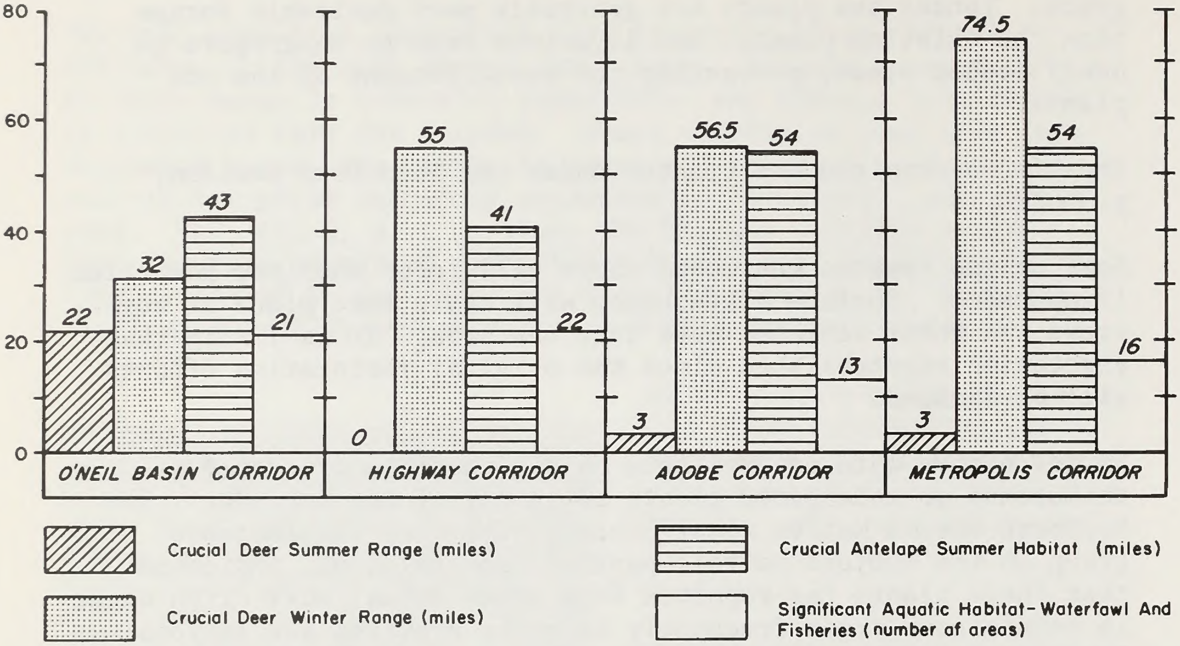
WILDLIFE

The potential impacts to the various species of wildlife and their respective habitats are quantified by corridor on bar graphs (see Figures. III-4 and III-5, pp. 122 and 123). Potential impacts were derived through an analysis of corridor locations and the wildlife habitats as shown on the Wildlife Maps, pp. 55 and 57. The primary impact of the transmission line and its required construction activities to wildlife populations and habitats is removal of vegetation, which represents wildlife food, nesting or fawning cover, or winter protective cover; human activity, which may cause disturbance to some wildlife populations; and physical disturbance to aquatic habitat. Road construction and other surface disturbing activities may reduce wildlife habitat at the rate of 2 to 3 acres per transmission line mile.

TERRESTRIAL

Human activity causing disturbance to wintering or fawning big game species could adversely affect local populations of mule deer and antelope. Due to the extensive acreage of existing mule deer and antelope habitat, as shown on the Big Game and Fisheries Map. p. 55, the potential loss of 290 to 400 acres of big game habitat, depending on the corridor selected, will not signifi-

FIG. III-4 IMPACTS TO WILDLIFE

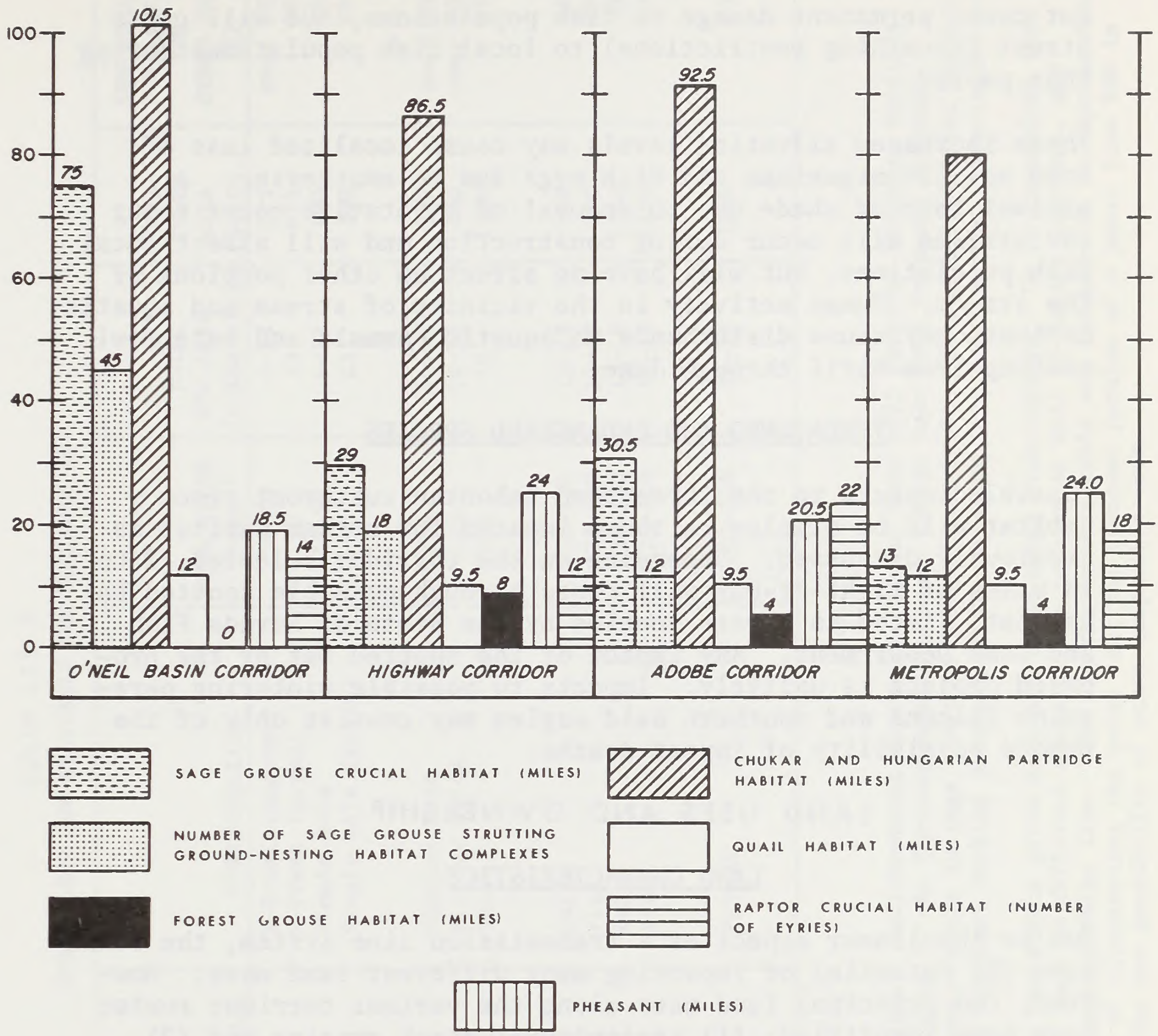


cantly affect the overall mule deer or antelope populations, but may have localized adverse impacts on mule deer and antelope herds existing on restricted critical ranges.

Alteration of vegetation within sage grouse strutting ground-nesting complexes and disturbance during the strutting-nesting period from March through May could result in the permanent lowering of the year-to-year sage grouse population. Where protective winter and nesting cover within the critical upland game habitat areas is removed, the impact on these species would be adverse, since these plants are necessary for both food and shelter. Upland game species which may be adversely affected include mourning doves, which nest throughout the area, chukar and Hungarian partridge, quail, forest grouse, and pheasants.

Construction activities in the near vicinity of raptor nesting sites could cause abandonment of from 12 to 22 known raptor eyries. Transmission towers placed adjacent to roads could lead to increased indiscriminate shooting of perching raptors. Transmission phase lines within concentration areas of raptors could lead to limited impact death of raptors. Because of the wide spacing of the phase lines, electrocution of perching raptors is not likely to occur. Increased vehicular activity is likely to occur due to increased and improved access for construction and maintenance, which could lead to harassment of wildlife during stress periods.

FIG. III-5 IMPACTS TO WILDLIFE



Towers may serve as hunting perches for raptors in treeless terrain, thus increasing raptor hunting areas. Disturbance to existing vegetation by construction activities could result in sub-climax vegetative cover which would in turn result in increased rodent population, thus benefiting raptor populations through an increased prey-species base.

AQUATIC

A number of stream and aquatic habitat areas, ranging from 13 to 22 sites depending on the corridor (see Figure III-5, above), will be crossed by the transmission line. Siltation may occur within the stream and aquatic habitat areas. Possible levels of siltation are described in the Water section, p. 111 . These potential increased siltation levels for short durations will not cause permanent damage to fish populations, but will cause stress (breathing restrictions) to local fish populations during that period.

These increased siltation levels may cause localized loss of some aquatic organisms and fish eggs due to smothering. A minimal loss of shade due to removal of vegetative cover along the streams will occur during construction and will affect local fish populations, but will have no effect on other portions of the stream. Human activity in the vicinity of stream and aquatic habitats may cause disturbance to aquatic mammals and waterfowl nesting from April through June.

THREATENED AND ENDANGERED SPECIES

Possible impacts to the threatened Lahontan cutthroat trout habitat will be similar to those impacts for stream habitat as previously discussed. Depending on the corridor selected, 2 to 14 miles of right-of-way will cross through possible spotted bat habitat, listed as a rare species by the State of Nevada Fish and Game Department. Any impact ot the spotted bat by the proposed project is unlikely. Impacts to possible wintering peregrine falcons and southern bald eagles may consist only of the remote possibility of impact deaths.

LAND USES AND OWNERSHIP

LAND CHARACTERISTICS

Due to the linear aspect of a transmission line system, the lines have the potential of impacting many different land uses. However, two principal land uses along the various corridor routes have been identified: (1) agricultural stock grazing and (2) recreation. Since these two primary uses are extensive rather than intensive, impacts of a transmission line are expected to be minimal, in that over 99 percent of the transmission right-of-way area is available for other uses. (See Table III-3, p. 125.)

AGRICULTURE - EXISTING

The impact on irrigated agriculture from the construction of a transmission line is that, under the worst circumstances, it can remove land from production, and interrupt farming activities during construction and maintenance operations. However, in Nevada and that portion of southern Idaho within the study area the corridors traverse less than 200 cultivated acres, with the majority of these acres being located along that segment common to all four corridors extending from the northern boundary of the Sawtooth National Forest to Hunt, Idaho. (See the Study

Table III-3

POWER LINE ROW AVAILABLE FOR MULTIPLE USE

kV	SYSTEM TYPE (CIRCUITS)	MATERIAL	CONFIGURATION	ROW WIDTH (Feet)[1]	TOTAL ROW AREA (ACRES/MILE)	TOTAL TOWER AREA (sq.ft.)	ROW AREA AVAILABLE FOR OTHER USE (%)
115	Single or Double	Wood	H-frame (unguyed)	50-90	6-13	275	over 99
115	Single or Double	Wood	H-frame (guyed)	90	13	675	99
115	Single or Double	Wood	Single pole	50-90	6-13	100	99
115	Single or Double	Wood	Single pole (guyed)	90	13	300	99
230	Double	Metal	Tubular Pole	125	14-15	100	over 99
230	Single	Metal	Flat or delta	125	14-15	400	over 99
230	Double	Metal	Stack	125	14	1000	98
500	Single	Metal	Delta	125-160	15-19	900	99
500	Single	Metal	Flat	125-160	15-19	700	99
500	Double	Metal	Delta	125-160	15-19	1200	98
500	Double	Metal	Stack	125-160	15-19	1700	98
765	Single	Metal	Portal	180-220	21-26	3200	89-91

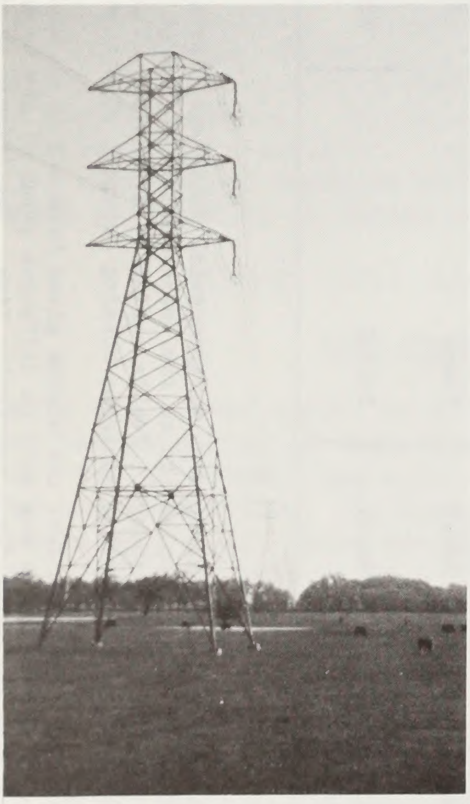
Sources: Bonneville Power Administration: Environmental Statement, Fiscal Year 1975 Proposed Program, Facility Evaluation Appendix; Supplements to the Environmental Statement Fiscal Year 1976 Proposed Program: Lower Snake Grid Reinforcement, Pebble Springs - Marion 500-kV Line, Shelton-Kitsap 230-kV Line; General Construction and Maintenance Program; Working Document of Transmission Line Construction Characteristics.

It is important to emphasize that the widths given here are in no sense prescriptive. It is recognized that the widths for particular voltages may vary in different areas of the country as well as design features, and special conditions that may exist for a particular line. The figures in this table are intended to be representative only, and are provided for the purpose of illustrating rhe point that the greatest portion of a power line ROW is actually left free, as open space or for the possibility of other compatible uses.

Area Map, p. 7 .) This segment traverses section lines the entire distance to Hunt, Idaho, and it is expected that impacts will be minimal due to the fact that along this segment, roads, fences, and fields are in most cases laid out along section lines. Given this set of circumstances, and the fact that transmission lines take very little land out of production, the overall impact on existing agricultural development will be minimal. (See Table III-3, p. 125, and photograph below.)

AGRICULTURE - POTENTIAL

A more important aspect of the agriculture/transmission line relationship is the effect on potentially new agriculture lands. (See Table II-3, p. 63.) Although 30,000 acres have been identified as "potential" based on physical factors, it is the institutional constraints that most probably will preclude full development of these acres. At the present time these constraints are: (1) checkerboard land pattern in the prospective area (See the Land Status Map and Agricultural Potential Map, pp. 61 and 64.), (2) capital intensive nature of bring new lands into production, and (3) reliable electrical power availability. Checkerboard land pattern constraints are based primarily on the fact that in Nevada there are no agricultural entry programs available that will transfer BLM land into private ownership. However, at the present time there is a study underway that may re-open an agricultural development program within the state. New agricultural developments require large sums of capital which may preclude small family operations and, in combination with unreliable power availability, can inhibit development completely. In essence, it can be expected that any new agricultural lands within the Lovelock District will be located on private lands and as Table II-3, p. 63 indicates, these lands most probably will be in Eureka, Pershing, and Humboldt Counties.



Traverse of high-voltage transmission line through agricultural land. Note that there is little disturbance with current land uses.

With the existence of new sources of reliable and continuous power (i.e., the proposed Valmy power plant) located in an area where the availability of electrical power has been one of the limiting factors in agricultural development, it is expected that those lands will be developed where agricultural water applications have been issued by the Nevada Department of Water Resources. See Chapter II, Land Uses - Agriculture, p. 60, which states that approximately 11,200 acres fall within this classification. Impacts associated with increased agricultural/irrigation are discussed in the water section of this Chapter, p. 111.

Stabilized potato fields approximately 20 miles northeast of Winnemucca, Nevada, in Paradise Valley.

LIVESTOCK GRAZING

Loss of vegetation to access roads, tower sites, substations, storage yards, and conductor/wire stringing sites will reduce total available livestock forage, but will have no real effect on existing grazing programs. Animal unit months of livestock forage lost due to the proposed transmission routes can be seen in Table III-4, p. 128. Given the small number of AUMs lost, the impact on livestock forage is considered minimal. Secondary impacts on existing livestock operations would be crossing of range fences and livestock watering locations; however, these activities are expected to be of negligible impact.

MINERAL ACTIVITIES

There would be no known impacts on mineral development along the traverse of the four corridors. (See the Mineral Resources section of this Chapter, p. 113.)

Table III-4: Summary of Livestock Grazing Disturbance by Segment by Corridor 1/

Segment 2/	O'Neil Basin Corridor: Permanent Loss (AUMs) 3/	O'Neil Basin Corridor: Temporary Loss (AUMs) 4/	Highway Corridor: Permanent Loss (AUMs)	Highway Corridor: Temporary Loss (AUMs)	Adobe Range Corridor: Permanent Loss (AUMs)	Adobe Range Corridor: Temporary Loss (AUMs)	Metropolis Corridor: Permanent Loss (AUMs)	Metropolis Corridor: Temporary Loss (AUMs)
Oreana-Valmy	8.16	0.41	5.75	0.53	8.16	0.41	8.16	0.41
Valmy-Stateline	47.10	1.97	26.00	2.19	36.30	2.16	29.57	2.18
Stateline-Hunt	10.96	0.86	9.62	0.88	9.62	0.88	9.62	0.88
TOTAL AUMS	66.22	3.24	41.37	3.60	54.08	3.45	47.35	3.47

1/ See Table I-1 indicating miles of corridor by segment, and delineating access needs; site construction data; substation disturbance.

2/ These segments are common to all corridors and are primarily located in: (1) Winnemucca District (Oreana-Valmy), (2) Elko District (Valmy-Stateline), (3) Burley District (Stateline-Hunt). Estimation of carrying capacity for these Districts are 24,11 and 8 acres per AUM respectively. These figures were used to calculate disturbance.

3/ Permanent loss of AUMs based on total utilization of land needed for: (1) access roads, (2) centerline access road. See Table I-1., (3) tower sites, (4) Substations.

4/ Temporary loss of AUMs based primarily on site construction characteristics: (1) area needed for crane pads, (2) tension stations, (3) storage yards.

TRANSPORTATION

ROADS

For potential impacts caused by corridor crossings of major highways and traffic counts at those crossings, see Table III-5, p. 129.

RAIL

Railroad communications may be disrupted. The Highway, Adobe Range, and Metropolis Corridors parallel the tracks for long distances. Corridor crossings of tracks are: O'Neil, 5; Highway, 14; Adobe 7; and Metropolis, 7.

RIVERS

Corridor crossings of major river systems include the Humboldt and Snake Rivers. Impacts caused by construction will be minimal because construction equipment will not enter these watercourses.

Table III-5

POTENTIAL FOR ELECTRONIC AND VISUAL INTERFERENCE

Corridor	Corridor Crossings of Major Highways: Highway No.	No. of Times	Place	Traffic Volume (1972* & 1973): Average No. of Vehicles Per Day
O'Neil Basin	N-50	1	Buena Vista Valley	25
	I-80	1	near Valmy	3370
	N-11	1	near Taylor Canyon	70
	N-51	1	near Mahala Creek	235
	US-93	1	near Meteor, Idaho	1500*
	US-30	1	near Hansen	1500*
	I-80N	1	east of Id-25	7000*
	Id-25	1	near Eden	800*
Highway	I-80	1	west of Mill City	4010
	I-80	1	north of Mill City	4050
	I-80	2	east of Winnemucca	3770
	I-80	1	near Valmy	3370
	I-80	1	southwest of Elko	4100
	N-46	1	east of Elko	1275
	N-11	1	southeast of Halleck	85
	I-80	1	Wells	3420
	US-93	1	near Shores Siding	1010
	US-93	1	Contact	1025
	US-93	1	Amsterdam, Idaho	1700*
	US-30	1	near Hansen	1500*
	I-80N	1	east of Id-25	7000*
	Id-25	1	near Eden	800*
Adobe Range	N-50	1	Buena Vista Valley	25
	I-80	1	near Valmy	3370
	N-51 & 11	1	north of Adobe Range	360
	US-93	1	near Shores Siding	1010
	US-93	1	Contact	1025
	US-93	1	Amsterdam, Idaho	1700*
	US-30	1	near Hansen	1500*
	I-80N	1	east of Id-25	7000*
	Id-25	1	near Eden	800*
Metropolis	N-50	1	Buena Vista Valley	25
	I-80	1	near Valmy	3370
	N-51 & 11	1	northwest of Elko	535
	US-93	1	near Shores Siding	1010
	US-93	1	Contact	1025
	US-93	1	Amsterdam, Idaho	1700*
	US-30	1	near Hansen	1500*
	I-80N	1	east of Id-25	7000*
	Id-25	1	near Eden	800*

UTILITIES

The power supplied to the towns of Elko and Wells, Nevada, is a single loop feed from southern Idaho along an existing 138 kv line that, according to the general managers of Nevada Power Company (Elko) and Wells Rural Electric Company (Wells), will reach its maximum transmission capacity by 1980. At that time, it is expected that the Elko and Wells areas will need additional power. Sierra Pacific Power Company has agreed to allow Idaho Power to "tap" the proposed transmission in order to supply the needs of its Nevada customers. Also, Sierra Pacific has agreed in a public hearing to negotiate in good faith with Wells Rural Electric Company concerning a "tap" on intertie #2 should they desire. Sierra Pacific has also stated that at the time additional power is required in Elko County, each utility will have to evaluate the various sources and determine the best alternative. According to the Nevada Power Company in Elko, the only viable alternative is a "substation tap" at a yet-to-be determined location. Wells Rural Electric Company has stated that they would like to see the proposed line aligned parallel to the existing 138 kv line from Idaho, while Nevada Power Company has expressed a desire to minimize the length of a distribution line that would "tap" any new substation located within Elko County.

INTERRELATIONSHIPS WITH OTHER TRANSMISSION SYSTEMS

The Tracy to Hunt 230/345 kv transmission line will connect directly with others in the Sierra Pacific Power system and through these lines with other utility transmission systems. (See Transmission Line Interties Map, p. 24 .) The key to these interconnections are existing and proposed substations which will control and distribute bulk power from the transmission lines.

At the present time Sierra Pacific Power Company has contracts with Utah Power and Light Company for 50 megawatts (Mw) of power now, 150 Mw by October 1977, and 200 Mw by October 1978. One-half of the 150 Mw for 1977 and 200 Mw in 1978 will be carried on each intertie line. These interties have been designated: (1) Intertie #1 (Sigurd Substation, Utah, to Fort Churchill Substation, Nevada). This intertie is now completed and was energized in June 1975. Fifty Mw of power are delivered over this line to Fort Churchill substation while an additional 50 Mw are "wheeled" for distribution within Mt. Wheeler's system. Wheeler is a rural cooperative out of Ely, Nevada, primarily serving central Nevada customers. Intertie #1 has been designated at a 230 kv configuration to deliver a maximum 150 Mw, which is well within its nominal transfer capability of 188 Mw. No upgrading to 345 kv configuration is expected. This intertie will also facilitate a power supply expansion into central Lander County via connection with the Austin, Nevada, substation. (2) Intertie #2 (Hunt, Idaho, substation to Tracy generation/substation, Nevada). This proposed interconnection with Utah Power and Light Company via the Idaho Power hydroelectric system is expected to deliver the remaining 150 Mw from Utah Power and Light to Sierra Pacific's primary load center (Reno-Sparks-Carson City and Lake Tahoe area). With the establishment of the North Valmy substation, the need for existing peaking generation stations in Winnemucca and Battle Mountain, Nevada, will be eliminated, and reliability of the 120 kv feed from the Oreana substation to the above mentioned towns will be greatly increased due to the "looped" nature of the system. Initial construction and operation of Intertie #2 will be at a 230 kv configuration; however, detailed studies are presently underway by Sierra Pacific's planning department to determine the various effects and economics of a future conversion of the line to a 345 kv designation, and when this upgrading should occur. When this conversion does take place, the nominal power transfer capability of this intertie will increase to 282 Mw. Completion of construction of Intertie #2 will increase Sierra Pacific's power purchasing by 285 percent, and connect Sierra with three other utility transmission systems:

(1)	Pacific Gas & Electric Co. (Calif.)	-	108 megawatts	Existing
(2)	Utah Power & Light Co. (Utah)	-	50 megawatts	Intertie #1
(3)	Utah Power & Light Co. via Idaho Power Co.	-	150 megawatts	Intertie #2
	Power Purchase Total		308 megawatts	

Intertie #2 will also play an integral part in Sierra Pacific's proposed North Valmy coal-fired generation station. Installation of the first 250 Mw unit, planned for September 1980, will require two 230 kv transmission lines from the plant. In this regard, Sierra plans to use Intertie #2 (Tracy-Hunt 230 kv transmission line) through the proposed North Valmy substation, as one of the two lines. The other 230 kv line is associated with the North Valmy project which will connect with the Austin substation and Intertie #1.

With the completion and operation of the North Valmy coal-fired station in 1983, Sierra Pacific's total supply capacity will increase to 1,374 Mw, or 103 percent from the 1974 base year production of 674 Mw. In effect, Sierra Pacific will have more than doubled its total supply capacity in nine years.

Phase 1

Intertie #1	Intertie #2	North Valmy Station
100 Mw	100 Mw	500 Mw

RECREATION

Impacts to the recreationist and recreation resources vary in degree and intensity, and the effects of certain impacts may differ between individuals or groups. Even though the impacts of the transmission line vary in degree and intensity, they can be categorized and grouped under the following headings: (a) Physical Impacts to the Recreation Resource, (b) Specific Recreation Activity Impacts, and (c) Impacts to the Total Recreation Experience of Individuals and Groups. A brief discussion of these types of impacts follows. (Refer to recreation discussion, Chapter II, pp. 67 , for an explanation of the recreation resources.)

PHYSICAL IMPACTS TO THE RECREATION RESOURCE

Physical impacts are the direct impacts of transmission line construction that alter or change the recreation resource. This includes road and tower site surface disturbances and the physical presence of the tower structures and lines. Recreation resources affected by physical impacts are: specifically located natural land and vegetative areas used for sightseeing and collecting activities; and structures and developments designed for public use and conservation, such as roadside rest areas and established campgrounds. Physical impacts vary in intensity the closer the right-of-way is to the resource. No impacts occur when towers and/or lines are screened from view or are in the background visual zone.

SPECIFIC RECREATION ACTIVITY IMPACTS

Activity impacts are those usually resulting from a specific transmission line construction phase that alters the degree of success of a particular recreation activity. Some examples of activity impacts directly related to transmission line construction practices are:

... A fisherman's success ratio is lessened by a reduced fish population due to stream erosion and contamination caused by improper road construction techniques.

... A recreationist's geological sightseeing experience will be lessened if a unique geological formation he is viewing has been damaged by construction equipment.

... The creation of additional off-highway roads would result in a more successful outing for the off-road vehicle enthusiast.

IMPACTS TO THE TOTAL RECREATION EXPERIENCE OF INDIVIDUALS AND GROUPS

Recreation observations, questionnaires, and studies demonstrate that even though a recreationist identifies with a specific recreation activity for a particular outing, he actually is involved in several interrelated activities. A good example of this is illustrated in <u>Human Dimensions in Wildlife Programs</u>

Reports of Recent Investigations (Hendee and Schoenfeld, 1973). In this publication, several hunter surveys were conducted. The hunting experience involved a variety of recreation activities, and bagging game was not considered a major factor. In fact, nature appreciation, operating specialized equipment, and socializing with fellow hunters were all considered more important than bagging the game.

Impacts to the total recreation experience may result from the transmission line affecting the attitudes and emotions of the individuals and groups concerned with the recreation area it penetrates. (A subjective impact which cannot be quantified.) Recreation concentration areas shown on the Recreation Management Map, p. 69 , best identify the total recreation opportunities individuals and groups are primarily concerned with. (See chart in App. G , pp. 245, for types of impacts and approximate location by corridor and line segment.)

The above analysis has considered the type of impact upon the recreationist and the recreation resource, but has not discussed the severity of those impacts. The severity of impacts on the recreation resources (or values) are directly related to the types of terrain penetrated, the recreationist, and the concentrations, varieties, and importance of the resources or values.

There are a large number of impacts identified on the Highway Corridor; however, the recreationists participating in activities in this corridor are familiar with visual man-made intrusions such as the Southern Pacific and Western Pacific Railroads, Interstate 80, Highway 93, overhead transmission lines, and communities and residences all along the line location. The Highway Corridor is located along the valley base where the impact of the transmission line being skylined is lessened. The major recreation uses associated with the Highway Corridor involve the Humboldt River, where sightseeing and water-related activities occur. For these reasons, the Highway Corridor is expected to have the least impact on the recreationist and the recreation resource.

The Adobe and Metropolis Corridors penetrate a foothill terrain where recreation activities are non-water related, i.e., hunting, rock collecting, and off-road vehicles. The corridor alignments are within a short driving distance of the Battle Mountain, Carlin, and Elko communities. Recreationists from these communities use the area crossed by these corridors for short-term outings. Two proposed reservoirs, Devil's Gate and Vista, will be impacted by these corridor locations. This means a physical impact upon the reservoirs' development occurs within the foreground of the proposed Devil's Gate Reservoir and across the water body of the proposed Vista Reservoir. When development is complete, the recreation usage associated with these reservoirs will be strictly water-related, i.e., fishing, waterfowl hunting, water skiing, swimming, and boating. Considering the amount and type of use, and the area penetrated by line construction, the severity of impact to the recreationist and recreation resource on the Adobe and Metropolis Corridors is expected to be higher than the Highway Corridor, but not as great as in the O'Neil Basin Corridor.

The most severe impact of transmission line construction upon the recreationist and on the recreation resource is expected on the O'Neil Basin Corridor. The highest concentrations and widest range of recreation opportunities exist along the O'Neil Basin Corridor, especially within the mountainous terrain south of the Humboldt National Forest.

Recreation use of this area is destination-oriented, where visitors stay for extended periods of time. Of all the corridors, the O'Neil Basin Corridor is farthest removed from man's activities. In this area the most noticeable man-made intrusion is off-highway roads. Because of the mountainous terrain, the opportunity of the transmission line being skylined is greater than in all other corridors. Fig. III-6, p.135, illustrates recreation use by corridor within Elko County. The graph shows that more recreation will be affected by transmission line construction in the O'Neil Basin Corridor than in the Highway, Adobe, and Metropolis Corridors. (Information on recreation use was obtained from the <u>Recreation and Water Needs Unit Resource Analysis</u>, Elko BLM District Office.)

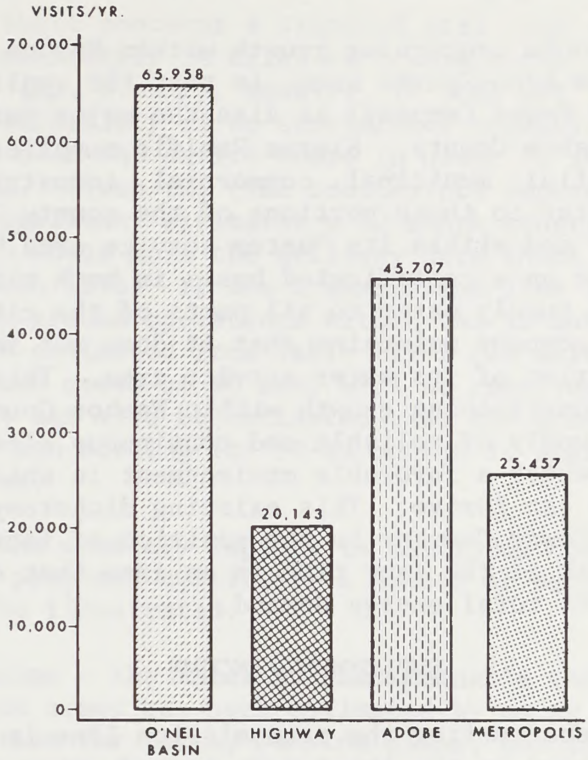
ECONOMIC AND SOCIAL CHARACTERISTICS

An economic profile of current and probable future activity in Sierra Pacific's service area, Elko County and the two affected Idaho Counties, has been presented in Chapter II. Against that base this section will attempt to indicate the possible impacts resulting from: (a) increased energy availability, and (b) construction of a 230/345 kv transmission line.

POPULATION

The impacts of continuous and reliable energy availability as an inducement to population growth vs. energy as a constraint to growth are quantitatively difficult to measure in a direct cause-and-effect relationship. However, average annual growth rates in energy requirements (10.4 percent in Sierra Pacific's service area and 10.5 percent in the Elko area), and population growth rates are interrelated (see Table H-2, p.253). This relationship is further illustrated by Figures H-3, H-4, H-5,

FIG. III-6 IMPACTS ON RECREATIONAL USE



H-6, pp. 258-261, which indicate that electrical energy growth patterns are tied to employment/income and population growth indices (see also Chapter II, Economics, p. 77).

Continuous and reliable electrical energy (as a facilitator of social and economic growth) will provide the impetus of moving the Reno-Sparks area toward its population growth potential as based on an estimate of the total population which the natural resources of the cities (Reno-Sparks) and county (Washoe) will support on a continuing basis without unreasonable impairment. Based upon available information (Regional Planning Commission, Reno, Sparks, and Washoe County, A Conservation/Population Plan, June 1975), the proposed plan suggests these total estimates to be:

Washoe County	-	618,000 persons
City of Reno	-	175,000 persons
City of Sparks	-	55,000 persons

(Washoe County figures include Reno and Sparks)

In sum, Washoe County's population and conservation plan proposed an estimated 230,000 persons in Reno and Sparks and the remaining population in the unincorporated areas of the county. Population projections (see Chapter II, Economics, p. 77), estimate that this population will be reached by the year 2000.

An interesting note concerning growth within Washoe County, specifically the Reno-Sparks area, is that the applicant (Sierra Pacific Power Company) is also the major purveyor of water within Washoe County. Sierra Pacific supplies recreational, residential, municipal, commercial, industrial, and some agricultural water to those portions of the county lying within Reno and Sparks and within its "water service area." Sierra Pacific operates on a certificated basis in both cities and is not required to supply water to all parts of the cities. At this time, the company maintains that it does not intend to expand the boundaries of its water service area. This intent has the effect of constraining growth within Washoe County while the effect of the supply of reliable and continuous electrical power availability creates a favorable environment in which social and economic growth can thrive. This existing dichotomy places Sierra Pacific Power Company in the position of facilitating and inhibiting growth at the same time in an area that constitutes 78 percent of its total energy demand.

EMPLOYMENT/INCOME

The impact of constructing the transmission line is expected to be temporary, based on the short-term introduction of the working force into the local economic profile. Due to the nature of transmission line construction, it is expected that the bulk of the salary income will not remain in the communities along the transmission route because the majority of the labor force is to be from out of the study area (out-of-state).

Depending on time constraints (Table III-6, p. 138), the total working force can vary significantly. However, a normal size crew is approximately 40 men with an estimated total average monthly income of $96,000. As Table III-7, p. 139 indicated, it will be the time needed for construction and size of crew that determines salary income impacts on local communities. An example of the interrelationship of these two tables in determining employment/income effects is as follows: Table III-7 indicates that the Valmy/state line segment of the O'Neil Basin Corridor is approximately 154 miles in length with an estimated 10-month construction time. Taking the estimated average salary from Table III-6, it can be seen that a 10-month construction time accomplished by a 40-man crew will earn $960,000 (gross income). Going back to Table III-7, we see that the affected local communities are Battle Mountain, Elko, Wells, and Jackpot, Nevada. Although this is only one example of a 40-man crew working for 10 months on a specific transmission line segment, it does provide the procedure in estimating employment/income effects of transmission line construction to local communities.

The above estimate concerns a standard size crew (40 men) constructing approximately 16 miles of transmission line per month (Table III-7, (2), p.139), however, it does not take into account the possibility of an accelerated schedule which fields a larger crew over the entire route in order to shorten construction time. Given the time constraints imposed by the ES process, the applicant estimates a 12 month construction schedule which would move the delivery date (Hunt substation hookup) to March 1978. If the transmission line is constructed exclusively by ground operations within the 12 month schedule, then it can be estimated from Table III-7 (16 miles per month) that 80 men (two crews of 40 men) will be required. Utilizing Table III-6 it can also be estimated that the gross salary/income for 80 men working for 10-12 months is approximately 2 million dollars.

To delineate the monetary impacts to the local communities adjacent to the proposed corridors, a number of explanatory factors must be illustrated.

Disposable income - the total actual spendable income available to construction crews has been estimated by using a 30 percent overall deduction for taxes, pension plans, health care, etc., thus leaving a total of 1.4 million dollars as spendable income.

Social/cultural characteristics of the construction crew - the prime contractor for the Tracy-Oreana segment of the transmission line has characterized the construction workers (called "boomers") as primarily single and highly mobile. (Most boomers travel the entire nation following extra-high voltage construction projects.) It is estimated that 90+ percent of the construction workers travel in some sort of self-contained vehicle such as a camper or trailer or motor home; thus, when on the job they carry their own accommodations.

Based on the socio/cultural nature of the "boomers" it is estimated that they will spend approximately 50 percent of their disposable income, amounting to $700,000.

The characteristics of the communities adjacent to the proposed corridors are primarily those of a tourist-service orientation dependent on the interstate tourist traffic and gaming activities. As a result, these communities have more than adequate health, police, and other infrastructure services to meet the needs of both the resident and transient populations.

From the preceding discussion it can be seen that positive monetary impacts to the communities adjacent to the corridors will be a one-time infusion into the local economy without multiplier effects. In summation, it can be estimated that during a 10-12 month construction period 80 construction workers will leave around $700,000 in the various communities in incremental amounts. Given the length of construction time, the mobility and social characteristics of the "boomers" and the number of tourist-oriented communities involved, minimum impacts to the infrastructures are expected.

Table III-6: Estimated Average Monthly Salary of Three Variable Size Transmission Line Crews 1/
($000)

Month	20 Man Crew	40 Man Crew	80 Man Crew 2/
1	$48,000	$96,000	$192,000
2	96,000	192,000	384,000
3	144,000	288,000	576,000
4	192,000	384,000	768,000
5	240,000	480,000	960,000
6	288,000	576,000	1,152,000
7	336,000	672,000	1,344,000
8	384,000	768,000	1,536,000
9	432,000	864,000	1,728,000
10	480,000	960,000	1,920,000
11	528,000	1,056,000	2,112,000
12	576,000	1,152,000	2,304,000

1/ Wage rate estimated at $15.00 per hour per man.

2/ 80-man crew reflects accelerated schedule and would be utilized to shorten construction time.

PUBLIC TAX BASE

Property taxes on transmission lines will be the primary tax benefit to the governments through whose jurisdiction the transmission line passes. (See Table H-4, p. 255.) Tax assessments are set by law at a certain percentage of cash value. In Nevada this is 35 percent and a variable rate in Idaho. The county tax rate is then applied to that percentage of the value. In the affected counties, this potential tax benefit can be estimated as shown on Table III-8, p. 140.

In all counties, the addition to the tax base will be beneficial.

Table III-7: Transmission Line Corridor By Segment/Towns and Estimated Time Needed for Construction 1/

Segment/ Towns	O'Neil Basin (Miles)	Const. 2/ Time (Months)	Highway (Miles)	Const. Time (Months)	Adobe (Miles)	Const. Time (Months)	Metropolis (Miles)	Const. Time (Months)
Oreana/ Valmy Winnemucca	73.5	4.6	103	6.4	73.5	4.6	73.5	4.6
Valmy/ Stateline Btle. Mtn. Elko Wells Jackpot	153.5	9.5	197	12.3	181.5	11.3	188.5	11.8
Stateline/ Hunt-ID. Jackpot Rogerson Hollister Hanson Eden/ Hazelton	59	3.7	60	3.7	60	3.7	60	3.7
TOTAL	286	17.8	360	22.4	315	19.6	322	20.1

1/ See map - Delineating transmission line corridors and segments.

2/ Estimates of construction time based on average of the following; (a) 120 miles in 17 months on the Austin to Yerington area segment Intertie #1, (b) accepted bid of 90 miles in 7 months on the Tracy to Oreana segment of Intertie #2, (c) Sierra Pacific estimate of 28 miles per month utilizing a 40-man crew. Average of these three examples = 16 miles per month. Variances in estimates due to (1) time constraints; (2) size of crew; (3) topography.

As Table III-8 indicates, Elko County's added tax revenue will be substantially higher in all corridors due to the fact that Elko County is common to all corridors and contains the greatest percentage of line miles.

HOUSING

The social impacts created by the construction work force on the affected communities are short-term and are not expected to generate adverse impacts. Although the size of the construction work force can vary widely depending on time constraints, the communities located along the various corridor routings are primarily tourist oriented (See Chapter II, Economics, p. 77), and fully capable of accommodating a temporary increase in transient population. This estimation is based on currently available motel units, and through personal contact with service sector personnel in the affected communities. The towns in question have adequate facilities to provide basic health, police, and other community services for the resident population as well as experiencing the seasonal demands of a much longer tourist population. Due to the transient nature of the working force, and the fact that few, if any, of the construction workers will bring school-age children into the area, no impact is expected on local schools.

Table III-8: Estimated Tax Situation by Corridor and County Nevada-Idaho

Corridor & County	Line Miles	Estimated 1/ Assessed Valuation $	Added Tax 2/ Revenue to County
O'Neil Basin			
Pershing	54	1,350,000	40,905
Humboldt	27	675,000	22,140
Lander	17	425,000	15,172
Elko	129	3,258,000	91,549
Twin Falls	54	490,050	17,592
Jerome	5	46,750	822
TOTAL	286	$6,244,800	$188,180
Highway			
Pershing	47	1,175,000	35,602
Humboldt	65	1,625,000	53,300
Lander	26	650,000	23,205
Eureka	25	625,000	20,187
Elko	137	3,425,000	96,242
Twin Falls	55	499,125	17,918
Jerome	5	46,750	822
TOTAL	360	$8,045,875	$247,276
Adobe Range			
Pershing	54	1,350,000	40,905
Humboldt	28	700,000	22,960
Lander	27	675,000	24,097
Eureka	25	625,000	20,187
Elko	121	3,025,000	85,002
Twin Falls	55	499,125	17,918
Jerome	5	46,750	822
TOTAL	315	$6,920,875	$211,891
Metropolis			
Pershing	54	1,350,000	40,905
Humboldt	28	700,000	22,960
Lander	26	650,000	23,205
Eureka	25	625,000	20,187
Elko	129	3,258,000	91,549
Twin Falls	55	499,125	17,918
Jerome	5	46,750	822
TOTAL	322	$7,128,875	$217,546

1/ Assessed valuation based on a estimated 1977-78 situation of $25,000 per line mile for the State of Nevada.

2/ Added tax revenue estimated by utilizing Local Government Red Book Ad Valorem Tax Rate for Fiscal Year 1975-76 by County x Assessed valuation of $25,000 per line mile.

PLANNING AND ZONING

FEDERAL

At the present time the only known conflict regarding the construction of the proposed transmission line is a recommended planning decision found in the Burley, Idaho, BLM District Management Framework Plan (MFP). This recommendation concerns routing any new transmission lines along an existing 138 kv corridor as established by Idaho Power Company. The applicant's proposed route (O'Neil Basin Corridor) by-passes the Burley District's recommended route on its way to Hunt, Idaho (see the Study Area Map, p. 7). The other three corridors, in the state line-to-Hunt segment, conform to Burley's MFP recommended route.

STATE

In a letter from the Nevada State Clearinghouse, dated January 30, 1976, it was stated that it was a Nevada State policy that transmission lines should be consolidated into existing corridors. At the present time the only corridor that conforms to this routing criterion is the Highway Corridor. It was also stated by the Clearinghouse that new corridors should be designed with the thought of expansion to accommodate additional transmission lines at a future date.

COUNTIES AND LOCAL GOVERNMENT

See p. 89 for Washoe County's recommended conservation and population plan.

ATTITUDES AND EXPECTATIONS

Local - A recently completed Nevada Highway Department Community Social Attitudes Survey (4-76), and a defeated sewer bond issue in Reno-Sparks, has revealed information that seems to indicate that urban area residents within Sierra Pacific's service area would prefer a "no growth" policy. The inherent conflict in this attitude is that the availability of continuous and reliable energy, as an expectation taken for granted, facilitates an environment in which growth can take place. Rural residents seem to lack these conflicting attitudes, a fact that has been well illustrated by the extremely small turnouts at public meetings conducted by the applicant in the various rural communities in northern and northeast Nevada.

Regional - At the present time there is no documentation of any regional attitudes or expectations of powerline development.

National - Same as the regional description.

CORRIDOR CONSTRUCTION COSTS

Discussion of the effect or impact of constructing a transmission line on the social and economic fabric within Sierra Pacific's primary load center and on the communities and counties along the various transmission line routes would not be complete without discussing the impact of the cost of constructing such a project. Since Sierra Pacific Power Company is a utility, most costs incurred are "pass on" costs to its customers. Although the impacts of the line are wide spread, it is Sierra's customers within its service supply area that incur the bulk of the cost of construction of the proposed 230/345 kv transmission line and substation. Table III-9, below, delineates these construction costs (see, also, Table H-4, p. 255). Total added per customer costs can be calculated based on amortization techniques. In this way a more realistic look at "pass on" costs can be presented. For the four corridors, per customer cost are:

Corridor		Total Added Per Customer Cost
O'Neil Basin	-	$31.00
Highway	-	36.00
Adobe Range	-	32.00
Metropolis	-	33.00

Amortization calculations based on 116,000 Sierra Pacific customers; 50-year life of project; 11.5 percent interest cost on borrowed capital.

Table III-9: Corridor Comparison of Construction Costs; Private Land Needed for Right-of-Way, and Estimated Added Tax Revenues

Corridor	Total Line Miles	Cost of Construction[1/] Millions $	Easement Requirement needed from Private Land as % of Total Line Miles	Total Estimated Added Tax Revenues to Counties[2/]
O'Neil Basin	286	31.5	33%	188,180
Highway	360	36.7	52%	247,276
Adobe Range	315	32.8	51%	211,891
Metropolis	322	33.2	48%	217,546

1/ Cost of construction calculated from figures submitted by Sierra Pacific Company: $90,700 per mile in flat terrain, $105,000 per mile in rugged terrain. See Appendix H Table H-5 indicating by county by corridor estimates of construction costs. Substation costs were added to each corridor because of common segments. Substation costs: 3.5 million. Valmy (new) Hunt (addition).

2/ Estimated tax revenues based on a 1977-78 assessed valuation of $25,000 per line mile x appropriate county tax rate. See Table III-8 delineating estimated tax revenues by individual counties within corridors.

These figures indicate that each customer within Sierra Pacific's service area would incur an added yearly cost between $31 to $36 each year for 50 years depending on which corridor is selected. The cost difference between corridors is in reality relatively insignificant on a per customer basis because: (1) with the addition of more Sierra Pacific customers the added yearly cost increase per customer would decrease, as there would be more customers to pay off a fixed rate; (2) inflation would dampen the effect of current debts over time; and (3) positive real disposable income changes would decrease the impact of fixed debts.

VISUAL RESOURCE

INTRODUCTION

Impacts on the visual resource associated with transmission line construction involve land form alteration, vegetation removal, and the introduction of tower structures and their associated components as intrusions on the natural scenery. By comparing the degree of contrast of these proposed activities in each corridor to the existing landscape character and to the quality of the visual resource, the degree of visual impact was assessed. This procedure, the Visual Contrast Rating System, was applied to determine the amount and the degree of visual impact on the proposed and alternative routes. It is suggested that the reader refer to Appendix I, p. 263, for familiarization with the visual contrast rating process.

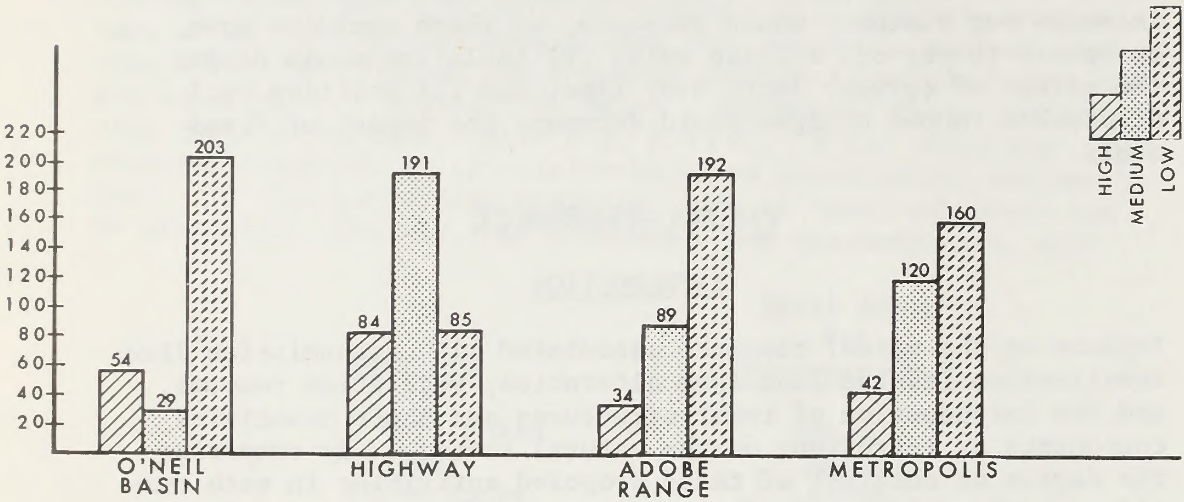
Areas that had potential for the highest visual contrast (the foreground zones where the proposed or alternative routes would be viewed from key observer positions) were delineated. Each of these areas were then rated, using the contrast rating system to determine the level of visual impact that would be created due to the introduction of a power transmission line and associated construction.

The following, Figure III-7 represents the number of miles of each corridor traversing the three levels of visual impact: high, medium, and low. These areas are also shown on the Visual Resource Map, p. 91 .

O'NEIL BASIN CORRIDOR

The first 10 miles of corridor from the Oreana substation through Sacramento Canyon would result in a high degree of visual impact. This is due primarily to the amount of contrast created by exposure of lighter-colored subsurface soils and landform alterations associated with road construction and tower site leveling. Shiny aluminum towers and other reflective hardware would also add to the high amount of visual contrast.

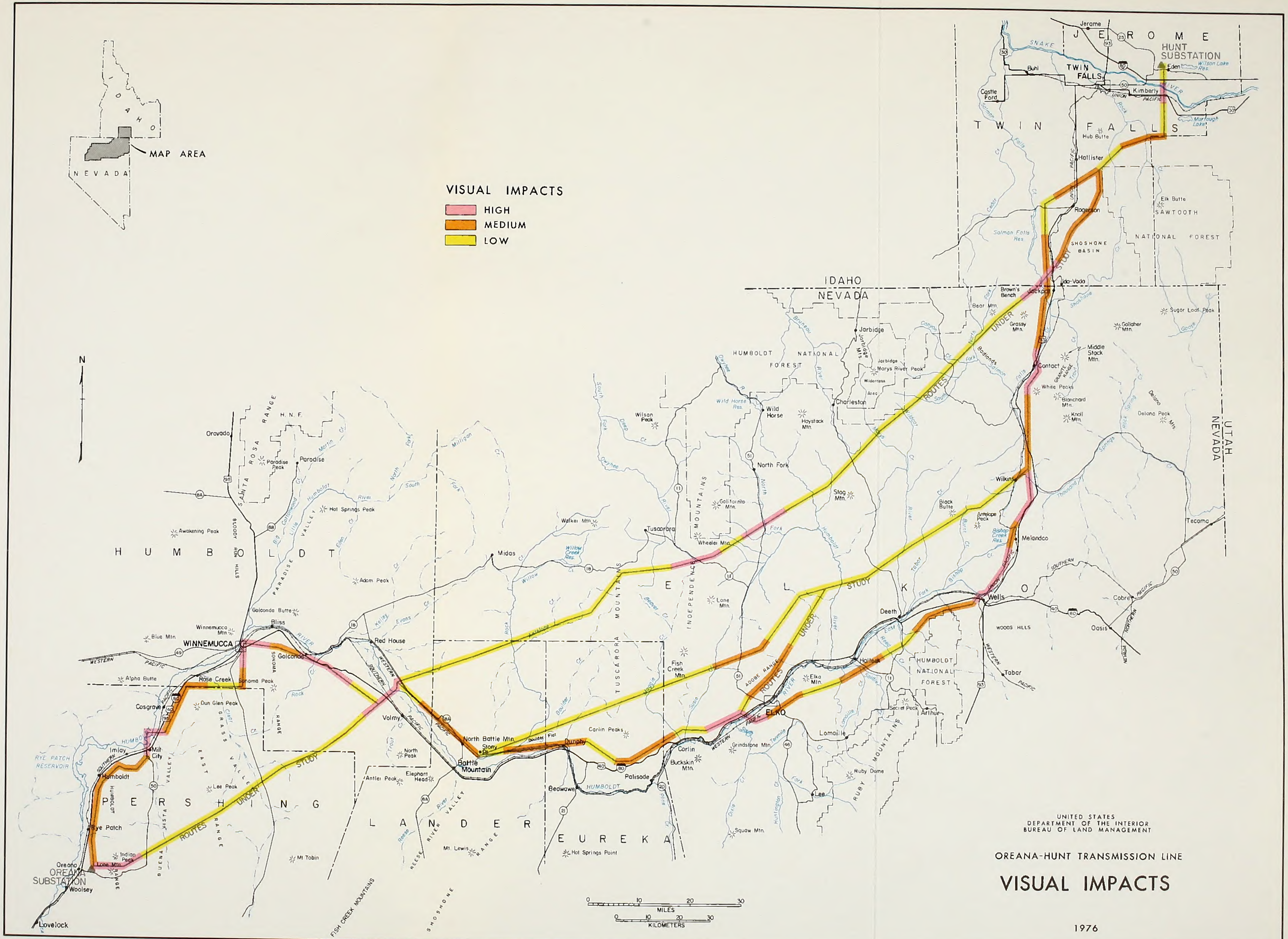
FIGURE III-7 DEGREE OF VISUAL IMPACT



For approximately the next 50 miles the corridor is in a low visual impact area as it traverses Buena Vista Valley, the lower elevations of the East Range and Pleasant Valley.

The corridor enters another high impact area as it crosses I-80 and the Southern Pacific and Western Pacific Railroads between Golconda and Battle Mountain. The contrast associated with this area exists primarily due to reflection of towers and conductors. Contrast as a result of road access and tower site leveling would be at a minimum in this area due to the relative flatness of the area.

For the following 60 miles, the corridor enters another low visual impact zone until it enters two sectors of high visual impact, each approximately 10 miles in length, crossing State Routes 11 and 51 to the south and east of the Humboldt National Forest. A 230 kv transmission line constructed in these two sections would result in very noticeable intrusion due to land alteration (from road and tower site construction), silhouetting of towers on the horizon line, and the reflection qualities of aluminum towers during certain times of the day. Vegetation removal would also create a noticeable degree of visual contrast because of change in the elements of color and form. The next 65 miles returns to a low visual impact zone until the corridor crosses State Route 93. Impacts associated with this crossing would be similar to those mentioned in the crossing of I-80: reflection of aluminum towers and conductors during certain times of the day and the opportunity for the actual transmission



VISUAL IMPACTS
HIGH
MEDIUM
LOW
MAP AREA
IDAHO
NEVADA
HUNT SUBSTATION
OREANA SUBSTATION
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREANA-HUNT TRANSMISSION LINE
VISUAL IMPACTS
1976

line to be viewed from Highway 51. Some contrast due to vegetation removal, roads, and tower site construction would also add to the high degree of visual impact in this area.

For the following 19 miles, the corridor enters an area of medium visual impact. Although the degree of visual disturbance due to contrast would not be as critical as in those areas rated as high, some impact can be expected from reflection of towers and minimal road and site disturbance because of subsurface lighter soil exposure and land form alteration.

The corridor re-enters a low visual impact zone as it rounds the northwest corner of the Sawtooth National Forest, crossing Cottonwood Creek before returning to approximately 10 miles of medium visual impact. Contrasts in this area would be evident from tower and conductor reflectivity, and some tower and road construction activity. Changes in the natural color and land form elements during construction would strengthen the degree of visual discord.

The remainder of the corridor would result in a low degree of visual impact except for approximately 4 miles associated with the crossing of the Snake River Canyon. A transmission line across this scenic canyon would create a high degree of contrast to the existing rugged landscape character regardless of where the impacts may be viewed from: outside of the canyon looking in, or inside the canyon looking up and out. These impacts are generally related to the towers and conductors rather than to road access and tower site development. The resultant tower location and conductor stretched across the canyon would create a high degree of visual disharmony due to the introduction of man-made forms and colors which would not blend into the natural features of the environment.

HIGHWAY CORRIDOR

As shown in Table III-10, p. 159, the strongest degree of cumulative visual impact would occur in this corridor. The basic reason for this is that it practically parallels I-80 and State Route 93 for its entirety and crosses major transportation routes 11 times between the Oreana and Hunt substations. The 84 miles designated as having a high degree of contrast are generally those associated with the crossing of the roadways and areas that have a high visual value where the corridor would be located in the immediate foreground zone. Most impacts in this corridor would result from the introduction of unnatural-appearing structures--the towers and conductors--and their color and reflective properties. Some road development along the corridor and individual tower sites would likewise create noticeable contrast. This would be most obvious in areas of steeper topography where road cuts and fills and tower site leveling would be necessary and in most cases noticeable.

Two areas where the Highway Corridor would cause significant visual impacts are: a location associated with the Mill City turn-off approximately 30 miles above the Oreana substation, and an area just north of the city limits of Winnemucca. In both of these areas the Highway Corridor route would cross I-80 two times within 3 miles. This has the possibility of having a significant adverse visual effect upon the I-80 traveler who would be observing the crossing of a 230 kv transmission line two times within a very short distance in two separate locations.

The 191 miles designated as having a medium amount of visual impact in this corridor are generally those areas not in the immediate foreground visual zone. However, these areas would still attract attention, although to a lesser degree, and the presence of man-made structures and associated construction would dominate the natural landscape.

ADOBE RANGE CORRIDOR

In terms of degree of overall adverse visual impact, the Adobe Range Corridor would have the least amount compared to all the others, with only 34 miles rating as high. All sections of the Adobe Corridor have been discussed in either the O'Neil Basin Corridor or Highway Corridor sections with the exception of an area approximately 12 miles in length to the east of Swales Mountain and crossing State Route 51 and a few miles prior to tying back into the Highway Corridor along State Route 93. Both of these areas are rated as having a medium degree of impact if a power transmission line is located here. This is due to the contrast of the towers with the natural character of the area and, to a limited degree, to road construction. Some vegetation removal at the Highway 51 crossing would cause a noticeable impact on either side of the road for some distance.

METROPOLIS CORRIDOR

All 42 miles of high visual impact that occur in this corridor have been addressed in the other corridor discussions. The only area unique to this corridor is a section approximately 30 miles in length between the Highway and Adobe Corridors. In this area 15 miles have been rated as having a medium degree of visual impact as the line would cross Highway 51 and several miles of the Ruby Valley. Visual impacts would result from the introduction of man-made materials and colors that would cause noticeable, although not severe, contrast to the existing landscape character. Some contrast due to soil manipulation associated with access roads and tower sites would also be evident in this location.

HISTORICAL / ARCHEOLOGICAL VALUES

DIRECT IMPACTS UPON HISTORICAL/ARCHEOLOGICAL VALUES

Wherever construction activity occurs, the potential for damage to archeological sites and artifacts exists. Historical/archeological sites are subject to partial or complete destruction by these construction activities.

INDIRECT IMPACTS UPON HISTORICAL/ARCHEOLOGICAL VALUES

COLLECTORS

Crews may collect cultural material along the corridor during ground survey, tower construction, line stringing, inspection, and maintenance operations.

When construction requires the opening of new roads or "jeep trails" in previously inaccessible country, increased human traffic is inevitable. Collectors in Nevada are known to partially or totally destroy surface archeological sites when access is easy by off-road vehicles.

AESTHETICS

The total transmission line (towers, conductors, and wires) may be an impact in certain locations, due to an introduction of "visual, audible, or atmospheric elements that are out of character" with the historical/archeological setting. (See 36 CFR 800.9 (c).)

HISTORICAL/ARCHEOLOGICAL IMPACTS - O'NEIL BASIN CORRIDOR

HUMBOLDT RANGE

Direct impacts to cultural values may result in Sacramento Canyon, located in the Humboldt Range, if strategic placement of construction activities is not practiced. The mere presence of the transmission line results in a secondary impact, as it will tend to be out of character with the historical/archeological setting.

UNSURVEYED 27-MILE SEGMENT

Direct and indirect impacts upon the unknown cultural material in this unsurveyed portion is expected due to line construction (see Cultural Resources Map, p. 99).

HISTORICAL/ARCHEOLOGICAL IMPACTS - ADOBE AND METROPOLIS CORRIDORS

Direct and indirect impact to a possible 150-plus sites is expected if either the Adobe or Metropolis Corridors is selected for the powerline right-of-way.

HISTORICAL/ARCHEOLOGICAL IMPACTS - HIGHWAY CORRIDOR

The Highway Corridor is expected to have the highest direct and indirect impact upon the historical/archeological values, due to the much higher probability of cultural material being located in proximity to the Humboldt River.

ACCIDENTS & CATASTROPHES

All four corridors have similar public safety impacts. Transmission lines are hazardous because they transmit electrical power at high voltages. The lines are designed to meet standards set by the National Electric Safety Code, established to reduce safety hazards to an acceptable level.

Potential hazards resulting from the use of construction vehicles and equipment include: traffice hazards on public roads in construction areas and the possibility of starting rangeland fires. Flammable liquids and potentially dangerous equipment and materials would in the storage yards.

Once the transmission line has been constructed, there would be numerous potential hazards to the integrity of the line and to public safety: earthquakes, floods, lightning, and line damage and injury resulting from aircraft that may fly too low.

All four corridors are equally vulnerable to earthquake damage. The corridors pass through seismic zone 3 (possible major earthquake damage) in western Nevada and through seismic zone 2 (possible moderate damage) in northeastern Nevada and southern Idaho. The demarcation line between the two zones passes north-northwest through the Battle Mountain area. Tower damage and line disruption could result from major earthquakes and shifts along fault lines in the immediate vicinity of the transmission line. The adverse impacts would be: (1) widespread temporary power outages in homes, businesses, and industry, or (2) other transmission lines in the service area having an increased load while the damaged line was being repaired. (See Seismic Risk Map, p. 35 .)

Flood potential exists along all four corridors. Many small streams may flood during or after thunderstorms and as a result of spring snowmelt. Floods great enough to erode soils around a transmission tower anchor and guy wires, causing the tower to topple, would be unusual, but could occur in alluvial areas near the Humboldt River unless towers are designed to withstand this possibility. The Metropolis and Highway Corridors between Stony Point (near Battle Mountain) and Dunphy are susceptible to flooding. Tower failure would disrupt service until repairs could be completed. The electric current would automatically be shut off should any flood damage occur to the line.

Lightning strikes on the transmission line during storms would be a hazard to humans or animals if they came in contact with, or were near the tower or guy wires at the precise moment and location of a strike.

The Federal Aviation Administration (FAA) has regulatory authority over the height of transmission towers close to airports. If the towers are 200 feet or higher above ground or water level at any location, a "Notice of Construction" must be filed with the FAA. None of the towers for the proposed line would reach that height. The line could be a hazard, however, to any pilot who fails to observe FAA regulations on low-altitude flying, or to crop dusters near the agricultural areas.

The transmission line would pose an "impact" hazard (flying into the powerline) to raptors and waterfowl in specific areas. Raptors may use the towers for perches and have been known to nest on the tower structures. Because of the wide separation of the phase lines, there is little probability of electrocution of raptors. The transmission line poses little threat to human safety from electrocution.

ECOLOGICAL INTERRELATIONSHIPS

The significant impacts caused by transmission line construction and operation on some key ecological interrelationships will be discussed in conjunction with the four matrices which have been developed. One matrix was developed for each of the four corridors: O'Neil Basin, Highway, Adobe Range, and Metropolis (see Figure III-8, p. 152). Each matrix consists of two identical axes containing 11 major headings, forming columns and rows. At the intersection between any given column and row, it is shown whether an adverse impact, a beneficial impact, or no impact would result on the selected ecological interrelationship from line construction or operation. A relative significance is attached to each impact; a highly adverse impact is indicated by a -H, a moderately adverse impact by a -M, and a slightly adverse impact by a -S. Beneficial impacts are indicated by corresponding positive letters. When both adverse and beneficial impacts would occur, a ± is shown (for simplicity, these were not quantified). Zero indicates little or no impact. A high impact on

IMPACTS ON ECOLOGICAL INTERRELATIONSHIPS

O'NEIL

	CLIMATE/AIR QUALITY	GEOLOGY	SOIL	HYDROLOGY	VEGETATION	WILDLIFE	LAND USE	SOCIO-ECONOMICS	RECREATION	CULTURAL	VISUAL
CLIMATE/AIR QUALITY	-M	O	-H	O	O	O	O	O	-M	O	-M
GEOLOGY		O	O	O	O	O	O	O	-M	O	-H
SOIL			-H	-M	-H	-M	-S	O	-S	O	-H
HYDROLOGY				O	O	-M	-S	+M	-M	O	-M
VEGETATION					-H	-H	±	O	-S	O	-H
WILDLIFE						±	±	±	±	O	O
LAND USE							+S	+H	±	O	-S
SOCIO-ECONOMICS								+H	±	-S	±
RECREATION									-H	±	±
CULTURAL										O	±
VISUAL											O

HIGHWAY

	CLIMATE/AIR QUALITY	GEOLOGY	SOIL	HYDROLOGY	VEGETATION	WILDLIFE	LAND USE	SOCIO-ECONOMICS	RECREATION	CULTURAL	VISUAL
CLIMATE/AIR QUALITY	-S	O	-H	O	O	O	O	-M	-S	O	O
GEOLOGY		O	O	O	O	O	O	O	O	O	-M
SOIL			-H	-M	-M	-S	-M	O	O	O	-M
HYDROLOGY				O	O	-S	-S	+M	-M	O	-S
VEGETATION					-H	-M	±	O	O	O	-M
WILDLIFE						±	±	±	±	O	O
LAND USE							+S	+H	±	O	-M
SOCIO-ECONOMICS								+H	±	-H	±
RECREATION									-S	±	±
CULTURAL										O	±
VISUAL											O

ADOBE

	CLIMATE/AIR QUALITY	GEOLOGY	SOIL	HYDROLOGY	VEGETATION	WILDLIFE	LAND USE	SOCIO-ECONOMICS	RECREATION	CULTURAL	VISUAL
CLIMATE/AIR QUALITY	-S	O	-H	O	O	O	O	-S	-M	O	-S
GEOLOGY		O	O	O	O	O	O	O	-S	O	-M
SOIL			-H	-M	-H	-S	-S	O	-S	O	-H
HYDROLOGY				O	O	-M	-S	+M	-S	O	-S
VEGETATION					-H	-H	±	O	O	O	-H
WILDLIFE						±	±	±	±	O	O
LAND USE							+S	+H	±	O	-M
SOCIO-ECONOMICS								+H	±	-S	±
RECREATION									-M	±	±
CULTURAL										O	±
VISUAL											O

METROPOLIS

	CLIMATE/AIR QUALITY	GEOLOGY	SOIL	HYDROLOGY	VEGETATION	WILDLIFE	LAND USE	SOCIO-ECONOMICS	RECREATION	CULTURAL	VISUAL
CLIMATE/AIR QUALITY	-S	O	-H	O	O	O	O	-M	-S	O	-S
GEOLOGY		O	O	O	O	O	O	O	-S	O	-M
SOIL			-H	-M	-H	-S	-M	O	-S	O	-H
HYDROLOGY				O	O	-S	-S	+M	-S	O	-S
VEGETATION					-H	-H	±	O	O	O	-H
WILDLIFE						±	±	±	±	O	O
LAND USE							+S	+H	±	O	-M
SOCIO-ECONOMICS								+H	±	-S	±
RECREATION									-M	±	±
CULTURAL										O	±
VISUAL											O

-H HIGHLY ADVERSE
-M MODERATELY ADVERSE
-L SLIGHTLY ADVERSE
O NO IMPACT

+H HIGHLY BENEFICIAL
+M MODERATELY BENEFICIAL
+L SLIGHTLY BENEFICIAL
± ADVERSE & BENEFICIAL

FIG. III-8

one interrelationship has not been ranked in importance relative to a high impact on another interrelationship because a subjective judgment largely dependent on personal perspective would be required.

The various components which comprise the 11 major headings were not separately listed so that the matrices would be of manageable size. (See the Key Ecological Interrelationships Matrix, Figure II-6, p. 102, for a listing of the separate components.) Each of the components under a given heading was considered when analyzing the level of impacts under that heading for the matrices in Chapter III. In cases where the components of a major heading interact with each other, the heading is shown as being interrelated with itself (example: soil vs. soil when relating soil fertillity to soil erosion). Both direct impacts (due to line construction) and indirect impacts (due to greater power availability from line operation) have been analyzed in conjunction with their magnitude, duration, intensity, and incidence. The discussion of the adverse and beneficial impacts is meant to highlight the more important and severe impacts.

The matrices are two-dimensional in that they show the level of impact on the relationship between only two headings at a time. The matrices can be used to show the multi-dimensional web-like nature of the impacts by relating the impacts under several different headings.

The following example will illustrate how to use the matrices. The soil vs. climate/air quality interrelationship was judged to be a highly adverse impact on all four corridors for two main reasons: (1) the use of construction vehicles and equipment will disturb the structure of the soil surfaces making them more susceptible to erosion; and (2) the new access roads or new roads needed for line maintenance would allow an increase in vehicular traffic. This soil disturbance, combined with the high winds common to the study area, will add significantly to the fugitive dust problem within the corridors. This impact on soil/air quality would be of high intensity during construction, and would continue over the long-term, due to vehicular traffic over new roads. This impact would, however, be concentrated along the right-of-way and in access road areas.

The following discussion of some of the more important impacts will be multi-dimensional and focused on cause-and-effect relationships. Impacts on three major spheres will be analyzed: (1) the human environment, (2) the biological communities (excluding man), and (3) the physical environment.

The proposed transmission line construction will cause soil disturbance in the storage yards, on the access roads, and along the right-of-way. The effects will be: (1) some stream sedimentation and greater erosion caused by overland flow (see soil vs. hydrology, a moderately adverse impact within all corridors), (2) greater wind erosion, (3) uprooting of some vegetation (soil vs. vegetation, a highly adverse impact in all corridors except the Highway, where it would be a moderately adverse impact), (4) a reduction in wildlife food and cover (vegetation vs. wildlife, a moderately adverse impact in the Highway Corridor, a highly adverse impact in the others), and (5) the human visual experience will be degraded by the soil and vegetative scars (soil vs. visual and vegetation vs. visual, both impacts are moderately adverse for the Highway and highly adverse for the other three corridors). The increased erosion and vegetative disturbance would be limited to the areas of soil disturbance. Stream sedimentation would occur downstream from disturbed areas. The increased erosion conditions could last for years, or until natural revegetation or re-seeding had been accomplished. Revegetation by native plant species could be exceedingly slow, if at all, because of the disturbance to the surface soil structure. Some of the more fertile soils presently capable of supporting plant life would become more susceptible to wind and water erosion (see soil vs. soil, referring to a highly adverse impact in the right-of-way and access road areas, regardless of corridor). The less fertile soils left behind may not be able to support vegetation as before. The removal of vegetation through soil disturbance would set back plant succession and allow undesirable invader species to become established. This impact (vegetation vs. vegetation) is a highly adverse impact in all corridors. The low, erratic precipitation would make revegetation difficult in many disturbed areas. All of the above mentioned direct impacts, resulting from construction activities and use of new and existing access roads, are related to soil disturbance. These impacts are least in the Highway Corridor.

The operation of the proposed transmission line will have long-term beneficial impacts on social-economic and land use interrelationships. These impacts are related to additional power availability and not to line placement. With the exception of social-economics (the social well-being component) vs. air quality and cultural components, the impacts are the same for the interrelationships between social-economics and the other headings in all corridors.

The additional power will have a population growth-inducing impact which will increase employment opportunities in the service industries and retail businesses. Since population in Sierra Pacific Power Company's service area is projected to increase, the impact of the line on the population/employment/social well-being interrelationship is judged to be a highly beneficial impact.

Social-economics vs. land use is a highly beneficial impact, because putting the land to the highest and best use is a social-economic stimulant. Additional power will permit irrigation of new cropland, creating more income and employment and contributing to the social well-being of the agricultural and food processing sectors of the economy.

Secondary impacts which may result from irrigation of new cropland must be considered. Thirty thousand acres of undeveloped land between Lovelock and Battle Mountain, Nevada, could potentially become irrigated cropland if power is made available from transmission line construction (see Chapter II and III, Land Uses, p. 60 and 124). Irrigation of these potential new croplands could result in a degradation of the quality of water flowing into Rye Patch Reservoir and ultimately into the Humboldt Sink. Development of an additional 30,00 acres of cropland would be incremental, due to the fact that national resource lands are interspersed with private lands and the suitable acreages are scattered over a large area.

For purposes of analyzing the secondary impacts on water quality, Humboldt Marsh vegetation, and aquatic habitats, the extreme case will be presented-that all 30,000 acres would be put into production in one year. The availability of additional electrical power would be a prime factor in the development of these acreages.

Any new croplands would be irrigated from the available groundwater supplies. Irrigation of these 30,000 acres is based on utilization of 50 percent of the perennial yield of any given groundwater reservoir (see Chapter II, Land Uses, p. 60). Therefore, it is estimated that no groundwater tables would be lowered due to these additional pumping loads.

The adverse impacts on water quality and associated biota would result from the leaching of salts and the surface runoff and leaching of herbicides and pesticides from the newly-irrigated lands into the irrigation return water flows. At this time, quantification of herbicide/pesticide impacts is not possible, since there would be numerous crops in rotation utilizing a variety of herbicides and pesticides.

The Humboldt Wildlife Management Area, located at the end of the Humboldt River system (the Humboldt Sink), is comprised of three marsh units: Toulon, Upper Humboldt Lake, and Lower Humboldt Lake. Water supply to the Humboldt Sink comes from the return flows from irrigated lands of Lovelock Valley, and Limited flows from the Humboldt River. Water enters the marsh through the Humboldt River and from the Army and Toulon drains. As more lands are put under cultivation more saline water enters the marsh. Data on water quality and salt concentrations entering the marsh is limited. Salinity measurements in October 1973, yielded 2.5 tons per acre-foot of water entering the Toulon drain, 4.5 tons per acre-foot entering the Army drain, and 1.5 tons per acre-foot entering from the Humboldt River. An average of 9.5 tons of salts per acre-foot of return drainage flow can be anticipated from newly-irrigated croplands. (Humboldt River Upstream Storage Project, Vol. II, June 1974.)

For potatoes, the consumptive crop water requirement is estimated at a minimum of 2 acre feet of water annually per acre of crop. ("Forecast for the Future-Agriculture", Report No. 8, Division of Water Resources, Nevada.) About 32 percent of the irrigation water used is ultimately returned to nearby surface waters. (EAR-Agricultural Development Program, Lower Snake River Plains of Idaho, Jan. 1976, p. III-31.)

30,000 acres X 2 acre-feet/acre = 60,000 acre-feet of water
60,000 acre-feet X 32 percent return flow = 19,200 acre-feet of return flow

19,200 acre-feet of return flow at an average of 9.5 tons of salt per acre-foot of water = 182,400 tons of additional salts during the first year.

As the lands are irrigated year after year, and the salts are continuously leached into drainage ditches (which greatly reduces salts leaching into the water table), the salt concentrations would steadily diminish from the initial average of 9.5 tons per acre-foot to as low as 2.5 tons for older, established irrigated land. (Humboldt River Upstream Storage Project, Vol. II, June 1974.) The return flows from 30,000 acres, widely dispersed between Lovelock and Battle Mountain (see the Agricultural Potential Map, p. 64), would be divided between Toulon and Army drains and the point where the Humboldt River enters the marsh. Therefore, the salt concentrations would be different at each point, depending on the water volume at those points. Current data is not sufficient to determine accurately how quickly additional concentrations of salts would adversely affect marsh vegetative growth.

Salt concentrations of 6,000-9,000 ppm (8.5-13 tons per acre-foot) strongly inhibit growth of sego pondweed. Cattail growth is inhibited by salt concentrations of 4,900 ppm (7 tons per acre-foot). Alkali bulrush, the most salt-tolerant of the emergent vegetation, can grow well in concentrations up to 10 tons of salt per acre-foot; adult plants tolerate concentrations as high as 17-19 tons per acre-foot. Widgeon grass, the most abundant submergent plant, has the highest salt tolerance. High salt concentrations are unlikely to become a limiting factor in growth of sego pondweed. Cattail growth is inhibited by salt concentrations of 4,900 ppm (7 tons per acre-foot). Alkali bulrush, the most salt-tolerant of the emergent vegetation, can grow well in concentrations up to 10 tons of salt per acre-foot; adult plants tolerate concentrations as high as 17-19 tons per acre-foot. Widgeon grass, the most abundant submergent plant, has the highest salt tolerance. High salt concentrations are unlikely to become a limiting factor in this plant's growth because concentrations greater than 9,000 ppm (13+ tons per acre-foot) are required by widgeon grass for good growth. Widgeon grass is an important duck food and is highly used by coots. Most of the marsh vegetation can tolerate higher salt concentrations if some water circulation is maintained in the marsh units.

The emergent vegetation can be temporarily flooded out when water levels rise due to additional water being released from Rye Patch Reservoir. Submergent vegetation is not affected by high water. Marsh habitat decreases in years of low water on the Humboldt River system, but the drying allows for soil aeration which stimulates plant growth when water levels again rise. Drying also keeps marsh vegetation from becoming over-abundant.

Irrigation of 30,000 additional acres from groundwater sources could contribute sizeable return flows to the lower Humboldt River system and may reduce the likelihood of low-water occurrences in the marsh units. As the newly irrigated lands are used and begin to leach a smaller concentration of salts, the additional return water flows would have a flushing effect on the marsh units greater than they would in the first year of development.

The recreational experience, as it relates to the other 10 headings, would be impacted by the presence of the transmission line. Only one of the interrelationships, recreation vs. recreation in the O'Neil Basin Corridor, is judged to be a highly adverse impact. The water-related and non-water-related sports enthusiasts will have their primitive experience lessened to a greater degree in this corridor than in the others by the presence of the line. Recreation vs. recreation has a moderately adverse impact in the Adobe Range and Metropolis Corridors and a slightly adverse impact in the Highway Corridor, where the primitive experience would be difficult to achieve under any circumstances. Another reason for this high to low spread on these impacts would be the degree of scenery impairment for the hunter, fisherman, or hiker out in the back country actively sightseeing. The O'Neil Basin Corridor has higher scenic qualities than the other corridors, so the presence of a transmission line and associated soil and vegetative scars would be a greater intrusion and cause more scenic quality impairment. The impacts on recreation, as related to all of the other 10 headings, are greatest in the O'Neil Basin Corridor.

The impacts of transmission line presence on the interrelations ship between the visual experience and the other 10 headings are significant. As previously explained, soil and vegetative scars will degrade the visual experience. Transmission line towers and land scars crossing over scenic topographic features reduce one's visual enjoyment of these features (see visual vs. geology). For the O'Neil Basin Corridor this is a highly adverse impact because of the greater topographic relief. This impact is moderately adverse for the other corridors. Changes in land use patterns, such as increased cultivation due to additional available power, would adversely impact the visual experience by changing small patches of land from the natural character of the surrounding terrain (see visual vs. land use). Since cultivation is not dependent upon line location, the impact is the same for all corridors - moderately adverse. The impacts on the visual experience, as related to the 10 other headings, are greatest in the O'Neil Basin Corridor and least in the Highway Corridor.

Both adverse and beneficial impacts would result on the interrelationship between cultural resources and recreation. Any new access roads needed for transmission line maintenance would allow more recreationists to view cultural sites and discover new ones (a beneficial impact). Opportunity for vandalism and other irresponsible acts on these sites would also increase with additional access (an adverse impact).

TABLE III-10
SUMMARY OF MAJOR IMPACTS

	Air Quality	Soils and Watershed	Vegetation	Wildlife	Social-Economic
O'Neil Basin Corridor	Dust production from construction activities and subsequent use of access roads. Ambient air quality already exceeds standards for particulates in many areas. Corona and vehicular emissions not a problem.	ROW corridor crosses 176 miles of soils groups having severe erosion hazard susceptibility. Construction activities will disturb approximately 843 acres.	44 mi.-salt-desert shrub 174 mi.-northern desert shrub 26 mi.-grassland 14 mi.-woodland 8 mi.-riparian 18 mi.-cropland(Idaho) 178 mi. of new roads mostly through northern desert shrub.	97 miles-critical big game range 21 aquatic habitats 45 sage grouse complexes 14 critical raptor areas 207 miles-upland game habitat	Additional electrical supply will facilitate population growth within the service area, especially Reno-Sparks.
Highway Corridor	Similar to O'Neil Basin Corridor.	ROW corridor crosses 112 miles of soils groups having severe erosion hazard susceptibility. Construction activities will disturb approximately 547 acres.	107 mi.-salt-desert shrub 187 mi.-northern desert shrub 20 mi.-grassland 2 mi.-woodland 26 mi.-riparian 18 mi.-cropland(Idaho) 14 mi. of new road mostly through northern desert shrub.	96 miles-critical big game range 22 aquatic habitats 18 sage grouse complexes 12 critical raptor areas 157 miles-upland game habitat	Same as above.
Adobe Corridor	Similar to O'Neil Basin Corridor.	ROW corridor crosses 129 miles of soils groups having severe erosion hazard susceptibility. Construction activities will disturb approximately 715 acres.	66 mi.-salt-desert shrub 187 mi.-northern desert shrub 27 mi.-grassland 10 mi.-woodland 5 mi.-riparian 18 mi.-cropland(Idaho) 109 mi. of new road mostly through northern desert shrub.	114 miles-critical big game range 13 aquatic habitats 12 sage grouse complexes 22 critical raptor areas 157 miles-upland game habitat	Same as above.
Metropolis Corridor	Similar to O'Neil Basin Corridor.	ROW corridor crosses 147 miles of soils groups having severe erosion hazard susceptibility. Construction activities will disturb approximately 641 acres.	66 mi.-salt-desert shrub 182 mi.-northern desert shrub 31 mi.-grassland 16 mi.-woodland 5 mi.-riparian 18 mi.-cropland(Idaho) 74 mi. of new road mostly through northern desert shrub.	132 miles-critical big game range 16 aquatic habitats 12 sage grouse complexes 18 critical raptor areas 131 miles-upland game	Same as above.

	Land Use	Recreation Activities	Archeological/Historical Values	Visual Resources
O'Neil Basin Corridor	(a) Land use impacts common to all corridors include: (1) commitment to land to future utility corridor uses, and (2) development of agricultural land. (b) Development of new roads has the possibility of bringing more people into this relatively unspoiled area.	Highest impact to recreation activities of any corridor. Represents an introduction of an overhead intrusion to an area removed from man's present activities. Extended use recreation in visits per year is the highest of all corridors.	The least impact to cultural resources is expected in this corridor. Majority of this corridor has had a Cultural Resources(BLM Class III) Reconnaissance performed by a qualified archeologist.	54 mi.-high visual impact 29 mi.-medium visual impact 203 mi.-low visual impact Parallels an existing transmission line ROW along a minor part of the corridor, this being in a low visual impact zone.
Highway Corridor	Same as (a) above.	Will impact activities associated with the Humboldt River; however, numerous intrusions exist including railroad, highways, powerlines, etc. Corridor parallels an existing transmission line ROW.	Highest direct and indirect impacts to cultural values is expected in this corridor because of its close proximity to the Humboldt River. This corridor has not been inventoried (Cultural Resources Reconnaissance) for cultural resources.	84 mi.-high visual impact 191 mi.-medium visual impact 85 mi.-low visual impact Parallel existing transmission line ROWs along a majority of the corridor.
Adobe Corridor	Same as (a) above.	Similar in part to the Highway Corridor. Within Elko County, significant day-use recreational activity will be impacted.	Similar, but to a lesser degree, to the Highway Corridor as a lesser amount of the ROW is in close proximity to the Humboldt River. Only one segment of this corridor has been inventoried for cultural resources.	34 mi.-high visual impact 89 mi.-medium visual impact 192 mi.-low visual imapct Parallels existing transmission line ROWs along a portion of corridor, when in the proximity of travel zones (medium or high visual impact zones).
Metropolis Corridor	Same as (a) above.	Similar in part to the Highway Corridor as to recreational uses along the Humboldt River. Similar, but to a lesser degree, to the Adobe Corridor in Elko County as it affects day-use recreation.	More probable impact to cultural resources than the Adobe Corridor; however, less than the Highway Corridor. Only one segment of this corridor has been inventoried for cultural resources.	42 mi.-high visual impact 120 mi.-medium visual impact 160 mi.-low visual impact Parallels existing transmission line ROWs along a portion of corridor, when in the proximity of travel zones (medium or high visual impact zones).

IV

MITIGATING MEASURES

IV

MITIGATING MEASURES

INTRODUCTION

If the proposed project is approved, federal, state and local government agencies having jurisdiction in the impact area would issue rights-of-way and other required permits and/or grants to allow implementation of those portions of the proposed construction crossing lands under their respective administration. The impact area includes the actual right-of-way from Oreana, Nevada, to Hunt, Idaho via the selected corridor and, for social-economic factors, the Sierra Pacific Power Company's service area. Some portions of construction, such as staging areas, storage yards, and portions of access roads may extend beyond the corridor limits. (Refer to the Study Area Map and the Service Area Map, pp. 7 and 80 .) Involved governmental agencies are obligated under statutes, regulations, and specific contractural requirements to specify stipulations intended to mitigate environmental impacts. These stipulations specify particular physical actions required of the applicants and contractors for compliance.

If a decision is made to construct the proposed transmission line, many of the identified potential impacts would be mitigated by means of the following general measures:

(a) Specific measures to protect the environment (including both public (BLM) and private lands) in regard to the design, construction, and maintenance of the line will be incorporated as stipulations to BLM grants of right-of-way and, for new access roads, to special land use permits. BLM personnel (the Authorized Officer and/or his designated area representative) will monitor construction of the line to insure compliance with these stipulations.

The Authorized Officer (AO) will be the District Manager of the respective District in which construction activity is taking place. The AO will appoint a Compliance Officer for his respective District, and will delegate to the Compliance Officer full authority to interpret and enforce stipulations included in the right-of-way grant. This delegation will be clearly communicated to the applicant at a pre-construction meeting.

If a situation should arise where the Compliance Officer(s) feels that the terms of the right-of-way grant are being violated and immediate action is necessary, he has the authority to terminate construction activity until adequate corrective measures are taken. Each Compliance Officer will keep his District Manager informed concerning the progress of the project and any problems which may arise. (Source: BLM Instruction Memorandum No. NSO 76-171, July 15, 1976.)

(b) Pre-construction conferences will be held with representatives of Sierra Pacific Power Company, their specific construction contractors, the BLM, and other jurisdictional agencies. These sessions will serve to identify environmentally sensitive areas, and to explain the procedures and stipulations required to protect the environment. In addition, review of two documents, Environmental Guidelines, (Environmental Committee of the Western Systems Coordinating Council, 1971), and Environmental Criteria for Electric Transmission Systems, (U.S. Department of the Interior, U.S. Department of Agriculture, 1970), will be undertaken by the concerned parties to insure complete understanding and compliance therewith by Sierra Pacific Power Company and their respective contractors.

Mitigating measures for the potential impacts of the transmission line and access roads, to include all lands ownership, are listed in terms of the following:

1. Measures proposed by Federal agencies.
2. Measures proposed by state, county, and local agencies.
3. Applicant - committed measures.

MEASURES PROPOSED BY FEDERAL AGENCIES

BUREAU OF LAND MANAGEMENT

The BLM will require the applicant to comply with the following measures intended to mitigate potential impacts to the environment.

SOILS, WATERSHED, AND WATER QUALITY

Before any construction begins, the applicant will present a complete plan of operation to the Authorized Officer. (For the purposes of this discussion, Authorized Officer also refers to his designated area representatives.) The applicant shall agree to stipulations as to the location of tower sites, roads, and related facilities, and the construction and rehabilitation methods required to meet the conditions of the grant of right-of-way. The applicant must contact the respective District Manager and other responsible officials for a pre-construction conference to arrive at a mutual and complete understanding of the job, the surface protection measures to be taken, the inspections required, and the liaison and requirements pertinent to the transmission line construction. The proposed mitigation measures for the protection of soils and watershed deteriorated as a result of construction (as listed below) will be supervised by the Authorized Officer, who will monitor specific site procedures in instances where judgement is required for possible abridgement of stipulations.

BLM will require, at the discretion of the Authorized Officer, dust control measures (watering or graveling) within one mile of residences or other populated areas. Watering of roads will also be required prior to, and during, periods of heavy vehicular traffic in areas of fine-textured soils and in areas where the soil surface is disturbed below a depth of six inches. This will partially mitigate fugitive dust problems and problems of general soil disturbance.

BLM roads required for access by the applicant will be maintained and/or rehabilitated as necessary if utilization by heavy construction vehicles damages these roads.

New access roads required for construction of the transmission line will be built to pertinent standards as set forth in BLM Manual 9113; water bars and drainage structures will be constructed as deemed necessary by the Authorized Officer. Specifications for new roads will take into account the equipment that will be using the roads, particularly the heavy construction and line-tensioning vehicles. To the extent possible, new roads required for construction will be routed through areas where excavation and fills are unnecessary or minimal in extent, to achieve grades which will allow passage of the required construction vehicles. These measures will partially mitigate impacts to soils and the visual resource. Water bars will conform to the specifications of the following table:

Slope Percent	Spacing of Water Bars
1% or less	400 feet
1% to 5%	300 feet
5% to 15%	200 feet
15% to 25%	100 feet
Greater than 25%	50 feet or less

Upon completion of construction, BLM will require that storage areas, access spurs, etc. no longer required for line construction and/or maintenance will be cleaned up, spoil piles smoothed, and water bars installed. These measures will mitigate some of the impacts to the soil and watershed and the visual resource. (Note: The applicant has indicated that the transmission line will be upgraded to 345 kv at some future date, requiring access to the right-of-way a second time for construction purposes. Therefore, initial deactivation of storage areas and some roads and trails will depend on the future needs of Sierra Pacific for access and on the judgement of the Authorized Officer.)

Soils removed from any area will be stockpiled for use during post-construction rehabilitation, where practicable.

Construction and maintenance activities will not be allowed during periods of weather-caused soil wetness.

All waste oil and petroleum products will be removed to a sanitary landfill which meets state and federal standards. BLM will require applicant to utilize portable chemical toilets during construction activities. No wastes of any kind will be disposed of into streams, stream beds, or onto the soil.

BLM will require culverts (or other environmentally protective measures, at the discretion of the Authorized Officer), to be installed at all live stream crossings along the access routes in order to reduce impacts to streams and the aquatic habitat. Additionally, no dry or intermittent drainage channels will be blocked with debris and no soil along roads and trails will be pushed into stream beds.

VEGETATION

In areas of natural grass and low brush cover, the need for roads or bladed trails is usually minimal, with the exception of areas of steep terrain. In these locations the natural ground cover will not be removed. Brush blades or back-blade techniques will be used in these areas. Cleared plant material will be chipped or shredded for use as mulch during the rehabilitation process.

Reseeding will be carried out in areas identified by the Authorized Officer. The applicant will provide for prompt scarification and seeding of disturbed areas which, in the opinion of the Authorized Officer, lend themselves to successful seeding. The seed mix (determined by BLM) will be provided and applied by the applicant in accordance with specific instructions and techniques prescribed by the Authorized Officer (see also Appendix E, p. 221). In addition, BLM will require that inspection and evaluation of seeding measures taken will be made by the Authorized Officer after completion of the first growing season, with further evaluation during the following two growing seasons. If rehabilitation fails to establish in three years due to inadequate reseeding techniques or drought conditions, the applicant would be required to reseed the previously treated area. Should upgrading of the line occur, revegetation measures may again be required. The revegetation process would partially mitigate impacts to vegetation, soils, and to the visual resource.

WILDLIFE

All hawks, owls, and eagles are protected by federal law - harassment, disturbance, or killing of these species is prohibited. Therefore, BLM will require the applicant to comply with the following measures:

* A field inventory of raptor nesting sites will be performed by a qualified raptor specialist (provided by the applicant and acceptable to the BLM) if construction activities will be occurring during the sensitive nesting/brood period (March through May). This survey will determine if raptor nesting sites which may be affected by construction activities are actually in use. If a nesting site is in use, construction activities will be confined to the nonsensitive period for raptors.

BLM will require the applicant to confine construction activities to nonsensitive periods within all critical wildlife habitats. Sensitive periods are generally defined as follows:

* Big game winter habitat--December to April.

* Sage grouse strutting/nesting complexes--March to June within critical habitat areas (see Chapters II and III, Wildlife, p. 52 and 121.) Where access is currently limited, applicant will be required to close new access roads and to restore the area as close as possible to original conditions upon completion of construction activities in order to reduce potential human interference with wildlife and to restore wildlife food, nesting, and protective cover.

BLM will require that the aquatic and stream habitat be spanned by the transmission line. Measures already listed under soils, watershed, and water quality will also mitigate impacts to the aquatic habitat. Protection of the Lahontan cutthroat trout (which is on the Threatened and Endangered Species List) will also be accomplished by adherence to the previously listed mitigating measures.

VISUAL RESOURCE AND RECREATION

The mitigating measures proposed for the visual resource are also considered the best method for lessening the impacts to the recreation experience. Those specific recreation resources affected by physical and activity impacts of the transmission line construction should be used as "observation sites" for the performance of the on-site visual contrast rating at the time the tower sites are finally located by the applicant and prior to the beginning of construction.

BLM will require a specific on-site application of the visual resource contrast rating procedure in all areas classified as having high visual impact prior to final design, tower location, road location, storage and staging area designation, etc., so that proper adjustments can be made in order to reduce the visual impacts of the transmission line. (The contrast rating will determine the specific sites in which these measures will apply. Refer to Chapter III, p. 143 for physical and activity impacts, and to Appendix I, p. 263 , for an explanation of the Visual contrast rating system.) Specific mitigation measures applicable to the visual and recreational experience are:

* location of individual towers in critical viewsheds in a manner which avoids skylining towers.

* crossing of roads and trails in sensitive visual areas in a manner designed to lessen impacts to the visual resource.

HISTORICAL/ARCHEOLOGICAL

The procedures for compliance with Section 106 of the National Historic Preservation Act and Executive Order 11593, require that BLM consult with appropriate State Historic Preservation Officer(s) on questions regarding historic sites. In the O'Neil Basin corridor, appropriate measures to preserve scientific historical/archeological information have been initiated by the completion of an archeological reconnaissance along the originally proposed route. (Report on file, BLM State Office, Reno, Nevada, see Appendix J, p. 277, letter from Nevada State Museum.)

With the exception of the following stipulations, all sites subject to direct or indirect impact have been mitigated by salvage.

O'Neil Basin Corridor--Sacramento Canyon: BLM will require the following measures be performed by a qualified archeologist acceptable to BLM and the applicant. (See the Sacramento Canyon Map, p. 167).

SACRAMENTO CANYON

OREANA-HUNT TRANSMISSION LINE

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

SCALE 1:62,500

* Prior to construction, complete a surface collection of of cultural materials

* Test excavate areas planned for construction activities to insure that stratified deposits are not present in these areas.

In addition, BLM will require the applicant to strategically place construction activities so as to mitigate impacts to surface and subsurface cultural resources. These measures will also mitigate the indirect impact of unsanctioned collecting activities resulting from increased accessibility to the area.

Adobe, Metropolis, Highway Corridors, and the 27-mile unsurveyed segment and Idaho portions of the O'Neil Basin Corridor: BLM will require an intensive survey (BLM Class III) by a qualified archeologist prior to construction activities to locate and salvage (or arrange to avoid) historical/archeological sites, depending upon the significance of the particular site. This survey will be extended as necessary to include any and all changes in the location of the right-of-way and/or access roads.

If a previously undiscovered historical/archeological site should be found during construction, BLM will require construction activities to be halted until the site can be inspected and salvaged by a qualified archeologist.

LAND USE AND SOCIAL/ECONOMIC FACTORS

(Refer to Chapter IV, measures proposed by state and local agencies, p. 170 for additional social/economic mitigation measures.)

BLM will require the applicant to locate right-of-way corridors in a manner which will cause the absolute minimum interference with agricultural production. This also requires the use of the cross-braced "H" frame towers in agricultural areas, especially the area from the northern end of the Sawtooth National Forest north to the Hunt, Idaho, substation.

The applicant will be required to locate the transmission line right-of-way adjacent to existing transmission lines and primary roads within mining districts to the maximum extent possible, which will partially mitigate impacts to existing mining activities.

The impacts to Federal (BLM) planning in the Idaho sections of the right-of-way can be mitigated to a large extent by following recommendations found in the Burley District MFP decision regarding routing any new transmission lines parallel to an existing 138 kv transmission line.

ACCIDENTS AND CATASTROPHIES

BLM will require that phase lines crossing the Humboldt and Snake

Rivers be properly marked so they can be avoided by aircraft, even though the height of the lines may not exceed the 200-foot FAA requirements.

State and federal regulations pertaining to construction safety standards and protection of traffic during construction will be observed.

FEDERAL AVIATION ADMINISTRATION (FAA)

The FAA will require the applicant to conform to requirements as listed in Ac70/7460-2F regarding the maximum height above ground and water level (200 feet) that a tower can be without filing a "Notice of Construction" with the FAA.

CORPS OF ENGINEERS

The applicant is required to obtain a permit from the Corps of Engineers for river crossings on rivers under their jurisdiction pursuant to Section 404 of the Water Pollution Control Act of 1972 (FWPCA). The Environmental Protection Agency (EPA) in consultation with the Corps has developed guidelines applicable to the permits. The permits regulate the discharge of dredged or fill material in navigable waters as defined by the FWPCA. (See the Federal Register, Vol. 40, No. 141, Part IV: "Permits for Activities in Navigable Waters or Ocean Waters," July 25, 1975, and Vol. 40, No. 173: "Navigable Waters, Discharge of Dredged or Fill Material," September 5, 1975.

BUREAU OF RECLAMATION

The proposed transmission line right-of-way crosses Bureau of Reclamation lands in two known areas: (1) in the vicinity of Battle Mountain, just south of Stony Point, and (2) the Salmon Tract Reclamation Project south of Twin Falls, Idaho. The Bureau of Reclamation will require the applicant to follow the following mitigation measures in areas under their jurisdiction:

(No information as yet.)

NATIONAL PARK SERVICE

The Park Service maintains the National Register of Historic Places. The applicant will be required to comply with all measures outlined by the National Park Service in regard to sites which are, or may be, identified as Historic Places. (Refer also to Chapter IV, Historical/Archeological, p. 166 .)

MEASURES PROPOSED BY STATE & LOCAL AGENCIES

GENERAL MEASURES

The impact of population growth within Washoe County (a secondary impact of increased power availability) can be mitigated to a certain extent by a controlled growth policy (for example: zone density maximums) as outlined in the Conservation and Population Plan for Washoe County. This plan has been presented (but not yet adopted as the official plan) by the Regional Planning Commission for Reno, Sparks, and Washoe County.

NEVADA STATE HIGHWAY DEPARTMENT

The Highway Department will require the applicant to obtain a permit for crossing of state highways by a transmission line. This permit will contain stipulations which the applicant must comply with in order to mitigate the possible impacts of a transmission line crossing the highways. (Refer to Table III-5, p. 129, Potential for Electronic and Visual Interference.)

IDAHO DEPARTMENT OF TRANSPORTATION

The Idaho Department of Transportation will require the applicant to comply with similar standards as delineated above for the Nevada Highway Department.

IDAHO DEPARTMENT OF PUBLIC LANDS

The applicant will be required to obtain permits for:

* Crossing Salmon Falls Creek and the Snake River, and

* Crossing any portion of state lands.

These permits will contain stipulations designed to mitigate possible impacts of transmission line construction.

APPLICANT-COMMITTED MEASURES

The measures listed in this section have been taken from the SE&A Environmental Analysis of the Tracy-Hunt Transmission line, Chapter IV, pp. V-14 through V-31. In reference to the measures listed in that section, the applicant has stated:

"All of the mitigating and enhancing measures discussed...are recommended and would be employed to mitigate adverse environmental impacts and foster beneficial impacts. Many of the measures have already been employed during the development of the project." (SE&A Environmental Analysis, p. V-31.)

BLM considers the measures discussed in the above-mentioned section of the applicant's analysis to be necessary mitigating measures and that the applicant and contractors will adhere to the provisions of the measures (as listed below). Some repetition of measures listed as "applicant-committed" and measures mentioned in the preceeding section has occurred. The overlap is necessary to avoid, where possible, conflicts of wording or definition between the various measures employed to mitigate possible impacts to the environment, and to clarify as much as possible exactly what is considered to be a mitigating action. (Some of the measures listed below are direct quotes, others have been paraphrased for clarity.)

SPECIFIC APPLICANT-COMMITTED MEASURES

In terms of safety, the line would be safeguarded at both ends and at the intermediate substations from the potential hazards of fire and shock. Lightning protection would be provided by shield wires on the towers and by grounding the circuits in the substations.

Care would be taken to control erosion during and after the construction of the proposed transmission line. To minimize the potential impact on water quality, construction would be performed to cause the least disturbance to the soil.

Cultivated meadowland is avoided wherever possible. When cultivated land is crossed, the largest reasonable span between towers would be used and the right-of-way would be aligned along fences, ditches, and meadowland perimeters to avoid conflicting with any agricultural production. When crossing land used for agricultural purposes the right-of-way would be located parallel to existing roads, insuring that a minimum area of productive land is used for tower sites, reducing the impact to individual farmers and farming operations.

When crossing irrigated land, the towers would be located to avoid conflicting with the operation of the various types of sprinkler/irrigation systems encountered. In order to avoid conflicting with installed sprinkler systems, where possible the transmission line corridor would be located along major roads and property lines.

The corridor would be located along the perimeter of fields in which harvestable crops are grown in order to avoid interference with harvesting equipment.

Areas containing plant communities such as meadow, willow, and juniper would be crossed at their narrowest points and, where possible, the routes avoid hayed meadows and aspen stands. Many of the riparian areas have been cleared for agricultural uses and the natural plant cover no longer exists. However, care would be taken to protect the remainder of the riparian communities encountered.

Erosion controls would be implemented in order to minimize the impact on the existing plant communities.

Impacts to wildlife habitats would occur mainly during the construction phase, and while these impacts would normally be temporary, every effort to minimize them would be taken. A close supervision of construction personnel to discourage undue harassment and harm to wildlife would be provided.

The distances prescribed between the conductors of the transmission line and the length of the insulators would preclude the possibility of large birds, such as eagles, being electrocuted by the energized lines.

The applicant has complied within the national policy of protecting endangered archeological resources by entering into an agreement with the Nevada Archeological Survey to:

* Conduct an intensive archeological reconnaissance along the proposed right-of-way ... and to make recommendations for the preservation of archeological values or to mitigate unavoidable adverse impacts on such values

* Mitigate unavoidable adverse impacts on fragile pattern sites by an immediate, complete, and systematic collection of ... specimens from the surface of these sites.

Direct and significant indirect impacts would be mitigated at some sites by the on-site strategic placement of towers within the proposed right-of-way, as it is now surveyed, and by the on-site strategic location of access roads to the proposed right-of-way to avoid sites containing valuable resources.

Construction and maintenance crews would be instructed, and held liable, on the provisions and intent of the state and federal antiquities preservation acts and the (National) Environmental Policy Act of 1969, in order to enlarge their appreciation of the importance of the archeological sites encountered along the right-of-way.

Transmission line towers would not be erected on the identifiable sections of historic trails and railroads that would be crossed by the proposed transmission line. Towers would be located as far as possible beyond these sites on either side to partially mitigate the visual intrusions.

V

UNAVOIDABLE ADVERSE IMPACTS

V

UNAVOIDABLE ADVERSE IMPACTS

INTRODUCTION

The following is a summary of the unmitigated adverse impacts that will remain if the proposal is implemented and the effective mitigating measures discussed in Chapter IV are applied. The relative values and significance placed upon these impacts, and the degree of who and what are affected is discussed.

AIR QUALITY

Dust production will be the only unavoidable adverse impact on air quality. Construction-caused dust generation will be localized and short-term; however, of more concern is the fugitive dust caused by wind and vehicular traffic after construction has been completed. In areas where revegetation efforts are successful, the problem will gradually diminish. In areas such as the salt desert shrub type (which is less conducive to rehabilitation), fugitive dust problems will continue virtually unabated.

WATER

Most adverse impacts on water resources resulting from construction activities can be mitigated by the measures discussed in Chapter IV, Soils, Watershed and Water Quality, p. 162.

Secondary impacts on water resources, i.e., increased population growth and irrigation of certain areas resulting from increased availability of electrical power, are unavoidable and cannot be mitigated by the applicant. (See Chapter III, Water, p. 111.)

MINERAL RESOURCES

The minimal disruption of mining exploration activity or small surface mining operations in mineralized areas would occur only during construction through those particular areas, an impact which cannot be mitigated.

SOILS & WATERSHED

Between 547 and 843 acres of soil (depending on the corridor selected) would be permanently impacted by the proposed construction. These impacts will include surface soil disturbance in all areas, subsoil disturbance in areas requiring access road cuts and fills of a substantial nature, and on tower locations, which will affect the entire soil profile down to and including the substrata.

The unavoidable adverse soil impacts can be categorized as follows:

Sheet and rill erosion will result from any soil disturbance due to soil compaction, which will reduce infiltration rates.

Organic matter displacement allowing for raindrop splash effects and subsequent overland flow and erosion.

Soil profiles which have developed congruently with the natural vegetation will be interrupted for several decades. (See sections on vegetation, water, and ecological interrelationships in Chapters III and V.)

Under normal conditions, soil losses due to natural effects are approximately 2 to 4 tons per acre per year. The activity associated with construction of the transmission line can create bare-ground conditions resulting in up to 20 to 30 tons of soil loss per acre per year, this rate gradually declining as revegetation occurs.

Project construction can contribute to soil conditions in the right-of-way area which will allow for wind erosion rates of 20 to 50 tons per acre per year. This rate of erosion is particularly significant at elevations below 5,000 feet, due to the marginal vegetation-producing climate at those elevations which makes revegetation difficult or impossible.

VEGETATION

Unavoidable disturbance to vegetation will occur as a result of the project being implemented. The areas most affected will be those in the salt desert shrub type, as this environment is least receptive to natural revegetation or re-seeding. Regrowth in these areas can take several decades, and in some circumstances where regrowth does occur, salt desert shrub is usually replaced by invader weed species.

Even in treated areas, the success of revegetation attempts is uncertain. A series of dry years could suppress the newly-seeded species. Natural revegetation in this event could take at least 10 years.

The availability of new access within the area of the project will attract use by recreational vehicles. Although some of those roads may be "put to bed" (see Chapter IV, Soils and Watershed, p.162), use may continue, as any vestige of a trail is attractive to four-wheel vehicle users -- often, the more primitive the trail, the more attractive it is. This will have an unavoidable impact on the vegetation of some areas and could interfere with revegetation efforts.

WILDLIFE

TERRESTRIAL

There will be a loss of vegetation in areas where revegetation is impossible or impracticable, or where revegetation techniques are not successful. This vegetation provides essential food and nesting/protective cover for birds and small animals.

Increased availability of access roads and trails may lead to an unquantifiable increase in indiscriminate shooting of raptor species perching on transmission towers.

The conductors will cause an unquantifiable increase in impact deaths to raptors, waterfowl, and other birds, especially in the area where the transmission line crosses the Humboldt and Snake River Valleys.

Increased wildlife disturbance will occur in critical wildlife habitat areas due to increased human activity along the maintenance access road and along the other roads (even if "put to bed").

AQUATIC

An unavoidable impact will result from the short-term sedimentation at stream crossings under conditions of normal construction operations. This impact is not expected to involve more than a 1-year period.

LAND USE

The implementation of the proposed project will result in the discontinuation of use of small areas of land occupied by the transmission line substations, towers, and the remaining trails and access roads. This will impact the land for the life of the project.

RECREATION

HIGHWAY CORRIDOR

The presence of a powerline within the Highway Corridor will represent an additional overhead intrusion visible to travelers along I-80, Highway 93, and to recreationists along portions of the Humboldt River.

METROPOLIS AND ADOBE CORRIDORS

The recreation experience of short-term recreationists from the communities of Battle Mountain, Carlin, and Elko will be affected by the presence of the transmission line within these corridors.

O'NEIL BASIN CORRIDOR

The presence of a powerline along the O'Neil Basin Corridor will affect destination-oriented use, where recreationists stay within the area for extended periods of time. The opportunity to participate in a wide range of recreation activities exists in this corridor location, and the presence of a powerline there will be a major intrusion within an area far removed from civilization and containing few existing man-made intrusions.

SOCIAL / ECONOMIC VALUES

Uncontrolled population growth (a secondary impact partially ascribable to the increased availability of power) can lead to environmental degradation of extremely broad scope and long-term effect (as outlined in the Conservation and Population Plan for Washoe County, produced by the Regional Planning Commission for Reno, Sparks, and Washoe County).

VISUAL RESOURCE

The presence of transmission towers, transmission lines and the right-of-way in general, along with certain necessary construction practices, will result in visual impacts that cannot be completely avoided or mitigated. The long-term impact is, therefore, an additional man-made intrusion placed on the natural landscape. Surface disturbance would result from construction activities including access roads, preparation of sites, tower construction, line construction, and clearing operations in general; additionally, the process of upgrading the line to 345 kv will result in similar disturbance at a later date, none of which can be completely mitigated.

HISTORICAL / ARCHEOLOGICAL VALUES

If the mitigation measures as outlined in Chapter IV are followed, no adverse impact on identified historical/archeological material is expected.

Depending on the specific location of construction activities, there may be adverse impacts to historical/archeological material which has not been previously located by cultural reconnaissance.

ACCIDENTS & CATASTROPHES

The transmission line and towers cannot be constructed to withstand damage due to significant earthquakes and seismic shifts. The resulting power outages cannot be mitigated beyond the standard protection afforded by interties with adjacent systems. (This damage, although geologic in nature, is discussed in Chapter III, Accidents and Catastrophes, p. 150.)

Low-flying aircraft may collide with the transmission lines despite implementation of safety precautions mentioned in Chapter IV, p. 168.

Damage to the line from sabotage or natural disasters cannot be prevented.

ECOLOGICAL INTERRELATIONSHIPS

Any disturbance to the components of an ecosystem will result in a continued disruption of the ecosystem.

Secondary impacts of increased dissolved salts in irrigation return flows entering the Humboldt River and the Toulon and Humboldt Marshes, (with the resulting effects on emergent and submergent vegetation) are unavoidable and cannot be mitigated.

Table V-1
Comparative Impacts of Corridors (by segment)

Environmental Components	Oreana to Valmy Segment		Valmy to State Line Segment				State Line to Hunt Segment	
	O'Neil Adobe Metropolis	Highway	O'Neil	Highway	Adobe	Metropolis	O'Neil	Adobe Metropolis Highway
Topography		X		X				X
Climate	---	---	---	---	---	---	---	---
Air Quality	---	---	---	---	---	---	---	---
Geology	---	---	---	---	---	---	---	---
Soils and Watershed		X		X				X
Water Resources								
Surface	X				X			X
Ground	---	---	---	---	---	---	---	---
Vegetation		X		X			---	---
Wildlife								
Aquatic	X				X			X
Terrestrial		X		X				X
Land Uses								
Land Ownership	X		X				X	
Agricultural Production	---	---	---	---	---	---	---	---
Livestock Production		X		X				X
Residential Uses	X					X	X	
Industrial Activities	X					X	X	
Recreational Uses	X			X				X
Designated Recreational Lands	X			X			X	
Other Recreational Lands	X			X			---	---
Public Utilities	---	---		X				X
Archeological/Historical Values	X		X					X
Visual	X				X			X
Ecological Interrelationships	---	---	---	---	---	---	---	---

X - indicates the corridor segment which would reduce or eliminate impacts upon the particular environmental component. Absence of an X indicates no measurable environmental impact difference among corridors.

VI

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE OF LONG-TERM PRODUCTIVITY

VI

RELATIONSHIPS BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT & THE MAINTENANCE OF LONG-TERM PRODUCTIVITY

Precisely what is meant by "short-term" and long-term" has varied considerably among the various environmental statements. For the purpose of this report, "short-term" shall refer to the projected useful life of the line, or approximately 50 years.

There are several reasons why impacts directly related to powerlines would extend beyond this period. Experience of the Bonneville Power Administration (USDI, BPA, Environmental Statement on General Construction and Maintenance Program, 1974) has shown that, in most cases, existing transmission corridors are upgraded in response to increasing demand. In many areas, according to BPA, new transmission lines are being built parallel to existing rights-of-way, further committing the land to utility purposes. Additionally, as long as demand and load centers exist, current rights-of-way will probably continue to be the best available routes from generation sources to the consumer. Although the transmission facilities could be completely removed in 50 years, these are some of the factors that would make this event unlikely.

Sierra Pacific Power Company does plan to use the corridor established by their intertie number 2 (Tracy/Hunt 230/345 kv line) for a parallel 230 kv transmission line when construction is completed on the second unit of their proposed coal-fired power plant at Valmy, Nevada. The first unit will use the transmission line discussed in this statement to transmit power from Valmy to Reno. One result of discussing these projects in separate reports is the commitment to two rights-of-way for parallel transmission lines, rather than including the possibility of constructing one double-circuit line (the two transmission systems on a single set of towers).

Some of the long-term effects that could result from implementation of the proposal, regardless of whether or not the facilities themselves remain in place longer than 50 years, include soil loss through erosion, vegetative disruption in the more sensitive areas, the visual impact of construction scars, increased access into some areas, and future land use planning decisions resulting from the physical presence of a transmission line in the area. These factors all contribute to a degradation of the recreational resource.

The visual impact of the line itself would be felt over the long term if the towers are not removed at the end of the 50-year period. Vegetative and soil losses, as well as faunal displacement, cover a proportionately small part of the total resource area but are still considered important impacts.

A number of secondary long-term impacts could be associated with completion of the project. One is increased recreational use of the area due to improved access and increased population pressures. Mining and other industrial activities could also expand as a result of increased power availability in the area. In addition, the availability of power is one of the required factors for agricultural production in the region. Increased agricultural production, in turn, would result in a long-term draw on the groundwater reserves of the hydrographic basins. Calculations (described in Chapter II, Land Uses, p. 60) show this use of groundwater would not exceed the annual recharge. Return flows could add markedly to the salt content of the Humboldt Marshes, however.

In summary, other than the long-term impacts resulting from construction activities, many of the long-term impacts are dependent on the continued existence of the powerline. For the reasons stated above, it is likely that an electric transmission system would continue to exist in the established corridor.

VII

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

VII

IRREVERSIBLE & IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible and irretrievable commitments of resources involve those commitments of resources that, once initiated, would continue beyond the life of the project, and those resources that are not replaceable. Projects may be considered as irreversible if costs make the removal of structures unlikely.

The estimated amounts of soils that will be disturbed by new access roads, as well as the 10 foot-wide maintenance road that may be needed along the entire length of the transmission line's center line, are as follows:

Corridor	Estimated Acres Disturbed
O'Neil Basin	770
Highway	470
Adobe Range	645
Metropolis	570

Disturbance at tower sites, figuring 635 square feet of disturbance per tower, includes the following impacted acres by corridor:

Corridor	Estimated Acres Disturbed
O'Neil Basin	21
Highway	26
Adobe Range	23
Metropolis	24

Soil losses due to water erosion will not be as great if rehabilitation measures are followed. Wind erosion will occur until endemic annual plants become established. This often takes 3 to 5 years in areas susceptible to revegetation. If the access roads are frequently used by ranchers and recreationists, revegetation would not occur. Soil loss can be considered as the greatest irretrievable commitment of a resource because of the slow formation in this dry climate. It has been estimated that from 400 to 1,000 years is required to form an inch of soil in this region.

Although the land required by towers and access roads could be returned to its natural state, the land must be considered to be irreversibly committed for the life of the facility (50 years), and perhaps longer, since another system could be constructed in its place at a future date. The lands occupied by substations will be irretrievably committed for industrial use. The long-term use of land for transmission corridors and substation sites could lead to land development adjacent to these facilities which would not otherwise occur (i.e. industrial development). Removal of the transmission facilities would not necessarily return the land to its previous use.

Location of a transmission line could affect the availability of that land for the extraction of a low unit-value mineral such as sand and gravel. Relocation of a portion of the line would be economically practical if a valuable mineral were discovered along the right-of-way in concentrations and quantities suitable for open-pit mining methods.

Any undiscovered archeological sites accidentally disrupted during construction would be irreversibly damaged and could lose much or all of their archeological or historical value.

Certain kinds of cultivation, such as circular irrigation, depend on large areas of unobstructed access. Use of the cross-braced H-frame towers will take less space in cropland areas and would help alleviate the obstruction problem. Nevertheless, small portions of land may be uneconomical or unavailable for farming for which the land owner will be compensated.

Construction of transmission facilities will irreversibly change the ecological interrelationships on, and adjacent to, the construction site by altering the habitats through soil and vegetative disturbance. These localized impacts on ecological interrelationships will not alter the character of the entire ecosystem, but will last as long as the effects of soil and vegetative disturbance persist.

The aluminum, steel, copper, and other materials used in construction will be irretrievably committed to transmission uses. Retired equipment is usually reclaimed for use in other transmission facilities. There will also be an irretrievable commitment of fuels used by equipment during construction of the project.

Areas cleared of plant material will remain in a regressive state for many years. Plants which do move in tend to be invader species, such as halogeton. The loss of some plant species, chiefly within the salt desert shrub type which is not conducive to artificial revegetation and which has a long delay in natural climax revegetation, can be considered an irretrievable loss of that vegetative resource. In perspective, this vegetative commitment would be small because the disturbed areas are minimal in relation to the size of the entire resource, but the commitment is significant in intensity.

The distribution of wildlife species will be altered. Disturbance and increased human activity will cause some sensitive, restricted habitat species, such as sage grouse and raptors, to leave the area. Species more tolerant of disturbance could move into the altered habitat. This degree of disturbance would be significant but of small areal extent because the disturbed habitat would be limited to narrow, linear strips of land in the right-of-way and access road areas.

Some loss of livestock forage will occur. The permanent loss of animal unit months (AUMs) by corridor is as follows: O'Neil Basin Corridor - 66 AUMs; Highway Corridor - 41 AUMs; Adobe Range Corridor - 54 AUMs; Metropolis Corridor - 47 AUMs. (See Table III-4, p. 126.) This permanent loss of AUMs would be extremely small when compared to the number of AUMs sold in northern Nevada and southern Idaho in 1975 (1,565,000 AUMs).

There will be a long-term loss to the visual resource regardless of where the proposed line is constructed. The transmission system would not be dismantled and removed for a minimum of 50 years and will probably remain in place beyond that time. If at a future date the line is dismantled, some scars caused by heavy equipment use will remain for generations, in spite of revegetation practices. These scars will involve an irreversible commitment of the visual resource within the right-of-way and access road areas.

VIII

ALTERNATIVES TO THE PROPOSED ACTION

VIII

ALTERNATIVES TO THE PROPOSED ACTION

NEW METHODS OF TRANSMISSION

No basically different methods for bulk transmission of electric energy from generating source to load centers are presently available. Various groups are conducting research into possibilities of microwave and laser transmission of energy and improved storage devices. However, these methods will not be practical for many years and cannot be considered as an alternative to the proposed action at this time (USDI, Bonneville Power Administration, General Construction and Maintenance Program, 1974.

UNDERGROUNDING

Technology in the field of undergrounding high voltage transmission lines has not yet progressed to the point where such an action can compete economically with overhead transmission lines. This method of energy transmission would require use of a trench-constructed corridor which can cause considerable disruption of the environment, particularly in arid country along the proposed route. The right-of-way would have to be cleared along the entire route to permit trench construction and to allow the installation of the underground transmission lines, cooling system, and other necessary equipment. Also, a backfilled trench, if it is on a slope, is difficult to stabilize in order to prevent longitudinal erosion. Soil erosion would be severe due to the extensive soil disturbance, the need to trench straight up hills, and the slow recovery time of vegetation on the disturbed soil profile. In general, the main benefit from undergrounding would be in the elimination of overhead intrusions (and thus, visual impacts) but, the effect of trenching and the resultant erosion and revegetation problems would create more adverse impacts than the conventional methods of building transmission lines.

UPGRADING EXISTING TRANSMISSION LINES

Replacing an existing line with a higher capacity line limits the impacts of the project to those associated with construction activity, i.e., temporary disturbance of wildlife, noise, dust, and erosion, plus the impacts of re-using the roads and access trails. Some additional visual impact may result, if taller towers are used and additional right-of-way width is required because of voltage requirements. The major limiting factor in the use of this technique is the need to remove existing lines from service to allow rebuilding, a step which cannot be taken where the existing line is needed for continued service to an area. Since the stated purpose of proposed action is to meet growing power demands while maintaining reliability requirements by interconnecting with other utility systems and proposed generating plants, these all but preclude the possibility of upgrading existing lines to accomplish these objectives.

MULTIPLE-CIRCUIT TOWERS

Double-circuit construction allows the transmission of electricity over one transmission line structure equivalent to that transmitted over two conventional lines. The obvious appeal of double-circuit towers is the narrower right-of-way which could accommodate two parallel lines, especially between the Valmy sub-station and the Reno-Sparks area where two parallel 230/345 kv lines are planned. Although total right-of-way area may not be as large (double-circuit), the steel towers required would need more base area and higher-standard access roads would probably be needed for construction of double-circuit towers. However, the greatest problem with the double-circuit technique is that the reliability of power delivery would be reduced, thus making this type of design undesirable to the power company.

LOCAL GENERATION

If the proposed transmission line is not constructed, then the only way of meeting electric utility power needs in Sierra Pacific's service area would be the addition of central station units located at Sierra Pacific's Tracy and Fort Churchill generating stations. The only viable system that could be installed in the preferred time frame would be small diesel engines or oil-burning turbines. Since fuel oil and natural gas are primarily imported, it can be expected that fuel costs for supplemental generation alone would approximate the total cost of the energy purchased. Fuel availability may also represent an additional barrier to development of on-site generation. Envircnmental impacts of on-site generation cannot be stated with any degree of accuracy; however, this type of electrical power generation can cause lowered air quality (air pollution due to burning oil or coal to generate electricity), and impact surface and ground waters. In any event, the use of on-site generation would not negate the need for additional energy input into Sierra's primary load centers.

NUCLEAR POWER

The alternative of using nuclear power to generate electricity is economically feasible, but the questions of proper siting, design, operation, transportation, and reprocessing of fuels, and storage of waste products remain unanswered to the satisfaction of many concerned agencies and the public in general. Although Sierra has precluded nuclear power usage at the present time, long-range goals of the Company include the possibility of nuclear generation if some of the above questions can be adequately answered, coupled with the availability of favorable financing.

GEOTHERMAL POWER

As demonstrated by the geothermal generating plants at Geysers, California, geothermal steam can provide very substantial energy once developed. However, due to the very high mineral content found in geothermal developments in northern Nevada, this potential source for generating electricity has been found too uneconomical at the present time. In this regard, Sierra Pacific Power Company explored the geysers at the Beowawe KGRA (known geothermal resource area) a decade ago as a potential power generating source, but an investment of more than $300,000 failed to produce a consistent steam source.

LIMITING CONSUMPTION OF ELECTRICITY

An alternative which could reduce the size and number of new transmission facilities needed to serve Sierra Pacific's service area is a reduction in consumption of electricity. In general, a reduction in peak demand could defer the need for a new facility. Due to the diversified, growing economy of the Reno-Sparks area, a voluntary reduction would be impossible to obtain. Even if a reduction could be obtained, the overall growth of the area would still result in an eventual need for additional power. (For a detailed look at various techniques developed for reducing demand for electricity, see Environmental Statement for a General Construction and Maintenance Program, USDI, BPA, 1974, pp. 86-94.)

DELAY OF CONSTRUCTION

The transmission facilities (transmission line/substation) are timed to meet power demands as projected by the applicant for the time of energizing of its facilities or shortly thereafter. Delaying construction of the entire program would be beneficial to the environment only if technological improvements or changes in demand were anticipated which would avoid the necessity of building the new facilities. Delay of construction would likely result in increased cost as materials and labor costs continue to increase. Delays could possibly preclude the use of the environmentally preferred route should land changes occur during the delay.

NO ACTION ALTERNATIVE

If new transmission facilities were not built to meet system needs resulting from load increases, the impacts described in the previous section would not occur. Non-construction would also result in increased risk (over a period of time) of power failures in the Reno-Sparks-Lake Tahoe areas. Power failure would have a significant impact on residential users, agriculture, and commerce, as well as the health and welfare of the public generally. Impacts to the service/gaming industry would result in serious social-economic impacts. Economic growth would be stifled, out-migration of young people would probably increase, employment opportunities would be limited, and in general, the community growth would be limited if additional power is not made available.

ALTERNATIVE RIGHTS-OF-WAY

In addition to the right-of-way corridors discussed in previous sections, there were two routes that were examined and discarded due to the cumulative adverse impact: (1) Owyhee Desert to Idaho: This route originally proposed connection with the Idaho Power Company system through Winnemucca District's proposed Owyhee Desert primitive area and Boise District's proposed Owyhee High Desert primitive area. The sensitivity of these areas precluded any viable discussion as to alternative routing: (2) Wells, Nevada, east to Utah: This company's proposed interconnection with Utah Power and Light Company proved disadvantageous to Sierra Pacific when contractual arrangements dictated taking delivery of power through Idaho Power's Hunt substation. The benefit of this arrangement provides Sierra with an additional intertie with another transmission system.

USE OF HELICOPTERS

At this time no site-specific written commitments to the use of helicopters for construction of the transmission line have been made by the applicant, BLM, or any other concerned agency. However, since the use of helicopters is a feasible alternative method, the following general comment is included.

The use of helicopters for constructing transmission lines can reduce or eliminate the need for access roads in most areas -- especially remote areas with limited access and/or rugged terrain. Since roads and the activity of actually assembling the transmission lines are the primary environmental impacts involved in this project, the effect of using helicopters is one of mitigation (in addition to being a viable alternative construction method) through reducing soil disturbance and fugitive dust problems, reducing the impacts on the water quality and the aquatic habitat (by eliminating or reducing the need for roads crossing these areas), reducing or eliminating impacts to the vegetation (for the same reasons), and lessening the impact of construction activity and its resultant scars on the visual resource and the historical/archeologically significant areas. Secondary benefits occur through reducing the human disturbance to critical wildlife habitat areas and from reducing or eliminating the possibility of future increased human access to these areas which would occur if access roads were built in these areas. (Even roads "put to bed" can attract four-wheel drive vehicle use. Experience in Nevada has shown that the more primitive the road, the more likely it would be to attract four-wheel vehicle use.)

Utilization of helicopter methods of construction "require staging areas approximately 10 miles apart and eliminates the necessity of delivering the tower components and some erection equipment (via roads) to each site. It therefore reduces the amount of construction activity at each site." (SE&A Engineers and Planners, Tracy-Hunt Transmission Project, Environmental Analysis, p. III-10, April, 1975.) This method of construction does, however, create an element of risk which is absent in normal ground methods.

CONSULTATION AND COORDINATION

IX

CONSULTATION & COORDINATION

CONSULTATION AND COORDINATION IN THE PREPARATION OF THE DRAFT ENVIRONMENTAL STATEMENT

During the preparation of the draft environmental statement the team was in contact with other federal offices, state and local agencies, interest groups, and individuals. Communication ranged from formal written comment to informal personal contact. In addition, a workshop dealing with cultural and recreational resources was held. Information concerning the proposed project, and BLM's role in the project, was published by local media.

Following is a list of agencies contacted by letter. The letter included a map of the four corridors and requested input concerning areas of jurisdiction, and possible impacts or conflicts with that agency's projects. An asterisk indicates those from whom the Environmental Coordination Staff received either a verbal or written response. Where a specific recommendation was made or conflict identified, that response has been briefly summarized.

* Bureau of Reclamation
Letter of January 22, 1976, in review of the Tracy-Oreana 230/345 kv transmission line Environmental Analysis Record (EAR), recommends covering both segments of the transmission line (i.e., Tracy-Oreana and Oreana-Hunt) in one environmental assessment so the implications of the entire project can be understood.

* Army Corps of Engineers
Letter of March 25, 1976, points out proposed reservoir and dam sites near two of the corridors. These have been discussed in the DES, p. 28. They also point out the requirement, after July 1, 1977, for a permit to discharge dredge or fill materials in waters where flows exceed five cubic feet per second.

*Idaho Public Utilities Commission
Letter of April 5, 1976, recommends the Highway Corridor through Idaho. They also recommend that where the route crosses state endowment land, easements be obtained along property boundaries rather than across the parcels.

* Idaho Bureau of Communications
Letter of March 31, 1976, points out a possible conflict with a radio and microwave communications site being considered by the state.

Because of possible interference with two-way mobile radio communications from a powerline located near a highway, they recommend a route that does not parallel the highway.

* Nevada State Historic Preservation Officer (SHPO)
The Nevada SHPO was contacted during the early stages of ES preparation. As of April 1, 1976, however, the SHPO relinquished his capacity to review proposed actions of agencies involved in public impacts or public fund expenditures in areas of potential historic or archeological significance. This relinquishment resulted from the National Parks Service decision that the staff of the SHPO was ineligible to conduct surveys, make determinations on nominations to the National Register of Historic Places, or to prepare the statewide historic preservation plan. Comments on proposals must now come directly from the President's Advisory Council on Historic Preservation.

* U.S. Forest Service
* Bureau of Indian Affairs
* Federal Power Commission
* Bureau of Outdoor Recreation
Idaho Department of Water Resources
Idaho Department of Parks and Recreation
Idaho Department of Fish and Game
* Idaho Department of Lands
* Idaho Department of Transportation
* Idaho Public Utility Commission
Nevada Division of Parks
* Nevada State Department of Fish and Game
* Nevada State Historical Society
* Elko County Planning Commission
Lander County Planning Commission
Twin Falls County Commissioners
Jerome County Commissioners
Humboldt County Planning Commission
Pershing County Planning Commission
Eureka County Planning Commission
* Nevada Power Company
* Wells Rural Electric Company

In addition, informal contact was made with the following groups. A double asterisk shows those from whom written comments were received. Where specific recommendations were made, or questions raised, these letters have been summarized. (The summarized letters were received in response to a request for review of the Tracy-Oreana EAR.)

** The Toiyabe Chapter of the Sierra Club
Letter of February 17, 1976, recommends energy conservation measures as a means of reducing growth of energy demand, questions need for

project, recommends the Highway Corridor, recommends the ES cover the entire transmission line from Tracy, Nevada, to Hunt, Idaho.

** The Wilderness Society
Letter of February 16, 1976, recommends the ES include the Tracy-Oreana segment, recommends the Highway Corridor, questions assumption by the applicant of increased population and per capita use of electrical power in the load area, and requests fuller discussion of this question, questions decision to not include Tracy-Oreana segment in the ES being made before the final EAR on this portion was completed and printed.

** Interested Citizen - Marjorie Sill
Letter of February 16, 1976, questions necessity for the intertie, recommends the Highway Corridor, recommends the ES cover the entire transmission line (i.e., include the Tracy-Oreana segment).

** Idaho Power Company
** Department of Anthropology, Idaho State University, Pocatello
Twin Falls County Tax Officer
Jerome County Tax Officer
Soil Conservation Service
U.S. Weather Service
Nevada State Tax Commission
Nevada State Division of Water Resources
Nevada State Environmental Protection Services
City Clerk's Office, Wells, Nevada
Lovelock Chamber of Commerce
Winnemucca Chamber of Commerce
Elko Chamber of Commerce
Office of Personal Relations, Jackpot, Nevada
Regional Planning Commission of Reno, Sparks, and Washoe County
Cooperative Extension Service, Elko
University of Nevada, Reno:
  Division of Agriculture and Resource Economics
  Department of Renewable Natural Resources
  Division of Range Resources
The Northern Nevada Native Plant Society
** Interested private citizens

COORDINATION IN THE REVIEW OF THE DRAFT ENVIRONMENTAL STATEMENT

Requests for comments on the DES will be made of the following interest groups and agencies:

Congressional Delegation, Nevada and Idaho:
  Senator James McClure, Idaho
  Senator Frank Church, Idaho
  Representative George Hansen, Idaho
  Representative Steve Sims, Idaho

Senator Howard Cannon, Nevada
Senator Paul Laxalt, Nevada
Representative James Santini, Nevada

Federal:
- Advisory Council on Historic Preservation
- Department of Agriculture -
  - Forest Service
  - Soil Conservation Service
  - Rural Electrification Administration
- Department of Defense -
  - Army Corps of Engineers
- Department of Health, Education and Welfare
- Department of Housing and Urban Development
- Department of the Interior -
  - Bonneville Power Administration
  - Bureau of Indian Affairs
  - Bureau of Outdoor Recreation
  - Bureau of Reclamation
  - National Park Service
  - U.S. Fish and Wildlife Service
  - U.S. Geological Survey
- Department of Transportation
- Environmental Protection Agency
- Federal Energy Administration
- Federal Power Commission

State:
- Office of the Governor, Idaho
- Office of the Governor, Nevada
- Idaho State Historic Preservation Officer
- Nevada State Historic Preservation Officer
- Nevada State Clearinghouse (25 copies) - distribute copies to the State agencies
- Nevada Historical Society
- Idaho State Clearinghouse
- Idaho State Public Utilities Commission
- Idaho State Department of Fish and Game
- Idaho Department of Public Lands
- Idaho Department of Parks
- Idaho Department of Transportation
- Tahoe Regional Planning Agency

Local:
- Jerome County Commissioners and Planning Commission
- Twin Falls County Commissioners and Planning Commission
- Elko County Commissioners and Planning Commission
- Eureka County Commissioners and Planning Commission
- Lander County Commissioners and Planning Commission
- Humboldt County Commissioners and Planning Commission
- Pershing County Commissioners and Planning Commission
- Churchill County Commissioners and Planning Commission
- Lyon County Commissioners and Planning Commission

Esmeralda County Commissioners and Planning Commission
Mineral County Commissioners and Planning Commission
Nye County Commissioners and Planning Commission
Storey County Commissioners and Planning Commission
Carson City Board of Supervisors and Planning Commission
Washoe County Commissioners
Regional Planning Commission of Reno, Sparks, and Washoe County
Washoe Council of Governments
Carson River Basin Council of Governments

Interest Groups:

Sierra Club, Idaho and Nevada
The Wilderness Society
Nevada Outdoor Recreation Association
Foresta Institute
League of Women Voters, Idaho and Nevada
University of Nevada, Reno
Idaho State University, Pocatello

Copies of the draft environmental statement will be available for public review at the following locations:

Bureau of Land Management Offices -

Washington Office of Public Affairs
18th and C Streets
Washington, D.C. 20240

Idaho State Office
Room 398 Federal Building
550 West Fort Street
Boise, Idaho 83724

Nevada State Office
Room 3008 Federal Building
300 Booth Street
Reno, Nevada 89509

Burley District Office
200 South Oakley Avenue
Burley, Idaho 83318

Elko District Office
2002 Idaho Street
Elko, Nevada 89801

Battle Mountain District Office
North 2nd and South Scott Streets
Battle Mountain, Nevada 89820

Carson City District Office
801 N. Plaza Street
Carson City, Nevada 89701

Las Vegas District Office
4765 Vegas Drive
Las Vegas, Nevada 89102

Winnemucca District Office
705 East 4th Street
Winnemucca, Nevada 89445

Public Libraries -

Carson City Public Library
900 N. Roop
Carson City, Nevada 89701

Reno Central Library
301 S. Center Street
Reno, Nevada 89501

Humboldt County Library
85 East 5th Street
Winnemucca, Nevada 89445

Lander County Library
315 South Humboldt
Battle Mountain, Nevada 89820

Elko County Library
720 Court Street
Elko, Nevada 89801

Clark County Library
1401 E. Flamingo Road
Las Vegas, Nevada 89109

Churchill County Library
553 South Maine Street
Fallon, Nevada 89406

Pershing County Library
1125 Central Avenue
Lovelock, Nevada 89419

PUBLIC HEARING

Public interest in the proposed project was light during the development of the Draft Environmental Statement. Because controversy does not appear to be major, no public hearings are planned.

LIST OF APPENDICES

APPENDIX A

STRATEGY FOR ENVIRONMENTAL ASSESSMENT

(ENCL. 2 OF MEMORANDUM, SEPTEMBER 25, 1975)

Strategy For Environmental Assessment-
Northern Nevada Electrical Power Generation & Transmission
Sierra Pacific Power Company

Background:

Sierra Pacific is a relatively small, investor owned utility serving North Central Nevada and Eastern California. The prime load center is the Reno - Lake Tahoe area, but irrigation in North Central and projected growth in Northern Nevada has outstripped the companies capabilities to produce and import power. In order to increase their capability, a 5-year plan has evolved that combines importing reliable power from other companies to meet immediate needs and developing additional coal-fired generating capability of their own to meet projected demands through 1985. In brief, the power sources, transmission lines and timing of development are:

	Power Source	Transmission	Load Center	Date needed to meet demand
Phase I	Company-owned from Tracy Gas fired plant	Tracy to Oreana 230/345 KV power-line (new)	Lovelock (irrigation	Energize May 1976 @120 KV
Phase II	Contact Purchase 150 MW Utah P&L via Idaho Power Co. lines to Hunt, Idaho	Oreana to Hunt 230/345 KV Line (new)	Entire Service area	Energize Oct. 1977 @ 230 KV
Phase III	Company-owned coal power plant 2-250 MW units	Will use above 230/345 KV power-line; plus Valmy to Austin-230/345 intertie and a second 230/345 KV in parallel back to Tracy for unit 2 (new)	Entire Service area	On line unit 1-1980 unit 2-1982

The entire project involves separate facilities in point of time and sources of power and yet in total they are related as is any component of a system.

Encl. 2

The Issue:

The August 26 Departmental briefing by Sierra Pacific Power Company explained their plan for meeting both existing and future load growth demands. The question is how to organize the resources available to meet the requirements of NEPA and to the extent possible, meet the time schedule of energy demand for several inter-related facilities?

The Strategy:

The Department has assigned lead agency responsibility to BLM for the powerplant EIS and recognizes the rationale for treating the Oreana to Hunt powerline as a separate but related project. The following strategy is based on full public disclosure.That is,news releases, contacts with concerned groups and, if needed, a discussion meeting to explain BLM's approach to NEPA compliance for the separate, but related projects. If controversy develops during the public awareness stage, the strategy will be reassessed. Based on the phases identified above and still maintaining full opportunity for public review of environmental impacts, the following strategy is proposed:

Action: PHASE I

The Tracy to Oreana transmission line will be assessed first by using an Environmental Analysis Record which will be completed and offered for public review. If found environmentally acceptable, the right-of-way will be grante

Rationale:

* This line will be energized @ 120 KV from the Tracy Generating Station to meet immediate demand for irrigation power.

* Should the other phase not be built, this line could continue to operate in this manner.

* Intensive investigation reveals that this route does not exhibit characteristics whereby significant environmental impacts will result from the first power line use. The area is impacted by an interstate highway; an existing 120 KV line; a gas transmission line; power distribution lines; telephone lines; county roads and mining activity. The relationship

to future projects and full awareness of a future additional line will be shown and the adequacy of the route as a corridor assessed.

PHASE II

Action:

The Oreana to Hunt powerline will be analysed in an environmental impact statement.

(Note:) The section from Valmy to Oreana will be treated as a corridor for two powerlines and the environmental impacts assessed on this basis because of the proposed line for unit 2 of the powerplant.

Rationale:

* Preliminary review indicates potential for significant impacts especially northeast from the Valmy substation to Idaho, therefore an EIS is needed.

* Imported power will continue to flow to Tracy regardless of whether or not the coal-fired plant is built at Valmy.

PHASE III

Action:

The power plant and the two powerlines emanating out of it, plus all ancillary facilities will be analyzed in a second EIS.

Rationale:

* A decision on the plant, its transmission lines directly emanating from it and on all ancillary facilities will have to await an environmental impact statement.

* Project design specifies and environmental data will not be availbable until at least February 1976, too late for phase II.

APPENDIX B

AIR QUALITY

Nevada State air quality information for total suspended particulates (TSP) is summarized in this appendix. The data is presented two ways: as the geometric mean (average for the year); and as 24-hour maxima (the highest 24-hour reading per calendar quarter). A monitoring station with a low geometric mean and high, occasional 24-hour maxima indicates the source is probably natural dust pollution. A high geometric mean indicates a persistent problem, suggesting a localized source of pollution, e.g., spoil piles from a mining operation.

Table B-1

TOTAL SUSPENDED PARTICULATES (ug/m^3)
24 HOUR MAXIMUM CONCENTRATION
FEDERAL AND STATE AMBIENT AIR QUALITY STANDARD-150 ug/m^3

Monitoring Station	1972 Quarters				1973 Quarters				1974 Quarters			
	1	2	3	4	1	2	3	4	1	2	3	4
Fernley	176	116	149	154	230	180	198	181	224	173	233	---
Lovelock	---	---	---	--	---	--	---	---	475	432	103	91
Winnemucca	254	89	270	76	124	271	95	112	146	127	388	147
Battle Mountain	---	---	---	---	---	---	---	---	---	---	208	---
Elko	145	92	115	66	99	104	228	113	---	---	---	---

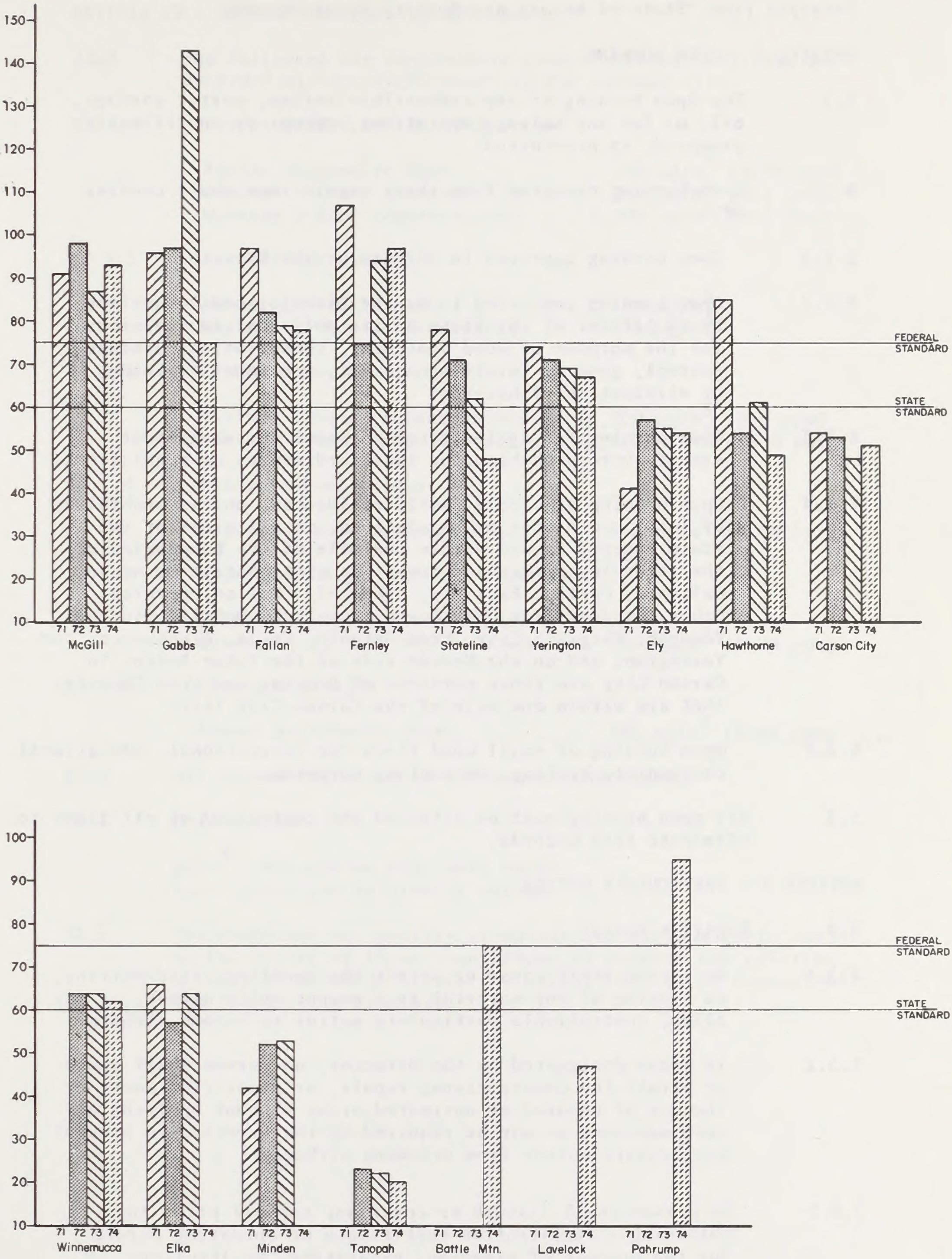


FIGURE B-1 SUSPENDED PARTICULATES
1971-1972-1973-1974

Mg/m^3
geometric mean

Excerpts from "State of Nevada Air Quality Regulations":

ARTICLE 5 - OPEN BURNING

5.1 The open burning of any combustible refuse, waste, garbage, oil, or for any salvage operations, except as specifically exempted, is prohibited.

5.2 Open burning exempted from these regulations shall consist of:

5.2.1 Open burning approved in advance by the Director.

5.2.2 Open burning concurred in by the Director and authorized by an officer of the State or its political subdivisions for the purpose of weed abatement, conservation, disease control, game or forest management, personnel training, or elimination of hazards.

5.2.3 Open burning for agricultural purposes and management except where prohibited by local ordinances or regulations.

5.2.4 Open burning at single family residences, unless prohibited by local ordinances or regulations, in all areas of the State <u>except</u>: in and within one mile of the boundaries of the following cities and towns: Babbitt, Battle Mountain, Caliente, Carlin, East Ely, Elko, Ely, Fallon, Fernley, Gabbs, Gardnerville, Hawthorne, Lovelock, McGill, Minden, Tonopah, Virginia City, Weed Heights, Wells, Winnemucca, and Yerington; and on the Nevada side of the Tahoe Basin, in Carson City and those portions of Douglas and Lyon Counties that are within one mile of the Carson City line.

5.2.5 Open burning of small wood fires for recreational, educational, ceremonial, heating, or cooking purposes.

5.3 All open burning must be attended and controlled at all times to eliminate fire hazards.

ARTICLE 7 - PARTICULATE MATTER

7.3 Fugitive Dusts:

7.3.1 No person shall cause or permit the handling, transporting, or storing of any material in a manner which allows, or may allow, controllable particulate matter to become airborne.

7.3.2 In areas designated by the Director, no person shall cause or permit the construction, repair, or demolition work, or the use of unpaved or untreated areas without applying all such measures as may be required by the Director to prevent particulate matter from becoming airborne.

7.3.3 No person shall disturb or cover any topsoil prior to obtaining a registration certificate or operating permit for the purpose of clearing, excavating, or leveling land of 8 hectares (20 acres) or more for any building construction. An operating permit for the deposit of any foreign material covering land of 8 hectares (20 acres) or more is required except for agricultural land.

ARTICLE 12 - AMBIENT AIR QUALITY STANDARDS

12.1 The following air contaminant concentrations shall not be exceeded at any single point in the ambient air:

12.1.1 Sulfur oxides as sulfur dioxide

Annual arithmetic mean.	60 $\mu g/m^3$	(0.02 ppm)
Maximum 24-hour concentration . .	260 $\mu g/m^3$	(0.1 ppm)
Maximum 3-hour concentration. . .	1,300 $\mu g/m^3$	(0.5 ppm)

12.1.2 Particulate matter

Annual geometric mean	60 $\mu g/m^3$
Maximum 24-hour concentration . .	150 $\mu g/m^3$

12.1.3 Carbon monoxide

Maximum 8-hour concentration. . .	10,000 $\mu g/m^3$	(9.0 ppm)
Maximum 1-hour concentration. . .	40,000 $\mu g/m^3$	(35.0 ppm)

12.1.4 Photochemical oxidant

Maximum 1-hour concentration. . .	160 $\mu g/m^3$	(0.08 ppm)

12.1.5 Hydrocarbons (nonmethane fraction)

Maximum 3-hour concentration between 6:00 a.m. and 9:00 a.m. .	160 $\mu g/m^3$	(0.24 ppm)

12.1.6 Nitrogen dioxide

Annual arithmetic mean.	100 $\mu g/m^3$	(0.05 ppm)

12.2 All values corrected to reference conditions.

12.3 Definitions:

$\mu g/m^3$ - micrograms per cubic meter
ppm - parts per million by volume

12.4 These ambient air quality standards are minimum goals and it is the intent of these regulations to protect the existing quality of Nevada's air to the extent that it is economically and technically feasible.

APPENDIX C

SOILS

Dominant soil taxonomic units that occur in the 12 soil groups. (See p. 36 for soil taxonomic relationships.)

Group #1

None.

Group #2

Typic Natrargid - fine 1/ loamy, mixed 2/, mesic 3/, 0-2% slopes, saline and gravel substratum. These soils are usually corrosive to concrete and steel by the presence of ionic sulphur.

Typic Torriorthent - fine silty, mixed calcareous, mesic, 0-2% slopes, saline and, occasionally flooded.

Typic Torripsamments - mixed, mesic, 2-8% slopes.

Aeric Fluvaquents - coarse loamy, mixed, 0-2% slopes, saline-alkali, occasionally flooded.

Group #3

Entic Durorthids - loamy, mixed, mesic, shallow, 2.8% slopes.

Duric Camborthids - loamy-skeletal, mixed, mesic, 4-15% slopes, stony.

Xerollic Haplargids - fine montmorillonitic, mesic, 8-15% slopes.

Group #4

Fluvaquentic Haplaquolls - fine loamy, mixed, mesic, calcareous, 0-2% slope, saline-alkali, frequently flooded.

Typic Torriorthents - coarse, silty, mixed, calcareous, mesic, 0-2% slopes, strongly dissected.

Group #5

Xerollic Durargids - fine, montmoron illonitic, mesic, shallow, 0-15% slopes.

Typic Natrargid - fine, montmorillonitic, mesic, shallow, 0-15% slopes. These soils may contain enough sulphur to be corrosive

1/ Fine refers to clay size particles.
2/ Mixed refers to more than one kind of clay.
3/ Mesic refers to annual soil temperature between 47 F. and 50 F.

to concrete and steel.

Duric Camborthid - fine loamy, mixed mesic, 0-15% slopes.

Group #6

Aridic Durixerolls - fine montmorillonitic, frigid, 4-15% slopes.

Xerollic Haplargid - clayey skeletal, montmorillonitic, frigid, 30-75% slopes.

Xerollic Haplargids - fine, montmorillonitic, frigid, 8-30% slopes, stony.

Group #7

Xerollic Durargid - fine loamy, mixed 8-30% slopes, some stones.

Lithic Xerollic Camborthid - loamy, mixed, frigid, 4-30% slopes and stony.

Group #8 and #12

Mollic Durorthid - coarse silty, mixed, mesic.

Mollic Calciorthid - coarse silty, mixed, mesic.

Group #9

Aridic Argixerolls - clayey skeletal, montmorillonitic, fridgid, 30-50% slopes, very stony.

Xerollic Camborthid - fine loamy, mixed, mesic, 30-50% slopes.

Lithic Argixerolls - clayey skeletal, montmorillonitic, frigid, 5-50% slopes, stony.

Groups #10 and #11

Pachic Cyroborolls - loamy skeletal, mixed 30-70% slopes.

Pachic Cyroborolls - fine loamy, mixed, mesic, 4-70% slopes.

Lithic Cyroborolls - loamy skeletal, mixed, 4-70% slopes, stony.

Table C-1
Soil Taxonomic Descriptions
And Some Important Properties

Soil Taxonomic Unit (sub-group)	Common Occurence Soil Group No.	Land Form	Drainage	Erosion Hazard	Annual Precip.	Depth (in.)	Texture (Subsoil)	Alkalinity	Permeability	Slope Per Cent
Aridic Argixeroll	9	Mountain	Well	Severe	10-15	40+	Fine	Neutral	Slow	15-30
Aridic Durixeroll	6	Terrace	Well	Moderate	10-15	20-40	Fine	Neutral	Slow	4-15
Duric Camborthid	3-5	Terrace	Well	Moderate	6-8	40+	Medium	Moderate	Moderate	0-4
Entic Durorthid	3	Terrace	Well	Moderate	6-8	10-20	Medium	Moderate	Moderate	2-8
*Fluvaquentic Haplaquoll	4	Flood Plain	Poor	Slight	6-8	40+	Mod. Fine	Strong	Slow	0-2
Lithic Argixeroll	9-10-11-12	Mountain	Well	Severe	10-20	10-20	Fine	Neutral	Slow	5-50
Lithic Cryoboroll	9-10-11-12	Mountain	Well	Severe	10-20	10-20	Medium	Neutral	Moderate	4-70
Lithic Xerollic Camborthid	7	Terrace	Well	Moderate	8-10	10-20	Medium	Moderate	Moderate	4-30
Mollic Calciorthid	8	Terrace	Well	Moderate	8-12	40+	Medium	Moderate	Moderate	4-16
Mollic Durorthid	8	Terrace	Well	Moderate	8-12	40+	Medium	Moderate	Moderate	4-16
Pachic Cryoboroll	10-11	Mountain	Well	Severe	10-20	40+	Medium	Neutral	Moderate	30-70
*Typic Natrargid	2-4-5	Terrace	Poor	Slight	6-8	40+	Fine	Strong	Slow	0-20
*Typic Torriorthent	2-4	Flood Plain & Terrace	Mod. Well	Severe	6-8	40+	Mod. Fine	Strong	Mod. Slow	0-2
Typic Torripsammant	2-4	Terrace	Well	Moderate	6-8	40+	Coarse	Moderate	Rapid	2-8
Xerollic Camborthid	3-9	Terrace & Mountain	Well	Severe	6-15	20-30	Mod. Fine	Moderate	Moderate	30-50
Xerollic Durargid	5-7	Terrace	Well	Moderate	8-10	10-20	Mod. Fine	Moderate	Moderate	8-30
Xerollic Haplargid	6	Terrace	Well	Moderate	10-14	40+	Fine	Neutral	Slow	4-15

*May be corrosive to concrete and steel because of the presence of sulphur.

APPENDIX D

VEGETATION

SALT DESERT SHRUB

Big Greasewood Community

Big greasewood	Sarcobatus vermiculatus
Shadscale	Atriplex confertifolia
Budsage	Artemisia spinescens
Spiny hopsage	Grayia spinosa
Dalea	Dalea polyadenia
Spiny horsebrush	Tetradymia spinosa
Rubber rabbitbrush	Chrysothamnus nauseosus
Big saltbrush	Atriplex lentiformis
Squirreltail	Sitanion hystrix
Great Basin wildrye	Elymus cinereus
Saltgrass	Distichlis stricta
Alkali sacaton	Sporobolis airodes
Halogeton	Halogeton glomeratus
Inkweed	Suaeda torreyana
Pickleweed	Allenrolfea occidentalis
Tansy mustard	Descurainia sophia
Clasping pepperweed	Lepidium perfoliatum
Desert mentzelia	Mentzelia multiflora

Shadscale Community

Shadscale	Atriplex confertifolia
Dryland greasewood	Sarcobatus baileyi
Budsage	Artemisia spinescens
Big sagebrush	Artemisia tridentata
Low rabbitbrush	Chrysothamnus viscidiflorus
Burro brush	Hymenoclea salsola
Mormon tea	Ephedra nevadensis
Spiny hopsage	Grayia spinosa
Spiny horsebrush	Tetradymia spinosa
Littleleaf horsebrush	Tetradymia glabrata
Dalea	Dalea polyadenia
Winterfat	Eurotia lanata
Cheatgrass	Bromus tectorum
Indian ricegrass	Oryzopsis hymenoides
Squirreltail	Sitanion hystrix
Desert needlegrass	Stipa speciosa
Gooseberry-leaf globemallow	Sphaeralcea grossulariaefolia
Clasping pepperweed	Lepidium perfoliatum
Tansy mustard	Descurainia sophia
Skeleton plant	Lygodesmia spinosa
Pursh locoweed	Astragalus purshii
Prince's plume	Stanleya pinnata

FRESHWATER MARSH

Narrow-leaved cattail	Typha angustifolia
Alkali bulrush	Scirpus robustus
Three-Square bulrush	Scirpus americanus
Common tule	Scirpus acutus
Bulrush	Scirpus nevadensis
Sedge	Carex spp.
Rush	Juncus spp.
Spike-rush	Heleocharis spp.
Pondweed	Potamogeton pectinatus
Widgeon grass	Ruppia maritima
Muskgrass	Chara sp.

MEADOW/RIPARIAN

Fremont cottonwood	Populus fremontii
Willow	Salix spp.
Wood's rose	Rosa woodsii
Silver buffaloberry	Shepherdia argentea
Streambank wheatgrass	Agropyron riparium
Slender wheatgrass	Agropyron trachycaulum
Red top	Agrostis alba
Spike bentgrass	Agrostis exarata
Saltgrass	Distichlis stricta
Creeping wild rye	Elymus triticoides
Foxtail barley	Hordeum jubatum
Meadow barley	Hordeum brachyantherum
Timothy	Phleum pratense
Bluegrass	Poa spp.
Beard grass	Polypogon monospeliensis
Sedge	Carex spp.
Rush	Juncus spp.
Western yarrow	Achillea lanulosa
Aster	Aster adscendens
Bull thistle	Cirsium vulgare
Cinquefoil	Potentilla flabelliformis
Curly dock	Rumex crispus
Common dandelion	Taraxacum officinale
rocky mountain iris	Iris missouriensis

NORTHERN DESERT SHRUB

Big Sagebrush Community

Big sagebrush	Artemisia tridentata
Spiny hopsage	Grayia spinosa
Low rabbitbrush	Chrysothamnus viscidiflorus

Spineless horsebrush	*Tetradymia canescens*
Littleleaf horsebrush	*Tetradymia glabrata*
Bitterbrush	*Purshia tridentata*
Mormon tea	*Ephedra nevadensis*
Cheatgrass	*Bromus tectorum*
Sandberg bluegrass	*Poa secunda*
Nevada bluegrass	*Poa nevadensis*
Idaho fescue	*Festuca idahoensis*
Squirreltail	*Sitanion hystrix*
Thurber's needlegrass	*Stipa thurberiana*
Great Basin wild rye	*Elymus cinereus*
Bluebunch wheatgrass	*Agropyron spicatum*
Arrowleaf balsamroot	*Balsamorhiza sagittata*
Tailcup lupine	*Lupinus caudatus*
Tapertip hawksbeard	*Crepis acuminata*
Halogeton	*Halogeton glomeratus*

Low Sagebrush Community

Low sagebrush	*Artemisia arbuscula*
Yellowbrush	*Chrysothamnus viscidiflorus* var. *puberulus*
Big sagebrush	*Artemisia tridentata*
Bitterbrush	*Purshia tridentata*
Snowberry	*Symphoricarpos longiflorus*
Serviceberry	*Amelanchier alnifolia*
Currant	*Ribes* spp.
Shrubby eriogonum	*Eriogonum* spp.
Sandberg bluegrass	*Poa secunda*
Idaho fescue	*Festuca idahoensis*
Squirreltail	*Sitanion hystrix*
Thurber's needlegrass	*Stipa thurberiana*
Bluebunch wheatgrass	*Agropyron spicatum*
Locoweed	*Astragalus* spp.
Phlox	*Phlox* spp.
Mat eriogonum	*Eriogonum caespitosum*
Slender eriogonum	*Eriogonum microthecum*
Penstemon	*Penstemon* spp.
Foothill death camas	*Zigadenus paniculatus*
Lupine	*Lupinus* spp.
Mulesear	*Wyethia amplexicaulus*

Pinyon-Juniper Woodland

Single-leaved pinyon	*Pinus monophylla*
Utah juniper	*Juniperus osteosperma*
Big sagebrush	*Artemisia tridentata*

Low sagebrush	*Artemisia arbuscula*
Rubber rabbitbrush	*Chrysothamnus nauseosus*
Yellowbrush	*Chrysothamnus viscidiflorus* var. *puberulus*
Prickly phlox	*Leptodactylon pungens*
Mormon tea	*Ephedra nevadensis*
Squaw tea	*Ephedra viridis*
Buckwheat	*Eriogonum* spp.
Spiny hopsage	*Grayia spinosa*
Bitterbrush	*Purshia tridentata*
Serviceberry	*Amelanchier alnifolia*
Skeleton plant	*Lygodesmia spinosa*
Cheatgrass	*Bromus tectorum*
Sandberg bluegrass	*Poa secunda*
Squirreltail	*Sitanion hystrix*
Indian ricegrass	*Oryzopsis hymenoides*
Great Basin wild rye	*Elymus cinereus*
Needle and thread	*Stipa comata*

APPENDIX E

REVEGETATION

Revegetation techniques have met with varying degrees of success in the Great Basin region. Success generally depends on favorable terrain, soil, and rainfall conditions, any or all of which can be limiting factors in Nevada.

As a whole, the state is subject to extreme drought, with many of the basins containing strongly alkaline or saline water. Temperature extremes range from -20 degrees Fahrenheit to over 100 degrees Fahrenheit. Lack of rain in the summer also precludes plant species which otherwise might be able to survive within this temperature range.

Many of the soils are low in available nutrients, or contain excess salt or alkali which only a few plants can tolerate. Heavy expansive clay soils in some areas are adverse to plants requiring good drainage and soil aeration.

Strong and persistent seasonal winds also create a problem for new vegetative growth. A sand blast effect is felt in areas of loose soil, and in winter the result is blowing snow particles. Wind-blown alkali would injure many non-native plants.

As a general rule, seeding can be successfully done where the average annual precipitation is 8-10 inches or higher. Revegetation of the salt desert shrub zone, characterized by shadscale saltbrush, is virtually impossible due to the arid climate (an average of slightly over 4 inches of rain in western Nevada). On the other hand, attempts to revegetate the sagebrush zone have been relatively successful.

<u>A Guide to Unsuitable Soil Conditions</u> (from Artz, <u>et al</u>., 1970)

1. Soils that are salt or alkali-affected throughout the upper 18".

2. Soils with cobbles or stones at the soil surface that would prevent use of available seeding equipment.

3. Soils on slopes greater than 30 percent (sometimes slopes greater than 20 percent).

4. Soils that have more than 4 inches of sand coarser than loamy-fine sand at the surface, regardless of underlying texture, and which occur in areas with less than 12 inches annual precipitation. Seedlings are quite difficult to establish on these soils unless there are predictable summer rains, as in Southern Nevada.

5. Soils that are clay-textured throughout, crack deeply from the surface on drying, and tend to spontaneously form a

granular surface as the summer progresses (Vertisols).

6. Soils with less than 6 inches of topsoil (A horizon) with an abrupt boundary to an underlying claypan, i.e., very clayey B2t horizon.

7. Soils less than 12- to 20-inches deep over clean gravel, hardpan, or bedrock, depending on the climate and water capacity of the soil.

8. Soils with light colored topsoil which is commonly crusted between plants. The crust has numerous bubble-like pores (vesicles). (Typic Subgroups of the Aridisols.)

Undoubtedly there are circumstances where soils identified as "unsuitable" could be successfully seeded and individual judgements must be made. Climate and inherent fertility are, in part, reflected in these groupings by soil properties, but separate consideration should be helpful in borderline cases.

Often, the existing vegetation in the area can be a clue to what type of plants could be introduced, and how successful revegetation might be. Shadscale (mentioned above) and winterfat indicate dry areas not conducive to revegetation. Greasewood or saltgrass indicate salt-tolerant plants should be used. Vigorous stands of sagebrush, cheatgrass, or Russian thistle indicate a site that could produce high-yielding stands of forage plants. Remnants of bluebunch wheatgrass generally show that drought resistant species should grow well. Mountain shrubs in an area indicate a mix of less drought-resistant plants would succeed.

Several problems arise in trying to revegetate areas disturbed by access road and powerline construction. The most important thing is to get adequate cover established before erosion can get started. However, in areas where the exposed soil material resulting from construction activities is from the subsoil or substrata it is distinctly inferior to the natural soil of the area. This makes it difficult for soil stabilization plantings to take hold. On-site investigation and special preparation, in some cases, is needed. The following outlines some important site considerations (adapted from Artz, et al., 1970).

1. When slopes steeper than 3:1 are necessary, structural or mechanical stabilization or protection from runoff must be part of the design.

2. Cut and fill slopes should be covered with 6 or more inches of topsoil during construction. Scarification of slopes before placing topsoil is desirable.

3. Soil tests to determine needs for fertilizers or amendments are advisable.

4. Mulching will always improve chances for establishments . Straw mulch must be anchored in place. Hydraulically placed seed and mulch is especially adaptable around structures and other inaccessible and necessarily steep slopes.

5. Drill seeding is preferable to broadcasting. Seed should be applied prior to mulching.

6. Seedbed should be firm with adequate loose surface and mulch to cover the seed; scarify if hard or crusted.

A mixture of plant species is recommended in most cases. Some recommend a mix consisting of a rapid-growing annual species (pioneer plant) along with the slower-growing permanent species. (However, some BLM District experience has indicated that in mixtures of this nature, the annual proves too competitive for the slower-growing species. The success of this measure depends on the particular mix used.) A permanent species frequently is not a quick stabilizer because of failure to adapt to disturbed sites or because of a slow growth rate. For this reason, pioneer plants, such as some of the grasses, are depended on to do the initial job of stabilization along with a followup planting of more permanent species.

When a mixture of species is used, the chances of success are increased. There may be a variation in success and productivity of a single species because soil and moisture conditions can change markedly within short distances. When a mix is used, if one species does poorly, one or more of the others may take its place. One disadvantage of mixtures is that they are often hard to seed evenly.

Another factor in the use of plant materials is the ecotype. In a publication on Nevada highway plantings, Stark (1966, p. 8-9) explains:

> Each ecotypic variation of a species is especially adapted to a particular range of environmental conditions such as a particular soil or local climate. As long as the plant remains within its natural range, it is likely to grow well and reproduce. When an ecotype is removed from its natural range, the chances of survival are greatly reduced. *Artemisia tridentata* is a widely distributed species with many possible ecotypes. It appears to play the roles of both pioneer and climax plant in many cases.

He recommends using plants that are weedy by nature:

> Natural weeds, although often low in ornamental value, are usually adapted to a wide range of soils, temperature extremes, and moisture condtions. The wider the "ecological tolerance range" of a plant (or its ability to withstand environmental extremes), the better are its chances of success. In a hostile desert climate, ability to adapt successfully to a site should be more important than ability to beautify.

A good idea (Stark, 1966; Plummer, et al., 1968) is to collect all plant material from near the site where it is to be used, or from areas where soils, exposure and microclimate are similar.

The balance of this appendix will consist of a brief revegetation discussion by specific vegetative type. (Most of the information is derived from Hull and Doran, 1950; Plummer, et al., 1955; and Plummer, et al., 1968.)

Shadscale

Artificial revegetation is not recommended in this type. Although desirable for increasing forage, reducing erosion, and controlling noxious plants, artificial seeding attempts have generally failed. Even the native vegetation is sparse and natural revegetation is slow and spotty. Droughts, low humidity, high evaporation, and high diurnal temperature fluctuations add to the other problems such as poor soil conditions and scavenging of seeds by rodents.

Big Greasewood/Rabbitbrush

Studies (Rollins, et al., 1968; Evans, et al., 1969; Eckert, et al., 1973) indicate reseeding these areas is impractical, if not impossible, without a large supply of irrigation water and costly reclamation measures. Reasons include restricted rooting depth, high soil moisture tension, poor physical conditions, and a possible specific ion effect from sodium. (Conditions are similar to the shadscale zone.)

Cheatgrass

Cheatgrass has now gained control over large valley and foothill areas wherever perennial vegetation has been depleted. It maintains control for long periods of time because of a phenomenal ability to consume the surface soil moisture on which perennial seedlings depend. Cheatgrass now dominates former brushy types in the following approximate order of decreasing importance: big sagebrush, pinyon-juniper, mountain shrub, and shadscale (Plummer, et al., 1968).

Because it is a fire hazard and provides little forage value in dry years, the introduction of other species into these areas is desirable. These areas do provide good habitat for chukar and quail, however.

When to plant - Mid-October through February.

How to plant - Aerial broadcasting with a followup by anchor chain or harrow to cover the seed. Hand broadcasting can be used on small sites. (Broadcasting is not always a good method of seeding for several reasons, including a requirement to use twice as much seed as other methods, but often is the only practicable method for small and/or inaccessible areas.) Drilling can be successful on machine-scalped areas. A rangeland drill is a tractor-drawn apparatus specially designed for sowing seeds. Detailed descriptions of the apparatus used in revegetation work can be found in several publications. The Handbook of Range Seeding Equipment put out jointly by the Forest Service and BLM is one example (FSH 2244.01).

What to plant - Species and mixtures are essentially the same as should be planted in whatever type existed before the cheatgrass gained control. Check the appropriate brushy type for species and mixtures to plant.

Big Sagebrush

This type occurs over a wide range of differing climates and soil conditions, necessitating the use of varied treatments.

When to plant - Winter is best, although mid-October through February can be successful.

How to plant - Aerial broadcasting followed by anchor chaining for large areas; hand broadcasting for small, isolated tracts. The rangeland drill can be used, and requires one third to one half the seed. There is some difference of opinion among professionals as to the relative efficiency of broadcasting versus drilling.

What to plant - Suggested species include crested wheatgrass, Russian wildrye, Indian ricegrass, four-wing saltbrush in lighter moisture areas. Where moisture is more available (i.e., 11 inches), intermediate wheatgrass, smooth brome, alfalfa, and antelope bitterbrush are suggested. Native shrubs such as sagebrush, rabbitbrush, and ephedra can also be used.

Wet and Semi-Wet Meadows

These areas are important because they provide succulent vegetation throughout the growing season for wildlife and livestock. Most meadows have been seriously depleted of valuable sedges, grasses, forbs, and shrubs that were once abundant (Plummer, et al., 1968). The amount of organic mater present and available moisture in meadows tends to overcome the limitations found in other vegetative areas.

When to plant - Early spring to early summer is effective.

How to plant - Broadcasting is usually better than drilling on wet site.

What to plant - Two of the best varieties (Plummer, et al., 1968) are reed canarygrass and meadow foxtail. Black medick, redtop, and smooth brome are also suggested. Shrubs include bush cinquefoil, bearberry honeysuckle, and native willows. Silver buffaloberry and Russian olive may be used in slightly alkaline areas. Shrubs must be transplanted rather than seeded.

Juniper and Pinyon-Woodland

There is a large variation in these sites, with a variety of climates. These areas are often without an adequate understory, resulting in erosion and siltation of streams. Seeding pinyon-juniper stands, although difficult, can improve the watershed qualities of the area. It is not easy to reseed these areas because the soils are usually low in organic matter and moisture-holding capacity. Where erosion has occurred, much of the topsoil is gone. Competition with tree roots for moisture and nutrients is an added factor.

When to plant - Late fall through winter.

How to plant - Helicopters are better than fixed-wing planes for seeding areas broken into patches. A pipe or log harrow is effective for covering seed on small areas. Seeds of any species in short supply can be dropped into cleat marks by seed dribblers mounted on crawler tractors.

What to plant - Because of the variety of conditions in these sites, the species to be planted frequently depends on what seeds are available. A number of shrubs, forbs, and grasses are recommended for use in erosion control or roadbank stabilization (Plummer, et al., 1968; Stark, 1966).

Mountain Shrub

Soils in the mountain shrub type are usually fertile and will support high yield of seeded plants. This, combined with moisture availability, makes the mountain shrub type generally successful to seed.

When to plant - Late fall until snow, or right after snow melt in the spring. Fall is best because the seeds will then be covered naturally when leaves drop.

How to plant - Hand broadcasting is best for the small areas that are likely to be involved. Broken down brush from clearing operations makes an excellent seedbed.

What to plant - Great Basin wildrye, intermediate wheatgrass, tall oatgrass, arrowleaf balsamroot, alfalfa, rabbitbrush, antelope bitterbrush, currant, serviceberry, and mountain mahogany are some of the suggested species.

Aspen

This type, especially where depleted of herbaceous groundcover, also supplies some of the best and easiest areas for revegetation.

When to plant - Before leaf fall and the first permanent snows.

How to plant - Hand or helicopter broadcasting is best for the small areas likely to be necessary.

What to plant - Since the intensity of shade will differ among aspen stands, shade-tolerant species should be used. Tall oatgrass, intermediate wheatgrass, Kentucky bluegrass, mountain lupine, common cowparsnip, antelope bitterbrush, snowberry, and rabbitbrush are among the species suggested.

Before a course of action is outlined for revegetation, the sites involved should be investigated closely. The discussion outlined above is quite general, so detailed sources of information, such as the references cited, should be consulted. Detailed lists of plant species, sources of seed, costs, methods of collection, quantities to use, and other information are found in these publications.

In summary, the following conditions and procedures should be observed for successful revegetation efforts (adapted from Plummer, et al., 1968).

1. Terrain and soil type must be suitable.

2. Precipitation must be adequate to assure establishment and survival of planted species.

3. Competition must be low enough to assure that the desired species can become firmly established.

4. Only species and strains of plants adapted to the area should be planted.

5. Mixtures of plant types rather than single species should be planted.

6. Sufficient seed of acceptable purity and viability should be planted to insure getting a stand.

7. Seed must be covered sufficiently.

8. Planting should be done in a season that gives promise of optimum conditions for establishment.

9. The planted areas must not be over-grazed.

APPENDIX F

WILDLIFE

WILDLIFE SPECIES LIST

Amphibians

Common Name	Scientific Name
Tiger Salamander	*Ambystoma tigrinum*
Great Basin Spadefoot	*Scaphiopus hammondi*
Western Toad	*Bufo boreas*
Woodhouse's Toad	*Bufo woodhousei*
Pacific Tree Frog	*Hyla regilla*
Western Chorus Frog	*Pseudacris triseriata*
Leopard Frog	*Rana pipiens*
Spotted Frog	*Rana pretiosa*
Bullfrog	*Rana catesbeiana*

Reptiles

Collared Lizard	*Crotaphytus collaris*
Leopard Lizard	*Crotaphytus wislizenii*
Western Fence Lizard	*Sceloporus occidentalis*
Sagebrush Lizard	*Sceloporus graciosus*
Side-blotched Lizard	*Uta stansburiana*
Desert Horned Lizard	*Phrynosoma platyrhinos*
Short-horned Lizard	*Phrynosoma douglassi*
Western Skink	*Eumeces skiltonianus*
Western Whiptail	*Cnemidophorus tigris*
Rubber Boa	*Charina bottae*
Racer	*Coluber constrictor*
Desert Striped Whipsnake	*Masticophis taeniatus*
Gopher Snake (Pine)	*Pituophis melanoleusus*
Western Long-nosed Snake	*Rhinocheilus lecontei*
Western Garter Snake	*Thamnophis elegans*
Common Garter Snake	*Thamnophis sirtalis*
Western Ground Snake	*Sonora semiannulata*
Desert Night Snake	*Hypsiglena torquata*
Western Rattlesnake	*Crotalus viridis*

Mammals

Merriam Shrew	*Sorex merriami*
Masked Shrew	*Sorex cinereus*
Vagrant Shrew	*Sorex vagrans*
Dusky Shrew	*Sorex obscurus*
Northern Water Shrew	*Sorex palustris*
Little Brown Myotis	*Myotis lucifugus*
Yuma Myotis	*Myotis yumanensis*
Long-eared Myotis	*Myotis evotis*
Fringed Myotis	*Myotis thysanodes*
Long-legged Myotis	*Myotis volans*

Mammals

Common Name	Scientific Name
California Myotis	*Myotis californicus*
Small-footed Myotis (Least)	*Myotis subulatus*
Big Brown Bat	*Eptesicus fuscus*
Silver-haired Bat	*Lasionycteris noctivagans*
Western Pipistrella	*Pipistrellus hesperus*
Hoary Bat	*Lasiurus cinereus*
Western Big-eared Bat	*Corynorhinus rafinesquei*
Spotted Bat	*Euderma maculata*
Pallid Bat	*Antrozous pallidus*
Big Freetail Bat	*Tadarida macrotis*
Mexican Freetail Bat	*Tadarida brasiliensis*
Raccoon	*Procyon lotor*
Short-tail weasel	*Mustela erminea*
Long-tail weasel	*Mustela frenata*
Mink	*Mustela vison*
River Otter	*Lutra canadensis*
Spotted Skunk	*Spilogale putorius*
Striped Skunk	*Mephitis mephitus*
Badger	*Taxidea taxus*
Red Fox	*Vulpes fulva*
Kit Fox	*Vulpes macrotis*
Coyote	*Canis latrans*
Mountain Lion	*Felis concolor*
Bobcat	*Lynx rufus*
Yellowbelly Marmot	*Marmota flaviventris*
Townsend Ground Squirrel	*Citellus townsendi*
Richardson Ground Squirrel	*Citellus richardsoni*
Belding Ground Squirrel	*Citellus beldingi*
Whitetail Antelope Squirrel	*Citellus leucurus*
Golden-mantled Ground Squirrel	*Citellus lateralis*
Least Chipmunk	*Eutamias minimus*
Cliff Chipmunk	*Eutamias dorsalis*
Northern Pocket Gopher	*Thomomys talpoides*
Townsend Pocket Gopher	*Thomomys townsendi*
Little Pocket Mouse	*Perognathus longimembris*
Great Basin Pocket Mouse	*Perognathus parvus*
Dark Kangaroo Mouse	*Microdipodops megacephalus*
Ord Kangaroo Rat	*Dipodomys ordi*
Great Basin Kangaroo Rat	*Dipodomys microps*
Merriam Kangaroo Rat	*Dipodomys merriami*
Desert Kangaroo Rat	*Dipodomys deserti*
Beaver	*Castor canadensis*
Northern Grasshopper Mouse	*Onychomys leucogaster*
Western Harvest Mouse	*Reithrodontomys megalotis*
Canyon Mouse	*Peromyscus crinitus*
(Whitefooted) Deer Mouse	*Peromyscus maniculatus*

Mammals

Common Name	Scientific Name
Pinyon Mouse	Peromyscus truei
Bushytail Woodrat	Neotoma cinerea
Boreal Redback Vole	Cethrionomys gapperi
Meadow Vole	Microtus pennsylvanicus
Mountain Vole	Microtus montanus
Longtail Vole	Microtus longicaudus
Sagebrush Vole	Lagurus curtatus
Muskrat	Ondatra zibethica
Norway Rat	Rattus norvegicus
House Mouse	Mus musculus
Western Jumping Mouse	Zapus princeps
Porcupine	Erethizon dorsatum
Whitetail Jackrabbit	Lepus townsendi
Snowshoe Hare	Lepus americanus
Blacktail Jackrabbit	Lepus californicus
Mountain Cottontail	Sylvilagus nuttalli
Pigmy Rabbit	Sylvilagus idahoensis
Mule Deer	Odocoileus hemionus
Pronghorn Antelope	Antilocarpa americana

Birds

Common Name	Scientific Name
Common Loon	Gavia immer
Horned Grebe	Colymbus auritus
Eared Grebe	Podiceps caspicus
Western Grebe	Aechmophorus occidentalis
Pied-Billed Grebe	Podilymbus podiceps
White Pelican	Pelecanus erythrorhynchos
Double-Crested Cormorant	Phalacrocorax auritus
Great Blue Heron	Ardea herodias
American Egret	Casmerodius albus
Snowy Egret	Egretta thula
Black Crowned Night Heron	Nycticorax nycticorax
Least Bittern	Ixobrychus exilis
American Bittern	Botaurus lentiginosus
White-Faced Glossy Ibis	Plegadis chihi
Whistling Swan	Olor columbianus
Canada Goose	Branta canadensis
White-fronted Goose	Anser albifrons
Lesser Snow Goose	Chen hyperborea
Ross Goose	Chen rossii
Mallard	Anas platyrhynchos
Gadwall	Anas streperas
Baldpate (American widgeon)	Mareca americana
Pintail	Anas acuta
Greenwinged teal	Anas carolinenis

Birds

Common Name	Scientific Name
Blue-winged teal	Anas discors
Cinnamon teal	Anas cyanoptera
Shoveler	Spatula clypeata
Wood Duck	Aix sponsa
Redhead	Aythya americana
Ring-necked Duck	Aythya collaris
Canvas-back	Aythya valisineria
Greater Scaup Duck	Aythya marila
Lesser Scaup Duck	Aythya affinis
American Goldeneye	Bucephala clangula
Barrow's Goldeneye	Bucephala islandica
Buffle-Head	Bucephala albeola
Ruddy Duck	Oxyura jamaicensis
Hooded Merganser	Lophodytes cucullatus
(Common) American Merganser	Mergus merganser
Red-Breasted Merganser	Mergus serrator
Turkey Vulture	Cathartes aura
Goshawk	Astur atricapillus
Sharp-Shinned Hawk	Accipiter velox
Cooper's Hawk	Accipiter cooperii
Red-Tailed Hawk	Buteo borealis
Swainson's Hawk	Buteo swainsoni
American Rough-Legged Hawk	Buteo lagopus
Ferruginous Hawk	Buteo regalis
Golden Eagle	Aquila chrysaetos
Bald Eagle	Haliaeetus leucocephalus
Marsh Hawk	Circus hudsonius
Osprey	Pandion haliaetus
Prairie Falcon	Falco mexicanus
Peregrine Falcon (Duck Hawk)	Falco peregrinus
Pigeon Hawk	Falco columbarius
Sparrow Hawk	Falco sparverius
Blue Grouse	Dendragapus obscurus
Ruffed Grouse	Bonasa umbellus
Sage Grouse	Centrocercus urophasianus
Hungarian Partridge (gray)	Perdix perdix
Chukar Partridge	Alectoris graeca
California Quail	Lophortyx californicus
Mountain Quail	Oreortyx pictus
Ring-necked Pheasant	Phasianus colchicus
Sandhill crane	Grus canadensis
Virginia Rail	Rallus limicola
Sora Rail	Porzana carolina
American Coot	Fulica americana
Killdeer	Charadrius vociferus
Black-bellied Plover	Squatarola squatarola

Birds

Common Name	Scientific Name
Wilson Snipe (common)	Capella delicata
Long-billed Curlew	Numenius americanus
Spotted Sandpiper	Actitis macularia
(Western) Solitary Sandpiper	Tringa solitaria
Willet	Catoptrophorus semipalmatus
Greater Yellowlegs	Totanus melanoleucus
Lesser Yellowlegs	Totanus flavipes
Baird's Sandpiper	Erolia bairdii
Least Sandpiper	Erolia minutilla
Long-billed Dowitcher	Limnodromus scolopaceus
Western Sandpiper	Ereunetes mauri
Marbled Godwit	Limosa fedoa
American Avocet	Recurvirostra americana
Black-necked Stilt	Himantopus mexicanus
Wilson Phalarope	Steganopus tricolor
Northern Phalarope	Lobipes lobatus
California Gull	Larus californicus
Ring-billed Gull	Larus delawarensis
Franklin's Gull	Larus pipixcan
Bonaparte's Gull	Larus philadelphia
Forester's Tern	Sterna forsteri
Common Tern	Sterna hirundo
Caspian Tern	Hydroprogne caspia
Black Tern	Chlidonias niger
Band-tailed pigeon	Columba fasciata
Domestic Pigeon (Rock Dove)	Columba livia
White-winged dove	Zenaida asiatica
Mourning Dove	Zenaidura macroura
Barn Owl	Tyto alba
Screech Owl	Otus asio
Horned Owl	Bubo virginianus
Pygmy Owl	Glaucidium gnoma
Burrowing Owl	Speotyto cunicularia
Long-eared Owl	Asio wilsonianus
Short-eared Owl	Asio flammeus
Saw-whet Owl	Cryptoglaux acadica
Poor-will	Phalaenoptilus nuttalii
Common Nighthawk	Chordeiles minor
White-throated Swift	Aeronautes saxatalis
Broad-tailed Hummingbird	Selasphorus platycercus
Rufous Hummingbird	Selasphorus rufus
Calliope Hummingbird	Stellula calliope
Belted Kingfisher	Megaceryle alcyon
Yellow-Shafted Flicker	Colaptes auratus
Red-shafted Flicker	Colaptes cafer
Lewis's Woodpecker	Asyndesmus lewis

Birds

Common Name	Scientific Name
Yellow-bellied sapsucker	Sphyrapicus varius
Williamson's Sapsucker	Sphyrapicus thyroideus
Hairy Woodpecker	Dendrocopos villosus
Downy Woodpecker	Dendrocopos pubescens
Eastern Kingbird	Tyrannus tyrannus
Western Kingbird	Tyrannus verticalis
Ash-throated Flycatcher	Myiarchus cinerascens
Say's Phoebe	Sayornis saya
Traill's Flycatcher	Empidonax traillii
Hammond's Flycatcher	Empidonax hammondii
Dusky Flycatcher	Empidonax oberholseri
Gray Flycatcher	Empidonax wrightii
Western Flycatcher	Empidonax difficilis
Western Wood Pewee	Contopus richardsonii
Olive-sided Flycatcher	Nuttallornis borealis
Horned Lark	Otocoris alpestris
Violet-green Swallow	Tachycineta thalassina
Tree Swallow	Iridoprocne bicolor
Bank Swallow	Riparia riparia
Rough-winged Swallow	Stelgidopteryx ruficollis
Barn Swallow	Hirundo erythrogaster
Cliff Swallow	Petrochelidon pyrrhonota
Purple Martin	Progne subis
Steller's Jay	Cyanocitta stelleri
Scrub Jay	Aphelocoma coerulescens
American Magpie	Pica pica
Raven	Corvus corax
Crow	Corvus brachyrhynchos
Pinyon Jay	Gymnorhinus cyanocephaus
Clark's Nutcracker	Nucifraga columbiana
Black-capped Chickadee	Penthestes atricapillus
Mountain Chickadee	Penthestes gambeli
Plain Titmouse	Parus inornatus
Common Bushtit	Psaltriparus minimus
White-Breasted Nuthatch	Sitta carolinensis
Red-Breasted Nuthatch	Sitta canadensis
Brown Creeper	Carthia familiaris
Dipper (Water Ouzel)	Cinclus mexicanus
(Western) House Wren	Troglodytes aedon
Winter Wren	Troglodytes troglodytes
Long-billed Marsh Wren	Telmatodytes palustris
Canon Wren	Catherpes mexicanus
Rock Wren	Salpinctes obsoletus
Catbird	Dumetella carolinensis
Sage Thrasher	Oreoscoptes montanus
Mockingbird	Mimus polyglottos

Birds

Common Name	Scientific Name
Robin	Turdus migratorius
Hermit Thrush	Hylocichla guttata
Swainson's Thrush	Hylocichla ustulata
Veery	Hylocichla fuscescens
Western Bluebird	Sialia mexicana
Mountain Bluebird	Sialia currucoides
Townsend's Solitaire	Myadestes townsendi
Golden-Crowned Kinglet	Regulus satrapa
Ruby-Crowned Kinglet	Corthylio calendula
American Pipit (Water)	Anthus spinoletta
Bohemian Waxwing	Bombycilla garrula
Cedar Waxwing	Bombycilla cedrorum
Northern Shrike	Lanius borealis
Loggerhead Shrike	Lanius ludovicianus
Starling	Sturnus vulgaris
Solitary Vireo	Vireo solitarius
Red-eyed Vireo	Vireo olivaceus
Warbling Vireo	Vireo gilvus
Orange-Crowned Warbler	Vermivora celata
Nashville Warbler	Vermivora ruficapilla
Virginia's Warbler	Vermivora virginiae
Yellow Warbler	Dendroica aestiva
Myrtle Warbler	Dendroica coronata
Audubon's Warbler	Dendroica auduboni
Black-throated Gray Warbler	Dendroica nigrescens
Townsend's Warbler	Dendroica townsendi
Hermit Warbler	Dendroica occidentalis
Chestnut-sided Warbler	Dendroica pensylvanica
Blackpoll Warbler	Dendroica striata
Northern Waterthrush	Seiurus noveboracensis
Mac Gillivray's Warbler	Oporornis tolmiei
Yellow-Throat	Geothlypis trichas
(Long-tailed) Yellow-breasted Chat	Icteria virens
(Wilson's) Pileolated Warbler	Wilsonia pusilla
American Redstart	Setophaga ruticilla
(English) House Sparrow	Passer domesticus
Bobolink	Dolichonyx oryzivorus
Western Meadowlark	Sturnella neglecta
Yellow-headed Blackbird	Xanthocephalus xanthocephalus
Red-winged Blackbird	Agelaius phoeniceus
Bullock's Oriole	Icterus bullockii
Brewer's Blackbird	Euphagus cyanocephalus
(Brown-head) Common Cowbird	Molothrus ater
Western Tanager	Piranga ludoviciana
Rose-breasted Grosbeak	Pheucticus ludovicianus

Birds

Common Name	
Black-headed Grosbeak	Hedymeles melanocephalus
Indigo Bunting	Passerina cyanea
Lazuli Bunting	Passerina amoena
Evening Grosbeak	Hesperiphona vespertina
California Purple Finch	Carpodacus purpureus
Cassin's Purple Finch	Carpodacus cassini
(Linnet) House Finch	Carpodacus mexicanus
Gray-Crowned Rosy Finch	Leucosticte tephrocotis
Black Rosy Finch	Leucosticte atrata
Common Redpoll	Acanthis linaria
Pine Siskin	Spinus pinus
(Common) American Goldfinch	Spinus tristis
Lesser Goldfinch	Spinus psaltria
Red Crossbill	Loxia curvirostra
Green-tailed Towhee	Chlorura chlorura
(Rufous-sided) Spotted Towhee	Pipilo maculatus
Lark Bunting	Calamospiza melanocorys
Savannah Sparrow	Passerculus sandwichansis
(Western) Grasshopper Sparrow	Ammodramus savannarum
Vesper Sparrow	Pooecetes gramineus
(Western) Lark Sparrow	Chondestes grammacus
Sage Sparrow	Amphispiza nevadensis
Slate-colored Junco	Junco hyemalis
Oregon Junco	Junco oreganus
Gray-headed Junco	Junco caniceps
(Western) Tree Sparrow	Spizella arborea
(Western) Chipping Sparrow	Spizella passerina
Brewer's Sparrow	Spizella breweri
Harris Sparrow	Zonotrichia querula
White-Crowned Sparrow	Zonotrichia leucophrys
White-throated Sparrow	Zonotrichia albicollis
Fox Sparrow	Passerella iliaca
Lincoln's Sparrow	Melospiza lincolnii
Song Sparrow	Melospiza melodia
(Lapland) Alaska Longspur	Calcarius lapponicus
Snow Bunting	Plectrophenax nivalis

TABLE F-1
Existing Aquatic (Stream) Habitat

STREAM	AVERAGE FLOW (CFS) 1/	BIOLOGICAL RATING 2/	GAME FISH SPECIES 3/
Humboldt River Basin			
Humboldt River (Humboldt Co.)	38.13	171	B,BB,CC,LB,SB,WCR, BNB,GS,WBA,SP
Rock Creek	1.12	115	BT
Maggie Creek	5.88	173	BNT,BT,CT
Susie Creek	*	*	*
Humboldt River (Elko Co.)	12.61	201	B,BB,BNT,CC,LB,RT, SB,WC
Pie Creek	2.97	121	BNT,CT
Gance Creek	1.45	109	CT,RT
Mahala Creek	0.31	79	BT,CT
N. F. Humboldt River	2.33	134	BNT,BT,CT,RT
W. F. Beaver Creek	*	*	*
E. F. Beaver Creek	*	*	*
Mary's River	5.02	193	CT
T Creek	0.87	113	BT,CT
Wild Cat Creek	*	*	*
Tabor Creek	2.48	142	BT,RT
Burnt Creek	*	*	*
Sherman Creek	*	*	CT
Jackstone Creek	*	*	BT
Rabbit Creek	*	*	*
Lamoille Creek	11.90	196	BT,CT,RT
Cold Creek	3.14	153	BT
Soldier Creek	2.79	143	BT,CT
Stephens Creek	*	*	BT
Boulder Creek	9.74	220	BNT,BT
Derring Creek	2.00	95	BT,RT
Ackler Creek	12.92	225	BT
Trout Creek	*	*	*
Clover Creek	*	*	*
Willow Creek	*	*	*
Bishop Creek	*	*	*
Great Salt Lake Basin			
Loomis Creek	*	*	BT
Pole Creek	*	*	*
Thousand Springs Creek	*	54	BT
Snake River Basin			
Sun Creek	0.93	125	BT,RT
Camp Creek	2.25	91	RT
Cottonwood Creek	0.59	105	RT
Canyon Creek	3.30	133	BT,RT
N. F. Salmon Falls Creek	*	*	RT
Salmon Falls Creek	20.00	214	BNT,RT,W,KT
Snake River Basin (Idaho)			
Salmon Falls Creek	*	*	BNT,RT,CT,BT,KT,W, CS,LB,SB,BC,CC
Cottonwood Creek	*	*	RT
McMullan Creek	*	*	RT
Rock Creek	*	*	RT
Snake River	*	*	CT,RT

1/ Average Flow - Mean flow in CFS of the stream on date of survey on upper, middle sections of the stream.

2/ Biological Rating - Rating system developed by the Fisheries Division, Nevada Dept. of Fish & Game, which includes analysis of ten biological factors: velocity, temperature, volume flow, bottom type, turbidity, pools, cover, riffles, spawning and food.

3/ Game Fish Species:

B -Bluegill
BB -Black Bullhead
BNB-Brown Bullhead
BT -Brook Trout
BNT-Brown Trout
BC -Black Crappie
CC -Channel Catfish
CT -Cutthroat Trout
CS -Coho Salmon
GS -Green Sunfish
KT -Kokanee Salmon
LB -Largemouth Black Bass
RT -Rainbow Trout
SB -Smallmouth Black Bass
SP -Sacramento Perch
W -Whitefish
WC -White Catfish
WCR-White Crappie
WBA-White Bass

* Data not available

Fish Fauna of the Humboldt System

Trout (Family Salmonidae)

Cutthroat trout - Salmo clerki (N)
Rainbow trout - Salmo gairdneri (I)
Brown trout - Salmo trutta (I)
Brook trout - Salvelinus fontinalis (I)
Mountain whitefish - Prosopium williamsoni (N)

Suckers (Family Catostomidae)

Mountain sucker - Catostomus platyrhynchus (N)
Tahoe sucker - Catostomus tahoensis (N)

Catfish (Family Ictaluridae)

White catfish - Ictalurus catus (I)
Black bullhead - Ictalurus melas (I)
Brown bullhead - Ictalurus nebulosus (I)
Channel catfish - Ictalurus punctatus (I)

Basses (Family Serranidae)

White bass - Roccus chrysops (I)

Sunfishes (Family Centrarchidae)

Sacramento Perch - Archoplites interruptus (I)
Green sunfish - Lepomis cyanellus (I)
Bluegill - Lepomis macrochirus (I)
Largemouth bass - Micropterus salmoides (I)
Smallmouth bass - Micropterus dolomieui (I)
White crappie - Pomoxis annalaris (I)

Perches - (Family Percidae)

Walleye - Stizostedion vitreum (I)

Minnow and Carp (Family Cyprinidae)

Goldfish - Carassius auratus (I)
Carp - Cyprinus carpio (I)
Lahontan tui chub - Gila bicolor obesus (N)
Lahontan speckled dace - Richichthys osculus robustus (N)
Lahontan redside - Richardsonius egregius (N)

Livebearers (Family Pocciliidae)

Mosquitofish - Gambusia affinis (I)

Northern squawfish - Ptychocheilus oregonensis (N)
Longnose dace - Rhinichthys cataractae (N)
Speckled dace - Rhinichthys osculus (N)
Redside shiner - Richardsonius balteatus (N)

Sculpins (Family Cottidae)

Mottled sculpin - Cottus bairdi (N)
Piute sculpin - Cottus beldingi (N)
Shorthead sculpin - Cottus confusus (N)

(N) = Native (I) = Introduced

Fish Fauna of the Snake System (Nevada & Idaho)

Sturgeon (Family Acipenseridae)

White sturgeon - *Acipenser transmontanus* - Snake River below Shoshone Falls (N)

Trout (Family Salmonidae)

Coho salmon - *Oncorhynchus kisutch* (I)
Kokanee salmon - *Oncorhynchus nerka* (I)
Mountain whitefish - *Prosopium williamsoni* (N)
Cutthroat trout - *Salmo clarki* (N)
Rainbow trout -*Salmo gairdneri* (N)
Brown trout - *Salmo trutta* (I)
Brook trout - *Salvelinus* (I)

Suckers (Family Catostomidae)

Utah sucker - *Catostomus ardens* (N)
Longnose sucker - *Catostomus catostomus* (N)
Bridgelip sucker - *Catostomus columbianus* (N)
Largescale sucker - *Catostomus macrocheilus* (N)
Mountain sucker - *Catostomus platyrhychus* (N)

Catfish (Family Ictaluriadae)

Brown bullhead - *Ictalurus nebulosus* (I)
Channel catfish - *Ictalurus punctatus* (I)

Sunfishes (Family Centrarchidae)

Pumpkinseed - *Lepomis gibbosus* (I)
Bluegill - *Lepomis macrochirus* (I)
Smallmouth bass - *Micropterus dolomieui* (I)
Largemouth bass - *Micropterus salmoides* (I)
Black crappie - *Pomoxis nigromaculatus* (I)

Perches (Family Percidae)

Yellow perch - *Perca flavescens* (I)
Walleye - *Stizostedion vitreum* (I)

Minnow and Carp (Family Cyprinidae)

Chiselmouth - *Acrocheilus alutaceus* (N)
Carp - *Cyprinus carpio* (I)
Utah chub - *Gile atraria* (N)
Peamouth - *Mylocheilus caurinus* (N)

Sculpins (Family Cottidae)

Piute sculpin - *Cottus beldingi* (N)

(N) = Native (I) = Introduced

APPENDIX G

RECREATION

The Following Table Lists Impacts To The Recreation Resource By Corridor And Segment.

Table G-1 Recreational Impacts By Corridor

HIGHWAY CORRIDOR

Type of Impact	Resource	Type	Location
Segment A-B			
physical impact	structure	proposed road side rest	I-80, west of Rye Patch Dam
physical impact	structure	proposed state recreation area	I-80, west of Rye Patch Dam
impacts on recreation experience	recreation concentrations	non-water related/sightseeing	north end of Humboldt Range
physical impact	structure	private recreation area	north end of Humboldt Range
Physical impact	Structure	road side rest	Cosgrave - 17 miles s.w. of Winnemucca
Impacts on recreation experience	recreation concentrations	water related/sightseeing	Winnemucca
Segment B-C			
impact on recreation experience	recreation concentrations	non-water related/sightseeing	Sonoma Mt. east of Winnemucca
activity impacts	stream	fishing	Rock Creek - on line 15 miles east of Winnemucca
Segment C-D			
impacts to recreation experience	recreation concentrations	water related/sightseeing	adjacent to I-80 and river
Segment D-E			
impacts to recreation experience	recreation concentrations	water related/sightseeing	adjacent to I-80 and river
Segment E-F			
impacts to recreation experience	recreation concentrations	non-water related	Emigrant Pass west of Carlin
Segment F-G			
impact to recreation experience	recreation concentrations	water & non-water related/sightseeing	on I-80 & river west of Elko
activity impacts	stream	fishing	where line crosses stream flow from Ruby Mts. to Humboldt River

Table G-1 Recreational Impacts By Corridor
(Continued)

HIGHWAY CORRIDOR

Type of Impact	Resource	Types	Location
Segment G-J			
impacts to recreation experience	recreation opportunity	sightseeing	on line north of Wells, Nevada
Segment J-K			
impacts to recreation experience	recreation concentrations	non-water related/sightseeing/primitive values	at Contact, Nevada on Hwy 93, 15 miles south of Jackpot, Nevada
physical impact	structures	proposed state recreation area	at Contact, Nevada
impacts to recreation experience	recreation opportunity	sightseeing	on line along Highway 93
physical impact	structures	proposed state recreation area	Jackpot, Nevada
Segment K-L			
impacts to recreation experience	recreation concentrations	water related/primitive values/sightseeing	in Idaho on line 5 miles north of Jackpot, Nevada
impacts to recreation experience	recreation concentrations	water related/sightseeing	Salmon Falls Reservoir, Idaho
Segment L-M			
physical impact	structures/development	private recreation area	18 miles south of Twin Falls, Idaho
Segment M-N			
impacts to recreation experience	recreation opportunity	non-water related	foothills, Sugarloaf Mt., 18 miles s.
activity impacts	historical trail	Oregon trail	south of Snake River, Idaho
impacts to recreation experience	recreation concentrations	water related/sightseeing	Snake River, Idaho

Table G-1 Recreational Impacts By Corridor (Continued)

O'NEIL BASIN CORRIDOR

Type of Impact	Resource	Type	Location
Segment A-C			
impacts to recreation experience	recreation concentrations	non-water related/sightseeing	Humboldt Range, Sacramento Canyon
impacts to recreation experience	recreation concentrations	non-water related/sightseeing	East Range, Table Mountain
impacts to recreation experience	recreation concentrations	water related/sightseeing	as line crosses Humboldt River
Segment C-K			
impacts to recreation experience	recreation concentrations	non-water related/sightseeing	on line 15 miles from Humboldt River
physical impacts	development	proposed reservoir	Rock Creek Reservoir
impacts to recreation experience	recreation concentrations	non-water related/sightseeing	E side of proposed Rock Creek Reservoir
impacts to recreation experience	recreation concentrations	non-water related/water related	S of tip of Humboldt National Forest west of North Fork of the Humboldt
impacts to recreation experience	recreation opportunity	water related	as line crosses North Fork of the Humboldt
impacts to recreation experience	recreation opportunity	sightseeing	on line NW of North Fork of the Humbolc
impacts to recreation experience	recreation concentrations	water related/non-water related sightseeing/primitive values	throughout upstream tributaries of Mary's River and Salmon Falls Creek
activity impacts	streams	fishing	upstream tributaries of Mary's River
physical impacts	development	proposed state recreation area	Mary's River camp
physical impacts	development	proposed state recreation area	Deer Creek Camp, tributary of Salmon Falls Creek
impacts to recreation resource	recreation concentrations	water related/non-water related sightseeing/primitive values	O'Neil Basin/Browns Bench
Segment K-M			
impact to recreation resource	recreation concentrations	non-water related/sightseeing	along foothills east of Highway 93

Table G-1 Recreational Impacts By Corridor
(Continued)

ADOBE RANGE CORRIDOR

Type of Impacts	Resource	Type	Location
Segment A-C	(see Recreation - Impacts O'Neil Basin Corridor)		
Segment C-D	(see Recreation - Impacts Highway Corridor)		
Segment D-H			
impacts to recreation experience	recreation opportunities	non-water related	Tuscarora Mountain 10 miles nw of Car'
impacts to recreation experience	recreation opportunities	winter sports	where line crosses Highway 51
impacts to recreation experience	recreation concentrations	non-water related/water related sightseeing	approximately 18 miles due n. of Elko
activity impacts	stream	fishing	approximately 18 miles due n. of Elko
Segment H-I			
impacts to recreation experience	recreation concentrations	non-water related/sightseeing	w. of North Fork of the Humboldt River
Segment I-J			
physical impacts	development	proposed Devils Gate Reservoir	n. of where line crosses North Fork of the Humboldt River
impacts to recreation experience	recreation concentrations	non-water related/water related	where line crosses North Fork of the Humboldt River
activity impacts	river	fishing	where line crosses North Fork of the Humboldt River
impact to recreation experience	recreation opportunity	sightseeing	west of Mary's River
physical impact	development	proposed Vista Reservoir	where line crosses Mary's River
impacts to recreation experience	recreation concentrations	non-water related/water related	where line crosses Mary's River
activity impacts	river	fishing	where line crosses Mary's River
impacts to recreation experience	recreation concentrations	non-water related/sightseeing	Snake Range, west of Highway 93

Table G-1 Recreational Impacts By Corridor (Continued)

METROPLIS CORRIDOR

Type of Impacts	Resource	Type	Location
Segment A-C (see Recreation - Impacts, O'Neil Basin Corridor)			
Segments C-D-E-F (see Highway Corridor)			
Segment F-I			
impacts to recreation experience	recreation opportunity	non-water related	north of Elko 8 miles
impacts to recreation experience	recreation opportunity	non-water related/water related sightseeing	north of Elko 10 miles
activity impacts	stream	fishing	north of Elko 10 miles
impacts to recreation experience	recreation concentrations	non-water/sightseeing	on line west of North Fork of the Humboldt River
Segment I-J (see Recreation - Impacts, Adobe Range Corridor)			
Segment J-K-L-M-N (see Recreation Impacts, Highway Corridor)			

APPENDIX H

SOCIAL-ECONOMICS

Table H-1
CIVILIAN LABOR FORCE

	Census of Population (Residence Based)			Department of Employment (by Place of Work)		
	1960	1970	% Change	1968	1973	% Change
Jerome County						
Civilian Labor Force	4,064	4,086	.5	3,821	4,539	18.8
Unemployment	176	211	19.9	223	222	-0.4
% Unemployed	4.3	5.2		5.8	4.9	
Total Employment	3,888	3,875	-.3	3,598	4,317	20
Agricultural	1,612	1,179	26.9	1,676	1,472	-12.2
Total Manufacturing	248	432	74.2	179	709	296.1
Food Processing	168	352	109.5	155	165	6.5
Lumber	11	4	-63.6			
Other	69	76	10.1	24	514	2,166.7
Total Non-Manufacturing	1,958	2,264	15.6	1,430	1,741	21.7
Construction	244	222	-9	72	108	50
Transportation, Communition and Utilities	262	258	-1.5	67	116	73.1
Trade	642	770	19.9	527	693	31.5
Finance, Insurance, and Real Estate	52	65	25	47	70	48.9
Service and Misc.	470	635	35.1	285	321	12.6
Government	288	314	9	432	433	.2
Not Reported	70					
Non-Agriculture Self-Employed and Domestic				313	395	26.2
Total Employment	3,888	3,875	-.3	3,598	4,317	20
Twin Falls County						
Civilian Labor Force	16,046	16,774	4.5	18,570	19,762	6.4
Unemployment	604	593	-1.8	770	768	-0.3
% Unemployed	3.7	3.5		4.2	3.9	
Total Employment	15,442	16,181	4.8	17,800	18,994	6.7
Agricultural	3,685	2,710	-26.46	2,900	2,751	-5.1
Total Manufacturing	1,382	1,911	38.3	1,830	2,571	40.5
Food Processing	757	978	29.19	1,390	1,466	5.5
Lumber	40	42	5			
Other	585	891	52.3	440	975	121.6
Total Non-Manufacturing	10,072	11,560	14.8	9,800	11,972	22.2
Construction	983	842	-14.3	700	961	37.3
Transportation, Communition and Utilities	1,267	1,203	-5.1	990	1,239	25.2
Trade	3,688	4,422	19.9	3,870	4,654	20.3
Finance, Insurance, and Real Estate	550	734	33.45	530	620	17
Service and Misc.	2,619	2,931	11.9	1,890	1,885	-0.3
Government	965	1,428	47.9	1,820	2,613	43.6
Not Reported	303					
Non-Agriculture Self-Employed and Domestic				3,270	1,700	-48
Total Employment	15,442	16,181	4.8	17,800	18,994	6.7

Sources: Census of Population, 1960, Table 83, Labor Force
1960, Table 85, Industry of Employed Persons
1970, Table 121, Labor Force
1970, Table 123, Industry of Employed Persons
Basic Economic Data for Idaho, Department of Employment, State of Idaho, March 1970.
1973 Date from unpublished Department of Employment Information.

Table H-2

POPULATION AND RATE OF CHANGE
NEVADA-IDAHO BY COUNTY
1960-70-75

County	1960 1/ Pop.	1970 1/ Pop.	Rate of Change 1960-70 %	1975 3/ Pop.	Rate of Change 1970-5 %
URBAN					
Washoe	84,743	121,068	43	159,000	31
Carson City	8,063	15,468 2/	92	26,600	72
Douglas	3,481	6,882	98	10,700	55
Storey	568	695	22	1,100	58
TOTAL	96,855	144,113	49	197,400	37
RURAL					
Humboldt	5,708	6,375	12 5/	7,600	19
Pershing	3,199	2,670	-17 5/	2,900	09
Churchill	8,452	10,513	25	11,600	10
Lyon	6,143	8,221	34	8,900	08
Mineral	6,329	7,051	11 5/	7,550	07
Nye	4,374	5,599	28	4,500	-20
Lander	1,566	2,666	70	2,900	09
Eureka	767	948	24	1,000	05
Esmeralda	619	629	02 5/	500	-21
TOTAL	37,157	44,672	20	47,450	06
Elko	12,011	13,958	16	18,800	35
Nevada	285,278	488,778	71	606,850	24
Twin Falls 4/	41,842	41,807	-.01	45,900	10
Jerome 4/	11,712	10,253	-12	13,500	32
TOTAL	53,554	52,060	-.03	59,400	14
Idaho 4/	667,191	713,008	.07	799,000	12

1/ 1970 Census of Population, Number of Inhabitants, Nevada, April 1971, U.S. Dept. of Commerce, Bureau of Census, Population Division.

2/ Between 1960-70, the name of Ormsby County, which was separated into both rural and urban areas, was changed to Carson City County. Since then, no distinction can be made between the rural and urban populations.

3/ Building Bridges to Work, Nevada Employment Security Dept., March 1975, Manpower Information and Research Section.

4/ U.S. Dept. of the Interior, Bureau of Land Management, Environmental Analysis for the Agricultural Development Program, Lower Snake River Plains of Idaho, January 1976.

5/ Due to the nature of components of change, Humboldt, Pershing, Mineral, and Esmeralda Counties experienced net out-migration in the decade 1960-1970, (-0.1, -24.0, -1.6, and -5.5 percent respectively).

Table H-3

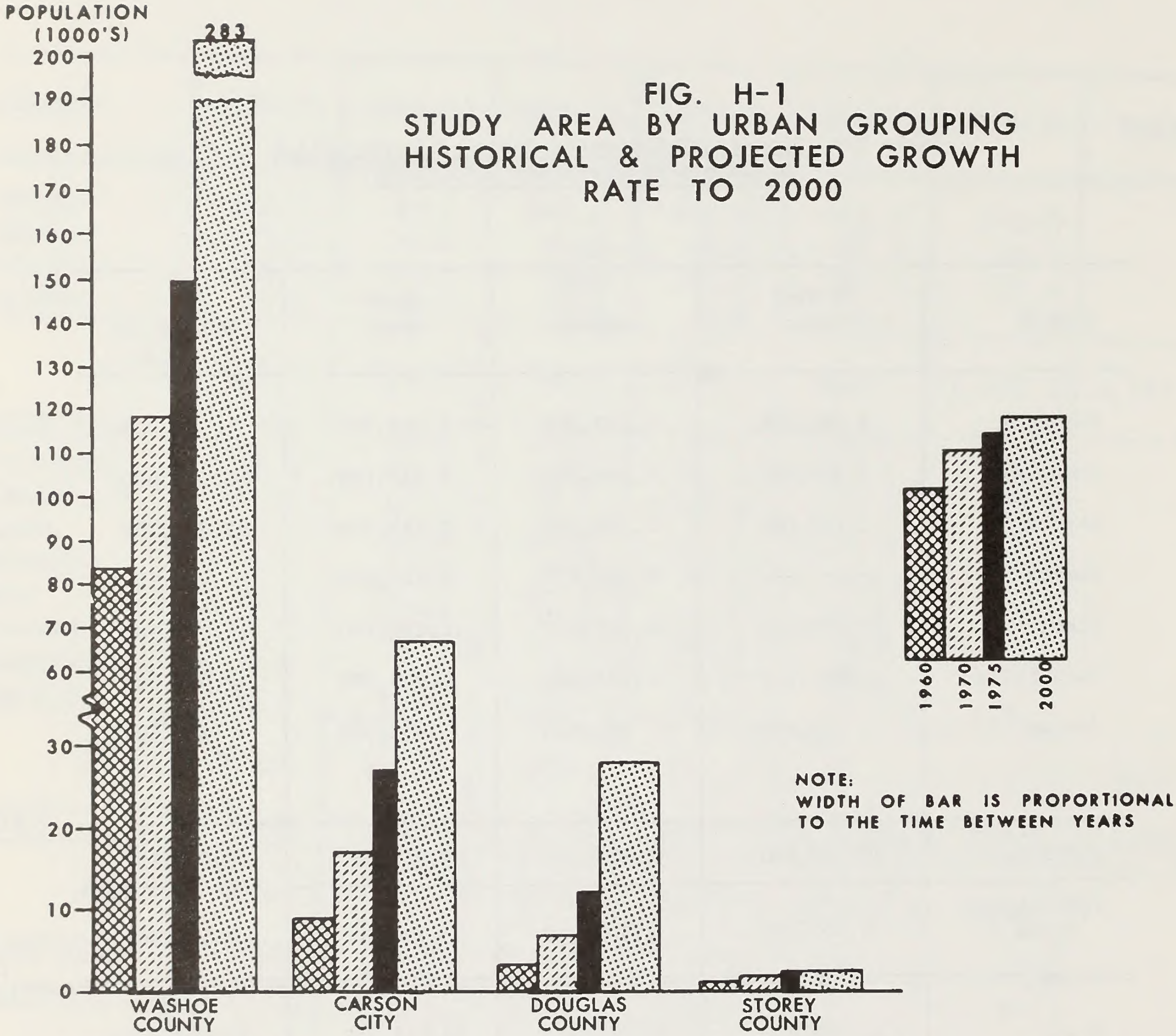
INCREASE IN TOTAL ASSESSED VALUATION $MILLIONS

County	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76	Total
Washoe	482.2	543.1	595.2	687.9	778.2	878.7	
Carson	29.0	34.0	39.3	42.9	48.3	52.4	
Douglas	65.4	69.7	74.6	82.6	96.1	111.4	
Storey	4.8	5.5	5.8	5.8	6.5	7.8	
TOTAL	581.4	652.3	714.9	819.2	929.1	1,050.3	4,747.2
Humboldt	33.6	35.4	34.5	39.2	44.3	51.0	
Pershing	21.3	22.8	23.4	25.3	27.5	29.8	
Churchill	29.0	32.5	34.7	38.5	42.7	47.4	
Lyon	52.1	60.4	63.8	62.1	65.9	75.7	
Mineral	11.2	14.3	15.3	17.1	19.2	21.0	
Nye	24.7	27.9	31.8	45.0	48.6	58.4	
Lander	20.2	21.0	21.0	21.9	23.5	26.1	
Esmeralda	5.9	7.0	7.4	9.1	10.4	11.3	
Eureka	16.5	16.2	16.5	18.1	21.4	28.1	
TOTAL	214.5	237.5	248.4	276.3	303.5	348.8	1,629.0
Elko	80.4	84.4	90.8	107.7	123.1	143.7	630.1
TOTAL	80.4	84.4	90.8	107.7	123.1	143.7	
Twin Falls	56.7	58.1	60.7	63.2	66.9	71.0	
Jerome	19.7	20.4	21.6	23.9	27.6	30.9	
TOTAL	76.4	78.5	82.3	87.1	94.5	101.9	520.7

Source: Local Government Red Book and Ad Valorem Tax Rates Budget Summaries for Nevada Local Governments, Fiscal Years 1971-6. Idaho data obtained through personal contact with local Tax Commissions in Twin Falls and Jerome Counties.

Table H-4 Summary of Estimated Costs of Construction by County by Corridor (Millions)

County	O'Neil Basin	Highway	Adobe Range	Metropolis
Pershing	5,283,900	4,262,900	5,283,900	5,283,900
Humboldt	2,448,900	6,124,300	2,539,600	2,539,600
Lander	1,785,000	2,358,200	2,448,900	2,358,200
Eureka	---------	2,446,250	2,446,250	2,446,250
Elko	13,180,300	12,640,400	11,196,700	11,700,300
Twin Falls	4,897,800	4,988,500	4,988,500	4,988,500
Jerome	453,500	453,500	453,500	453,500
Sub-Total	28,049,400	33,274,050	29,357,350	29,770,250
Substation Costs	3,500,000	3,500,000	3,500,000	3,500,000
Total	31,549,400	36,774,050	32,857,350	33,270,250



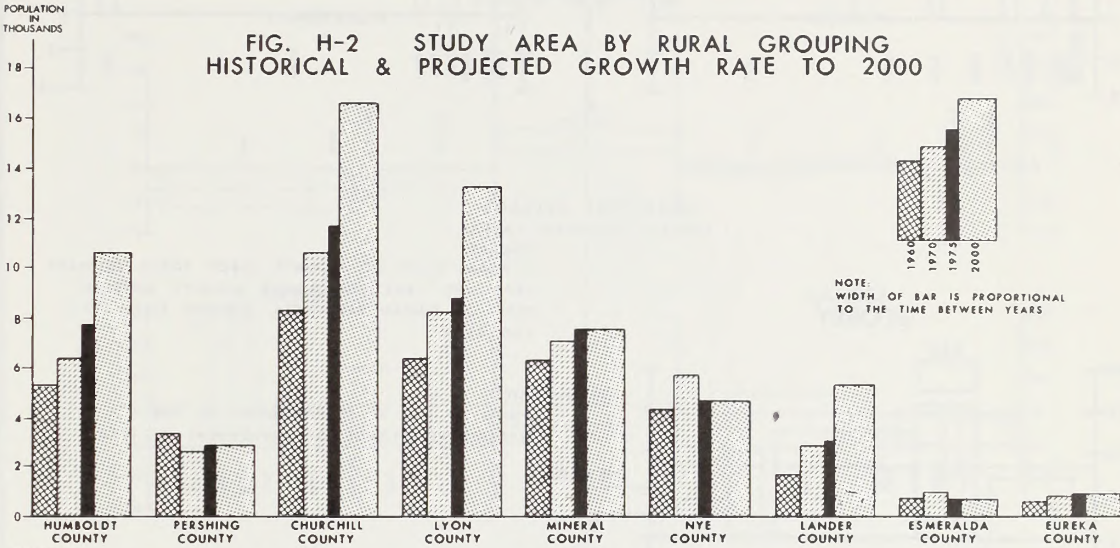
SOURCE:

1970 Census of Population, Number of Inhabitants, Nevada, April 1971, U. S. Department of Commerce, Bureau of Census, Population Division; Building Bridges to Work, Nevada Employment Security Department, March 1975, Manpower Information and Research Section.

Population Projections For The Year 2000 developed by S.F. Chu, Bureau of Business and Economic Research, University of Nevada, Reno, March 1975.

Population projections for the year 2000 for Twin Falls and Jerome County, Idaho based on the rate of growth in those counties 1970-4 and projected to 2000.

FIG. H-2 STUDY AREA BY RURAL GROUPING
HISTORICAL & PROJECTED GROWTH RATE TO 2000



SOURCE:

1970 Census of Population, Number of Inhabitants, Nevada, April 1971, U. S. Department of Commerce, Bureau of Census, Population Division; Building Bridges to Work, Nevada Employment Security Department, March 1975, Manpower Information and Research Section.

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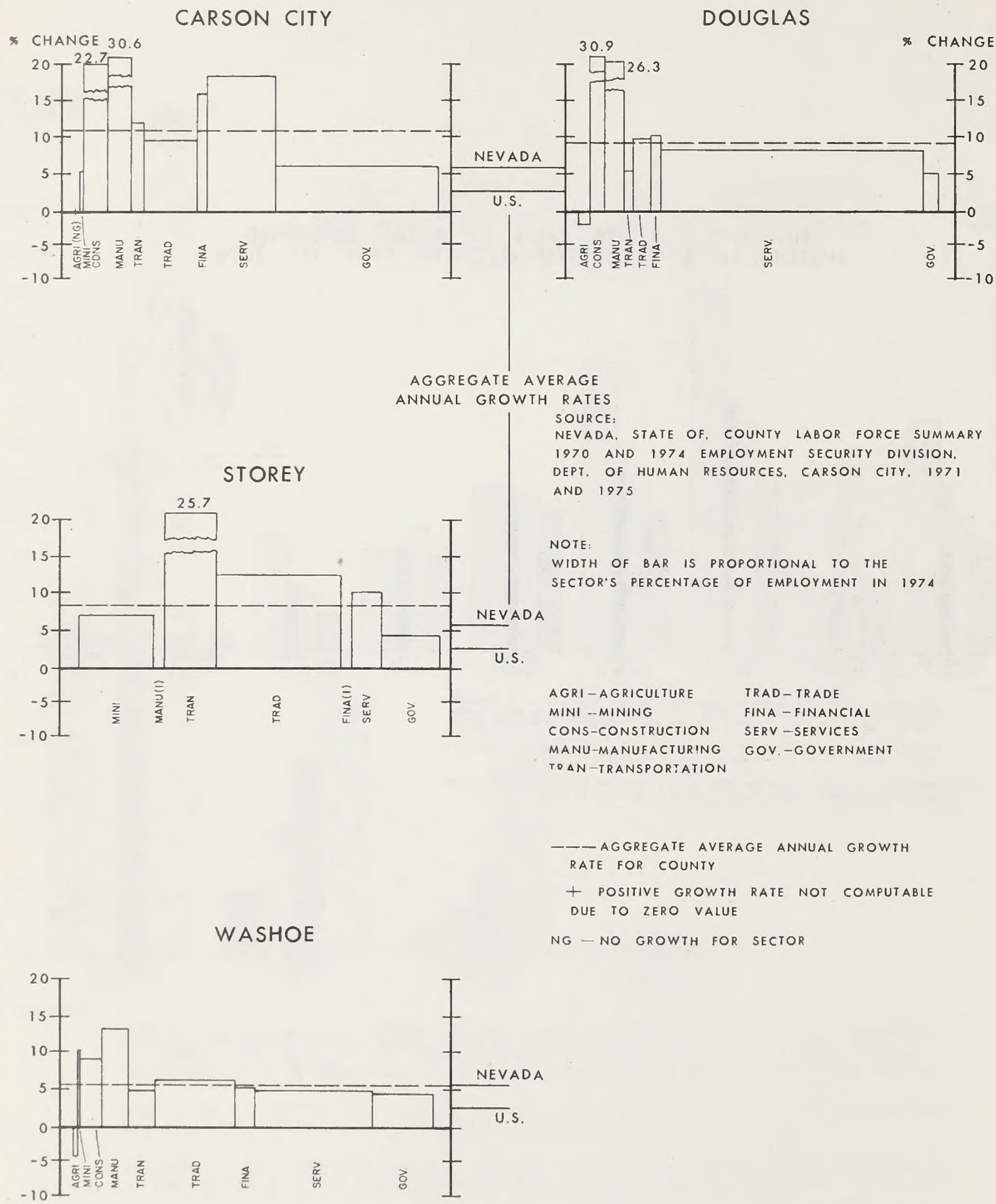
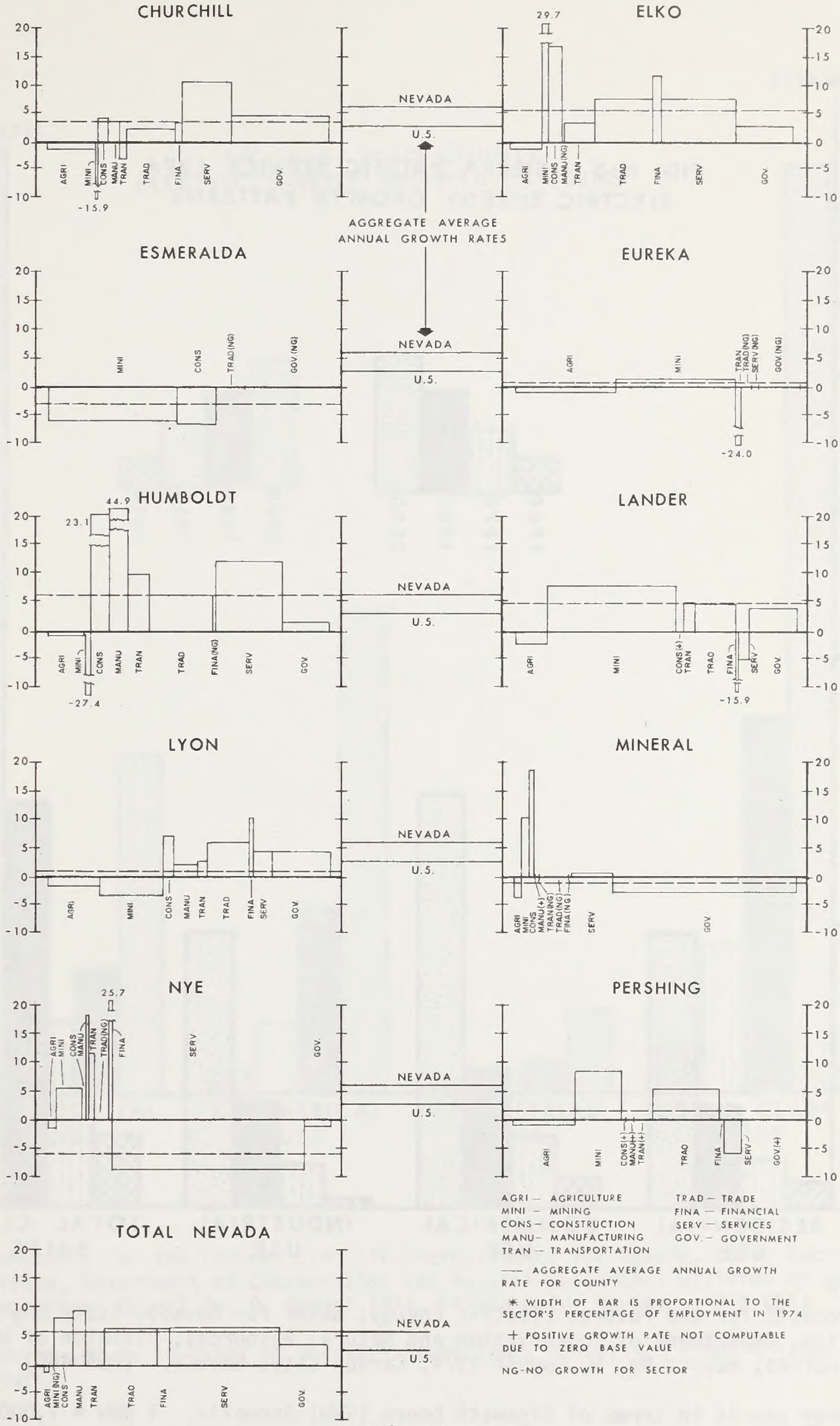


FIG. H-3
CHANGE IN EMPLOYMENT BY ECONOMIC SECTOR
URBAN COUNTIES



AGRI — AGRICULTURE
MINI — MINING
CONS — CONSTRUCTION
MANU — MANUFACTURING
TRAN — TRANSPORTATION
TRAD — TRADE
FINA — FINANCIAL
SERV — SERVICES
GOV. — GOVERNMENT

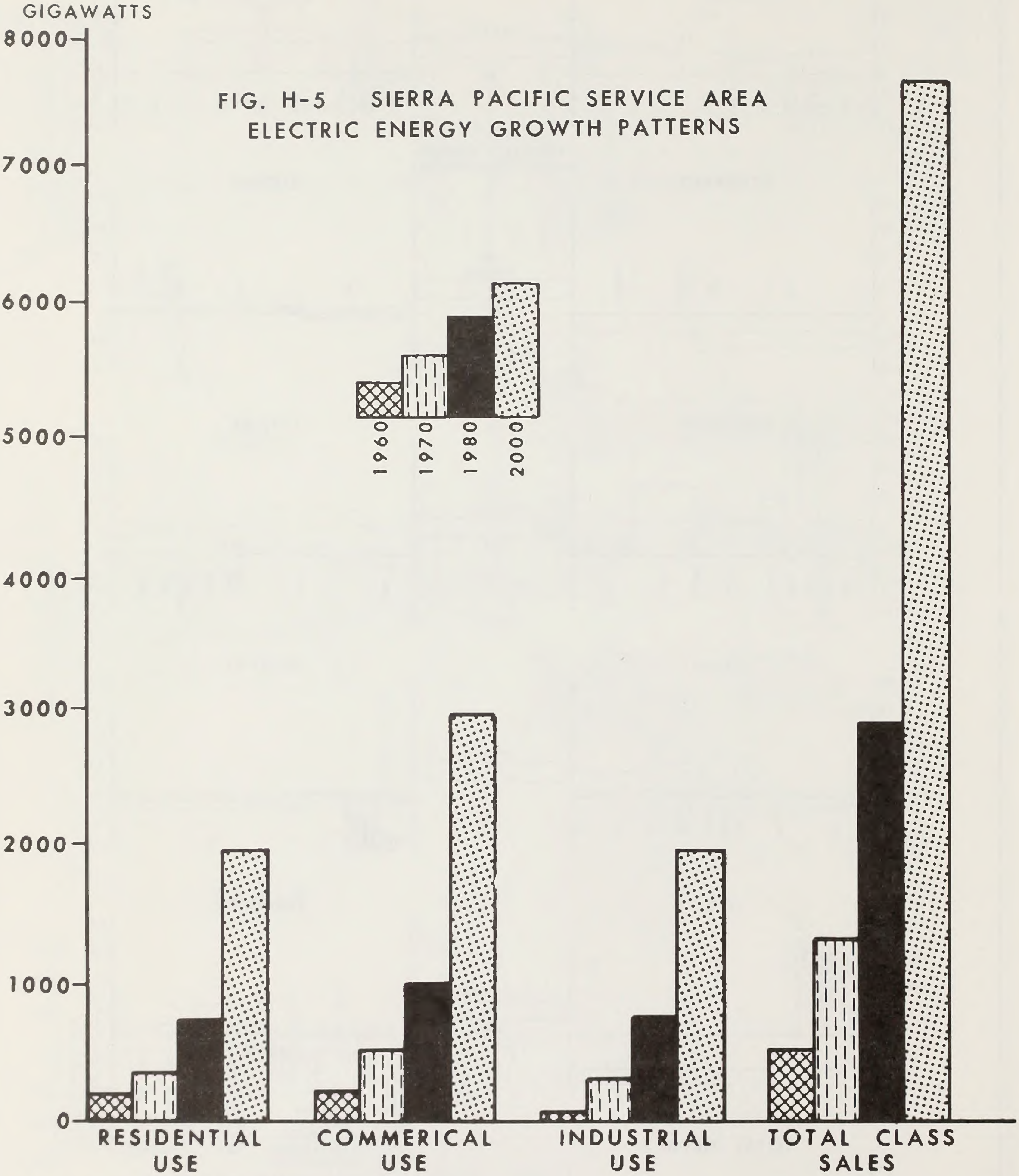
--- AGGREGATE AVERAGE ANNUAL GROWTH RATE FOR COUNTY

* WIDTH OF BAR IS PROPORTIONAL TO THE SECTOR'S PERCENTAGE OF EMPLOYMENT IN 1974

+ POSITIVE GROWTH RATE NOT COMPUTABLE DUE TO ZERO BASE VALUE

NG - NO GROWTH FOR SECTOR

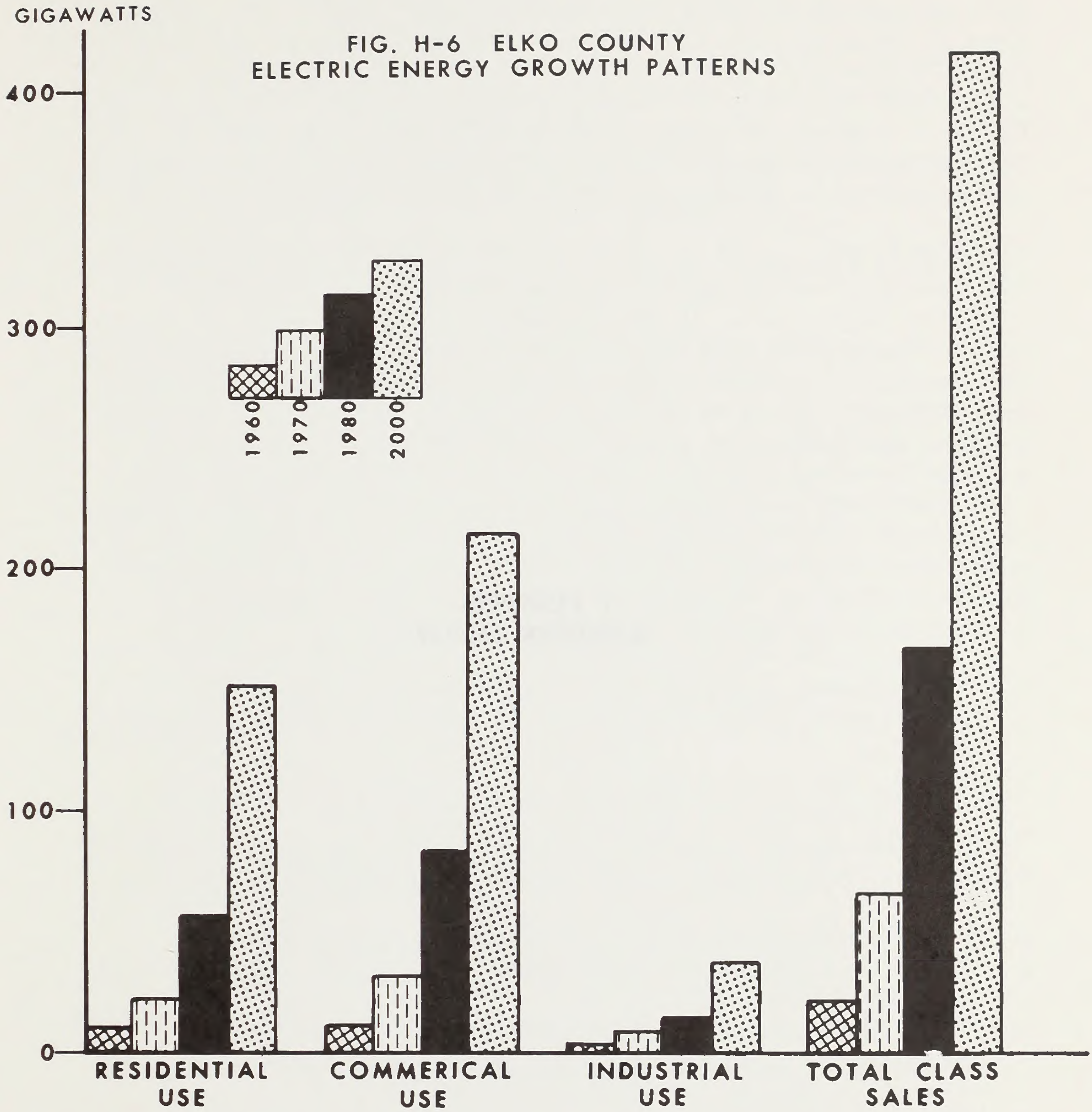
FIG. H-4
CHANGE IN EMPLOYMENT BY ECONOMIC SECTOR RURAL COUNTIES



SOURCE:

Forecasts for the Future, Electric Energy; Water for Nevada, State Engineer's Office, Department of Conservation and Natural Resources, Division of Water Resources; Report No. 9, August 1974, Carson City, Nevada. (PSA 46B)

Energy use is in terms of Gigawatt hours (GWH) Annually. 1 GWH = 1,000 Megawatt hours.



SOURCE:

Forecasts for the Future, Electric Energy; Water for Nevada, State Engineer's Office, Department of Conservation and Natural Resources, Division of Water Resources; Report No. 9, August 1974, Carson City, Nevada. (PSA 46B)

Energy use is in terms of Gigawatt hours (GWH) Annually. 1 GWH = 1,000 Megawatt hours.

APPENDIX I
VISUAL RESOURCE

VISUAL RESOURCE ANALYSIS

Purpose: The intent of this study is to serve as a creditable and meaningful evaluation of the visual resource for a large area of northern Nevada and southeastern Idaho. The subject area is generally located between Oreana, Nevada, and Twin Falls, Idaho, along and extending for several miles on either side of Interstate 80 between Oreana and Wells, Nevada, and north from Wells on Highway 93 into Twin Falls, Idaho. The subject area is currently under consideration by Sierra Pacific Power Company for location of a 230 kilovolt (kv) power transmission line.

Evaluation Process: The process utilized in this analysis has been recently developed by the Bureau of Land Management. A complete explanation of the procedure with examples of various phases appears in BLM Manual 6300 - Visual Resource Management. The overall objective is to provide a Bureau-wide, systematic approach for identifying scenery quality and setting minimum quality standards for management of the visual resource on national resource lands. Through the process, all national resource lands are classified into one of five visual resource management classes. Each of these classes contains a specific management objective for maintaining or enhancing the visual resource values. The visual management class assigned to a given land area depends upon three factors:

1. The inherent quality of the scenery being viewed.
2. The visual sensitivity level of the type of visual use it receives.
3. The visual zone it is in.

These three factors are analyzed through a six-step process to form visual management units. Briefly, these six steps are:

1. The determination and delineation of scenic quality.
2. The determination of the visual sensitivity level of each land area.
3. The identification and delineation of visual zones (the foreground, middleground, and background areas seen from travel routes or use areas).
4. The delineation and labeling of all areas where the combination of all three of the above factors are similar.
5. Assigning a visual resource management class to each of these areas.
6. The combining of contiguous areas of similar visual quality to form visual management units.

Scenic Quality: This process assigns a rating of: A-high scenic quality; B-moderate scenic quality; and C-low scenic quality, to all lands within a given area. The procedure analyzes six key factors: land form, color, water, vegetation, uniqueness, and intrusions. Each of these factors is rated against a set of general criteria and a score assigned accordingly. When the evaluation is complete on a given land unit, the individual key factor scores are totalled and the letter rating A, B, or C is assigned, depending upon the total points received. Although the majority of the study area is rated C in terms of scenic quality, many A and B areas do exist. Many of the A and B areas are associated with the mountain-type and foothill-type landscape character types, although several A and B areas are associated with the linear mountain ranges, particularly in the basin/range character type to the south of Interstate 80 in the Winnemucca and Battle Mountain area.

Visual Sensitivity Level: The next process in the evaluation is the determination of the visual sensitivity levels. (This, basically, is an indicator of people's concern for the relative importance or value of visual response to an area in relation to other areas within a given boundary.) One of the most important aspects of this procedure is criteria selection. Individual meetings were held with the BLM District Offices affected by this action including Winnemucca, Battle Mountain, Elko, and Burley, Idaho. In addition to these meetings, a recreation, cultural, and visual resource workshop was held where various factions of the public were invited to aid in determining the criteria we would use for the visual sensitivity level determination. From these meetings three visual sensitivity level criteria were determined. They are:

1. The use volume of all highway and secondary transportation routes.
2. The intensity of various recreation values.
3. Zones of influence.

These criteria and evaluation factors for determining what category they fall into, high, medium, or low, are found in the following table.

VISUAL SENSITIVITY

	High	Medium	Low
Use Volume	+600 Observers Per Day	60-600 Observers Per Day	-60 Observers Per Day

Recreation Values	3 or more rec. values, i.e., - H_2O related - Winter - Non H_2O or Concentration of 2 or more specific activities with established high use	2 major rec. values or 1 specific activity with established high use	Other identified use
Zones of Influence	- Views from with +1000 pop. - Est. overlooks on highways	- Views from towns with less than 1000 pop. - Historic marker sites - Road side rest area	- All other

Most of the subject area falls into the medium sensitivity level; however, some areas of considerable acreage are identified as having a high sensitivity level. The major ones are in the West Humboldt Range to the east and north of Lovelock and areas surrounding the Rye Patch Reservoir, several hundred acres on either side of Winnemucca, two large areas to the east and west of the community of Battle Mountain, and several miles along either side of Interstate 80 from Beowawe to approximately 20 miles beyond Elko. Another large high sensitivity level zone is located to the east of the community of Lamoille and several acres on either side of Highway 93 in the vicinity of the Nevada-Idaho border.

Visual Zones: The final major step in the process is the determination of visual zones. These zones which are actually seen areas from key observer positions such as highways, well traveled roads, overlooks, recreation sites, etc., are classified into three units:

1. Foreground-middleground zone - The foreground-middleground zone is the area visible from an observer position for a distance of five miles where management activities might be viewed in detail. The outer boundary of this zone is defined as the point where the texture and form of individual

Recreation Values	3 or more major rec. values, i.e., - H_2O related - Winter - Non H_2O or Concentration of 2 or more specific activities with established high use	2 major rec. values or 1 specific activity with established high use	Other identified use
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1. Foreground-middleground zone - The foreground-middleground zone is the area visible from an observer position for a distance of five miles where management activities might be viewed in detail. The outer boundary of this zone is defined as the point where the texture and form of individual

plants are no longer apparent in the landscape.

2. Background - The background is the viewshed which lies beyond the foreground-middleground zone from five miles to a maximum of 15 miles.
3. Seldom Seen Zone - All areas not identified in the two previous zones are considered to be in the seldom seen zone. Generally, these are areas seen from low-use transportation routes or are beyond the 15-mile background zone.

Assigning Resource Management Classes: Following the identification and delineation of the three previous evaluation factors, all areas of common characteristics were mapped and labeled. Utilizing the following matrix, a visual resource management class was then assigned to each of the units with common characteristics. For example, all areas in Class B scenery, high sensitivity level and in the background zone, would be in Class III visual resource management class.

Chart for Determining Visual Resource Management Class

		VISUAL SENSITIVITY LEVEL 2/						
		HIGH			MEDIUM			LOW
SPECIAL AREAS		I	I	I	I	I	I	I
SCENERY 1/ CLASS	A	II	II	II	II	II	II	II
	B	II	III	IV	III	IV	IV	IV
	C	III	IV	IV	IV	IV	IV	IV
		FG	BG	SS	FG	BG	SS	SS
		VISUAL ZONES 3/						

1/ SCENERY QUALITY INVENTORY: A, B, C

2/ VISUAL SENSITIVITY LEVEL: High, Medium, Low

3/ VISUAL ZONES: FG - Foreground-Middleground
BG - Background
SS - Seldom Seen

Note: Class I applies only to classified special areas, e.g., Wilderness, Primitive, Natural Areas, etc. This quality standard is established through legislation or policy.

Class V applies to areas identified in the scenery quality inventory where the quality class has been reduced because of unacceptable intrusions.

In this study three visual resource management classes were identified. Each of these classes described the visual resource value in terms of highly significant, moderately significant, or significant and the different degrees of modification allowed in the basic elements of the landscape. They are:

CLASS II

Changes in any of the basic elements (form, line, color, or texture) caused by a management activity should not be evident in the characteristic landscape.

CLASS III

Changes in the basic elements (form, line, color, or texture) caused by a management activity may be evident in the characteristic landscape; however, the changes should remain subordinate to the visual strength of the existing character.

CLASS IV

Changes may subordinate the original composition and character, but must reflect what could be a natural occurrence within the characteristic landscape. The visual resource management classes are delineated on the Visual Resource Management Map, p. 91.

VISUAL CONTRAST RATING

The BLM has devised a visual resource contrast rating method to measure the impact of proposed activities to determine whether or not they meet the standards for each visual resource management class. A complete explanation of this system can be found in the 6320 section of the BLM Manual.

Briefly, the system is based on the premise that the degree to which a management activity adversely impacts the visual quality of the landscape depends upon the amount of visual contrast that is created between the activity and the existing landscape character. The amount of contrast between a proposed activity and the existing landscape character can be measured by separating the landscape into its major features (land form features, vegetation, and structures), and then predicting the magnitude of change in contrast of each of the basic elements (form, line, color, and texture) to each of the features. Assessing the amount of contrast for a proposed activity in this manner can give a good indication of the severity of impact and serve as a guide in determining what is required to reduce the contrast to the point where it will meet the visual resource management classes for the area.

Use of the Contrast Rating - The contrast rating must be applied in the planning stages to all proposed land management activities that will disturb the soil, change or remove vegetation, or place a structure in the landscape. It should also be applied to all areas that are identified as needing rehabilitation or enhancement. Application of the contrast rating system should be done from the most critical view point or points that are or will be commonly in use although a general "overall" application can be made to give an indication of the impact by the proposed activity. When applying the rating system, keep in mind the following variables are the factors which determine how well the contrast is seen:

- Distance from which the project will be viewed.
- Angle of observation. The apparent size of a management activity is directly related to the angle between the viewers' line-of-sight and the slope being viewed. As this angle nears 90^{o}, the maximum area is viewable and becomes most critical.
- Length of time the project is in view. If the viewer has only a brief glimpse of the project, the contrast can almost be disregarded. If, however, the project is subject to view for a long period, as from an overlook, the opportunity to detect contrast becomes very critical.
- Relative size or scale of the project in relation to its surroundings.
- Season of the year and the effects of seasonal changes. Contrast rating should be done considering the heavy or most critical use season.
- Light and how it will effect the project being viewed.
- The effect time has on the healing process. Few projects can be expected to meet the visual classes immediately upon completion.

With some long-term projects, such as a strip mine, it may be desirable to have both short-term (5 years) and long-term objectives (completion of the project).

Visual Constrast Application

Landscape Description - Write a brief description of the exist-vegetation, and structures), and then predicting the magnitude of change in contrast of each of the basic elements (form, line, color, and texture) to each of the features. Assessing the amount of contrast for a proposed activity in this manner can give a good indication of the severity of impact and serve as a guide in determining what is required to reduce the contrast to the point where it will meet the visual resource management classes for the area.

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With some long-term projects, such as a strip mine, it may be desirable to have both short-term (5 years) and long-term objectives (completion of the project).

Visual Constrast Application

Landscape Description - Write a brief description of the existing landscape. Describe each of the landscape features (land form, vegetation, structures) in terms of the basic elements (form, line, color, texture).

Activity Description - Briefly describe and define the proposed activity or project. Tell how it will be accomplished and the anticipated impacts on the landscape by feature and element.

Methodology - The visual contrast created by a management activity can be measured by determining the contrast caused by that activity in each of the basic elements.

The ease of detecting contrast in the basic elements varies on a scale from 4 (form) to 1 (texture). By assigning values that indicate degree of contrast, 3 for strong, 2 for moderate, and 1 for weak, we can set up a direct multiplier for an indication of the strength of the contrast.

Elements	
Form	- 4
Line	- 3
Color	- 2
Texture	- 1

Degree of Contrast	
Strong	- 3
Moderate	- 2
Weak	- 1
None	- 0

The following rating sheet is then used to evaluate the proposed action.

VISUAL RESOURCE CONTRAST RATING SHEET

Project: ______________________________

Landscape Character Type: ______________________________

	Element	Contrast	Score	Maximum Score Possible
Land Form Features	Form - 4 X	______		
	Line - 3 X	______		
	Color - 2 X	______		
	Texture- 1 X	______		

	Total Land Form Feature Score	___	30
Vegetation Features	Form - 4 X	__________	
	Line - 3 X	__________	
	Color - 2 X	__________	
	Texture- 1 X	__________	
	Total Vegetation Feature Score	___	30
Structures Features	Form - 4 X	__________	
	Line - 3 X	__________	
	Color - 2 X	__________	
	Texture- 1 X	__________	
	Total Structures Feature Score	___	30

Individual Feature Scores:

1-10: Indicated contrast can be seen, but does not attract attention.
11-20: Attracts attention, the contrast begins to dominate the characteristic landscape.
21-30: Demands attention, will not be overlooked.

Degree of Contrast:

Strong	- 3
Moderate	- 2
Weak	- 1
None	- 0

Note: Refer to BLM Manual 6230 for complete explanation of the contrast rating system.

Contrast Rating as a Measure of Meeting Established Visual Resource Management Classes - The following is applied to determine if the proposed activity will meet the visual resource management class assigned to an area.

Class I. The contrast rating for any one element may not exceed 1 (weak) and the total contrast rating for any feature must be less than 10.

Class II. The contrast rating for any one element should not exceed 2 (moderate) and the total contrast rating for any feature may not exceed 10.

Class III. The contrast rating for any one element should not exceed 2 (moderate) and the total contrast rating for any feature may not exceed 16.

Class IV. The total contrast rating for any feature should not exceed 20.

Class V is an interim classification for rehabilitation or enhancement of an area. Based upon its indicated potential visual resource management class (II, III, or IV), select the appropriate contrast rating.

Contrast Rating - Using the methodology described, determine a contrast rating for the proposed activity. The rating quickly points out the elements and the features that will cause the greatest visual impact. This provides a guide to the most effective method of reducing the visual impact of a proposed activity or project. Those elements with the highest contrast rating are the ones that can be attacked and lowered most effectively.

If the activity does not meet the requirements for the VRM Class that has been established for the area, look at the rating scores and see what can be done to reduce the impact more effectively, then redesign the project and run through the rating process again. If the proposed activity still will not meet the requirements of the VRM Class, a landscape architect should be called in to re-assess the design. If the VRM Class requirements still cannot be met, a written recommendation by the landscape architect should be made to the District Manager to either go ahead with the proposal with the impacts reduced as much as possible, revise the proposal, or abandon the proposal in favor of the protection of the visual resource.

APPENDIX J

HISTORICAL/ARCHEOLOGICAL

The Nevada State Museum
CAPITOL COMPLEX
CARSON CITY, NEVADA 89710
Telephone (702) 885-4810

May 17, 1976

Mr. E. I. Rowland
State Director, Nevada
Nevada State Office
Room 3008 Federal Building
300 Booth Street
Reno, Nevada 89509

re: Historical/Archaeological sections Chapters II - IV, Oreana to Hunt EIS

Dear Mr. Rowland,

This is to confirm my various telephone discussions with Larry Hand of your Oreana to Hunt EIS Team on the above referenced matter.

The Nevada Archaeological Survey, Nevada State Museum conducted an intensive archaeological and historical reconnaissance along a 60 m wide segment of the O'Neil Basin Corridor, during which we recorded a total of 151 historical and archaeological sites. In addition we have made a general archive search along the Adobe, Metropolis and O'Neil Basin Corridor in order to evaluate the information compiled for these by Mr. Hand and others in your EIS team. On the basis of the intensive reconnaissance and the archive search I think it is reasonable to conclude:

1) The number, type and significance of archaeological and historic sites along the Adobe and Metropolis Corridor would probably not vary significantly from the O'Neil Basin Corridor.
2) More sites and especially more extensive sites might well be found along the Humboldt River Corridor, which follows this major river. The terraces and older flood plains of this river are the location of many semi-permanent base camps occupied intermittently for at least the past 5,000 years. It was also the location of historic trails and source of the earliest historic settlements in Northern Nevada.

I appreciate being kept informed on this and other similar projects.

Sincerely,

Mary Rusco

GLOSSARY

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acre-foot - The amount of water necessary to cover one acre to a depth of one foot, equaling 43,560 cubic feet.

alignment - The specific, surveyed route of a utility line.

alternating current - Electric current which reverses its direction of flow periodically (as contrasted to direct current).

alluvial fan - A low, outspread, relatively flat to gently sloping mass of loose rock material, shaped like an open fan, deposited by a stream at the place where it issues from a narrow canyon or wash onto a plain or valley.

alluvium - Clay, silt, sand, and gravel or other rock material transported by flowing water.

ampere - Unit of electrical strength.

Animal Unit Month - Pounds of forage or feed required to sustain an animal unit (one cow or five sheep) for a period of 30 days. (Abbreviated AUM, AUMs.)

background - That portion of the visual landscape lying from the middleground limits out to infinity. Color and texture are subdued in these areas, which are primarily concerned with the two-dimensional shape of landforms against the sky.

biome - A major biotic community; natural groupings of organisms characterized by the occurrence of certain dominant plants and animals.

biota - The plant and animal life of an area.

circuit - A complete closed conducting path over which electric current may flow.

circuit breaker - A switch which opens an electric circuit carrying power when abnormal load conditions occur.

community -	An aggregate of organisms which form a distinct ecological unit. Such a unit may be defined in terms of plants, animals, or both.
critical habitat -	Habitat of a limited nature, such as a deer winter range, which is vital to the survival of a particular species or population.
conductor -	A material, usually in the form of a wire or cable, suitable for carrying an electric current.
cultural resources -	Objects, structures, sites, and districts that pertain to native peoples or other communities; they are generally classified as either historic or prehistoric (archeologic). Such areas are of importance because of their educational, interpretative and/or scientific value, because they are vital to the preservation of a subculture, or because they are representative examples.
current (electric) -	The movement of electrons along a conductor
diurnal -	Having a daily cycle (over a 24-hour period).
double circuit -	Two electrical circuits strung through a single tower structure, one circuit below the other.
ecology -	The study of the relationships of organisms or groups of organisms to their environment; animals and plants in their relation to each other.
ecotype -	A subdivision of a species that comprises individuals inter-fertile with each other and with members of other ecotypes of the same species but surviving as a distinct group through environmental selection and isolation.
emergent vegetation -	In water plants, those portions of the plant extending above the surface of the water.
endangered species -	(a) Federal regulation: any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the class Insecta deter-

mined by the Secretary of the Interior to constitute a pest whose protection would present an overwhelming and overriding risk to man.
(b) State of Nevada regulation: any species whose prospects of survival and reproduction are in immediate jeopardy.

environment - All that surrounds an organism and interacts with it.

evapotranspiration - The total water returned to the atmosphere from the land by evaporation and by plant transpiration.

fauna - Animal life of a region, period, or special environment (includes mamals, reptiles, amphibians, birds, fishes, insect, etc.)

flora - The plant life of a region, period, or special environment.

forb - A non-woody plant other than grass.

foreground - That portion of the visual landscape lying generally from one-quarter to one mile beyond the viewer. Details of human-size features are visible at this distance, and all features are large scale elements.

fugitive dust - Any dust particles which become airborne other than those being emitted by a stack or chimney.

groundwater - That part of the subsurface water that completely saturates the rocks and is under hydrostatic pressure.

guy - A strand used to balance the horizontal forces on a pole or tower.

habitat - A specific environment which surrounds a species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.

insulator - A device that is resistant to the conduction of electricity used for isolating and supporting conductors.

intertie - A transmission line linkage joining two or more load systems or utility systems through which power produced by one can be utilized by the other.

kilovolt (kv) - 1000 volts (a volt is a measure of electrical potential difference which will cause a current of one ampere to flow through a conductor whose resistance is one ohm).

load center - The point at which electrical loads of a given area are assumed to be concentrated for purposes of analysis.

middleground - That portion of the visual landscape lying generally between the limits of the foreground (about one mile) to eight miles beyond the viewer. Overall patterns of vegetation and earthform constitute texture which is no longer distinguishable in human-size features.

megawatts (Mw) - 1000 kilowatts or one million watts (a watt is a unit of electrical power equal to 1/756th horsepower).

ohm - Unit of electrical resistance.

perennial - Enduring; reoccurring year after year with the seasons.

perennial yield - The amount of groundwater which can be removed from a hydrographic area, each year without depleting the groundwater reservoir.

rare species - (State of Nevada regulation): one that, although not presently threatened with extinction, is in such small numbers throughout its range that it may be endangered if its environment -orsens, requiring a necessary close observation of its status.

raptor - A bird of prey, such as an easgle or hawk.

riparian - Vegetation related to or living on the bank of a natural watercourse or lake.

silicic - Of, relating to, or derived from silica (SiO_2).

submergent vegetation - vegetation normally covered entirely with water.

substation - Any intermediate station in a power system that regulates transmitted electrical power into lower voltage distribution lines for consumer service.

threatened species - (Federal regulation): any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

volt - See kilovolt.

voltage - The electrical potential or potential difference expressed in volts.

watt - See megawatt.

BIBLIOGRAPHY

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Artz, J.L., J.B. Price, F.F. Peterson, H.B. Summerfield, R.E. Eckert Jr., R.L. Post, N.R. Ritter, and S.H. Skou. Plantings for Wildlands and Erosion Control. Reno: University of Nevada, 1970. (In cooperation with U.S. Department of Agriculutre, Soil Conservation Service.)

Bailey, R.M., et al. A List of Common and Scientific Names of Fishes from the United States and Canada: (American Fisheries Society Special Pub. No. 2). Washington, D.C.: American Fisheries Society, 1960.

Beeler, Don. "Recreation Use of the Proposed Upper Humboldt Reservoirs". Reno, Nevada: College of Agriculture, University of Nevada, 1972.

Bleak, A.T., N.C. Frischknecht, A.P. Plummer, and R.E. Eckert, Jr. "Problems in Artificial and Natural Revegetation of the Arid Shadscale Vegetation Zone of Utah and Nevada." Journal of Range Management, 18 (1965) 59-65.

Bronson, F.A., R.F. Miller, and I.S. McQueen. "Geographic Distribution and Factors Affecting the Distribution of Salt Desert Shrubs in the United States." Journal of Range Management, 20(5) (1967), 287-296.

Bureau of Business and Economic Research, University of Nevada, "Nevada In-migration, Income, and Quality of Life". Nevada Business Review, Reno, Nevada: University of Nevada, 1974.

Butler, Robert B. Final Report on an Archeological Clearance Survey of the Proposed Right-of-Way for the Idaho Section of 230 kv Transmission Line from Tracy, Nevada to Hunt, Idaho. Pocatello, Idaho: Department of Anthropology and Museum, Idaho State University, May, 1975.

Chilton Engineers, Inc. "Preliminary Engineering Report of Rock Creek Reservoir." Elko, Nevada: Chilton Engineers, Inc. (No publication date).

Chu, Shih-Fan, and B.M. Wofford. An Econometric Model for the State of Nevada: Research Report No. 12. Reno, Nevada: Bureau of Business and Economic Research, University of Nevada, 1974.

Eakin, T., R. Lambe, and D. Everett. Hydrologic Reconnaissance of the Humboldt River Basin, Nevada, Water Resources Bulletin No. 32, Carson City, Nevada: State of Nevada Department of Conservation and Natural Resources, 1966.

Eckert, R.E. Jr., A.D. Bruner, and G.L. Klomp. "Productivity of Tall Wheatgrass and Great Basin Wildrye Under Irrigation on a Greasewood-Rabbitbrush Range Site." Journal of Range Management, 26 (40) (1973), 286-288.

Environmental Specialist, Inc. (PEDCO). Investigation of Fugitive Dust Sources, Emissions, and Control: EPA Contract No. 68-02-0044, Task Force #9. Washington, D.C.: Environmental Protection Agency, 1973.

Evans, R.A., J.A. Young, and R.E. Eckert, Jr. "Herbaceous Weed Control and Revegetation of Semi-Arid Rangelands in the Western United States." Outlook on Agriculture 6 (2) (1969) 60-66.

Executive Office of the President, Office of Emergency Prepardness. Disaster Prepardness: Report to the Congress, Washington, D.C.: January 1972.

Forest, Range and Watershed Consultants, Inc. An Evaluation of Ecological Impacts of Sierra Pacific Power Company's 230 kv Transmission Line - Tracy, Nevada to Jackpot, Nevada. (Prepared for SE&A Engineers and Planners, Inc. Reno, Nevada, 1974.)

Granger, A., B. Bell, G. Simmons, and F. Lee. Geology and Mineral Resources of Elko County, Nevada. Bulletin No. 54. Reno, Nevada: University of Nevada, 1957. (Published in cooperation with the Nevada Bureau of Mines.)

Governor's Office of Planning Coordination, State of Nevada, Directory of Local Planning Organizations. Carson City, Nevada: State Printing Office, May 1975.

Hendee, John and Clay Schoefelt. Human Dimensions in Wildlife Programs: Reports of Recent Investigations. Washington, D.C.: U.S. Department of Agriculture, Forest Service, 1973.

Hull, A.C., Jr., and C.W. Doran. "A Preliminary Guide to Reseeding Pinyon-Juniper Lands of Western Colorado" - Station Paper No. 4, Ft. Collins, Colorado: Rocky Mountain Forest and Range Experimental Station, 1950. (In cooperation with the U.S. Forest Service.)

LaRivers, Ira. Fishes and Fisheries of Nevada. Carson City, Nevada: State Printing Office, 1962. (Published for the Nevada State Fish and Game Commission.)

Munz, P.A., and D.D. Keck. A California Flora and Supplement. Berkeley: University of California Press, 1973.

Nevada Bureau of Mines. Mineral and Water Resources of Nevada, Bulletin No. 65. Reno, Nevada: University of Nevada, 1964. (In cooperation with U.S. Geological Survey, and Mackay School of Mines.)

Nevada Department of Fish and Game. Report of Environmental and Wildlife Investigation: Vol. II, Wildlife Investigation (Humboldt River Upstream Storage Project and Rock Creek Dam Project). Carson City, Nevada: State Printing Office, June, 1974. 1974.

Nevada Dept. of Taxation. Local Governemnt Red Book and Ad Valorem Tax Rates Budget Summaries for Nevada Local Governments, Fiscal Years 1971-6. Carson City, Nevada: State Printing Office, 1971.

Nevada State Board of Fish and Game Commissioners. Classification of Wildlife: General Regulations No. 1, Amendment No. 5. Carson City, Nevada: State Printing Office, May 15, 1974.

Nevada State Engineer's Office. Water for Nevada, Report No. 3, 6, 8, and 9. Carson City, Nevada: State Printing Office, 1971.

Nevada State Parks System. "State Comprehensive Outdoor Recreation Plan", Carson City, Nevada: Nevada State Parks System, 1976.

Plummer, A.P., D.R. Christensen, and S.B. Monsen. Restoring Big Game Range in Utah. Utah: Utah Division of Fish and Game Pub. No. 68-3, 1968.

Plummer, A.P., A.C. Hull, Jr., G. Stewart, and J.H. Robertson. Seeding Rangelands in Utah, Nevada, Southern Idaho, and Western Wyoming: (U.S. Department of Agriculture, Forest Service, Agricultural Handbook No. 71, Washington, D.C., 1955.) 1955.)

The Regional Planning Commission (Reno, Sparks, and Washoe County). A Conservation Plan; A Population Plan, Washoe County, Nevada. Reno, Nevada: Regional Planning Commission, June, 1975.

Rollins, M.B., A.S. Dylla, and R.E. Eckert, Jr. "Soil Problems in Reseeding a Greaswood-Rabbitbrush Range Site." Journal of Soil and Water Conservation, Vol. 23, No. 2, July-August, 1968.

Rural Development Center. "Rural Population Growth - More than a Transient Fad." Western Wire, Vol. 1, No. 2, December 1975.

Rusco, Mary. "Archeological Reconnaissance of the Proposed 230 kv Transmission Line from Tracy, Nevada, to Hunt, Idaho." Reno, Nevada: Central Division of the Nevada Archeological Survey, Nevada State Museum.

SE&A Engineers and Planners, Inc. Tracy-Hunt Transmission Project UP&L Intertie No. 2 Environmental Analysis. Reno, Nevada: SE&A Engineers and Planners, 1975.

Stark, N. Review of Highway Planting Information Appropriate to Nevada: College of Agriculture Bulletin No. B-7. (Desert Research Institute, University of Nevada, in cooperation with the Nevada State Highway Department.) Reno: University of Nevada, 1966.

Stuart, D.M., R.E. Eckert, Jr., A.S. Dylla, and G.E. Schuman, "Seeding Coppice Dune Areas in Northern Nevada". Reno: Agricultural Experiemnt Station, University of Nevada, 1973. (In cooperation with U.S. Department of Agriculture, Agricultural Research Station, Western Division.)

U.S. Army Corps of Engineers. Environmental Inventory and Base Assessment of the Upstream Storage Project in Elko County, Nevada. Washington, D.C.: U.S. Army Corps of Engineers.

U.S. Department of Agriculture, Soil Conservation Service. Soil Survey Manual: Agricultural Handbook No. 16, Washington, D.C. 1962.

U.S. Department of Agriculture, Soil Conservation Service. Personal consultations and unpublished soil legends. Reno Nevada: Soil Conservation Service files and records, unpublished.

U.S. Department of the Interior, Bonneville Power Administration. Final Environmental Statement, General Construction and Maintenance Program. Washington, D.C. August, 1974.

U.S. Department of the Interior and Department of Agriculture, Environmental Criteria for Electric Transmission Systems. Washington, D.C., 1971.

U.S. Department of the Interior, Bureau of Land Management, Alaska Natural Gas Transportation System Draft Environmental Statement, Part V: North Border, Washington, D.C.: 1975.

U.S. Department of the Interior, Bureau of Land Management. Economic Profile for the State of Nevada. Washington, D.C. June 1974.

U.S. Department of the Interior, Bureau of Land Management. Environmental Analysis Record for the Agricultural Program, Lower

Snake River Plains of Idaho. Washington, D.C, January 1976.

U.S. Department of the Interior, Bureau of Land Management, Final Environmental Statement: Tucson Gas and Electric Westwing to El Sol to Vail, Arizona EHV Transmission Line Corridor, (Ch. II, III), Washington, D.C., 1975.

U.S. Department of the Interior, Bureau of Land Management. The Need for A National System of Transportation and Utility Corridors. July 1975.

U.S. Department of the Interior, Bureau of Land Management. Resource and Land Investigations (RALI) Program Considerations in Evaluating Utility Line Programs. Washington, D.C., September 1975.

U.S. Department of the Interior, Bureau of Land Management. Unit Resource Analysis and Management Framework Plan materials for Winnemucca, Battle Mountain, Elko, Boise and Burley Districts. (Unpublished) Available at the respective District Offices, the Nevada State Office, Reno, Nevada and the Idaho State Office, Boise, Idaho.

U.S. Department of the Interior, Fish and Wildlife Service. The Endangered Species Act - Endangered and Threatened Wildlife. Washington, D.C. December 28, 1973, as amended.

U.S. Department of the Interior, Fish and Wildlife Service. Threatened Wildlife of the United States, Washington, D.C., 1973. (and Federal Register Vol. 40, No. 188, amendments; Endangered and Threatened Wildlife and Plants, September, 1975.)

U.S. Department of the Interior, Fish and Wildlife Service, United States List of Endangered Species. Washington, D.C., 1974.

U.S. Department of the Interior, Geological Survey, Nevada Bureau of Mines, and Mackay School of Mines, Bulletin No. 65. Reno, Nevada: University of Nevada, 1964.

U.S. Department of the Interior, Geological Survey, Water Resource Data for Nevada. Washington, D.C. 1974.

Walstrom, Robert E. Water for Nevada, Forecasts for the Future, Volume 6, Appendix D. Carson City, Nevada: State Printing Office, 1973. (Published for Nevada State Division of Water Resources.)

Wernstedt, Frederick. World Climate Data. Lemont, Penn. Climatic Data Press, 1972.

Willden, Ronald. Geology and Mineral Deposits of Humboldt County, Nevada. Bulletin No. 59. Reno, Nevada: University of Nevada, 1964. (Published in cooperation with the Mackay School of Mines.)

GPO 690—108/1001