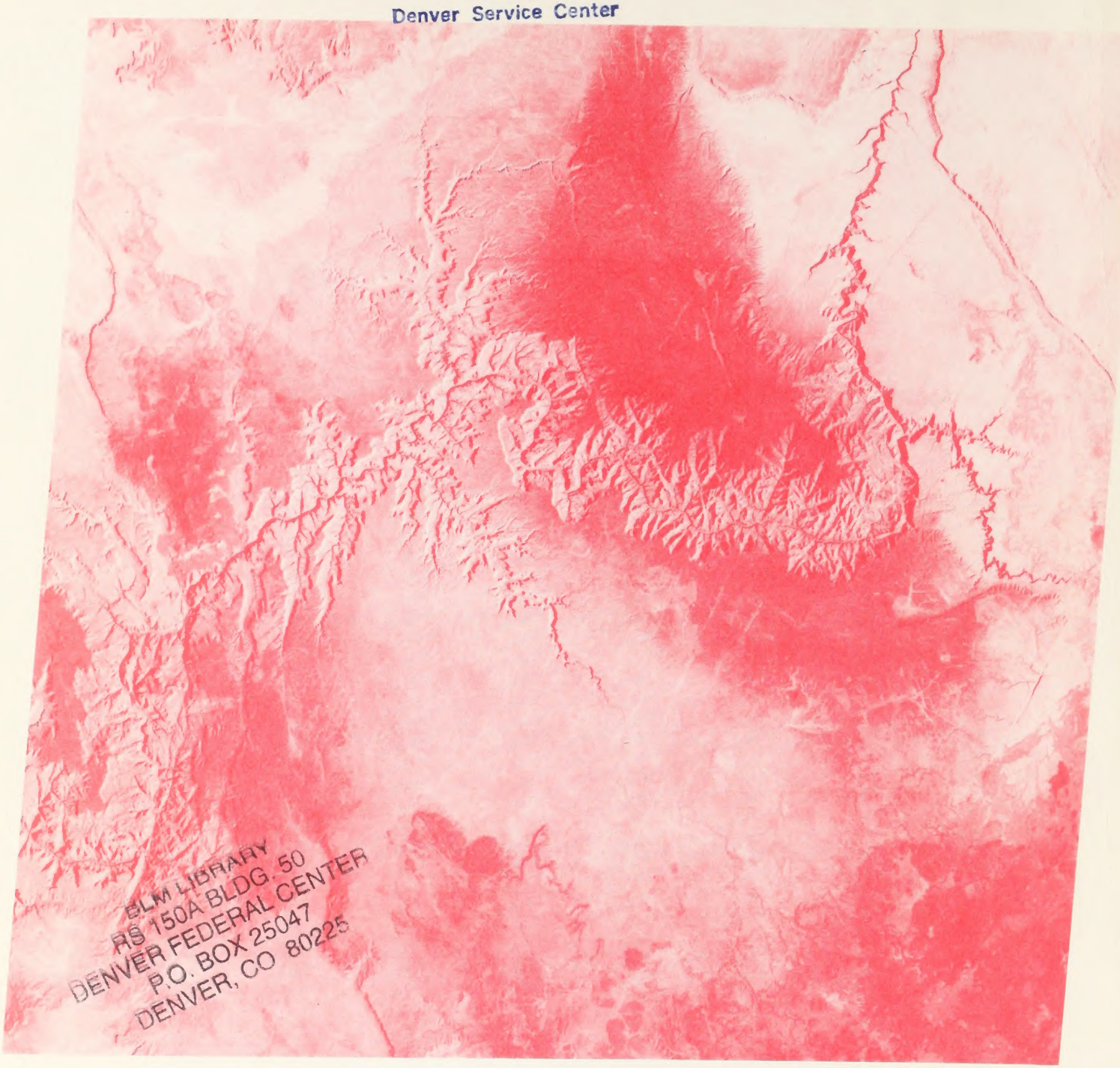
VERMILLION

Proposed Grazing Management

Draft

ENVIRONMENTAL STATEMENT

Prepared By
US DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
ARIZONA



LANDSAT IMAGE OF THE VERMILLION ES AREA

The upper half of the above Landsat Image (imaged September 18, 1977) shows most of the Vermillion ES area, to the north and west of the Colorado River, which winds its way through the Grand Canyon. The dark area in the top center of the image is the forested Kaibab Plateau (Kaibab National Forest), to the east of which is the Paria Plateau and House Rock Valley, separated by the Vermillion Cliffs. West of the Kaibab Plateau, Kanab Creek flows into the Colorado River. The dark area in the left center of the image is the forested Mt. Trumbull area. To the North of Mt. Trumbull is the Uinkaret Plateau and the Hurricane Cliffs.

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
ARIZONA STATE OFFICE
2400 VALLEY BANK CENTER
PHOENIX, ARIZONA 85073

IN REPLY REFER TO

Enclosed for your review and comment is the Draft Environmental Statement for the Proposed Livestock Grazing Program, Vermillion Resource Area, Coconino and Mohave Counties, Arizona.

The statement is based on information from Bureau of Land Management and other sources, including information supplied by and in consultation with Federal, State, and local agencies, and interested private organizations and individuals. The purpose of the statement is to disclose in advance the probable environmental impacts of the proposed action and its alternatives, and to assure that these factors are considered, along with economic, technical, and other considerations, in the decisionmaking process.

We would appreciate receiving your comments on the environmental impacts of the proposed action. The comment period will run for 45 days after the draft is filed with the Environmental Protection Agency and the notice of receipt is published in the Federal Register. The notice is anticipated in March, 1979. A Public Hearing will be held in Fredonia, Arizona, and details of this hearing will be advertised.

Comments received after the 45-day review period will be considered in the subsequent decision process, even though they may be too late for inclusion in the final environmental statement.

Your comments should be sent to:

Arizona State Director (911)
Bureau of Land Management
2400 Valley Bank Center
Phoenix, Arizona 85073

Sincerely,

B B Buffington

State Director

DEPARTMENT OF THE INTERIOR

DRAFT

ENVIRONMENTAL STATEMENT

VERMILLION GRAZING

PREPARED BY

BUREAU OF LAND MANAGEMENT

DEPARTMENT OF THE INTERIOR

STATE DIRECTOR, ARIZONA STATE OFFICE

SUMMARY

(X) Draft ( ) Final Environmental Statement

Department of the Interior, Bureau of Land Management

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

2. Brief Description of Action: The proposed action of this environmental statement (ES) involves a livestock grazing management program within the Vermillion Resource Area on 1,407,476 acres of Federal lands. The ES area lies north of the Colorado River in the eastern half of the region known as the Arizona Strip.

The proposed action includes the following components:

A. Intensive management of grazing on 1,369,043 acres of Federal land.

B. Less intensive management of grazing on 38,433 acres of Federal land.

C. Building range improvements and applying land treatments to facilitate grazing management.

3. Summary of Environmental Impacts:

Beneficial Impacts: The production of desirable vegetation and the total vegetation ground cover would increase. Overall watershed conditions would improve. Wildlife habitat would improve and the numbers of big-game and nongame animals would increase. Surface water quality would improve, and sediment yield would decrease. Overall range-related income would increase in the long term.

Adverse Impacts: Proposed range improvements would degrade the area's scenery. Although range improvements, cattle trampling, and erosion would slightly disturb archaeological and historical remains, these disturbances would be permanent and irretrievable. Range-related income, ranch values, and assessed valuation could decrease on some grazing operations.

4. Alternatives Considered:

A. No action.
B. Elimination of grazing on public lands.
C. Stocking level by condition class.
D. Benefit/cost.

5 Comments have been requested from:
See chapter 9.

6. Draft Statement Made Available to EPA and to the Public:
March 1979

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DESCRIPTION OF THE PROPOSED ACTION

CHAPTER 1

DESCRIPTION OF THE PROPOSED ACTION

INTRODUCTION

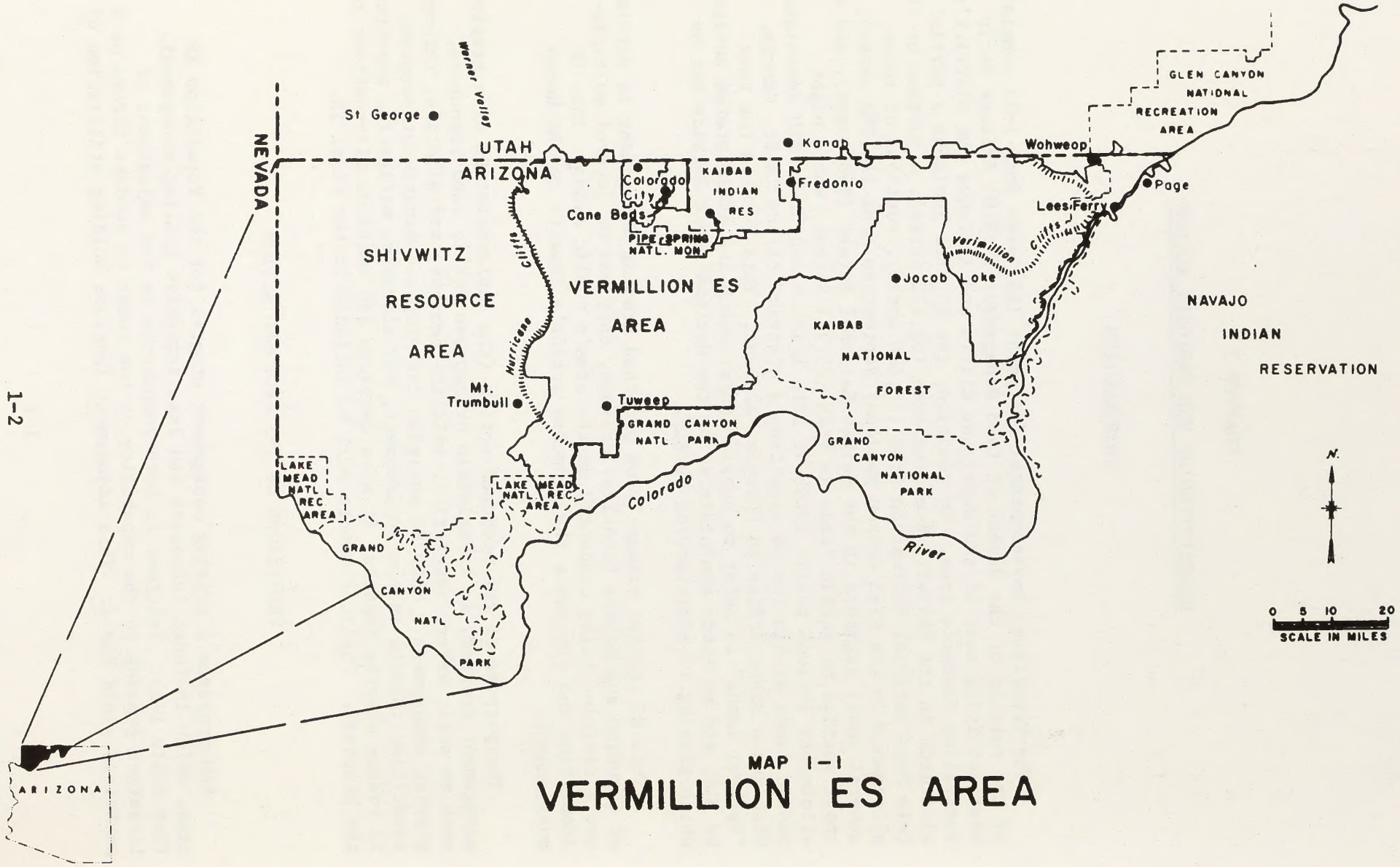
The Vermillion Environmental Statement (ES) area (map 1-1) consists of the portion of the Bureau of Land Management's (BLM) Arizona Strip District lying east of the Hurricane Cliffs and includes the District's Vermillion Resource Area. In addition, the ES area includes a partial allotment in the Shivwits Resource Area (35,670 acres), a portion of the Lake Mead National Recreation Area (13,680 acres), portions of three allotments in the Glen Canyon National Recreation Area (14,750 acres), several small segments in the Kaibab National Forest (940 acres), and a small portion of public lands in Utah (23,243 acres), where eight allotments include public lands in both Arizona and Utah. BLM administers public lands within the ES area from a district office in St. George, Utah and a State Office in Phoenix, Arizona. This ES uses the term "Federal lands" to refer to public lands, which are administered entirely by BLM, and to lands administered by the National Park Service but on which grazing is administered by BLM.

This ES focuses primarily on proposed grazing management in portions of Coconino and Mohave Counties, Arizona, only one of several multiple-use activities being conducted on the area's public lands. This ES identifies and discusses the proposed action's impacts on the human environment.

The purpose of the proposed action (the implementation of a grazing management program) is to maintain or improve public land resources, such as soil, water, vegetation, wildlife habitat, and wildlife, through grazing management. This ES analyzes the proposed management program, identifies impacts on the environment, and addresses mitigating measures to reduce adverse impacts. It also develops and analyzes alternatives to the proposal. Public comments will be included in the final ES.

PROVISIONS OF THE PROPOSED ACTION

BLM proposes a grazing management program for the Vermillion ES area, which includes intensive and less intensive grazing management. (See table 1-1). Inherent in both components is the adjustment of livestock grazing to the capability of the range to produce forage on a sustained yield basis. This adjustment involves holding utilization of



MAP 1-1

VERMILLION ES AREA

key forage plant species to moderate levels--40 to 60 percent--of the current year's growth. (See appendix 1-1). The utilization of key species would average 50 percent over an extended period of time (considering all grazed and rested pastures). The remainder of the vegetation would be available for nongame wildlife food and cover, soil and watershed protection, and vegetation resource maintenance.

The average annual licensed livestock use on Federal lands in the ES area during the past 5 years has been 108,736 animal unit months (AUMs). The proposal would allow 89,535 AUMs for livestock, a reduction of 19,201 AUMs or an overall reduction of 18 percent. Wildlife would be allocated 11,940 AUMs (in cooperation with Arizona Game and Fish Department, August 8, 1975).

Table 1-1 shows the acreage and the percentage of the ES area involved in the intensive and less intensive grazing systems of the proposed action. The present, proposed, and potential stocking rates by existing and proposed allotments appear in table 1-2. Stocking rates were determined using carrying capacity data gathered or rechecked between 1975 and 1977. (See appendix 1-1 for the methodology.)

TABLE 1-1
ACRES PROPOSED FOR INTENSIVE AND LESS INTENSIVE MANAGEMENT

Proposed Action (Components)	Federal Land Acres	Other Acres	Total Acres	Percent of ES Area
Intensive livestock management (55 allotments)	1,369,043	164,802	1,533,845	97
Less intensive management (11 allotments)	38,433	8,226	46,659	3
Total land under management plans	1,407,476	173,028	1,580,504	100

Range improvements such as fences and water sources would be required for the implementation of intensive management, but none would be needed to implement less intensive management.

The proposed action would combine 115 existing allotments into 66 allotments. A total of 55 allotments are proposed for intensive grazing management under allotment management plans (AMPs), and 11 allotments are proposed for less intensive management. The proposed action would modify the existing management and level of grazing use in the area. It would involve the following actions:

1. Combination of smaller allotments. To reach the best possible combination for intensive management, this action considers resource values, physical barriers, potential for improvement, economics, and existing use.

2. Adjustment in current levels of grazing. This action considers quality and amount of vegetation, wildlife competition, resource condition and trend, utilization, range suitability, and season of use.

3. Changes in season of use. This action considers vegetation and wildlife needs, watershed condition, other resource conditions, and operator objectives.

4. Implementation of grazing management systems. This action considers AMP objectives, such as competition with wildlife, watershed condition, other resource conditions, opportunities for improvement, operator objectives, management goals, and construction of range improvements. (See appendix 1-2.)

5. Monitoring and evaluation. Once implemented, the proposed grazing management program would be dynamic and flexible. Stocking levels and use periods could be adjusted in response to fluctuating precipitation and forage conditions. If evaluation and monitoring indicate the need for changes, the proposal would be modified and a supplementary environmental assessment would be prepared for significant changes.

The proposed action would require increased management and supervision of public lands as well as increased cooperation between BLM and the range users. The proposal would be administered and managed through standard BLM licensing and operating procedures.

After implementation of the proposed action, an estimated 15 years would be required to meet the objectives of the AMPs for long-term sustained productivity of livestock forage and improvement of watershed and wildlife resources (appendix 1-2). This time span would allow for several repetitions of the grazing cycle (alternate periods of grazing and resting) on all allotments.

INTENSIVE MANAGEMENT OF GRAZING

BLM proposes intensive livestock management systems for 55 allotments involving 1,369,043 acres (Federal lands) and 87,942 livestock AUMs of forage. The Arizona Strip District has prepared AMPs for each of the 55 allotments, 12 of which have been implemented on 674,305 acres of Federal lands. Two basic grazing systems are proposed: (1) rest-rotation systems, which incorporate at least a 1-year rest period per grazing cycle and (2) deferred rotation grazing systems, which delay grazing on a portion of an allotment each year during the growing period and rotate this delay among the pastures. AMP objectives appear in appendix 1-2.

BLM would implement intensive livestock management through AMPs. Each AMP is based upon the multiple-use needs of the allotment and the pastures within the allotment. The levels of livestock grazing, season of use, and specific grazing system are designed to meet goals and objectives and to provide adequate protection for the watershed, water quality, vegetation, and wildlife within and dependent upon the allotment or pasture. Allotments will meet these objectives before additional forage will be allocated to livestock. BLM Manual 4100 outlines the steps followed in the preparation of an AMP.

BLM would use various study procedures to evaluate each AMP at the end of each grazing cycle. These studies would monitor changes in plant density, composition, ground cover, and soil stabilization. Four studies are basic to the evaluation: actual grazing use, vegetation utilization, range condition and trend (soils and vegetation), and climate.

General Criteria Considered in Selection of Intensive Grazing Systems and the Number of Pastures

BLM resource specialists (range conservationists, wildlife biologists, and watershed specialists) selected the type of grazing system to meet the needs of the various resources for the 55 AMPs. They considered the following criteria in their selection:

1. Grazing unit size and shape;
2. Physiographic characteristics;
3. Vegetation factors--present condition, production, present use, composition, physiological requirements, and estimated potential for improvement;
4. Resource constraints identified in land use planning;
5. Resource management objectives--wildlife, watershed, soil, and recreation;
6. Present and desired vegetation condition, including composition, production, and degree of use;
7. Sequence and timing of grazing to meet management objectives;
8. Livestock handling requirements of the operator and grazing system preference;
9. Existing range improvements--location and condition;
10. Needed improvements and development practices; and
11. Resource specialist professional judgment of system considered best adapted to achieve resource objectives.

Resource specialists considered the following criteria in the selection of the number of pastures proposed with each grazing system:

1. Type of grazing system proposed;
2. Grazing unit size, shape, and physiographic characteristics;
3. Resource management objectives--wildlife, watershed, soil, and recreation;
4. Grazing period proposed (yearlong vs. seasonal);
5. Existing subdivisions;
6. Location and condition of existing range improvements;
7. Needed improvements (type, quantity, and location); and
8. Livestock handling requirements and operator preference.

After applying the above criteria, resource specialists selected the rest-rotation and deferred rotation grazing systems.

Rest-Rotation Grazing

Rest-rotation grazing is proposed on 1,040,719 acres (Federal lands), involving 65,760 livestock AUMs. (See table 1-2 for allotments involved.) Rest rotation would be implemented on pastures nearly equally divided in forage production, each of which would be systematically grazed and rested over an entire grazing cycle.

Grazing systems that apply rest are designed to allow completion of plant growth and fulfillment of reproductive requirements and to permit proper utilization of available livestock forage. Regardless of the number of pastures involved, all systems have scheduled grazing and resting sequences in common. Properly applied, rest-rotation grazing should allow for improvement in plant vigor and desirable species composition.

The following criteria were used for selecting rest-rotation grazing systems:

1. The need for long periods of rest to restore range condition, plant vigor, and vegetation cover;
2. The need to tailor grazing system treatments to the physiological requirements of specific key management species (see table 2-3 for phenology of key species); and
3. The need to manipulate vegetation communities to produce desirable species compositions within a relatively short period of time.

Tables 1-3 and 1-4 outline the basic treatment descriptions for rest-rotation grazing and the type of sequence. The number of pastures receiving each treatment each year depends on the number of pastures in each allotment designated for rest-rotation grazing. The rest-rotation grazing systems already implemented in the ES area are shown on table 1-2.

The proposed one-pasture system is similar to the three-pasture systems proposed, except that the entire allotment would be treated as one pasture, and 3 years would be needed to complete the grazing cycle. For 2 of the 3 years the pasture would be grazed from October 1 to May 15 for livestock production and seed trampling. During the third year the pasture would be completely rested from grazing to allow for seedling establishment and browse reproduction. During this time the livestock would be moved to other allotments or private land.

Deferred Rotation

The proposed action also calls for grazing systems that would delay grazing each year during the growing period on a portion of the allotment and would rotate this delay among pastures during the cycle.

TABLE 1-2
LIVESTOCK GRAZING SUMMARY

LEGEND

1/ Unfenced private or State land within an allotment, but not owned or leased by the livestock operator. BLM does not license additional carrying capacity for grazing on these lands.

2/ Represents maximum allowable use at present and reflects any previous reduction in grazing preference.

3/ Includes wildlife AUMs. See appendix 1-1 for methodology to determine carrying capacity. The number of AUMs in this table differ from the number shown in appendixes 2-4 and 3-2 because estimated carrying capacities shown in this table do not include unallotted wildlife AUMs, unpalatable or unavailable to livestock and presently unneeded by wildlife. Wildlife allocations are based on reasonable big-game numbers, and available wildlife AUMs exceed the identified need.

4/ All use is by cattle except 1,100 sheep AUMs in the Mt. Logan allotment. Initial stocking rate includes normal operation and normal flexibility.

5/ All wildlife AUM allocations come from Federal lands and represent competitive as well as noncompetitive use.

6/ AUMs allocated for vegetation maintenance and watershed protection, resulting from rest pastures and the moderate utilization limit.

7/ Adjusted AUMs represent the difference between average 5-year license and initial livestock stocking rate.

8/ Total estimated increase in AUMs, 15 years after implementation of AMPs, includes Federal, State, and private lands. This estimate also includes increases expected from land treatments. See appendix 1-1 for the methodology used to determine carrying capacity and increased forage.

9/ YL = yearlong

10/ Livestock handling pastures not included in the grazing system. AUMs of use included in the proposed stocking rate. In no case does proposed use exceed the carrying capacity of the pasture.

11/ Represents the normal herd size (which can vary by season) and the class of livestock: C = Cattle, S = Sheep, H = Horses

12/ Represents an average of available actual use data for allotments with implemented AMPs (except for Buffalo Tank, June Tank, and Fuller Road allotments) and the 5-year average licensed use on allotments proposed for AMPs and for Buffalo Tank, June Tank, and Fuller Road allotments.

13/ Some AMPs incorporate two or more grazing systems such as a spring-summer system and a fall-winter system, each system using its own separate pastures.

Note: Allotments listed as having implemented AMPs are being managed under the identified type of grazing system. All remaining allotments are being grazed during the period identified under "season of use" without the benefit of a grazing system.

TABLE 1-2
LIVESTOCK GRAZING SUMMARY

Grazing System and Allotment	I.D. No.	Present Grazing on Federal Acres: Total Acres	Federal Acres	State Acres	Private Acres	Uncontrolled Acres 1/	Average 5-year License 12/	Active Privileges AUMs 2/	Season of Use	Estimated Carrying Capacity AUMs 3/	Proposed Grazing on Federal Acres: Initial Livestock Stocking Rate AUMs 4/	Wildlife AUMs 5/	Resource Conservation AUMs 6/	Season of Use	Adjusted AUMs 7/	Combined Allotments	Total Eat. Inc. AUMs 8/
6-Pasture Rest Rotation																	
Hack Canyon (one pasture uaed 7/1 - 10/31) 10/	23	37307	34707	2560	40	0	3602	3602	YL 9/	3150	2753 230C 11/	55	342	YL	- 849	5	687
5-Pasture Rest Rotation																	
Atkin Well	11	28647	26253	477	1917	0	2378	2868	YL	2542	2291 210C 2H	69	182	YL	- 87	3	321
*Tuweep Implemented in 1975 (4-pasture system alao) 13/	10	57494	46616	5120	5758	0	1781	2458 12/	YL	2909	2113 240C 195C	741	55	YL	+ 332	No	1086
*Vermillion Implemented in 1974 (3 and 4-pasture systems also) 13/	56	116321	109994	5327	1000	0	7653	8686	YL	10448	6703 750C 40C	1504	2241	YL	- 950	No	1395
TOTALS		202,462	182,863	10,924	8,675	0	11,812	14,012		15,899	11,107	2,314	2,478		- 705		2,802
4-Pasture Rest Rotation																	
Cannan Gap	16	8390	5270	640	2480	0	328	331	YL	357	202 43C	83	72	9/1-5/31	- 126	2	246
*Cowboy Butte Implemented in 1974	36	4245	3120	605	520	0	86	228	5/1-11/30	244	227 45C	7	10	5/1-11/30	+ 141	No	83
Cram	60	25430	23770	1340	320	640	2837	3360	YL	2200	1727 150C	32	441	YL	-1110	No	848
*Fern Tank Implemented in 1975	7	51749	48269	3440	40	0	4988	6263	10/16-6/30	5574	5114 650C	460	0	10/16-6/30	+ 126	No	121
Mt. Logan	8	97290	82240	6980	8070	0	5689	6366	YL	6322	4009 1400S 260C	1977	336	YL	-1680	10	1445
Soap Creek	61	49430	44670	4080	680	720	2689	3147	YL	2395	1711 150C 5H	203	481	YL	- 978	No	872
Temple Trail (one pasture used 10/15-2/28) 10/	4	41306	36471	4075	760	0	4303	4700	YL	4367	3098 290C	101	1168	YL	-1205	4	1645
Two Mile	55	41830	39390	2360	80	0	3934	4014	YL	3531	2823 275C	540	168	YL	-1111	2	554
TOTALS		319,670	283,200	23,520	12,950	1360	24,854	28,409		24,990	18,911	3,403	2,676		-5943		5,814
3-Pasture Rest Rotation																	
Antelope	3	41080	32937	4184	3959	0	3356	3690	YL	3611	2188 240C	380	1043	YL	-1168	3	2019
Antelope Spring	2	16899	14219	1920	760	0	1114	1167	YL	1205	787 80C	56	362	YL	- 327	No	635
Beanhole	59	20920	18960	1960	0	0	971	2555	YL	1792	1325 130C	29	438	YL	+ 354	No	671
*Buffalo Tank Implemented in 1975	58	34442	29342	5100	0	0	2894	3366	YL	2996	2086 200C	48	862	YL	- 808	No	1413
Cane Beds (1-pasture also) (one pasture uaed 10/15-2/28) 10/	19	22180	17080	1600	3500	0	611	733	YL	856	610 68C	121	125	YL	- 1	2	546
*Cedar Knoll Implemented in 1972	40	17951	17951	0	0	0	912	1110	11/16-5/15	1004	774 167C	230	0	11/16-5/15	- 138	No	282
*Clayhole Implemented in 1966 (one pasture used 12/1-5/31) 10/	6	178560	158544	17776	2240	0	15764	15896	YL	17398	13020 1085C	248	4130	YL	-2744	No	6775
Cottonwood	12	4080	3760	320	0	0	310	310	YL	304	218 20C	6	80	YL	- 92	No	125
Coyote	54	41261	35229	6032	0	0	2834	3701	YL	2459	1566 135C	463	430	YL	-1268	2	756
Crosby Tank	9	5360	4720	0	640	0	359	359	YL	340	173 28C	108	59	4/1-11/30	- 186	No	88
*Fuller Road Implemented in 1975	52	35807	31069	3138	1600	0	1281	1852	YL	1663	1243 145C	339	81	YL	- 38	3	1364

* Allotments managed under implemented AMPs

TABLE 1-2 (cont.)
LIVESTOCK GRAZING SUMMARY

Grazing System and Allotment	I.D. No.	Present Grazing on Federal Acres: Total Acres	Federal Acres	State Acres	Private Acres	Uncontrolled Acres 1/	Average 5-year License 12/	Active Privileges AUMs 2/	Season of Use	Estimated Carrying Capacity AUMs 3/	Proposed Grazing on Federal Acres: Initial Livestock Stocking Rate AUMs 4/	Wildlife AUMs 5/	Resource Conservation AUMs 6/	Season of Use	Adjusted AUMs 7/	Combinements	Total Est. Inc. AUMs8/
*House Rock Implemented in 1973	57	18664	17584	920	160	0	1581	2226	YL	1766	1722 223C 4H	44	0	YL	+ 141	No	629
Lamb Tank (two pastures used 10/1-3/31) 10/	22	12600	11240	720	640	0	979	1260	YL	577	418 38C	31	108	YL	- 561	4	358
Moonshine	21	10045	9725	320	0	0	830	851	YL	770	526 50C 2H	25	219	YL	- 304	3	227
Muggins Flat	51	11888	11088	800	0	0	428	793	YL	672	388 71C	142	142	10/16-5/31	- 40	No	355
Pratt Tank	45	22663	19903	1510	1250	710	255	1486	11/1-5/15	1082	580 100C	280	222	10/1-4/15	+ 325	No	305
Shuttleworth	44	26787	22547	2600	1640	0	924	1360	YL	1362	900 100C	150	312	YL	- 24	No	752
Suicide	42	4830	4830	0	0	0	319	464	10/1-5/31	390	200 40C	114	76	11/15-4/15	- 119	No	23
Valley Wash (1 pasture winter use) (one pasture used 9/1-2/28) 10/	25	16523	14981	0	1542	0	1421	1439	YL	1489	1053 81C	23	413	YL	- 368	5	574
Wells	14	5290	4650	0	640	0	419	530	YL	346	192 20C	76	78	YL	- 227	No	146
*White Sage Implemented in 1975	43	14100	11010	1330	1760	50	281	1017	6/1-10/31	894	478 110C	153	263	6/1-10/31	+ 197	No	402
*Wild Band Implemented in 1975	24	52340	47220	4440	680	0	2933	4321	YL	3940	2420 350C 60C	334	1186	YL	- 513	No	310
TOTALS		614,270	538,589	54,670	21,011	760	40,776	50,486		46,916	32,867	3,400	10,629		-7,909		18,755
1-Pasture Rest Rotation																	
Rock Canyon	1	2410	1360	410	640	0	192	193	10/1-5/15	137	122 29C	14	1	10/1-5/31	- 70	No	160
3-Pasture Deferred Rotation																	
Button	47	5660	4500	640	520	0	297	389	11/15-5/31	336	260 45C	26	50	11/15-5/31	- 37	No	109
Chatterly	46	7500	6140	1280	80	0	457	467	9/1-5/31	444	327 50C	75	42	9/1-5/31	- 130	No	135
Ferry Swale	65	30340	28580	1760	0	1760	1124	1884	YL	1405	1225 150C	96	84	10/15-5/31	+ 101	No	645
Frank's Reservoir	53	8406	7694	711	1	0	426	426	11/10-5/10	259	182 30C	74	3	11/10-5/10	- 244	2	70
Glazier Dam	13	9989	6787	2562	640	0	600	605	10/16-6/15	608	516 100C	14	78	11/1-5/31	- 84	No	542
Grama Point	30	23865	23545	320	0	0	2085	2079	11/16-5/31	2154	2059 315C 5H	95	0	11/16-5/31	- 26	No	247
Home Ranch (4-pasture system also) 13/	62	43708	38390	5318	0	0	4926	5225	YL	4459	3643 340C 5H	568	248	YL	-1283	No	755
Jacob Canyon	38	3840	3200	640	0	0	108	217	11/16-4/30	191	140 40C	35	16	1/1-4/30	+ 32	No	72
*June Tank Implemented in 1974	27	92632	88208	4424	0	0	7824	9780	YL	8027	7132 968C	893	2	10/16-6/15	- 692	4	1863
Pigeon Tank	26	15368	15368	0	0	0	1489	1547	YL	1403	1236 177C	167	0	11/1-5/31	- 253	2	100
Rock Canyon Tank	39	11255	11255	0	0	0	248	840	11/1-5/31	620	597 91C	23	0	11/1-5/31	+ 349	1	377
Rock Pocket	5	22990	19830	3040	120	0	1759	1762	YL	2272	1762 225C	28	482	10/1-7/31	+ 3	2	1100
Rider	50	4852	3132	640	1080	0	217	267	11/1-4/30	194	130 34C	61	3	11/1-4/30	- 87	2	121

TABLE 1-2 (cont.)
LIVESTOCK GRAZING SUMMARY

Grazing System and Allotment	I.D. No.	Present Grazing on Federal Acres: Total Acres	Federal Acres	State Acres	Private Acres	Uncontrolled Acres 1/	Average 5-year License 12/	Active Privileges AUMs 2/	Season of Use	Estimated Carrying Capacity AUMs 3/	Proposed Grazing on Federal Acres: Initial Livestock Stocking Rate AUMs 4/	Wildlife AUMs 5/	Resource Conservation AUMs 6/	Season of Use	Adjusted AUMs 7/	Combined Allotments	Total Est. Inc. AUMs 8/
Sage	28	11650	10490	880	280	0	789	1104	YL	1056	864 86C	98	94	10/1-5/31	+ 75	2	118
Shinarump	48	4629	4009	620	0	0	293	320	YL	286	243 30C	39	4	9/1-5/1	- 50	4	54
Sunshine (one psasture used 10/1-4/1) 10/	29	8930	8440	490	0	0	707	888	YL	866	608 75C	63	195	10/15-6/15	- 99	2	89
TOTALS		305,614	279,568	23,325	2,721	1,760	23,349	27,800		24,580	20,924	2,355	1,301		-2425		6,397
2-Pasture Deferred Rotation																	
Badger Creek	63	6362	5876	396	90	0	111	205	YL	107	96 8C	8	3	YL	- 15	No	3
Gunsight	41	7610	7230	380	0	380	561	563	10/15-5/15	516	421 53C	95	0	10/15-4/30	- 140	No	105
Lee's Ferry	64	20060	19290	770	0	0	526	1129	YL	450	314 50C	51	85	11/15-5/15	- 212	No	135
Spooks Knoll	37	18080	16360	1000	720	0	623	1184	YL	465	427 67C	38	0	9/1-3/31	- 196	2	501
TOTALS		52,112	48,756	2,546	810	380	1,821	3,081		1,538	1,258	192	88		- 563		744
INTENSIVE MANAGEMENT TOTALS		1,533,845	1,369,043	117,955	46,847	4,260	106,406	127,583		117,210	87,942	11,733	17,515		-18,464		35,359
Less Intensive																	
Cove	15	110	110	0	0	0	12	12	YL	12	10 2C	2	0	11/1-3/31	- 2	No	NA
Eight Mile Pass	49	440	440	0	0	0	36	36	12/1-5/31	23	15 5C	6	2	12/1-2/28	- 21	No	NA
Ferrin	18	3360	2350	0	1010	370	272	272	YL	167	126 14C	38	3	9/1-5/31	- 146	No	NA
Gramma Springs	32	4495	4495	0	0	0	466	466	11/1-4/30	137	108 21C	26	3	11/1-4/30	- 358	No	NA
Gulch	34	3400	3400	0	0	0	151	176	11/1-4/30	138	90 18C	44	4	11/1-4/30	- 61	No	NA
Harris Well	20	6800	2640	0	4160	0	319	319	YL	285	272 22C	13	0	YL	- 47	No	NA
Kanab Creek	31	5260	4544	560	156	0	209	254	10/1-5/31	115	91 13C	22	2	10/1-4/30	- 118	No	NA
Kanab Gulch	33	3700	3700	0	0	0	202	210	11/16-5/15	113	77 31C	36	0	11/16-4/1	- 125	No	NA
Lost Spring Gap	35	1875	715	520	640	0	64	72	11/1-5/15	65	48 8C	10	7	11/1-4/30	- 16	No	NA
State Line	17	1760	580	0	1180	0	29	29	YL	40	24 2C	10	6	YL	- 5	No	NA
Wahweep	66	15459	15459	0	0	0	570	1248	YL	734	732	0	2	YL	+ 162	No	NA
LESS INTENSIVE MANAGEMENT TOTALS		46,659	38,433	1,080	7,146	370	2,330	3,094		1,829	1,593	207	29		- 737		0
GRAND TOTALS		1,580,504	1,407,476	119,035	53,993	4,630	108,736	130,677		119,039	89,535	11,940	17,544		-19,201		35,359

TABLE 1-3
THREE-PASTURE REST-ROTATION TREATMENT SCHEDULE

Typical yearlong system

Years in grazing cycle	PASTURES		
	A	B	C
1	Graze yearlong March - Feb.	Graze Summer-Fall July - Feb.	Rest yearlong March - Feb.
2	Graze Summer-Fall July - Feb.	Rest yearlong July - Feb.	Graze yearlong March - Feb.
3	Rest yearlong March - Feb.	Graze yearlong March - Feb.	Graze Summer-Fall July - Feb.

TABLE 1-4
FOUR-PASTURE REST ROTATION TREATMENT SCHEDULE

Typical yearlong system

Years in grazing cycle	PASTURES			
	A	B	C	D
1	Graze Spring March - June	Graze Summer Graze Fall July - Oct.	Graze Winter Nov. - Feb.	Rest yearlong
2	Graze Summer Graze Fall July - Oct.	Graze Winter Nov. - Feb.	Rest yearlong	Graze Spring March - June
3	Graze Winter Nov. - Feb.	Rest yearlong	Graze Spring March - June	Graze Summer Graze Fall July - Oct.
4	Rest yearlong	Graze Spring March - June	Graze Summer Graze Fall July - Oct.	Graze Winter Nov. - Feb.

Rotation allows other areas of the range to benefit from deferment (Stoddart, Smith, and Box, 1975). If the deferment is of sufficient length and occurs during the growing season, range plants would benefit. Even though moisture may be insufficient for full vegetative growth during such a deferment period, deferred rotation would still relieve pressure from further deterioration of plants, including their root systems (Bell, 1973).

The deferred rotation system primarily involves winter-spring use of two or more pastures, at least one of which would be rested during the spring. The grazing deferral and rest sequences would be rotated among pastures similarly to rest rotation. The deferred rotation system is proposed for 20 allotments, involving 328,324 acres (Federal lands) and 22,182 livestock AUMs. Table 1-2 identifies allotments proposed for deferred rotation grazing.

Tables 1-5 and 1-6 outline the two- and three-pasture treatment schedules of deferred rotation grazing. The number of pastures receiving each treatment each year would depend on the number of pastures in each allotment designated for deferred rotation.

The deferred rotation system was selected for the following reasons:

1. Allotment size, shape, or physiography limits management system options;
2. The system satisfies resource management objectives without long rest periods;
3. The system allows the maintenance of range condition and plant vigor; and
4. The system is more practical for ranchers and tends to elicit more rancher cooperation.

Yearlong grazing was not chosen for these allotments because, unlike deferred systems, yearlong grazing does not provide a pasture free of grazing by livestock. Moreover, systematic rest provides for the physiological requirements of browse, whereas continuous grazing does not.

One three-pasture deferred rotation grazing system has been implemented in the ES area. This system was implemented in 1974 in the June Tank allotment.

Holding Pastures

Five pastures in the ES area, involving 38,812 acres, are proposed as holding pastures. These pastures would be used when cattle must be separated for handling, including when cattle are being gathered for pasture changes, shipping, calving, or weaning. These five pastures include the Yellowstone pasture of Clayhole allotment, Corral and Cottonwood pastures of Two Mile allotment, and Franks and Mountain pastures of Fuller Road allotment.

TABLE 1-5
THREE-PASTURE DEFERRED ROTATION TREATMENT SCHEDULE

Typical Use: November 15 through May 15

Years in grazing cycle	PASTURES		
	A	B	C
1	Graze Winter thru Early Spring Nov. - March	Graze Spring April - June	Graze Winter thru Early Spring Nov. - March
2	Graze Spring April - June	Graze Winter thru Early Spring Nov. - March	Graze Winter thru Early Spring Nov. - March
3	Graze Winter thru Early Spring Nov. - March	Graze Winter thru Early Spring Nov. - March	Graze Spring April - June

TABLE 1-6
TWO-PASTURE DEFERRED ROTATION TREATMENT SCHEDULE

Typical Use: November 15 through May 15

Years in Grazing cycle	PASTURES	
	A	B
1	Graze Winter thru Early Spring Nov. - March	Graze Spring April - June
2	Graze Spring April - June	Graze Winter thru Early Spring Nov. - March

NOTE: Pastures are resting when not scheduled for grazing.

LESS INTENSIVE MANAGEMENT OF LIVESTOCK GRAZING

Less intensive management is a reduced degree of management effort in which BLM regulates only livestock numbers, class of animal, and grazing season. It is proposed for 11 allotments, involving 38,433 acres of Federal lands and 1,593 AUMs. BLM resource managers used one or more of the following criteria to identify allotments and pastures suitable for less intensive management.

1. Less than 100 AUMs of forage is available on the allotment.
2. Conflicts with other resources were not identified in the inventory and planning process.
3. Eighty percent of the area or more is not in Federal ownership or is in Federal ownership where other uses have priority over grazing.
4. Range condition is good to excellent.
5. Range management practices are satisfactory.
6. Allotments have been identified through land use planning.

Less intensive management would require yearly supervision by BLM, primarily to ensure compliance and evaluate resource conditions. Under less intensive management BLM would regulate livestock use on a range area, assuring that the trust guardianship and preservation of Federal land is upheld. BLM would issue permits specifying season of use, class of livestock, and amount of livestock AUMs available on Federal lands.

Less intensive management could be continued as long as livestock grazing is not detrimental to Federal lands. No specific objectives are proposed to implement less intensive management other than use of existing developments and forage resources and the maintenance of resource conditions. No new range developments are proposed for areas under less intensive management.

Less intensive management would be implemented following the filing of the final ES and would be completed within a 3-year period.

BENEFIT/COST ANALYSES

Benefit/cost (B/C) analyses have been conducted for 49 of the 66 allotments under the proposed action. The 17 allotments not analyzed include 6 allotments with partially or fully implemented AMPs and the 11 allotments proposed for less intensive management. The following listing summarizes the B/C analyses. The complete B/C analyses are available for review in the Arizona Strip District office.

BENEFIT/COST ANALYSES SUMMARY

Number of allotments with less than a 1/1 ratio	=	2
Number of allotments with a 1/1 to 2/1 ratio	=	26
Number of allotments with greater than a 2/1 ratio	=	21

IMPLEMENTATION SCHEDULE

The proposed AMPs would be implemented during an 8-year period as shown in table 1-7. Table 1-7 also lists AMPs by priority for implementation.

The following criteria were used to establish the priority for implementation of AMPs.

1. Fragile land areas (soils and vegetation);
2. Range and watershed condition;
3. Conflicts with other resources (wildlife, watershed, recreation);
4. Potential for improvement;
5. Operator willingness to cooperate; and
6. Required improvements for implementation.

AMPs identifying fragile land areas, poor range or watershed conditions, serious conflicts with other resources, or excellent potential for improvement were given highest priority. The willingness of an operator to cooperate would further insure the success of the AMP. The Arizona Strip District considered this willingness to cooperate in selecting priority AMPs. Those AMPs requiring the least improvement work for implementation would provide early benefits with minimal funding.

The following stages of implementation (listed in order) have been identified.

1. Adjust to initial livestock stocking rate within a 3-year period after filing the final environmental statement. Adjustments exceeding 20 percent may be made over a period not to exceed 3 years after a final decision.
2. Initiate studies and evaluations.
3. Develop waters.
4. Construct fences.
5. Implement grazing systems. (See table 1-7 for improvement completion schedule.)
6. Treat land. (Some AMPs may require land treatments before implementing the grazing system to balance pasture carrying capacities.)
7. Upon completion of construction initiate a maintenance schedule for all improvements. (All existing and proposed projects have maintenance schedules that assign responsibility to either BLM or the grazing permittee.)

The proposed action's goal is to attain specific management objectives within 15 years after implementation.

TABLE 1-7
AMP AND RANGE DEVELOPMENT IMPLEMENTATION SCHEDULE, COSTS, AND LAND DISTURBANCE

Construction Schedule	Allotment	Type of Improvement	Units	Approximate Improvement Cost BLM	Private	Total	Acreage Disturbed Short Term	Long Term	Two-Track Road Mileage Long Term
Year 1	Fuller Road	Fence	12 miles	10,920	10,560	21,480	6.00	1.20	
		Catchment	2 each	30,600	-	30,600	3.00	3.00	
		Well	1 each	-	10,000	10,000	0.20	0.10	
		Trough	3 each	*			0.30	0.30	
		Land treatment	5,350 acres	48,000	2,800	50,800	5,350.00	-	
		Seeding	2,000 acres	42,000	-	42,000	-	-	
		Total		131,520	23,360	154,880	5,359.50	4.60	2.10
	Glazier Dam	Fence	2.7 miles	2,457	2,376	4,833	1.30	0.27	
		Reservoir	2 each	12,360	-	12,360	1.40	1.40	
		Total		14,817	2,376	17,193	2.70	1.67	0.75
	Lee's Ferry	Fence	5 miles	5,000	4,975	9,975	2.50	0.50	
		Spring dev.	1 each	2,180	150	2,330	0.20	0.20	
		Trough	1 each	*	*		0.10	0.10	
		Total		7,180	5,125	12,305	2.80	0.80	0.0
	Mt. Logan	Catchment	3 each	37,300		37,300	4.50	4.50	
		Fence	5.3 miles	5,000	4,800	9,800	2.55	0.55	
		Pipeline	3.8 miles	4,400	3,500	7,900	3.80	-	
		Land treatment	1,120 acres	8,960		8,960	1,120.00	-	
		Seeding	1,120 acres	19,040		19,040	-	-	
		Trough	5 each	*	*		0.50	0.50	
		Total		74,700	8,300	83,000	1,131.35	5.55	4.00
	Buttoo	Fence	1.5 miles	1,365	1,320	2,685	0.70	0.15	
		Total		1,365	1,320	2,685	0.70	0.15	1.00
TOTAL FOR YEAR 1				229,582	40,481	270,063	6,497.05	12.77	7.85
Year 2	Antelope	Catchment	1 each	12,000**	-	12,000	1.50	1.50	
		Fence	.75 miles	684	660	1,344	0.35	0.08	
		Trough	1 each	*	*		0.10	0.10	
		Total		12,684	660	13,344	1.95	1.68	1.25
	Antalopa Spring	Catchment	1 each	15,300		15,300	1.50	1.50	
		Fence	5 miles	4,550	4,400	8,950	2.50	0.50	
		Trough	1 each	*	*		0.10	0.10	
		Total		19,850	4,400	24,250	4.10	2.10	3.75
	Cram	Catchment	1 each	13,500	900	14,400	1.50	1.50	
		Fence	3.1 miles	3,200	3,100	6,300	1.55	0.31	
		Trough	1 each	*	*		0.10	0.10	
		Total		16,700	4,000	20,700	3.15	1.91	0.0
	Soap Creek	Fence	.8 rile	800	800	1,600	0.40	0.08	
		Pipaline	6 miles	5,000	6,400	11,400	6.00	-	
		Spring dev.	1 each	1,500	1,500	3,000	0.20	0.20	
		Water st. tank	1 each	3,000	-	3,000	0.20	0.20	
		Trough	3 each	*	*		0.30	0.30	
		Total		10,300	8,700	19,000	7.10	0.78	6.00
	Chatterly	Fence	2.3 miles	2,093	2,024	4,117	1.10	0.23	
		Pipaline	4.5 miles	7,650	1,605	9,255	4.50	-	
		Water st. tank	1 each	3,000	3,000	6,000	0.20	0.20	
		Trough	3 each	*	*		0.30	0.30	
		Total		12,743	6,629	19,372	6.10	0.73	4.50
	Juna Tank	Catchment	1 each	7,650**	-	7,650	1.50	1.50	
		Fence	3 miles	1,800	3,550	5,350	1.50	0.30	
		Pipeline	1 mile	1,900	-	1,900	1.00	-	
		Trough	3 each	*	*		0.30	0.30	
		Land treatment	4900 acres	33,300	-	33,300	4,900.00	-	
		Seeding	4700 acres	84,600	-	84,600	-	-	
		Total		129,250	3,550	132,800	4,904.30	2.10	2.00
TOTAL FOR YEAR 2				201,527	27,939	229,466	4,926.70	9.30	17.50
Year 3	Valley Wash	Fence	.25 miles	225	220	445	0.12	0.03	
		Pipeline	3.5 miles	3,985	2,800	6,785	3.50	-	
		Water st. tank	1 each	135	5,000	5,135	0.20	0.20	
		Trough	2 each	*	*		0.20	0.20	
		Total		4,345	8,020	12,365	4.02	0.43	3.50
	Two Mile	Fence	1 mile	910	880	1,790	0.50	0.10	
		Land treatment	2360 acres	10,620	-	10,620	2,360.00	-	
		Total		11,530	880	12,410	2,360.50	0.10	3.00
	Pratt Tank	Fence	5 miles	8,945	-	8,945	2.50	0.50	
		Land treatment	500 acres	8,000	-	8,000	500.00	-	
		Seeding	500 acres	8,500	-	8,500	-	-	
		Total		25,445	-	25,445	502.50	0.50	2.00
	Ridar	Fence	4 miles	2,710	3,520	6,230	2.00	0.40	
		Total		2,710	3,520	6,230	2.00	0.40	0.0
	Temple Trail	Catchment	1/	11,000		11,000	1/	1/	
		Cattleguard	1 each	2,000		2,000	0.10	0.10	
		Fence	5.5 miles	8,700	1,100	9,800	2.70	0.55	
		Pipaline	1 mile	+			1.00	-	
		Trough	1 each	*			0.10	0.10	
		Total		21,700	1,100	22,800	3.90	0.75	1.00
	Cane Beds	Fence	5 miles	2,730	6,220	8,950	2.50	0.50	
		Total		2,730	6,220	8,950	2.50	0.50	2.00
	Tuweep	Land treatment	2900 acres	34,800		34,800	2,900.00	-	
		Seeding	960 acres	13,668		13,668	-	-	
		Total		48,468		48,468	2,900.00	0.0	0.80
	Varmillion	Fence	7.5 miles	11,600	1,800	13,400	3.70	0.75	
		Pipeline	6 miles	11,700	-	11,700	6.00	-	
		Trough	2 each	*			0.20	0.20	
		Total		23,300	1,800	25,100	9.90	0.95	6.00
	Buffalo Tank	Pipeline	2 miles	2,200	1,600	3,800	2.00	-	
		Trough	1 each	*	*		0.10	0.10	
		Total		2,200	1,600	3,800	2.10	0.10	0.0
	Farn Tank	Fence	.5 mile	900	-	900	0.25	0.05	
		Reservoir	3 each	-	6,000	6,000	2.10	2.10	
		Total		900	6,000	6,900	2.35	2.15	1.25
TOTAL FOR YEAR 3				143,328	29,140	172,468	5789.77	5.88	19.55
Year 4	Atkin Wall	Fence	4.5 miles	8,060	-	8,060	2.20	0.45	
		Pipaline	8.5 miles	10,450	6,740	17,190	8.50	-	
		Spring dev.	1 each		3,000	3,000	0.20	0.20	
		Well	1 each		4,700	4,700	0.20	0.10	
		Trough	8 each	*	*		0.80	0.80	
		Total		18,510	14,440	32,950	11.90	1.55	8.75
	Cannan Gap	Wall	1 each	-	8,625	8,625	0.20	0.10	
		Pipeline	.25 mila		++		0.25	-	
		Total		-	8,625	8,625	0.45	0.10	1.00
	Cottonwood	Fence	3.5 miles	3,185	3,080	6,265	1.70	0.35	
		Pipeline	1 mila	2,423	500	2,923	1.00	-	
		Trough (storage)	1 each	*	*		0.10	0.10	
		Total		5,608	3,580	9,188	2.80	0.45	2.00

* Costs for troughs are included in water development costs.
** Improvement benefits two allotments and costs have been split between both allotments.
\+ Costs are included in catchment costs.
++ Costs are included in wall development costs.

1/ Catchment is located in the Antelope allotment but provides water to the Temple Trail allotment.

TABLE 1-7 (cont.)

Construction Schedule	Allotment	Type of Improvement	Units	Approximate Improvement Cost BLM	Private	Total	Acreage Disturbed Short Term	Long Term	Two-Track Road Mileage Long Term
Year 4 (cont.)	Coyote	Catchment	1 each	8,400**	1,075	9,475	1.50	1.50	
		Cattleguard	1 each	3,380	-	3,380	0.10	0.10	
		Fence	5 miles	4,550	4,400	8,950	2.50	0.50	
		Pipeline	2.5 miles	2,750	2,000	4,750	2.50	-	
		Reservoir	2 each	10,000	-	10,000	1.40	1.40	
		Trough	2 each	*	*		0.20	0.20	
		Total		29,080	7,475	36,555	8.20	3.70	6.75
	Hack Canyon	Catchment	4 each	61,200	-	61,200	6.00	6.00	
		Fence	7 miles	12,600	-	12,600	3.50	0.70	
		Pipeline	2.5 miles	4,410	100	4,510	2.50	-	
		Trough	5 each	*			0.50	0.50	
		Total		78,210	100	78,310	12.50	7.20	5.45
	Shuttle-worth	Fence	6 miles	5,005	3,315	8,320	3.00	0.60	
		Land treatment	800 acres	10,640	-	10,640	800.00	-	
		Seeding	800 acres	10,400	-	10,400	-	-	
		Total		26,045	3,315	29,360	803.00	0.60	0.50
TOTAL FOR YEAR 4				157,453	37,535	194,988	838.85	13.6	24.45
Year 5	Beenhole	Cattleguard	1 each	3,400		3,400	0.10	0.10	
		Fence	6 miles	5,460	5,280	10,740	3.00	0.60	
		Pipeline	4.5 miles	9,090	200	9,290	4.50	-	
		Reservoir	2 each	10,000	-	10,000	1.40	1.40	
		Water st. tank	1 each	4,300	-	4,300	0.20	0.20	
		Trough	4 each	*			0.40	0.40	
		Total		32,250	5,480	37,730	9.60	2.70	4.50
	Ferry Swale	Fence	9.25 miles	8,355	8,140	16,495	4.60	0.93	
		Pipeline	5.75 miles	6,325	5,140	11,465	5.75	-	
		Trough	4 each	*	*		0.40	0.40	
		Total		14,680	13,280	27,960	10.75	1.33	6.00
	Grema Point	Fence	14.25 miles	20,552	2,956	23,508	7.10	1.43	
		Total		20,552	2,956	23,508	7.10	1.43	7.30
	Lamb Tank	Catchment	1 each	21,670	-	21,670	1.50	1.50	
		Fence	2.5 miles	2,275	2,200	4,475	1.20	0.25	
		Trough	1 each	*			0.10	0.10	
		Total		23,945	2,200	26,145	2.80	1.85	1.00
	Rock Pocket	Catchment	1 each	21,260	-	21,260	1.50	1.50	
		Cattleguard	1 each	2,020	-	2,020	0.10	0.10	
		Fence	4.5 miles	4,095	3,960	8,055	2.20	0.45	
		Pipeline	1.2 miles	2,463	-	2,463	1.20	-	
		Reservoir	1 each	-	3,000	3,000	0.70	0.70	
		Water st. tank	1 each	3,000	-	3,000	0.20	0.20	
		Trough	3 each	*			0.30	0.30	
		Total		32,838	6,960	39,798	6.20	3.25	2.00
	Muggins Flat	Pipeline	2.5 miles	2,750	2,000	4,750	2.50	-	
		Land treatment	1,600 acres	19,200	-	19,200	1,600.00	-	
		Seeding	1,600 acres	33,600	-	33,600	-	-	
		Trough	1 each	*			0.10	0.10	
		Total		55,550	2,000	57,550	1,602.60	0.10	1.50
	White Sage	Cattleguard	1 each	3,380	-	3,380	0.10	0.10	
		Fence	1 mile	1,790	-	1,790	0.50	0.10	
		Total		5,170	-	5,170	0.60	0.20	1.35
TOTAL FOR YEAR 5				184,985	32,876	217,861	1,639.65	10.86	23.65
Year 6	Crosby Tank	Cattleguard	2 each	1,980	1,400	3,380	0.20	0.20	
		Fence	1.3 miles	1,181	1,140	2,321	0.60	0.13	
		Reservoir	2 each		4,000	4,000	1.40	1.40	
		Total		3,161	6,540	9,701	2.20	1.73	3.10
	Gunsight	Catchment	1 each	1,600	4,000	5,600	1.50	1.50	
		Fence	3 miles	3,000	3,000	6,000	1.50	0.30	
		Reservoir	1 each	300	2,000	2,300	0.70	0.70	
		Trough	1 each	*			0.10	0.10	
		Total		4,900	9,000	13,900	3.80	2.60	0.20
Year 6 (cont.)	Home Ranch	Catchment	1 each	8,700	4,145	12,845	1.50	1.50	
		Fence	14 miles	12,509	12,509	25,018	7.00	1.40	
		Pipeline	8.5 miles	12,272	4,556	16,828	8.50	-	
		Well	1 each		23,245	23,245	0.20	0.10	
		Trough	8 each	*	*		0.80	0.80	
		Total		33,481	44,455	77,936	18.00	3.80	8.50
	Rock Canyon Tank	Fence	2.75 miles	2,750	2,420	5,170	1.35	0.28	
		Pipeline	4.25 miles	8,075	450	8,525	4.25	-	
		Water st. tank	1 each	4,000	-	4,000	0.20	0.20	
		Reseeding	1,090 acres	13,080	-	13,080	-	-	
		Well	1 each	*	12,500	12,500	0.20	0.10	
		Trough	3 each	*			0.30	0.30	
		Total		27,905	15,370	43,275	6.30	0.88	4.25
	Sage	Catchment	2 each	30,790**	-	30,790	3.00	3.00	
		Pipeline	2.5 miles	4,700	-	4,700	2.50	-	
		Trough	3 each	*			0.30	0.30	
		Total		35,490	-	35,490	5.80	3.30	2.50
	Moonshine	Catchment	1 each	23,953		23,953	1.50	1.50	
		Trough	1 each	*			0.10	0.10	
		Total		23,953		23,953	1.60	1.60	1.25
TOTAL FOR YEAR 6				128,890	75,365	204,255	37.70	13.91	19.80
Year 7	Frank's Reservoir	Catchment	2/	8,100**	1,075	9,175	2/	2/	
		Fence	4.5 miles	4,095	3,960	8,055	2.20	0.45	
		Pipeline	1.5 miles		5,400	5,400	1.50	-	
		Land treatment	160 acres	1,920	-	1,920	160.00	-	
		Seeding	160 acres	1,680	400	2,080	-	-	
		Trough	2 each	*	*		0.20	0.20	
		Total		15,795	10,835	26,630	163.90	0.65	1.50
	Pigeon Tank	Catchment	3/	7,650**	-	7,650	3/	3/	
		Pipeline	1.5 miles	2,100	750	2,850	1.50	-	
		Trough	1 each	*	*		0.10	0.10	
		Total		9,750	750	10,500	1.60	0.10	2.75
	Sunshine	Catchment	4/	11,480**	-	11,480	4/	4/	
		Pipeline	4 miles	7,735	-	7,735	4.00	-	
		Fence	4 miles	3,640	3,520	7,160	2.00	0.40	
		Trough	1 each	*			0.10	0.10	
		Total		22,855	3,520	26,375	6.10	0.50	4.00
	Badger Creek	Fence	.2 mile	350	-	350	0.10	0.02	
		Total		350		350	0.10	0.02	0.0
	Shinarump	Catchment	1 each	21,155	-	21,155	1.50	1.50	
		Pipeline	2 miles	4,800		4,800	2.00	-	
		Trough	3 each	*			0.30	0.30	
		Total		25,955		25,955	3.80	1.80	2.00
TOTAL FOR YEAR 7				74,705	15,105	89,810	175.50	3.07	10.25
Year 8	Rock Canyon	Reservoir	1 each	2,500	2,500	5,000	0.70	0.70	
		Total		2,500	2,500	5,000	0.70	0.70	1.00
	Spooks Knoll	Catchment	1 each	15,300	2,000	17,300	1.50	1.50	
		Trough	2 each	*	*		0.20	0.20	
		Total		15,300	2,000	17,300	1.70	1.70	3.25
	Suicide	Fence	2.5 miles	4,475		4,475	1.20	0.25	
		Water st. tank	2 each		4,700	4,700	0.40	0.40	
		Trough	4 each	*	*		0.40	0.40	
		Total		4,475	4,700	9,175	2.00	1.05	0.50
	Wells	Fence	.3 mile	537		537	0.15	0.03	
		Pipeline	1 mile	1,900	515	2,415	1.00	-	
		Trough	1 each	*	*		0.10	0.10	
		Total		2,437	515	2,952	1.25	0.13	1.00
TOTAL FOR YEAR 8				24,712	9,715	34,427	5.65	3.58	5.75
GRAND TOTAL				1,145,182	268,156	1,143.338	19,910.87	72.97	128.80
						Acreage disturbed by 128.8 miles of two-track road =	64.40	64.40	
						Total acreage disturbed	19,975.27	137.37	

2/ Catchment is located in the Coyote allotment but provides water to the Frank's Reservoir allotment.
3/ Catchment is located in the June Tank allotment but provides water to the Pigeon Tank allotment.
4/ Catchment is located in the Sage allotment but provides water to the Sunshine allotment.

RANGE DEVELOPMENTS

Range Improvements

To implement intensive grazing management, additional range improvements are usually needed. Additional fences are needed to hold livestock in specific areas or pastures to enable rotational grazing systems to be applied. Additional water sources are also needed to provide dependable livestock water in all pastures. In addition, land treatment may also be needed to balance carrying capacities between pastures and improve range conditions. The success of rotational grazing systems depends on having pastures of comparable carrying capacities with sufficient livestock water during the season they are to be grazed. The proposed three-pasture deferred rotation grazing system on the Ferry Swale allotment, for example, would require 9.25 miles of new fences, 5.75 miles of pipeline, and four troughs.

Twelve types of range improvements would be required for the implementation of the proposed action (table 1-8). Table 1-7 presents a chronological breakdown of proposed range developments by allotment.

The proposed action calls for water developments, such as springs, pipelines, wells, troughs, reservoirs, and catchments to provide a source of water to improve livestock distribution on areas where water is presently limited. All tanks, troughs, and reservoirs would store water for use by livestock and wildlife. Fences and cattleguards would control movement of livestock. Land treatment is proposed to balance the carrying capacities between pastures and to improve range conditions. Anticipated increases in carrying capacity through land treatment would not be allocated until seedings are established and ready for use. All seedings would be rested no less than 2 full years for seedling establishment. Locations of existing and proposed improvements are shown on plates 1-E and 1-W.

TABLE 1-8
SUMMARY OF PROPOSED DEVELOPMENTS AND ACRES DISTURBED

Structural Improvements	Number	Unit	Acres Disturbed/ Unit	Total Acres Temporarily Disturbed	Total Acres Permanently Committed
Water Developments					
Wells	5	No.	0.2	1.0	0.5
Catchments	23	No.	1.5	34.5	34.5
Pipelines	82	Miles	1.0	82.0	-
Storage Tanks	8	No.	0.2	1.6	1.6
Troughs	86	No.	0.1	8.6	8.6
Reservoirs	14	No.	0.7	9.8	9.8
Springs	3	No.	0.2	0.6	0.6
Total	221			138.1	55.6
Fences	167	Miles	0.5	83.5	16.7
Cattleguards	7	No.	0.1	0.7	0.7
Land Treatments					
Chaining	8,550	Acres	8,550.0	8,550.0	8,550.0
Spraying	5,760	Acres	5,760.0	5,760.0	5,760.0
Disc or Plow	5,380	Acres	5,380.0	5,380.0	5,380.0
Seeding	12,930	Acres	-	-	-
Total	32,620		19,690.0	19,690.0	19,690.0
Two-Track Road	128.8	Miles	0.5	64.4	64.4
TOTAL				19,976.7	19,827.4

Design Restrictions

Adherence to the following restrictions will be required when range improvements are constructed in the Vermillion ES area. These design restrictions are required to enhance resource values and reduce adverse impacts caused by the construction of range improvements.

1. Permanent two-track roads will be constructed only when necessary.

2. Disturbance of soil and vegetation at all project sites will be held to an absolute minimum (BLM policy, BLM Manual 8400).

3. Areas of soil disturbance will be finished to blend into the surrounding soil surface and reseeded as needed with a mixture of native or introduced species to replace ground cover on the sites and minimize losses of soil from wind and water erosion (BLM policy; BLM Manual 8400).

4. No clearing of the project sites will be allowed except on sites requiring excavation (BLM policy; BLM Manual 8400).

5. Archaeological clearance will be required for all project sites before new construction. Intensive surveys will be conducted to locate any cultural or paleontological remains present. If such remains are discovered, the improvement will be relocated or redesigned to avoid the remains. If the project cannot be moved, a mitigative data recovery or salvage program will be completed before construction. The clearance process will comply with relevant laws and required procedures throughout. Permits required for construction will contain stipulations to protect buried resources and provide for additional surveys should project locations be changed. (BLM policy; National Historic Preservation Act of 1966; National Environmental Policy Act of 1969; Executive Order 11593; 36 CFR Part 800).

6. Plant species proposed for threatened or endangered status will be surveyed for each project site before construction. If such plants are found and the range improvements would diminish the value of the habitat for the species encountered, the project will be relocated or abandoned (Arizona BLM policy).

7. An endangered animal clearance will be required before any construction can be started. If threatened or endangered species are found, BLM will consult with the U.S. Fish and Wildlife Service (FWS) and take the appropriate action. Such action might include the necessary mitigation to protect the species or relocation or abandonment of the project. (BLM Manual 6840; Endangered Species Act of 1973).

8. A visual resource contrast rating will be conducted for all project sites before construction. (BLM policy; BLM Manual 6300). Where visual resources would be impaired, range improvements will be modified by design or location, or be abandoned if necessary to meet visual resource management class objectives.

9. All new water developments will be constructed to meet the needs of wildlife. Each water development will include design features to allow wildlife safe, unrestricted use of the facility. Such design will include separate drinking facilities at ground level, which may be fenced for the exclusive use of wildlife. Waters will not be turned off except to prevent freezing or malfunction.

10. The wilderness inventory, in accordance with Section 603 (a) of the Federal Land Policy and Management Act (FLPMA), has not been completed on the public lands that would be impacted by the proposal. Before implementation of any action that could impair suitability for wilderness, the areas will have to be inventoried and impacts on potential or existing wilderness assessed.

    Until Congress acts on an area that has been designated for wilderness study, existing multiple-use activities, including grazing, will continue. New uses or expanded existing uses will be allowed if the impacts will not impair the suitability of the area for wilderness.

11. All range improvements will be built according to BLM policy and manual requirements (available in BLM District office).

12. For spraying projects, only chemicals registered with the Environmental Protection Agency and approved for BLM use will be applied and then only by certified personnel. All spraying projects will use diclorophenoxy acetic acid (2, 4-D) aerially applied. Chemicals such as 2, 4, 5-T and silvex will not be used.

13. Spraying projects will avoid all riparian areas by providing adequate buffer zones and limiting application to periods when winds are 4 miles per hour or less (normally in the morning).

14. Seeding mixtures will be determined on a site-specific basis. University of Arizona seeding studies conducted on the Arizona Strip to determine adaptability will be used to prepare seed mixtures. Resource specialists will consider wildlife, watershed, range, and other resource needs in formulating seed mixtures. Typical mixtures might include pubescent wheatgrass, Russian wildrye, crested wheatgrass, yellow sweetclover, Ladak alfalfa, fourwing saltbush, bitterbrush, and cliffrose.

Maintenance

Various procedures will be followed to maintain the existing and proposed range improvements. Each year water developments will be periodically inspected to ensure that they remain in usable condition. Preventative maintenance will be performed as needed.

MONITORING PROGRAMS

The proposed action provides for the following resource evaluation studies.

Trend

Trend studies, according to BLM Manual 4412.22c, will be conducted in key areas at each pasture before grazing system implementation and during each grazing cycle. The studies will be used to determine browse condition, watershed erosion condition, and trend. (See appendix 1-1.)

Utilization

During and after each pasture is grazed utilization of forage will be measured by the key species method described in BLM Manual 4412.22b. Utilization studies aid in determining whether stocking rates are at proper levels.

Wildlife Studies

Studies to monitor wildlife habitat conditions will continue, including exclosures, utilization cages, vegetation transects, and seeding plots. Population trends of both game and nongame species will also be studied. Studies are conducted on a year-round basis. The time of the year depends on the species and habitat being evaluated. These data will be used to determine trends in wildlife numbers and habitat conditions to insure the meeting of wildlife objectives.

Actual Use

The rancher will complete BLM Form 4412-8 and file it with the District at the end of the grazing season. This report will show how many cattle grazed a particular pasture and for what period of time. From this information the actual forage use in AUMs can be calculated for each pasture and for each allotment. (See table 1-2 for maximum allowable use.)

Weather Studies

Weather studies are conducted regularly and consist of reading and maintaining precipitation gauges across the resource area. Eighteen precipitation gauges have been established at representative sites throughout the ES area.

AMP MODIFICATION

The evaluation procedures will be completed at the end of each grazing cycle to determine if the AMP is meeting its objectives. If not, the AMP will be revised.

Such revisions might include changes in the grazing system, livestock numbers, or season of use, increases in range developments, or any combination of the above necessary to attain the objectives.

Major AMP modifications would require preparing an environmental assessment report (EAR) before significant change could be implemented. In addition, the area manager would adjust grazing systems during periods of drought or other emergencies when such adjustments would be in the interest of accomplishing the objectives. Depending upon the situation, the area manager would determine the time to be allowed for adjustments.

At the end of each grazing cycle, a multidisciplinary team of resource specialists would assemble all study data to evaluate the effectiveness of the grazing system and determine the need for any adjustment in the system or stocking rate. The following examples demonstrate how study data are used in stocking rate adjustment calculations.

	Allotment A	Allotment B
Climate	Normal precipitation	Normal precipitation
Trend	Cover down 5%	Cover up 10%
	Key species down 5%	Key species up 10%
Utilization	80%	35%
Actual Use	600 AUMs/Yr	400 AUMs/Yr

Allotment A shows a downward trend, and numbers must be adjusted to reduce utilization. Following is the formula (BLM Manual 4413.3) used to arrive at the adjusted stocking rate necessary to achieve a desired level of utilization:

$$\frac{600 \text{ AUMs}}{80\%} = \frac{x}{50\%} \qquad x = 375 \text{ AUMs}$$

Allotment B shows an upward trend, and an increase in stocking rate is permissible up to the 50 percent utilization limit. Again the formula is used to determine the adjustment.

$$\frac{400 \text{ AUMs}}{35\%} = \frac{x}{50\%} \qquad x = 574 \text{ AUMs}$$

Resource specialists would visit less intensive allotments periodically to conduct on-the-ground inspections for determining any change in resource conditions. If this monitoring identifies problems or conflicts, the allotment would be evaluated for a change in management. Changes in stocking rates would be determined by utilization studies and the above adjustment procedure.

ADMINISTRATION

BLM would issue grazing permits according to the Federal Land Policy and Management Act of 1976 and according to land use plans that provide for multiple-use management and protection of the environment.

On all allotments identified herein, each operator would be issued a term permit not to exceed 10 years. The term permit would include the terms and conditions of authorized grazing on the allotment. Where an AMP has been prepared it will be included in the term permit.

Each AMP outlines a given amount of normal flexibility in livestock numbers and movement dates the operator may exercize without prior BLM approval. This flexibility allows the operator to move livestock on or off an allotment or pasture up to 2 weeks before or after the scheduled dates. It also allows up to a 10 percent increase in livestock numbers. The 2-week and 10 percent adjustments are maximum, and the AMPs range from no flexibility up to the maximum.

The AMP will specify the normal livestock use and allowable flexibility authorized for the allotment. The initial stocking rates presented in table 1-2 include the allowed normal flexibility and represent the maximum authorized use during the grazing season. The normal operation plus the allowed flexibility never exceeds the proposed initial stocking rate shown in table 1-2.

Normal flexibility is desirable because it allows the operator to adjust to climatic fluctuations such as high or low production, availability of water, early or late range readiness, and variations in ranching operations.

BLM would supervise livestock grazing throughout the year. If the livestock operator wishes changes in use that are outside the limits of the normal flexibility specified in the AMPs but are consistent with management objectives, (changes in the normal operation livestock numbers and dates without prior BLM approval), he would formally request authorization for the deviation in advance of use.

Intensive grazing management also requires BLM approval for deviation of range use beyond flexibility limits. Because the lands involved in this proposal are semiarid and subject to wide fluctuation in precipitation from year to year and pasture to pasture, altering stocking rates and use periods may be necessary to meet management objectives. Rates and periods may be adjusted up or down on the basis of studies, range condition, competition with wildlife, amount of available forage and water, and time of year. In no case will utilization be allowed to exceed an average of 60 percent in the use pastures.

Any deviations from the grazing schedule outside normal flexibility must receive BLM's prior approval. Achieving AMP multiple-use objectives, protection of vegetation and soil, and livestock-wildlife competition will be of prime concern in the consideration of any changes in the grazing schedule.

Adjustments will be made to:

1. Authorize the movement of livestock from one pasture to another ahead of schedule, due to lack of forage in the first and the availability of forage in the second.

2. Hold livestock in a pasture longer than scheduled, if utilization has not reached 50-60 percent. This option could only be used when forage is lacking in the next use pasture or to obtain some stage of vegetative development such as seed ripe.

3. Allow use in the "rest" pasture if it has abundant forage while, because of rainfall patterns, forage is temporarily unavailable in the "graze" pastures.

4. Reduce livestock numbers in response to a lack of forage production in any one season or growing year.

5. Allow movement of livestock from one pasture to another ahead of schedule if sufficient water is lacking in the scheduled pasture and resource managers determine that objectives of the plan can be met. Present requirements for base waters will not be relaxed.

6. Increase or decrease livestock numbers temporarily to achieve a predetermined degree of utilization. (For example, if achieving a degree of hedging on browse species is desirable to benefit wildlife habitat, a temporary increase in livestock numbers may be warranted.)

Operators of allotments with less intensive grazing that want grazing different from that outlined on their licenses would formally request a change and may obtain approval in advance.

Grazing use outside the limits outlined in the AMPs or annual license and without prior authorization would be considered trespass. Should trespass occur, BLM would act to assure that it is eliminated and that those responsible pay for forage consumed and damages incurred.

Trailing needs would vary with each operation. Some livestock would trail to and from allotments, whereas others would simply trail between pastures. Most trailing would occur during licensed or authorized periods. An average of five crossing permits would be issued to operators moving livestock from Arizona to Utah and back again. Approximately 100 miles of administrative stock driveway are in the ES area; most receive little use. All stock driveways are shown on plates 1-E and 1-W.

MANPOWER REQUIRED

To implement and monitor the proposed action, 10 additional positions would be required: 3 engineering technicians for project development, 4 maintenance men, and 3 range technicians.

RELATED ACTIONS

The following actions would be required to implement the proposed action.

Federal Actions

All range improvement projects proposed on the Glen Canyon National Recreation Area would require National Park Service approval before construction.

County Action

Before installation of any project that would affect county roads, such as fences, cattleguards, and pipelines, clearance will be required from county commissions involved.

INTERRELATIONSHIPS

BLM's management of public lands in the ES area is related to projects or management practices of other Federal agencies, State agencies, and, to a limited extent, private enterprise.

Because BLM manages such a large percentage of the lands in the Arizona Strip, its management practices strongly influence State and private lands found interspersed within public lands. Close coordination between the various land managing agencies is required to accomplish common goals and avoid resource use conflicts.

BLM PLANNING

Specific objectives found in the Vermillion Management Framework Plan (MFP) and used as a basis for developing the management systems in each AMP are shown in table 1-9. Also see map 1-2.

RELATIONSHIPS TO OTHER FEDERAL PROGRAMS

Utah BLM

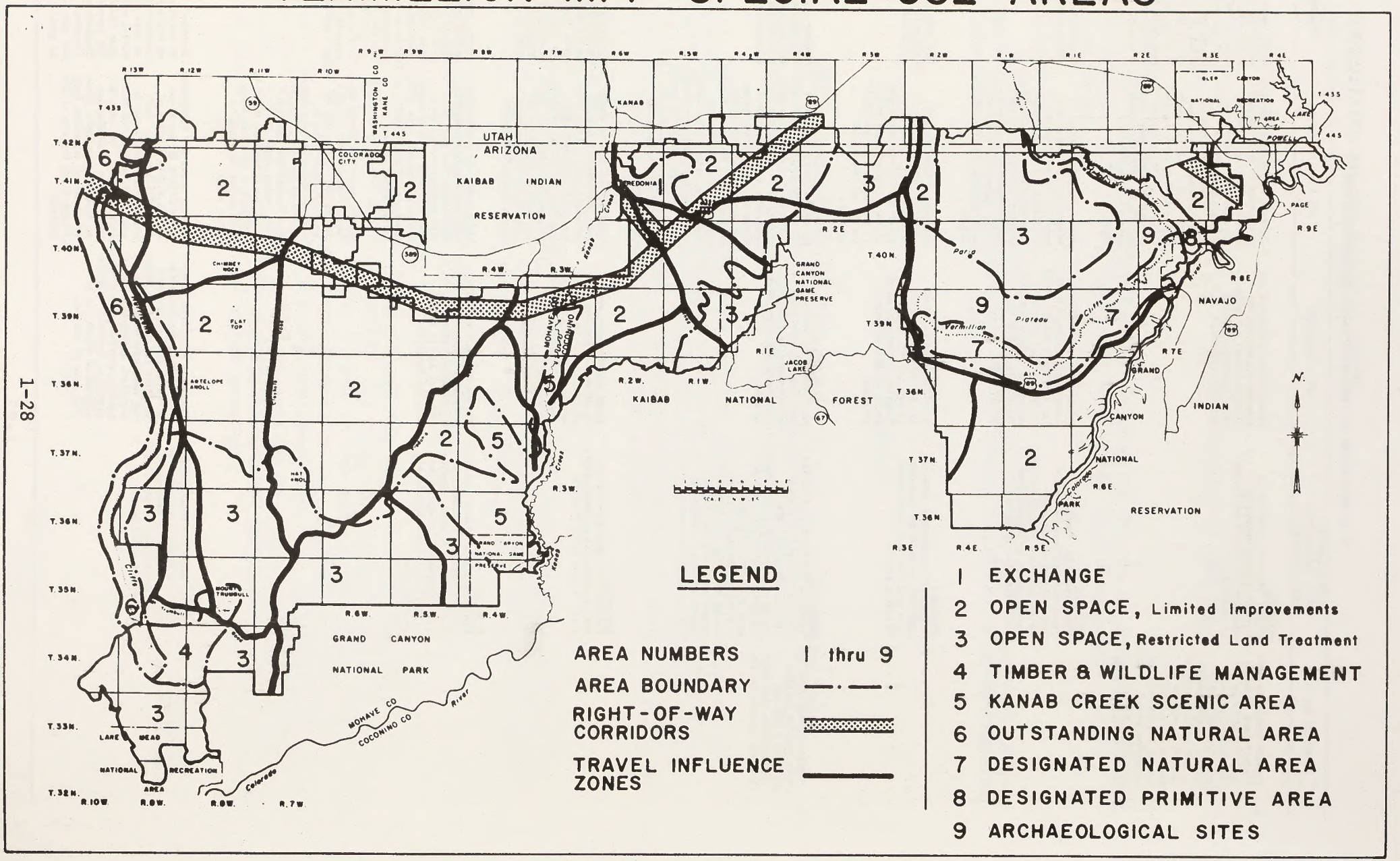
The BLM Cedar City District and the Arizona Strip District have signed an interdistrict agreement for range management along the Arizona-Utah boundary from the Nevada border to the easternmost edge of the Arizona Strip. This agreement permits an exchange of jurisdiction of eight Utah allotments to Arizona management and nine Arizona allotments to Utah management. Management of grazing on these allotments would require coordination, since grazing management interrelates with multiple-use planning, policies, and other programs.

TABLE 1-9
MFP RECOMMENDATIONS AND DECISIONS AFFECTING THE PROPOSED ACTION

LIVESTOCK MFP 1	OTHER RESOURCES MFP 1 (CONFLICTING WITH LIVESTOCK)	MFP 1 CONFLICTS	MFP 2 AND RATIONALE	RESOURCE TRADE-OFFS
1. Provide forage to meet Class I base property qualifications in all allotments that contain over 20% public lands. Allow upwards to 70% annual utilization by livestock of key forage species except 50% in critical watershed areas, crucial wildlife areas or travel influence areas.	Wildlife Adjust livestock numbers to current grazing capacity. Allocate all increased forage to wildlife.	Uncontrolled livestock use damages vegetation and reduces forage for wildlife, thereby limiting wildlife numbers.	Increase or maintain forage production to meet Class 1 grazing qualifications in all allotments except in Area 1 and a portion of Area 5. Allocate forage for big game on all big-game crucial habitat areas Use by livestock in crucial wildlife areas, critical erosion or frail land areas and travel influence areas should not exceed 50% annually.	No increase of livestock use should be allowed in any allotments until studies clearly indicate increases will not conflict significantly with wildlife. A total of 11,940 AUMs will be allocated to wildlife in the ES area, of which 66 AUMS have been allocated for bighorn sheep and 844 AUMs for antelope.
	Wildlife Where possible, fence reservoirs to improve waterfowl habitat conditions. Establish plant species within fenced areas to improve food conditions for waterfowl.	Reservoirs were mainly constructed by permittees for livestock water. This could restrict livestock access to water and riparian forage around the reservoirs.	Where possible, fence reservoirs for waterfowl, provided water is made available for other wildlife and livestock. Forage, resting and nesting areas can be provided for waterfowl, increasing waterfowl and enhancing recreational values.	Unquantified number of acres eliminated from grazing.
	Wildlife Transplant additional antelope, 200 head in Antelope Planning Unit and 100 head in Coconino Planning Unit.	Antelope-livestock conflicts will develop for forage for 400 antelope. Existing livestock fences would inhibit antelope movement.	Allocate forage for and establish 400 antelope. Many ranchers oppose proposal to increase antelope. AG&FD indicates this number is the minimum necessary to permit harvesting of antelope.	844 AUMs allocated for antelope will be lost to livestock use.
2. Complete range improvement jobs as outlined in Step 4 URA and improvements necessary for AMP implementation.	Recreation Establish buffer zone 1/2 mile wide on each side of centerline of historical trails. Restrict or prohibit land uses and construction and development projects altering the natural landscape or having potential adverse effects on scenic or recreation values. Remove or restore existing intrusions as necessary.	Development or construction of some range improvements is necessary for adequate grazing systems in AMPs.	Establish travel influence zones. Trails and roads are considered to be of adequate significance to qualify for inclusion on the National Register of Historic Places and worthy of preservation efforts. Mt. Trumbull, Kanab Creek, Hurricane Rim and Vermillion Cliffs offer good sightseeing. Land treatment areas must be small, on gentle slopes, cleaned up, and designed with visual considerations.	Maximum recreation, historical resources and aesthetic qualities would be forgone if developments and treatments are allowed.
	Recreation Prohibit all land disturbance and preserve all archaeological sites on the Paria Plateau.	Range improvements are necessary if grazing systems are to be implemented. Without grazing systems, vegetation cannot be managed.	Prohibit all land disturbance and preserve all archaeological sites. This important archaeological area has an average of 4 to 5 sites per acre. All land disturbance should be delayed until archaeological values can be determined.	Without land treatment maximum livestock production cannot be attained. 2,360 acres are planned in the Two Mile AMP. If project is not accomplished, 456 AUMs will be lost to livestock grazing.
	Wildlife Limit additional fence construction to absolute necessity in big-game habitat area. Modify existing fences to appropriate wildlife specifications in all crucial areas.	Fences restrict wildlife movement. Where a fence is required, design it to offer as little restriction as possible.	Limit fence construction to that absolutely necessary. New fences must meet wildlife specifications (not over 42" high in deer areas and smooth bottom wire 14" above ground in the deer and antelope areas). Modify existing fences to meet these standards where necessary. Since deer or antelope could inhabit most of the area, any fences should be built to wildlife specifications. Ranchers feel fences built to wildlife specifications would be inadequate, although these have proved adequate in other areas.	Fences necessary to implement grazing systems are planned, but have been held to a minimum to do the job. Even though fences will be built to wildlife specifications, some wildlife restriction may occur. Fences may not control livestock as well as desired. Some livestock may pass through, especially during handling and working of livestock.
3. Provide livestock water in suitable range areas of light use.	Wildlife Provide water for wildlife where forage is present and water is limited. Restrict additional water development within 3 miles of the Paria Plateau rim.	Providing additional livestock waters may cause new areas of competition with wildlife for forage. Without development of water supplies, implementation of grazing systems may not be possible. Several developed sources of water are in this area at present.	Provide water for livestock and wildlife in dry areas, except within 3 miles of Paria Plateau rim. Such water will provide for increased livestock and wildlife grazing. The restriction on the Paria Plateau is necessary to limit livestock use of important deer forage along the rim of the plateau.	Livestock production cannot be maximized along the rim of Paria Plateau. However, considerable use will still be made of the area as waters are available. The area involves approximately 250 square miles. Quantification of loss of AUMs to livestock is not possible, but such losses would not be great.

MAP 1-2

VERMILLION MFP SPECIAL USE AREAS



The following allotments were transferred:

To Utah Management:	To Arizona Management:
Blue Pools	Atkin Well (Haslem Spring, UT)
Cedar Mountain	Cannan Gap (Perkins, UT)
Judd Hollow	Coyote (Pine Hollow, UT)
Frank's	Frank's Reservoir (Rock Reservoir, UT)
Johnson Spring	Fuller Road (Utah allotment)
Colorado City Individual	Rider (Muggins Flat, UT)
Cottonwood	Shinarump (Brown-Shumway, UT)
Point	Two Mile (Buckskin Gulch, UT)
Short Creek	

U.S. Forest Service

BLM and Kaibab National Forest have a memorandum of understanding dated August 8, 1950. The memorandum outlines jurisdiction of grazing matters on the border of the Kaibab National Forest, water use in that area, fencing responsibility in that area, and grazing licensing procedures for that area.

The following allotments and acreage are involved in the above agreement:

House Rock	570 acres
Shuttleworth	10 acres
Two Mile	360 acres

National Park Service (NPS)

The Arizona Strip District and NPS have signed memorandums of understanding (dated June 11, 1973 and June 21, 1976) "Relating to Grazing in the Glen Canyon National Recreation Area and the Lake Mead National Recreation Area in Arizona." The memorandum places grazing administration with BLM but outlines coordination and cooperation procedures between the two agencies on all matters related to grazing on NPS lands.

The following allotments and acreage are involved in the NPS agreements:

Mt. Logan	13,680 acres
Ferry Swale	10,380 acres
Lee's Ferry	3,760 acres
Soap Creek	610 acres
Wahweep	15,459 acres

In addition, NPS has proposed to place 6,180 acres of the Glen Canyon National Recreation Area into wilderness status, including the Ferry Swale, Paria Canyon, and the Big Bend areas. Should this happen, no range improvements or motorized ingress or egress would be allowed.

Navajo Land Application

Through Public Law 93-531 the Navajo Indian Nation has a pending application to purchase public land in the House Rock Valley and Paria Plateau. Should this sale be approved, 250,000 acres of public land would be removed from BLM administration and this grazing management proposal. The following allotments would be affected by the application.

Allotment	Approximate Acres Affected	Approximate AUMs Affected
Badger Creek	5,320	184
Beanhole	3,200	451
Buffalo Tank	1,200	138
Coyote	29,280	3,142
Cram	2,560	356
Frank's Reservoir	400	23
Fuller Road	100	9
Home Ranch	36,844	4,978
House Rock	8,110	1,164
Lee's Ferry	80	4
Soap Creek	26,828	1,944
Two Mile	33,670	3,204
Vermillion	102,408	9,062
Total	250,000	24,659

RELATIONSHIP TO THE STATE OF ARIZONA

Arizona State Land Department

The Arizona State Land Department leases 114,195 acres of State land within the Vermillion Resource Area to livestock operators to run cattle in conjunction with BLM grazing permits. These lands are managed with public lands because the two are highly interspersed. State land and public lands receive essentially the same grazing use. The Land Department has received, as requested, copies of all AMPs that would impact State lands.

Arizona Game and Fish Department (AG&FD)

Cooperative relations between BLM and the Arizona Game and Fish Department (AG&FD) are outlined in a master agreement dated January 6, 1976. On February 2, 1977 BLM and AG&FD signed a habitat management plan for the Mt. Trumbull Habitat Area. This plan covers some 316,660 acres of public land within the ES area. BLM and AG&FD are presently formulating a habitat management plan for the Clayhole Habitat Area, involving approximately 500,000 acres of primarily pronghorn habitat on public lands within the ES area. In addition, BLM and AG&FD cooperatively set big-game populations and AUM allocations for the ES area.

RELATIONSHIPS TO LOCAL PROGRAMS

Coconino County

Coconino County has identified no proposals that would affect or be affected by the proposed action.

Mohave County

Mohave County has a pending application for an airport, which, if approved, would remove 380 acres of land from grazing in the Colorado City area (less than 5 AUMs). Only the runway will be fenced for the foreseeable future.

CHAPTER 2

DESCRIPTION OF THE ENVIRONMENT

CHAPTER 2

DESCRIPTION OF THE ENVIRONMENT

Chapter 2 describes the environmental components likely to be impacted by the proposed action. These descriptions are designed to be commensurate with the expected magnitude, intensity, duration, and incidence of impacts and to provide the reader with a sufficient understanding of the environment to evaluate possible impacts. A discussion of the future environment without the proposed action is included in chapter 8 under the no-action alternative.

CLIMATE AND AIR QUALITY

The climate of the Vermillion ES area is the typical southwestern biseasonal regime, having winter precipitation, spring drought, summer precipitation, and fall drought, with decidedly variable amounts of precipitation from year to year. Topography and elevation influence local climate. Increasing elevations have higher precipitation and lower mean temperatures. Data on prevailing winds, precipitation, and temperature in the ES area appear in table 2-1.

PRECIPITATION

The area's average annual precipitation is estimated at 8.6 inches, although the averages range from 4.9 inches at Wahweep to more than 18 inches at Mt. Trumbull.

Precipitation in July and August is slightly higher than during the winter (figure 2-1). May and June are normally the driest months. Summer precipitation comes from primarily convectional, often intense, local storms, usually less than 3 miles in diameter. These storms are occasionally violent, with high winds, torrential rains, rapid runoff, and local flash flooding. Winter precipitation is usually less intense and therefore more readily available to the soil. (See map 2-1 for locations of ES area rain gauges.)

AIR QUALITY

The ES area is generally free of man-made pollution sources. No air quality monitoring stations exist in the ES area, but monitoring stations are located outside, at Page, Arizona and Warner Valley, Utah.

Observations of background levels of various atmospheric pollutants generally reveal very clean air. The major source of air pollution is blowing dust. A limited number of measurements at Warner Valley indicates that the "desert haze" reducing visibility in this region may result from atmospheric moisture.

TABLE 2-1
SUMMARY OF CLIMATIC CONDITIONS IN THE ES AREA

Climatic Factor		West of Kaibab Plateau and Buckskin Mountains	East of Kaibab Plateau
PREVAILING WINDS			
	Seasonal	Summer: Southeasterly, convectional Winter: Westerly, frontal	Same 1-5 MPH monthly average at Page and Wahweap. April is the windiest month.
	Diurnal	Air flows upslope at night and downslope in daytime.	
TEMPERATURE			
	Seasonal	Summer mean: 65-80 degrees Winter mean: 32-42 degrees Maximum 110 degrees (1970) Minimum -18 degrees (1967)	76-88 degrees 32-45 degrees 115 degrees (1954) -11 degrees (1963)
	Growing Season (Frost-free Days)	140-170 days	200-230 days Paria Plateau is typical of west side.
PRECIPITATION			
	Annual	8-14" 14-20" on Uinkaret Plateau	4-8" 8-12" on Paria Plateau
	Maximum	23.54" at Bundyville (Mt. Trumbull) (1941)	10.83" at Lee's Ferry (1957)
	Minimum	4.03" at Fredonia (1956)	2.70" at Lee's Ferry (1955)
	Recording Stations	Colorado City Fredonia Bundyville Pipe Springs Tuweep	Lee's Ferry Page Wahweap

Source: Green and Sellers, 1964

CLIMATE AND PHENOLOGY

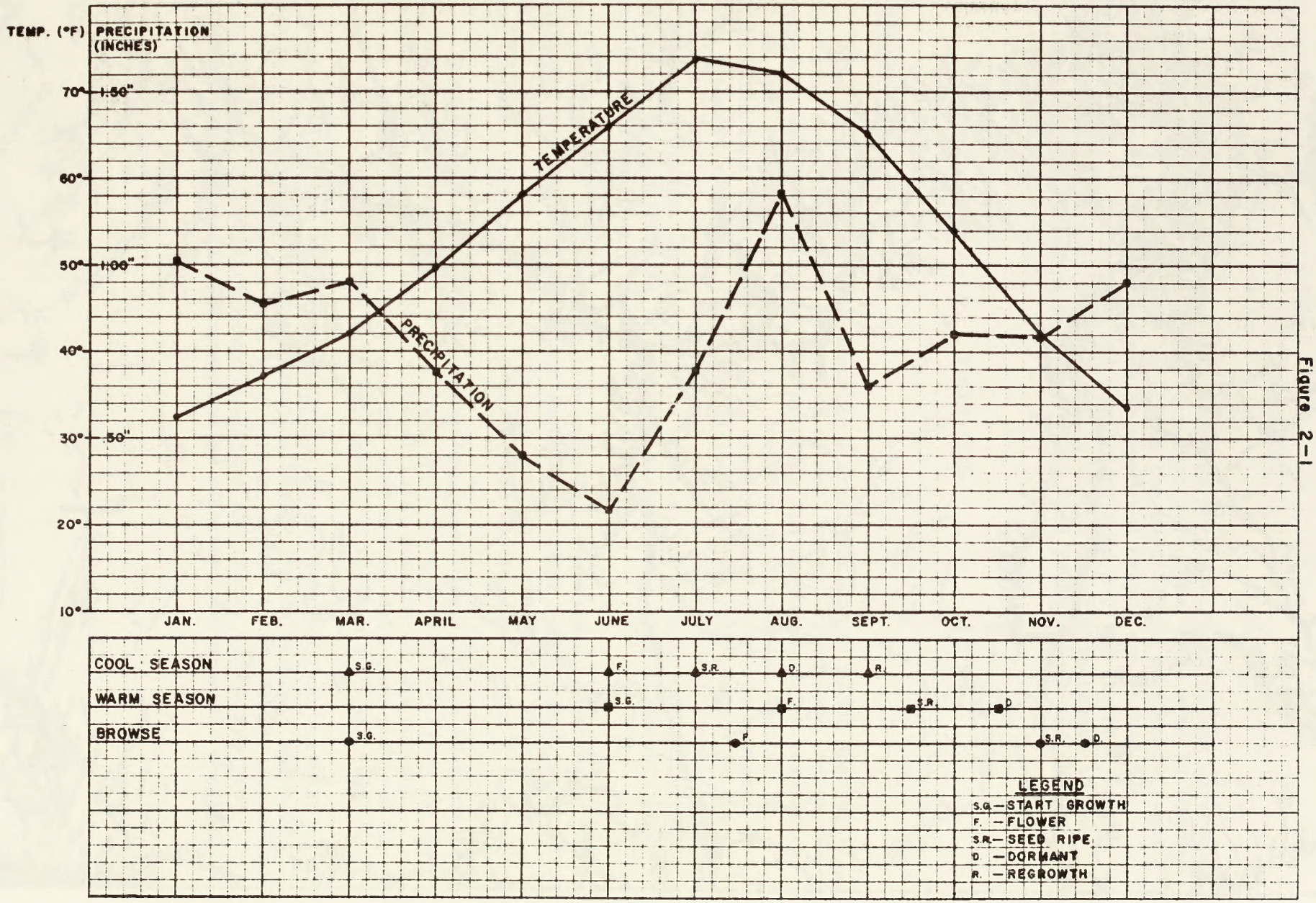
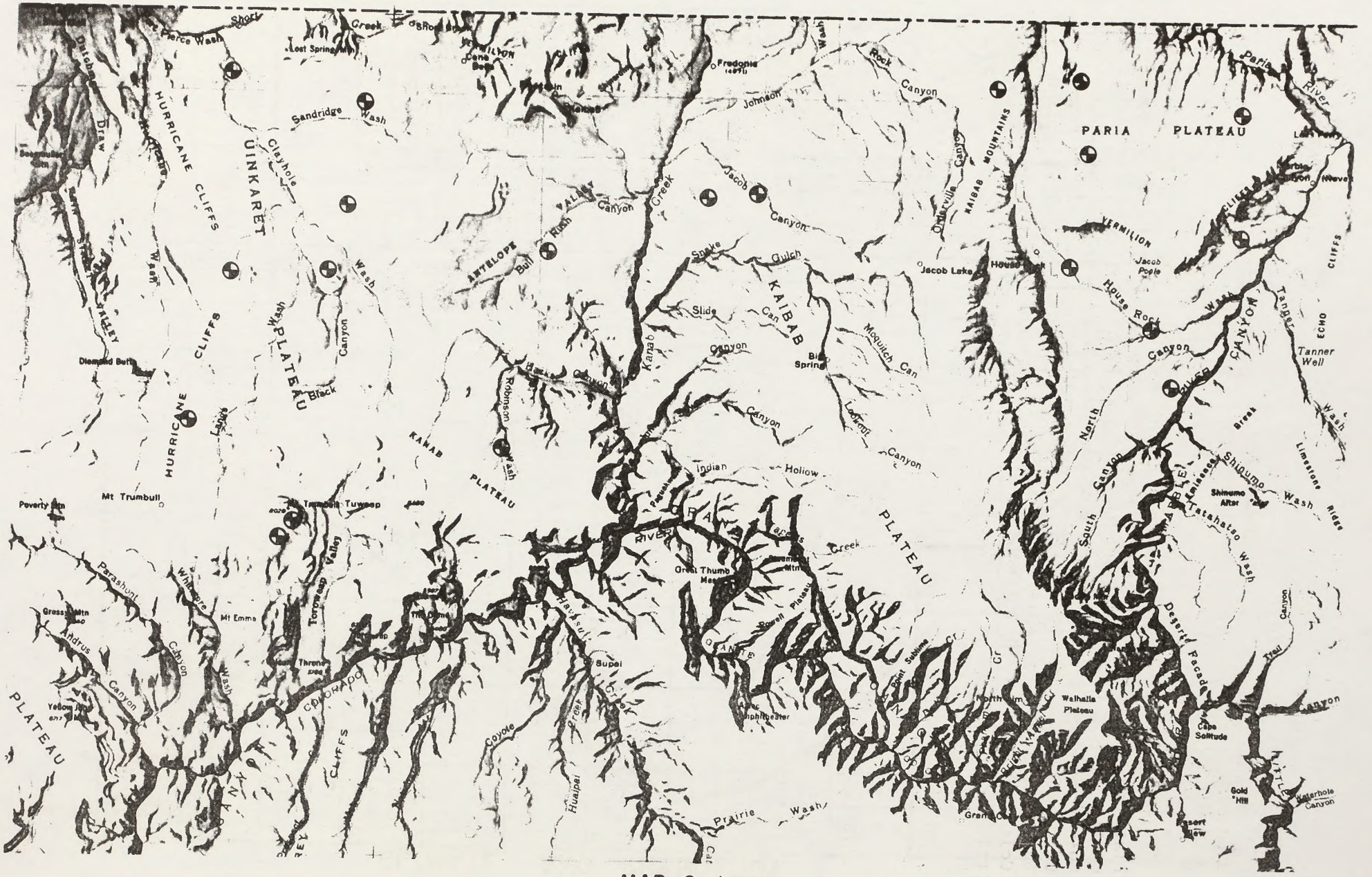


Figure 2-1

SOURCES: Climate — Green and Sellers, 1964
Phenology — Arizona Strip Study Data



MAP 2-1

RELIEF MAP OF VERMILLION ES AREA AND ENVIRONS (EXCLUDING PORTIONS IN UTAH)

⊕ Rain Gauge

Source: U. S. Geological Survey Relief Map of Arizona, 1959

TOPOGRAPHY

The Vermillion ES area lies near the southwest edge of the Colorado Plateau and exhibits typical plateau type structure. The area is bounded on the west by the Hurricane Fault, on the east by the southwest-trending Colorado River, and on the south by the Grand Canyon uplift and the Colorado River. The relief and topography (map 2-1) of the area have been determined largely by the carving of the major tributaries to the Colorado River, including Wahweap, Paria, and Kanab Creeks and their tributaries.

VEGETATION

INTRODUCTION

The Vermillion ES area supports a great variety of plant species, resulting from the area's diversity of soil types, elevations, exposures, temperatures, precipitation, and existing and past uses. The vegetation of an area that has one to several dominant or codominant species is identified as a vegetation subtype, usually named after the dominant or most abundant species. These vegetation subtypes vary greatly in the number of species and percent of each species in the total composition. A sagebrush vegetation subtype, for example, may consist of 100 percent sagebrush or as little as 10 percent sagebrush, as long as sagebrush is the dominant species.

The ES area has 16 vegetation subtypes: grassland, sagebrush, saltbush, pinyon-juniper, desert shrub, half-shrub, greasewood, mountain shrub, meadow, riparian, creosotebush, conifer, winterfat, shadscale, and annuals. (See table 2-2, plate 2, and appendixes 2-1 and 2-2.)

BLM obtained vegetation information from forage surveys as described in chapter 1 and appendix 1-1. These data exist in the AMP files at the Arizona Strip District office. The earliest portion of the current survey was conducted in 1972, and the most recent data were gathered in 1977. The majority of the data were gathered between 1975 and 1977.

Each allotment varies in elevation, precipitation, and seasonal growth of key species. Plant phenologies for the ES area are shown on table 2-3. Phenological data by allotment appear in the AMPs. Appendixes 2-3, 2-4, and 2-5 present range condition and trend, vegetation production, and key species composition by allotment and vegetation subtype.

TABLE 2-2
CHARACTERISTICS OF VEGETATION SUBTYPES

Subtype	Acres	Percent of ES Area	Associated Species Common Name*	Key Species Compoaition (Average Percent) Grass**	Shrub***	Average Total+ Production	Uaable Forage++ Production	Range Condition (Percent) Good	Fair	Poor	Apparent Trend (Percent) Up	Down	Static	Elevation (Feet)	Annual Precipitation (Inches)
Graasland	449,623	28	Blue grama, galleta grass, squirreltail, Indian ricegrass, crested wheatgrass, Russian wildrye	41	10	380	94	38	59	3	34	39	27	4,000-5,000	5-12
Sagebrush	385,401	24	Big sagebrush, sandsage, fringed sage, black aage-brush, Bigelow sage, squirreltail, Junegrass, weatern wheatgrass, blue grama, galleta grass, ephedra, cliffrose, fourwing saltbush	24	4	396	63	15	68	17	12	19	69	3,000-8,000	8-16
Pinyon-Juniper	358,327	23	Pinyon, juniper, sagebrush, cliffrose, blue grama, galleta grass, Indian ricegrass, squirreltail, ring muhly	17	6	443	52	13	58	29		32	68	4,500-8,000	10-20
Saltbush	164,481	10	Fourwing aaltbush, blue grama, galleta grass, aacaton, shadscale	24	14	400	63	13	76	11		32	68	3,000-6,000	5-12
Half-Shrub	43,873	3	Snakeweed, blue grama, galleta grasa, shadscale	30	11	486	64	7	93			7	93	3,000-6,000	5-12
Desert Shrub	90,124	6	Blackbrush, shadscale, ephedra, buckwheats, wolfberry, yucca	20	11	306	45	15	42	43		14	86	3,000-5,000	8-12
Grease-wood	1,000	1	Greaaewood, saltgrass, rabbitgrass, Great Basin wildrye, sacaton	20	5	484	80		64	36		36	64	3,000-5,000	5-10
Mountain Shrub	3,638	1	Oak, serviceberry, mountain mahogany, bluegrasses	5	10	446	48		13	87		44	56	5,000-8,000	15-25
Wet Meadow	170	1	Willow, bullrushes, saltgrass, western wheatgraases, sedges	60	-	1,500	349		100				100	4,800-5,400	6-12
Riparian	1,164	1	Cottonwoods, willows, bullrushes, sedges	23	8	270	36			100		100		3,200-4,000	3-8
Creosote-bush	1,700	1	Creosotebush, bursage, range ratany, big galleta	10	10	405	35		No data			No data		3,400-4,000	5-10
Winterfat	6,780	1	Winterfat	35	15	427	101		100			100		4,000-5,500	5-12
Shadscale	9,740	1	Shadscale, galleta grass, blue grama, fourwing aaltbush	20	17	270	31		100				100	3,000-4,500	5-10
Conifers	8,880	1	Ponderosa pine, cliffrose, blue grama, Arizona fescue, bitter-brush, sagebrush	9	T	537	53		43	57			100	6,000-8,000	15-25
Annuala	4,156	1	Cheatgrass, Russian thistle	21	11	450	49			100		60	40	4,000-6,000	8-12

* Refer to appendix 2-1 for acientific namea.
** Key Grasa Species: Indian ricegrass, aquirreltail, galleta, blue grama, black grama, weatern wheatgrass, sand dropseed, crested wheatgrass, Russian wildrye, needlegrass, tall wheatgrass
*** Key Shrub Species: Fourwing saltbush, winterfat, cliffrose, ephedra, serviceberry
\+ Air dry pounds/acre
++ Air dry pounds/acre at no more than 50 percent utilization. Usable forage is vegetation palatable and available to liveatock and wildlife.

Source: Forage Production Inventory Method

TABLE 2-3
PHENOLOGICAL DEVELOPMENT OF KEY SPECIES

Key Species	Developmental Stages			
	Start Growth	Flowering	Seed Ripe	Seed Dissemination
Grasses				
Blue grama and black grama	6/1	8/1	9/15	10/10
Indian ricegrass	3/15	6/1	7/15	8/15
Galleta	5/1	6/1	8/15	10/15
Squirreltail	3/15	6/1	7/1	8/1
Wheatgrasses	3/1	5/15	7/1	8/15
Sacaton	4/1	6/20	7/15	8/30
Russian wildrye	3/1	5/15	7/1	8/15
Needlegrass	3/1	5/15	7/1	8/1
Shrubs				
Cliffrose	4/1	5/15	7/1	8/1*
Fourwing saltbush	3/15	6/15	11/1	12/1
Winterfat	3/15	6/15	9/15	12/1
Mormon tea	5/1	7/20	9/15	12/1

* Following year

BARREN AND UNSUITABLE LAND

Three percent of the ES area (51,271 acres), supporting a variety of vegetation types, is too steep and rocky, too lacking in water, too inaccessible, or too low in forage productivity to be suitable for livestock grazing. BLM has allocated no livestock forage on these areas. Even though wildlife use these areas, livestock use them only lightly. Known as barren and unsuitable lands, these areas occur in 21 of the proposed 66 allotments of the ES area.

THREATENED AND ENDANGERED PLANT SPECIES

The Endangered Species Act of 1973 establishes two categories of species subject to Federal protection: endangered and threatened. Following the passage of this act, the Secretary of the Smithsonian Institution issued a report to Congress listing proposed endangered and threatened plant species of the United States. This list was published in the Federal Register on July 1, 1975, revised, and again published in the Federal Register on June 16, 1976. The taxa for Arizona shown in these two Federal Register lists are the basis for selection of proposed endangered and threatened plants of the Vermillion ES area.

Fifty-one species from the Smithsonian lists occur or possibly occur in the Vermillion ES area (table 2-4). Twenty-five of these plants have been located through field searches in 1976 and 1977.

Extensive field studies indicate that the proposed threatened and endangered plants found in or near the ES area are highly soil specific or site specific and therefore restricted in distribution. Intensive studies over a period of years covering at least one complete weather cycle, however, will be necessary to validate endangered or threatened status. Information obtained to date indicates that the listed plants are relatively unpalatable to livestock.

SOILS

The soils of the Vermillion ES area are formed mainly in residium from sedimentary rocks of limestone, sandstone, and shale. Soils of the southwest part of the ES area, however, are formed in basalt.

SOIL ASSOCIATIONS

Eight soil associations occur in the area (plate 2). Table 2-5 lists the acreage, percent of each association, soil productivity, limiting factors, physical properties of individual soils in each association, and typical vegetation occurring on each association. Table 2-6 shows the acreage of soil associations in each allotment. These general soil maps do not show the exact kind of soil at any particular place but show a pattern of occurrence on defined landscapes. The information is useful for general planning but is not suitable for use in detailed planning, specific interpretations, or determining production potentials.

The soils of the ES area have several limitations to forage production. Soil association 1 has severe limitations because of very steep slopes, shallow soils, and rock outcrops. Soil associations 2, 5, and 7 have large areas of shallow soils, which limit production, particularly in years of favorable precipitation on the Moenkopie, Shalet, Winona, Boysag, Rudd, and Cabezon series. Soils on associations 3, 7, and 8 have low water-holding capacities, association 3 because of sandy textures and associations 7 and 8 because of considerable amounts of rock fragments in the soil profile.

SEDIMENT YIELD

BLM specialists determined specific rates of sediment yield by allotment (table 2-7) using transects. They evaluated current erosion using the following factors that influence the rate and likelihood of erosion: surface geology, soils, climate, topography, ground cover, land use, upland erosion, channel erosion, and sediment transport. Table 2-7 shows a high variability in current erosion for the allotments,

TABLE 2-4

PLANT SPECIES PROPOSED FOR THREATENED AND ENDANGERED STATUS

Scientific Name	Proposed Status T = Threatened E = Endangered	Found Through Recent Field Search in or Near ES Area	Believed Possibly to Occur in ES Area
Agave utahensis var. kaibabensis	T		X
Amsonia palmeri	T		X
Aquilegia desertorum	T		X
Arabis gracilipes	T		X
Argemone arizonica	T		X
Astragalus ampullarius	T		X
Astragalus beathii	E		X
Astragalus cremnophylax	E	X	
Astragalus lancearius	T	X	
Astragalus striatiflorus	E	X	
Camissonia confertiflora	T		X
Camissonia exilis	T		X
Camissonia parryi	T	X	
Camissonia specuicola ssp. hesperia	T		X
Camissonia specuicola ssp. specuicola	E		X
Castilleja kaibabensis	T		X
Clematis hirsutissima var. arizonica	T		X
Cryptantha semiglabra	T	X	
Cymopterus newberryi	T	X	
Draba asprella kaibabensis	E		X
Encelia frutescens var. resinosa	T	X	
Erigeron lobatus	T		X
Eriogonum darrovii	E	X	
Eriogonum heermanii var. subracemosum	T		X
Eriogonum mortonianum	E	X	
Eriogonum thompsonae var. atwoodii	E	X	
Eriogonum thompsonae var. thompsonae	T	X	
Eriogonum zionis var. coccineum	E	X	
Fraxinus anomala var. lowellii	T		X
Fraxinus cuspidata var. macropetala	T	X	
Haplopappus salicinus	E		X
Haplopappus scopulorum	T		X
Hymenoxys subintegra	T	X	
Machaeranthera mucronata	T	X	
Nama retrorsum	T		X
Pediocactus bradyi	E	X	
Pediocactus paradinei	T	X	
Pediocactus peeblesianus var. fickeiseniae	T	X	
Pediocactus sileri	E	X	
Penstemon virgatus ssp. pseudoputus	T	X	
Peteria thompsonae	T	X	
Phacelia cephalotes	T	X	
Phacelia constancei	T	X	
Phacelia filiformis	E		X
Phacelia rafaelensis	T	X	
Primula specuicola	T		X
Psoralea epipsila	E		X
Rosa stellata	T	X	
Sclerocactus spinsosior	T		X
Silene rectiramea	E		X
Sisymbrium kearneyi	E		X

TABLE 2-5
SOIL ASSOCIATIONS

Soil Association No.	Name	Percent of ES Area	Acres	Slope (%)	Dominant Soil Textures	Depth (in.)	Precip-itation	Frost-Free Days	Drainage	Hydro-logic Group	Erosion Hazard	Total Potential Production Pounds/Acre Favorable Year	Unfavorable Year	Soil Qualities Limiting Forage Production	Common Plant Species
1	Torriothents-Camborthide Rock Outcrop Association	6.6	105,425						Somewhat						Bleckbrush, Mormon tea, pinyon pine end Uteh juniper
	Torriorthents - 65%			10-80	Veriable	4-20	8-16	120-200	excessive	D	Varieble	SCS data not available		Very steep slopea, shallow dapths, low water-holding cepacitiee	
	Camborthids - 15%			5-40	Variable	8-36	8-16	120-200	Well	D	Variable	" " "		" " " " " " " " "	
	Rock Outcrop - 15% *											No significant production		Bedrock outcrops	
	Incluaiona - 5% *														
2	Moenkopie-Shalet-Tours Association	25.8	408,478												Alkali sacaton, gallete, fourwing saltbueh, blue grama, black grama, sand dropseed, Mormon tee, sagebrueh and scattered juniper
	Moenkopie - 60%			2-15	Loamy sand and sandy loam	5-20	10-13	120-180	Well	D	Slight	650	300	Shellow deptha, low water-holding capacitiea	
	Shalet - 15%			2-8	Clay loam	4-15	10-13	150-180	Well	D	Moderate	500	200	" " " " " "	
	Tours - 15%			0-3	Silty clay loam, loam and silt loam	> 60	10-12	160-170	Well	B	Moderate	2,000	1,000	No limitations	
	Incluaione - 10% *														
3	Fruitland-Sheppard-Rock Outcrop Assoc.	16.8	264,197												Sand sagebrush, lndian ricegress, sand dropaeed, gallete, threeawn, blue grama, Mormon tea, scettered Utah juniper and pinyon pine
	Fruitlend - 35%			2-15	Sandy loam and loemy sand	60	12-16	120-160	Well	A	Slight	800	300	Sandy texturea, low water-holding capacities	
	Sheppard - 35%			2-15	Loamy fine sand and fine sand	60	12-16	120-160	Somewhat excessive	A	Slight	700	350	" " " " " "	
	Rock Outcrop - 15% *											No significant production		Bedrock outcrops	
	Incluaiona - 15% *														
4	Tours-Navajo Association	0.7	11,172												Fourwing saltbush, alkali eacaton, blue grama, threeawn, sand dropseed, saltgraes, ehadscale, rebbitbrueh and send sagebrush
	Tours - 35%			0-3	Silt loam and eilty clay loam	> 60	10-12	160-180	Well	B	Moderate	2,000	1,000	No limitations	
	Navejo - 35%			0-1	Clay and silty cley loam	> 60	10-12	160-170	Well	D	Slight	1,500	800	No limitations	
	Incluaiona - 30% *														
5	Winona-Boysag-Rock Outcrop Association	33.4	528,224												Blue grema, black grama, needle end thread graas, galleta, sand dropaeed, spike dropseed, winterfat, bigelow sagebrush, rabbitbruah, cliffrose, Utah juniper and pinyon pine
	Winona - 60%			2-15	Gravelly loam and cobbly loam	6-20	11-16	130-170	Well	D	Moderate	700	400	Shallow deptha, low water-holding capacities	
	Boysag - 15%			0-8	Gravelly loam, loam and sandy loam	10-20	11-16	130-170	Well	D	Slight to moderate	500	400	" " " " " "	
	Rock Outcrop - 15% *											No aignificant production		Bedrock outcrops	
	Inclusions - 10% *														
6	Palma-Clovis-Trail Association	6.1	95,742												Alkali sacaton, galleta, blue grama, sideoats grama, threeawn, stipaa, lndian ricegrass, western wheatgrass, big aagebrush, fourwing saltbush, scattered Utah juniper and pinyon pine
	Palma - 35%			0-3	Fine sandy loam and loamy fine aand	> 60	11-15	140-160	Well	B	Moderate	700	350	Sandy loam textures	
	Clovis - 30%			0-8	Fine sandy loam and losm	> 60	11-15	140-175	Well	B	Slight	700	350	" " "	
	Trail - 20%			0-5	Loamy fine ssnd and fine sandy losm	> 60	11-15	140-160	Somewhat moderate	A	Moderate	600	500	" " "	
	Inclusiona - 15% *														
7	Rudd-Wukoki-Cabezon Association	5.4	84,354												Blue grama, aideoats grama, galleta, ring muhly, western wheatgrass, wolftail, squirreltail, algerita, sand dropseed, Utah juniper and pinyon pine
	Rudd - 40%			2-15	Gravelly loam	6-20	12-16	130-160	Well	D	Slight	700	400	Shallow deptha, gravelly soils	
	Wukoki - 25%			1-15	Gravelly loam and very gravelly loam	> 60	16-20	110-150	Somewhat excessive	B	Slight	800	400	Gravelly soils	
	Cabezon - 20%			8-30	Cobbly loam, stony loam, cobbly clay	8-20	12-19	100-160	Well	D	Moderate	700	300	Shallow depths, cobbly and atony aoila	
	Inclusions - 15%*														
8	Collbran-Cabezon-Wukoki Association	5.2	82,910												Blue grama, sideoats grama, galleta, western wheatgrass, send dropseed, Utah juniper, pinyon pine and ponderoaa pine
	Collbran - 35%			1-10	Very cobbly clay losm	> 60	15-22	110-150	Well	C	Slight	900	400	Cobbly aoils	
	Cabezon - 30%			8-30	Cobbly loam, stony loam, cobbly clay	8-20	15-19	100-160	Well	D	Moderate	700	300	Shallow depths, shallow aoila	
	Wukoki - 15%			1-15	Gravelly loam and very gravelly loam	> 60	16-20	110-150	Somewhat excessive	B	Slight	800	400	Gravelly soils	
	Inclusions - 20% *														

* Propertiea too variable to be estimated

Source: U.S. Department of Agriculture, Soil Conservation Service, 1975, 1974a, 1974b, 1972, modified by subsequent field mapping.

TABLE 2-6
SOIL ASSOCIATION ACREAGE BY ALLOTMENT

Allotment	No.	SOIL ASSOCIATION 1	2	3	4	5	6	7	8	Total
Antelope	3		26,040			3,860	11,180			41,080
Antelope Spring	2					16,899				16,899
Atkin Well	11	3,330					25,317			28,647
Badger Creek	63	1,730	3,352			1,280				6,362
Beanhole	59		18,890	770		1,260				20,920
Buffalo Tank	58		13,200			21,242				34,442
Button	47		3,290		2,370					5,660
Cane Beds	19		15,400			2,750	4,030			22,180
Cannan Gap	16		3,390				5,000			8,390
Cedar Knoll	40	960				16,991				17,951
Chatterly	46		4,875		1,345	1,280				7,500
Clayhole	6		108,835			15,575	24,520	29,630		178,560
Cottonwood	12		260			3,820				4,080
Cowboy Butte	36		2,900		1,345					4,245
Cove*	15		110							110
Coyote	54			14,080		27,181				41,261
Cram	60	1,562	7,702			16,166				25,430
Crosby Tank	9					3,070			2,290	5,360
Eight Mile Pass*	49				440					440
Fern Tank	7					30,219		16,580	4,950	51,749
Ferrin*	18		3,360							3,360
Ferry Swale	65	11,651		18,689						30,340
Frank's Reservoir	53					8,406				8,406
Fuller Road	52		12,800			23,007				35,807
Glazier Dam	13		1,920			832	7,237			9,989
Grama Point	30	3,400	4,000			16,465				23,865
Gramma Springs*	32	4,495								4,495
Gulch*	34	3,400								3,400
Gunsight	41	1,418				6,192				7,230
Hack Canyon	23	2,624	15,739			18,944				37,307
Harris Well*	20		512				6,288			6,800
Home Ranch	62			43,708						43,708
House Rock	57	1,025	3,205	14,434						18,664
Jacob Canyon	38					3,840				3,840
June Tank	27	3,584	320			87,000		1,728		92,632
Kanab Creek*	31	5,260								5,260
Kanab Gulch*	33	3,700								3,700
Lamb Tank	22	8,260	3,140			1,200				12,600
Lee's Ferry	64	14,300	5,760							20,060
Lost Spring Gap*	35		740		1,135					1,875
Moonshine	21		8,245			1,800				10,045
Mt. Logan	8	18,880				25,408		6,656	46,346	97,290
Muggins Flat	51		5,760		960	5,168				11,888
Pigeon Tank	26					13,448		1,920		15,368
Pratt Tank	45		71			22,592				22,663
Rider	50		4,800		52					4,852
Rock Canyon	1					2,410				2,410
Rock Canyon Tank	39	1,090	4,095			6,070				11,255
Rock Pocket	5		16,830			5,760		400		22,990
Sage	28	200	1,470			9,980				11,650
Shinarump	48		4,629							4,629
Shuttleworth	44		12,127		1,730	12,930				26,787
Soap Creek	61	11,296	26,953	2,116		9,065				49,430
Spooks Knoll	37		10,525		1,410	6,145				18,080
Stateline*	17						1,760			1,760
Suicide	42					4,830				4,830
Sunshine	29	1,300	1,770		385	5,475				8,930
Temple Trail	4		1,090			16,000	9,000	15,216		41,306
Tuweep	10					15,946		12,224	29,324	57,494
Two Mile	55			41,830						41,830
Valley Wash	25		16,523							16,523
Vermillion	56	800	1,120	114,401						116,321
Wahweep*	66	1,290		14,169						15,459
Wells	14		3,880				1,410			5,290
White Sage	43					14,100				14,100
Wild Band	24	3,200	25,520			23,620				52,340
Totals		105,425	408,478	264,197	11,172	528,226	95,742	84,354	82,910	1,580,504
Percent of ES Area		6.6	25.8	16.8	0.7	33.4	6.1	5.4	5.2	100.0

* Less Intensive Management

TABLE 2-7
SEDIMENT YIELD - PRESENT EROSION

Allotment	Acre-Feet Per Square Mile	Allotment	Acre-Feet Per Square Mile
Antelope	.37	Muggins Flat	.38
Antelope Spring	.34	Pigeon Tank	.33
Atkin Well	.36	Pratt Tank	.28
Badger Creek	.27	Rider	.27
Beanhole	.35	Rock Canyon	.45
Buffalo Tank	.35	Rock Canyon Tank	.34
Button	.30	Rock Pocket	.30
Cane Beds	.21	Sage	.30
Cannan Gap	.31	Shinarump	.29
Cedar Knoll	.34	Shuttleworth	.34
Chatterly	.37	Soap Creek	.70
Clayhole	.36	Spooks Knoll	.33
Cottonwood	.44	Suicide	.35
Cowboy Butte	.44	Sunshine	.22
Coyote	.35	Temple Trail	.30
Cram	.50	Tuweep	.38
Crosby Tank	.31	Two Mile	.28
Fern Tank	.30	Valley Wash	.56
Ferry Swale	.18	Vermillion	.24
Frank's Reservoir	.38	Wells	.33
Fuller Road	.38	White Sage	.35
Glazier Dam	.45	Wild Band	.28
Grama Point	.26		
Gunsight	.34	LESS INTENSIVE MANAGEMENT	
Hack Canyon	.37	Cove	.28
Home Ranch	.20	Eight Mile Pass	.19
House Rock	.40	Ferrin	.26
Jacob Canyon	.36	Gramma Springs	.26
June Tank	.29	Gulch	.25
Lamb Tank	.38	Harris Well	.22
Lee's Ferry	.35	Kanab Creek	.21
Moonshine	.29	Kanab Gulch	.35
Mt. Logan	.38	Lost Spring Gap	.29
		Stateline	.53
		Wahweep	.19

Figures derived from Denver Service Center adaptation of Pacific Southwest Inter-Agency Committee (1968) method of calculating sediment yields. See appendix 2-6.

ranging from 0.18 to 0.70 acre-feet per square mile per year. The weighted average annual sediment yield for all allotments is 0.38 acre-feet per square mile. (See appendix 2-6 for methodology.)

The Paria River is the only drainage in the ES area having sediment yield data. Measurements for water years 1948-1957 average 2,557,600 tons per year (Iorns and others, 1964). The 241,920 acres of the Vermillion ES area draining into the Paria contribute approximately 259,240 tons annually to this amount. Similar yields could be expected from other areas.

WATER RESOURCES

GROUND WATER

Little data exist for ground water in the ES area. The water table under much of the area is known to be at depths that prohibit acquiring water for most general purposes. The subsurface water is erratic when compared to a more normal ground water basin or province. Ground water most commonly occurs as a relatively narrow perched table.

The area's most notable zones or aquifers known to supply some water under favorable structural conditions include alluvial valley fill, the Navajo sandstone, the Shinarump member of the Chinle formation, limestone lenses in the Moenkopie formation, and the Toroweap formation. Other formations at great depths, such as the Coconino sandstone, the Supai formation, and the Redwall limestone, could produce some water. Their depths, however, are generally too great to make them economically feasible sources.

The quality of ground water for livestock and wildlife ranges from very good to fair. In nearly all instances water quality has been found to be adequate.

Ground water in quantities and qualities necessary for general or supplementary livestock and wildlife use generally can be located throughout the ES area. In portions of the area, however, constructing a reservoir or catchment to supply additional water needs would be more advisable than seeking ground water.

SURFACE WATER

The Colorado River and its tributaries drain the entire watershed of the ES area. The area east of the Kaibab Plateau is drained mainly by the Paria River, House Rock Wash, and their intermittent tributaries. The area west of the Kaibab Plateau is drained primarily by Kanab Creek and its intermittent tributaries. Several small watersheds in the southwest portion of the area, such as Tuckup and Tuweap Canyons, drain directly into the Colorado River. Short Creek and Clayhole Wash join in the northwest part of the area to form the Ft. Pierce Wash, which flows into Utah and empties into the Virgin River. (See map 2-1.)

WATER QUANTITY

The ES area's average annual precipitation is estimated to be 8.6 inches. Of this total, an estimated 70 percent is consumed by evapotranspiration; 28 percent infiltrates the soil profile as ground water recharge; and 2 percent contributes to surface runoff.

The Western U.S. Water Plan (Westwide Study Team, 1974) gives the consumptive water requirements for livestock, wildlife, and recreation for the Arizona Strip District. The needs prorated for the Vermillion ES area are shown in table 2-8.

TABLE 2-8
ANNUAL CONSUMPTIVE WATER REQUIREMENTS FOR ES AREA*

Type of Water Use	1973 Surface Flow	1973 Surface Storage	1973 Subsurface	1973 Total	Projected 1980	Projected 2000	Projected 2020
Wildlife	1.6	7.7	1.6	10.9	11.1	11.7	12.4
Livestock	21.1	98.0	21.1	140.2	143.0	157.0	157.0
Recreation	0.2	1.0	0.3	1.5	3.7	7.3	9.4

* in acre-feet
Source: Westside Study Team, 1974.

Estimates of surface water runoff range from 22,300 to 30,000 acre-feet per year. As shown in table 2-8, sufficient water exists for the needs if collection and storage facilities are provided in strategic locations for livestock and wildlife. Springs and wells are also used in some areas.

WATER QUALITY

All of the surface and ground water is considered of good or very good quality for livestock and wildlife use. Measurements made from samples of these waters generally contain less than 600 milligrams per liter of total dissolved solids. By U.S. Public Health Service standards, the largest known source of water suitable for human consumption in the ES area is Nixon Spring on Mt. Trumbull. Additional smaller springs occur in the Navajo sandstone at the east end of the ES area.

ANIMALS

Although the Vermillion ES area includes important wildlife habitat for some 300 species of vertebrates, this ES will discuss individually only the animals expected to be significantly impacted by the proposed action. The other species will be included in general groups for discussion.

Other than livestock grazing developments, the ES area is mostly undeveloped, and much of the land retains its wild character. Eighty-nine percent of the ES area is Federal land; the remaining 11 percent of State and private land is evenly distributed throughout the ES area. All of the area is fenced into various sized pastures and allotments. These fences facilitate livestock use but in some cases interfere with big-game movements.

Present wildlife populations depend on the various habitats within the ES area. Where overgrazing and drought have degraded habitat, they have adversely affected wildlife. Insufficient data exist, however, to quantify the impact of present grazing use on wildlife populations. Range condition and classifications designed for livestock have been used as indicators of habitat quality for big-game animals. These data are the best available, indicating condition and trend of big-game habitat.

MAMMALS

Pronghorn Antelope

Historically antelope inhabited the Vermillion ES area, but by 1940 all antelope had been extirpated. In 1951 the Arizona Game and Fish Department and BLM began a cooperative effort to reestablish the pronghorn antelope on the Arizona Strip. Two herds presently exist in the ES area (map 2-2), having the following populations:

House Rock	80
Clayhole	150
	230 (Britt, 1978)

Table 2-9 summarizes the present condition of the antelope habitat by allotment. Seventy percent of the habitat is in only fair condition, with 27 percent in good and 3 percent in poor condition.

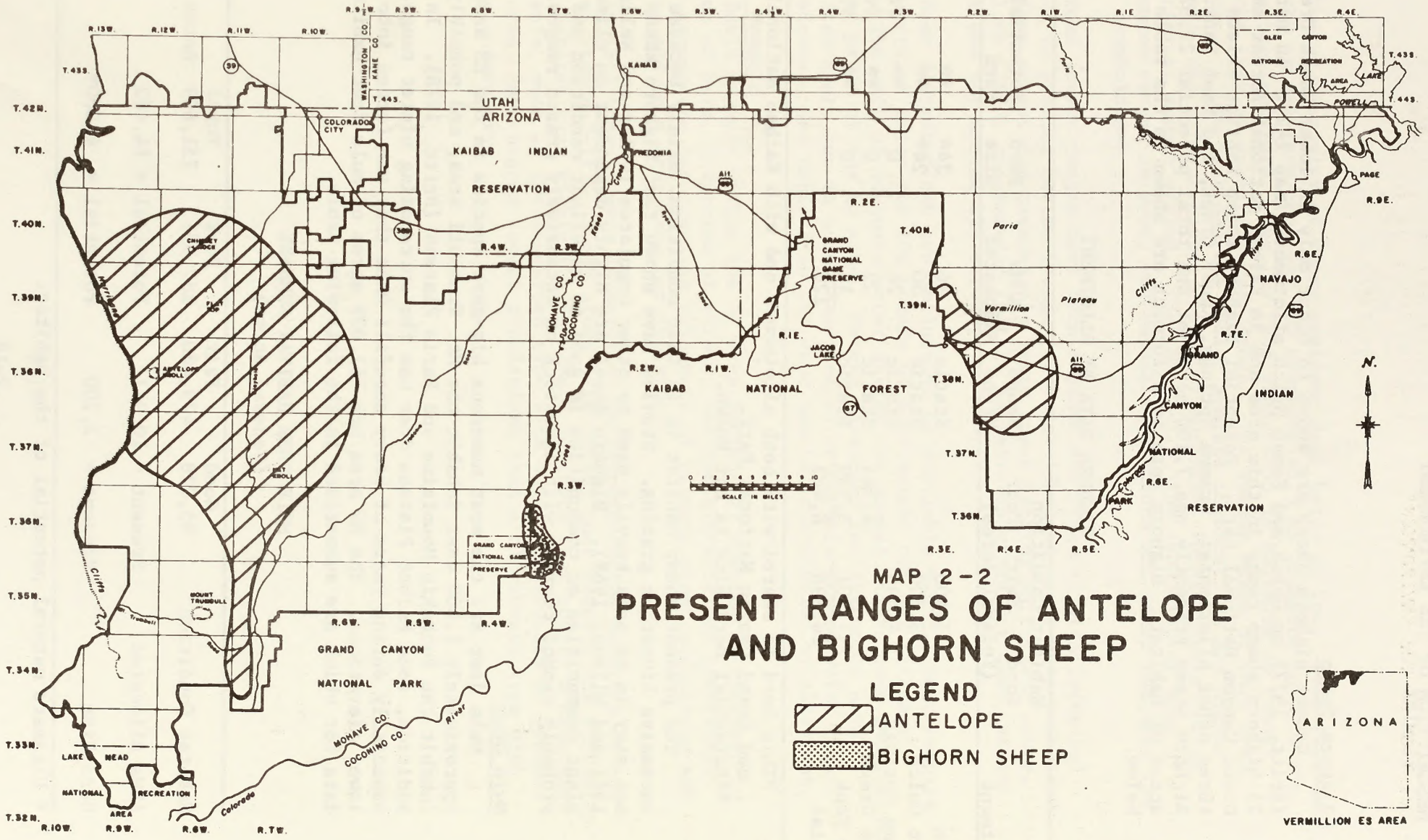
Antelope-livestock competition for forage varies with the season and with plant composition. Competition is generally not a problem on ranges in good condition (Yoakum, 1975). Stomach samples collected in 1977 in the Clayhole area indicated that globemallow, Bigelow sage, and paper flower are important fall antelope foods. The Bigelow sage and globemallow are both highly palatable to livestock.

TABLE 2-9
PRONGHORN DATA BY ALLOTMENT

Allotment	Habitat Condition (Federal Acres) Good	Fair	Poor	Range Trend	AUMs Allocated	Present Herd	Potential Herd*
Antelope	110	9,827		Static	48	10	31
Antelope Spring	2,190	9,310		Static	18	10	36
Atkin Well		13,321	1,384	Static	24	0	46
Beanhole		18,960		Down	29	12	59
Buffalo Tank	29,342			Down	48	20	92
Button		2,253	1,447	Static	8	3	12
Cane Beds		4,357	143	Down	7	3	14
Clayhole	44,414	113,410	720	Up	248	103	496
Cottonwood		3,680	80	Static	6	6	12
Cram	11,170	11,390	1,210	Static	32	13	75
Fern Tank	1,468	21,701		Up	35	6	73
Glazier Dam		6,787		Static	14	6	21
Grama Point		16,385		Static	23	0	51
Hack Canyon		24,789	7,141	Static	19	0	100
Harris Well	6,430			Static	13	3	20
House Rock	7,977	7,977		Down	23	10	50
June Tank	2,844	21,364		Static	27	29	76
Lamb Tank		2,398	254	Static	11	53	8
Moonshine		8,465		Static	11	53	26
Pigeon Tank	6,265	3,095		Static	13	2	29
Rock Pocket	2,810	17,020		Static	28	16	62
Soap Creek	8,044	8,996		Static	24	10	53
Sunshine	2,446	3,375		Down	8	0	18
Temple Trail	9,136	24,176		Down	65	0	104
Valley Wash	11,418		3,563	Up	23	0	47
Vermillion		3,840		Down	5	2	12
Wild Band		26,220		Static	34	15	82
TOTALS	146,064	383,096	15,942		844	**	1,705

* Potential herd represents the ultimate natural potential of the habitat, estimated to be one antelope per 320 acres of habitat.

** Pronghorns use various allotments during different seasons. Thus a total for this column would be greater than the actual herd size.



MAP 2-2

PRESENT RANGES OF ANTELOPE AND BIGHORN SHEEP

LEGEND

ANTELOPE

BIGHORN SHEEP

VERMILLION ES AREA

NOTE: 89% Of ES Area Is Federal Land

Bighorn Sheep

Desert bighorn sheep are known to occur only in lower Kanab Creek (Britt, 1977) on Gulch and Kanab Gulch allotments (map 2-2). An estimated 24 bighorn sheep range in this area and in Kaibab National Forest and Grand Canyon National Park. Potential bighorn sheep habitat exists on three other allotments: Gramma Springs, Kanab Creek, and Lamb Tank. Bighorn sheep presently use 7,100 acres of the total potential 27,379 acres of habitat. Bighorn data by allotment are shown in the table below.

BIGHORN DATA BY ALLOTMENT

Allotment	Habitat Condition Good (Federal Acres)	Fair (Federal Acres)	Poor (Federal Acres)	Range Trend	AUMs Allocated	Herd Size	Potential Herd	Conflicts Degree	Conflicts Resource
Gulch	3,400			Static	36	24*	**	High	Forage
Kanab Gulch	3,700			Static	30	24*	**	High	Forage
Gramma Springs	4,495			Static	26	0	**	Potential	Habitat
Kanab Creek			4,544	Static	22	0	**	Potential	Habitat
Lamb Tank	7,301		3,939	Static	14	0	**	Potential	Habitat
Total	18,896		8,483		128				

*This herd is shared with both allotments and with Kaibab National Forest and Grand Canyon National Park.
**Potential herd size is not known.

The present sheep habitat is in fair condition, mainly because of excessive livestock grazing. Studies have shown that bighorn sheep will not stay in an area heavily used by other ungulates (Wells and Wells, 1961 and Wilson, 1968). Bighorn sheep are highly dependent on climax plant communities or communities in good to excellent condition and probably cannot coexist with livestock on intensively grazed ranges.

Mule Deer

Mule deer are the most numerous big-game species in the ES area. Approximately 1,600 deer inhabit the Mt. Trumbull area, and possibly 600 inhabit the Buckskin Mountains and Paria Plateau (Britt, 1978). In addition, some Kaibab Plateau deer use the surrounding winter range, especially during years of heavy snowfall when they are forced into the lower elevations. The ES area has 751,609 acres of mule deer habitat, data for which are summarized in the following table.

MULE DEER HABITAT SUMMARY
(Federal Acres)

	Good	Fair	Poor	Total	
Habitat Condition	85,078	479,480	187,051	751,609	Acres
AUMs Allocated	Present = 10,971		Potential = 14,482		
Herd Size	Present = 2,200		Potential = 4,000*		

* Ultimate natural potential of the habitat.

The productivity of these resident deer herds is low. From 1961 to 1973 the annual fawn crop per 100 averaged 45.5 as compared to 83.6 for the Kaibab deer herd. The low fawn production is believed to result from the lack of quality summer range. The summer range of this area lies above 6,000 feet and has cooler average temperatures and higher rainfall, which favor better growth of succulent forage plants during the critical summer period. (See map 2-3.) The condition of most of the summer ranges is poor, and unpalatable shrubs and trees dominate the plant communities.

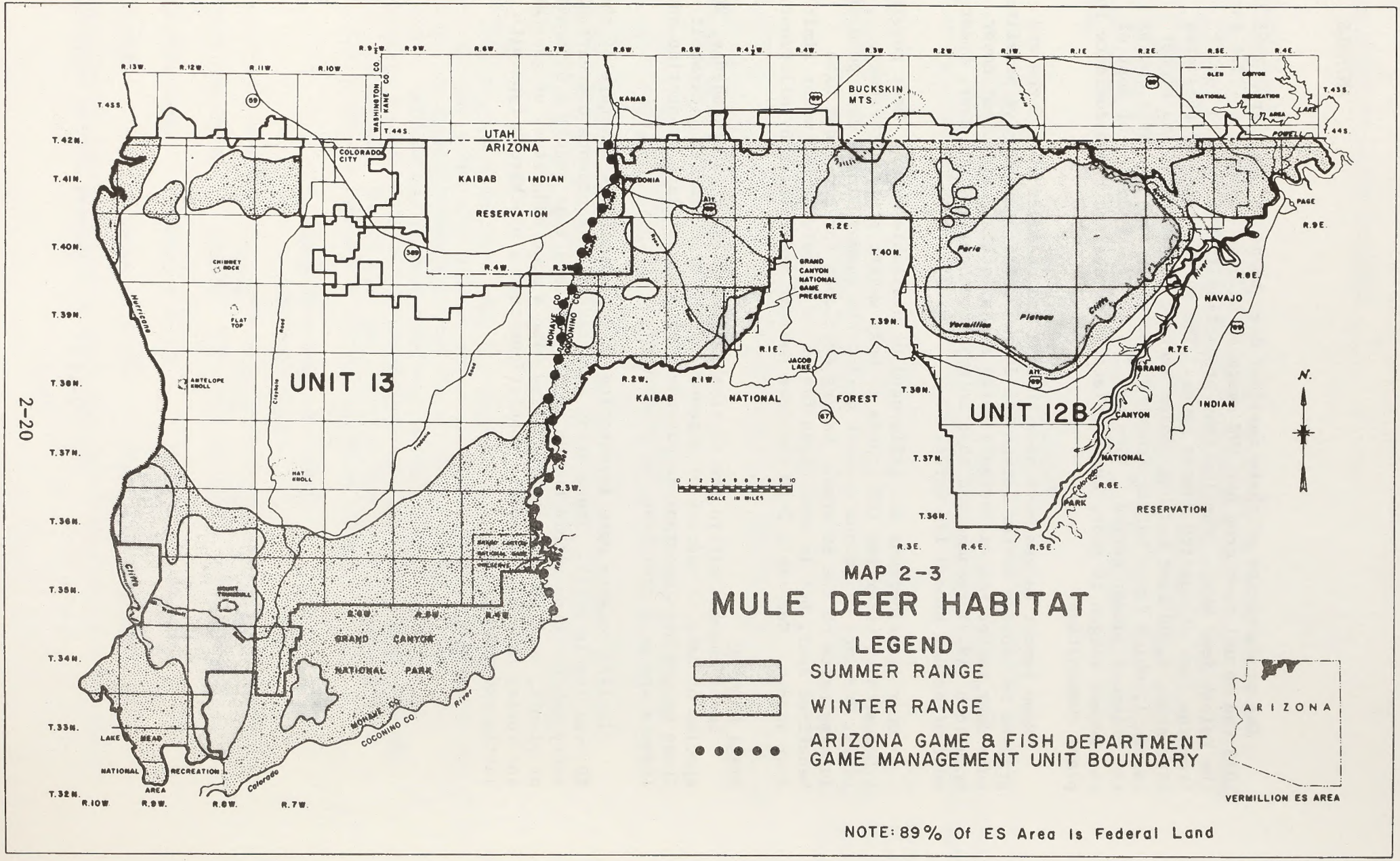
Some summer ranges have been chained and reseeded with forbs and grasses to provide better forage for deer. Chained areas have benefited mule deer except for excessively large areas lacking sufficient cover. McCulloch (1973) recommended that to maximize benefits for deer, treatment areas not exceed 120 acres.

Deer distributions are influenced by available water. Deer require 1.5 quarts of water per 100 pounds of body weight per day (Stewart, 1967). The lack of adequate water during the summer limits deer populations in some parts of the ES area. Waters developed for livestock have benefited deer, but in some cases fences or corrals around water limit deer access. See table 2-10 for deer habitat description by allotment.

Small Mammals

Small mammals within the ES area include 27 species of rodents, 20 species of bats, 2 species of shrews, and the black-tailed jackrabbit. These groups are important as consumers of primary plant production and insects and as a prey base for predators.

In 1975 rodents were inventoried in representative habitats of the ES area (table 2-11). These study data reveal that rodents use virtually every habitat type within the ES area. Habitats that supply a diversity of plants, such as the sagebrush type with a good understory of grasses and forbs, have higher rodent populations than a blackbrush type with little understory.



MAP 2-3

MULE DEER HABITAT

LEGEND

- SUMMER RANGE
- WINTER RANGE
- ARIZONA GAME & FISH DEPARTMENT GAME MANAGEMENT UNIT BOUNDARY

VERMILLION ES AREA

NOTE: 89% Of ES Area Is Federal Land

TABLE 2-10

MULE DEER DATA FOR FEDERAL ACRES

Allotment	Habitat Condition Good	Fair (Acres)	Poor	Range Trend	AUMs Allocated	Herd Size	Potential Herd	Conflicts Degree	Resource
Antelope	1,939	20,815	246	Static	332	23 W	345 W	Low	Forage
Antelope Sp.	1,549	1,170		Static	36	16 W	24 W	Low	Forage
Atkin Well		6,170	5,377	Static	45	5 W	8 W	Low	Forage
Badger Creek			2,206	Static	8	25 W	38 W	Low	Forage
Button		533	267	Static	18	18 W	27 W	Low	Forage
Cane Beds	2,417	2,781	72	Down	114	48 W	72 W	Low	Forage
Cannan Gap			5,270	Static	83	40 W	60 W	Low	Forage
Cedar Knoll		17,951		Down	230	20 YL	30 YL	Low	Forage
						150 W	225 W		
Chatterly		2,156	3,984	Static	75	50 W	75 W	Low	Forage
Cowboy Butte	1,432	20	1,668	Down	7	4 W	6 W	Low	Forage
Coyote	9,100	12,975	13,154	Static	463	74 W	111 W	Low	Forage
Crosby Tank		820	3,900	Static	108	72 S	144 S	High	Forage+W
Fern Tank		21,584	3,516	Up	425	176 S	252 S	High	Forage+W
						155 W	310 W		
Ferry Swale		4,549	2,861	Static	96	16 W	24 W	Low	Forage
Frank's Res.	2,053	222	1,885	Static	74	12 W	18 W	Low	Forage
Fuller Road		13,505	17,564	Static	339	290 W	435 W	Low	Forage
Grama Point		5,875		Static	72	30 W	45 W	Low	Forage
Gunsight		3,521	3,709	Static	95	28 W	42 W	Low	Forage
Hack Canyon			2,777	Static	36	33 W	50 W	Low	Forage
Home Ranch	38,390			Static	568	233 W	350 W	Low	Forage
House Rock	785	786	59	Down	21	17 W	27 W	Low	Forage
Jacob Canyon	460	2,740		Static	35	20 W	28 W	Low	Forage
June Tank		61,667	2,333	Static	866	868 W	1,736 W	Low	Forage
Lamb Tank		538	968	Static	20	28 W	56 W	Low	Forage
Lee's Ferry		7,253	2,157	Down	51	23 W	35 W	Low	Forage
Moonshine		1,260		Static	14	13 W	20 W	Low	Forage
Mt. Logan	329	33,718	48,193	Static	1,977	461 S	922 S	High	Forage+W
						697 W	1,394 W		
Muggins Flat		11,088		Static	142	95 W	143 W	Low	Forage
Pigeon Tank	5,071	4,917	5,380	Static	154	23 W	46 W	Low	Forage
Pratt Tank	6,756	13,147		Static	280	240 W	360 W	Low	Forage
Rider			3,132	Down	61	49 W	74 W	Low	Forage
Rock Canyon		1,360		Up	14	3 W	5 W	Low	Forage
Rock Canyon Tank		993	707	Static	23	18 W	27 W	Low	Forage
Sage		10,490		Down	98	28 YL	42 YL	Low	Forage
Shinarump	1,259	1,585	1,165	Up	39	16 YL	24 YL	Low	Forage
Shuttleworth	5,878	4,822	11,847	Static	150	80 W	120 W	Low	Forage
Soap Creek		9,626	1,774	Static	179	122 W	183 W	Low	Forage
Spooks Knoll	321		2,579	Down	38	30 W	45 W	Low	Forage
Suicide	1,120	3,510	200	Down	114	75 W	113 W	Low	Forage
Sunshine		3,109		Down	55	17 YL	26 YL	Low	Forage
Temple Trail	2,359	800		Down	36	81 W	122 W	Low	Forage
Tuweep		23,168	23,448	Static	741	392 S	784 S	High	Forage+W
						152 W	304 W		
Two Mile		38,230	1,160	Static	540	180 W	270 W	Low	Forage
Vermillion		106,154		Down	1,499	567 W	851 W	Low	Forage
Wells		1,407	3,243	Down	76	23 W	35 W	Low	Forage
White Sage	3,550		7,460	Static	153	143 W	215 W	Low	Forage
Wild Band		21,000		Static	300	223 W	446 W	Low	Forage
Cove		100		Down	2	1 W	2 W	Low	Forage
Eight Mile Pass			440	Static	6	2 W	3 W	Low	Forage
Ferrin			2,350	Static	38	10 YL	15 YL	Low	Forage
						30 W	45 W		
Gramma Springs				Static	26	21 W	32 W	Low	Forage
Gulch				Static	8	4 W	6 W	Low	Forage
Kanab Gulch				Static	6	2 W	3 W	Low	Forage
Harris Well	60	310		Static	5	3 W	5 W	Low	Forage
Kanab Creek				Static	22	3 W	5 W	Low	Forage
Lost Spring Gap	250	465		Down	10	3 W	5 W	Low	Forage
Stateline		580		Static	10	3 W	5 W	Low	Forage
TOTALS	85,078	474,480	187,051			*	*		

W = Winter S = Summer YL = Yearlong +W = And Water

* The deer herds share allotments and are highly mobile. Thus, the herd columns cannot be totaled for herd size.

TABLE 2-11
RELATIVE ABUNDANCE OF RODENTS OF REPRESENTATIVE VEGETATION HABITATS*

Vegetation Type	No. Rodents/400 Trap Nights/½ Acre Plot
Ponderosa	10
Gambel Oak-Ponderosa Woodland	25
Mountain Shrub	22
Pinyon-Juniper	20
Sagebrush (good understory)	34
Blackbrush	15
Grassland (estimated)	10
Creosotebush	22
Chained Pinyon-Juniper Types	
1. Old (10 years +)	28
2. New (debris burned)	23
3. New Edge ½ in, ½ out P-J	21
4. New Middle of Chaining	120

* Based on numbers of rodents trapped in 400 trap nights on each representative vegetation type (summer 1975).

Of all the small mammals of the ES area, the cottontail rabbit is the most important as a game species. Cottontails usually occur wherever they can find adequate cover. The chaining of trees for range improvement has improved cottontail habitat where the downed trees are left for cover.

CARNIVORES

Mammals

Mammalian predators in the ES area include mountain lion, coyote, grey fox, and bobcat. Other less abundant species are ringtailed cat and badger. These predators use a variety of habitats. The coyote occurs in all habitat types, whereas the bobcat is restricted to canyons, washes, rimrocks, and areas of dense tree cover.

Raptors

Twenty-five species of raptors or birds of prey are known to occur within the ES area (Robbins and others, 1966, and District records). Seven of these are thought to be permanent residents; the others are transients or spend only the winter or summer in the ES area. Raptor densities in the ES area are generally low.

The most abundant raptors in the area yearlong are the red-tailed hawk and the kestrel. Numerous redtail nests have been identified in the ES area, most of them in juniper trees. Golden eagles are known to have been nesting in the Yellowstone Mesa area. Three sightings of

peregrine falcons, an endangered species, have been recently reported, two in 1976. The major important raptor habitat systems are Hurricane Cliffs, Kanab Creek Canyon, Vermillion Cliffs, and Paria Canyon. The low raptor densities are believed to result from a lack of sufficient prey base, since nesting and perching sites are not limiting.

Riparian areas are also important for selected raptor species. Sharp-shinned, marsh, and black hawks and perhaps spotted owls occur in the ES area. Approximately 53 miles of riparian and semiriparian habitat have been identified in the ES area.

The ponderosa pine forest in the Mt. Trumbull area is important habitat to small numbers of Cooper's hawks and goshawks. Observations indicate that the Cooper's hawks may be permanent residents of the ES area.

BIRDS

A total of 261 species of birds have been identified or are known to occur within the ES area (Robbins and others, 1966, and District records). Birds occupy a variety of habitats, particularly the riparian, mountain shrub, and ponderosa types. ES area birds range from the generalists (occurring in many habitat types), such as the raven, to the specialists (restricted to specific habitats), such as the long-billed marsh wren.

Twenty-four species of waterfowl, 51 other aquatic and shorebirds, 5 upland game birds, and 156 nongame birds occur within the ES area.

In a study of breeding bird densities of selected habitat types within the ES area, Riffey (1977) found that the various habitat types supported different densities of birds (table 2-12). Of the undisturbed habitats, the pinyon-juniper type supports the greatest number of breeding birds. The study of chained pinyon-juniper areas indicates that chaining can adversely or beneficially affect bird populations, depending on how the treatment is applied.

Gambel's Quail

Quail occur in localized areas over much of the habitat. Although generally considered a desert species, Gambel's quail have been seen at elevations above 6,000 feet in the Mt. Trumbull area. In the ES area, Gambel's quail occur in scattered areas having sufficient escape cover. Semiriparian vegetation along washes is typical quail habitat. When burning or grazing of palatable shrubs reduces this cover, habitat quality may decline.

TABLE 2-12
BREEDING BIRDS OF THE ES AREA

Plot	No. of Breeding species 1976	No. of Breeding species 1977	No. of Species using area* 1977	No. of Breeding pairs/100 acres 1976	No. of Breeding pairs/100 acres 1977
Untreated Plots					
1. Grassland	*	3	13	*	19
2. Sagebrush	*	2	11	11	40
3. Ponderosa Pine	12	18	11	94	92
4. Mature Pinyon-Juniper	13	14	10	129	108
Treated Pinyon-Juniper Plots					
5. Open Chained	*	7	19	*	50
6. Island Chained	14	10	26	135	102
7. Peninsula Chained	*	15	11	*	161

* No data for 1976
Source: Riffey, 1977

Chukar

In 1949 AG&FD released 200 game farm chukars at Fredonia. During 1959-60, AG&FD released 333 chukars from Nevada and California in Snake Gulch, a tributary to Kanab Creek. Chukar now occur throughout Kanab Creek and up into several canyons on the west side, including Hack Canyon. Moreover, chukar might become established in Whitmore Canyon. Chukar presently occur on 4,000 to 5,000 acres of the ES area.

Merriam Turkey

Turkeys inhabit the Mt. Trumbull area as a result of a successful transplant of 37 birds in 1961 (Hewitt, 1967). Hunting is permitted, but the remoteness of the area makes the pressure on turkeys light.

Turkeys are closely associated with the ponderosa pine vegetation type because of the need for suitable roosts. The Mt. Trumbull area has approximately 13,000 acres of ponderosa pine. Turkeys also use the pinyon-juniper woodland of the lower elevations, particularly during winter when deep snows cover up food in the ponderosa areas (Phillips, 1975).

Reeves and Swank (1955) observed the following about turkey food preference in Arizona: (1) ponderosa pine seed and acorns are important food items from mid-November to July; (2) grass seed is important from May to November; (3) green foliage of grasses and forbs is important during March, April, and May; and (4) turkeys eat insects most frequently during summer and fall.

The most conspicuous deficiency in the plant composition of the ES area's turkey habitat is in perennial grasses and forbs. This deficiency results from overgrazing.

Water is a critical factor for turkey habitat in the ES area. Turkeys will normally water once a day during the hotter part of the summer. During winter they obtain needed moisture from snow. In addition, at times succulent plant and insect material may provide sufficient water.

Waterfowl

Although the ES area has few naturally occurring areas of suitable waterfowl habitat, 24 species of waterfowl are known to occur. Construction of livestock reservoirs and erosion control dams and dikes have created most waterfowl habitat. These facilities, however, are not dependable because many dry up during some parts of the year. Moreover, little food grows near the impoundments because livestock use around the edges is too heavy to allow food plants to develop (Fleming, 1959). Waterfowl now use the ES area for rest stops during the spring and fall Pacific flyway migration. If sufficient food and cover plants were allowed to develop, some waterfowl could nest and rear their broods.

Shore Birds

The ES area has 51 known and recorded species of shore birds and related aquatic species, not including waterfowl (Robbins and others, 1966, and Arizona Strip District records). Many of these species have been sighted at the stock ponds that are often used as resting stations during migration. Most of the stock ponds offer little more than resting spots since they usually lack food and cover beneficial to shorebirds.

The riparian zones identified in map 2-4 are also important areas for many shore birds, but the ecological integrity of many of these habitats has been jeopardized by livestock overuse. Brown and others (1977) suggested that grazing be eliminated from or controlled in riparian areas. Overgrazing in many areas is causing the replacement of native plant species by exotics, particularly Tamarix pentandra--saltcedar--which has little value for wildlife.

FISH

The Paria River is the ES area's only perennial stream. It flows out of Utah through the far eastern end of the ES area and into the Colorado River. Only three species of fish have been verified as occurring in the Paria River in Arizona: the speckled dace, the flannelmouth sucker, and the bluehead mountain sucker.

The woundfin minnow, an endangered fish found in the Virgin River, was transplanted into the Paria River by AG&FD, but the stocking effort was not successful (McAda and others, 1977).

REPTILES AND AMPHIBIANS

The ES area has 5 known species of amphibians and 25 known species of reptiles, none of which have been identified as being threatened or endangered. These 30 species inhabit a variety of habitat types, including riparian-aquatic, sagebrush, pinyon-juniper, ponderosa, desert shrub, and rocky slopes and cliffs. The only economically important species is the tiger salamander, which is occasionally netted to be sold as fish bait.

A reptile inventory conducted within the ES area in 1978 indicated lizard densities were lower in heavily grazed areas than in lightly grazed areas. Busack and Bury (1974) reported similar findings where lizard populations were greater in ungrazed areas than in areas grazed heavily by sheep.

Many of the reptiles and amphibians depend on arthropods, small vertebrates, and some vegetation for their diets. When grazing affects the vegetation and arthropods, reptiles and amphibians are affected by direct and indirect competition with livestock.

ARTHROPODS

Numerous species of arthropods inhabit nearly every environment type in the ES area. The most important groups are the insects and arachnids. Data on their identification and distribution, however, are limited. These invertebrates play significant roles in many food webs and have impacts on range and range economics. No endangered insects have been identified in the ES area.

THREATENED AND ENDANGERED SPECIES

The Vermillion ES area provides habitat for one federally listed species and three State listed threatened or endangered species, as shown in table 2-13.

The peregrine falcon is primarily a rare winter migrant to the ES area. Peregrines have been observed on the Two Mile and Fern Tank allotments, inhabiting the pinyon-juniper zone. Potentially suitable nesting areas do exist in the ES area. No intensive surveys, however, have been conducted to determine the peregrines' presence, and no active nests have been identified.

The black hawk, a rare summer resident in the ES area, has been observed near Colorado City. Its principal habitat is the riparian and semiriparian zones that support sufficient invertebrate prey populations. The Paria River Canyon contains potentially suitable black hawk habitat.

TABLE 2-13
THREATENED AND ENDANGERED WILDLIFE OF THE VERMILLION ES AREA

Common Name	Scientific Name	Status*		Presence
Birds				
Peregrine falcon	Falco peregrinus anatum	F,S	Group II	Confirmed
Snowy egret	Egretta thula brewsteri	S	Group III	Confirmed
Black-crowned night heron	Nycticorax nycticorax hoactli	S	Group III	Confirmed
Black hawk	Buteogallus anthracinus	S	Group III	Confirmed
Mammals				
Kaibab squirrel	Sciurus aberti kaibabensis	S	Group IV	Confirmed

*Status: F = Occurs on Federal Endangered or Threatened list.

S = Occurs on Arizona Threatened Wildlife list.

Group II = Endangered--Species or subspecies in danger of being eliminated.

Group III= Threatened--Species or subspecies whose status may be in jeopardy in the foreseeable future.

Group IV = Species or subspecies sufficiently limited in distribution in Arizona that a major ecological disturbance could jeopardize its existence in this State.

Many of the larger reservoirs and the limited riparian zones of the ES area offer snowy egrets and black-crowned night herons resting and feeding habitat during the fall and spring migrations. Livestock grazing and trampling immediately around the waters, however, have reduced food and protective cover, making these habitats less attractive to herons and egrets.

The Kaibab squirrel occurs in the Mt. Trumbull ponderosa pine stands. It was transplanted into the area from the Kaibab Plateau in 1972 and is presently expanding into the available habitat. Kaibab squirrels depend on the ponderosa pine (from 11 to 30 inches in diameter) for food and nesting cover (Patton and Green, 1970).

RIPARIAN AND AQUATIC HABITAT

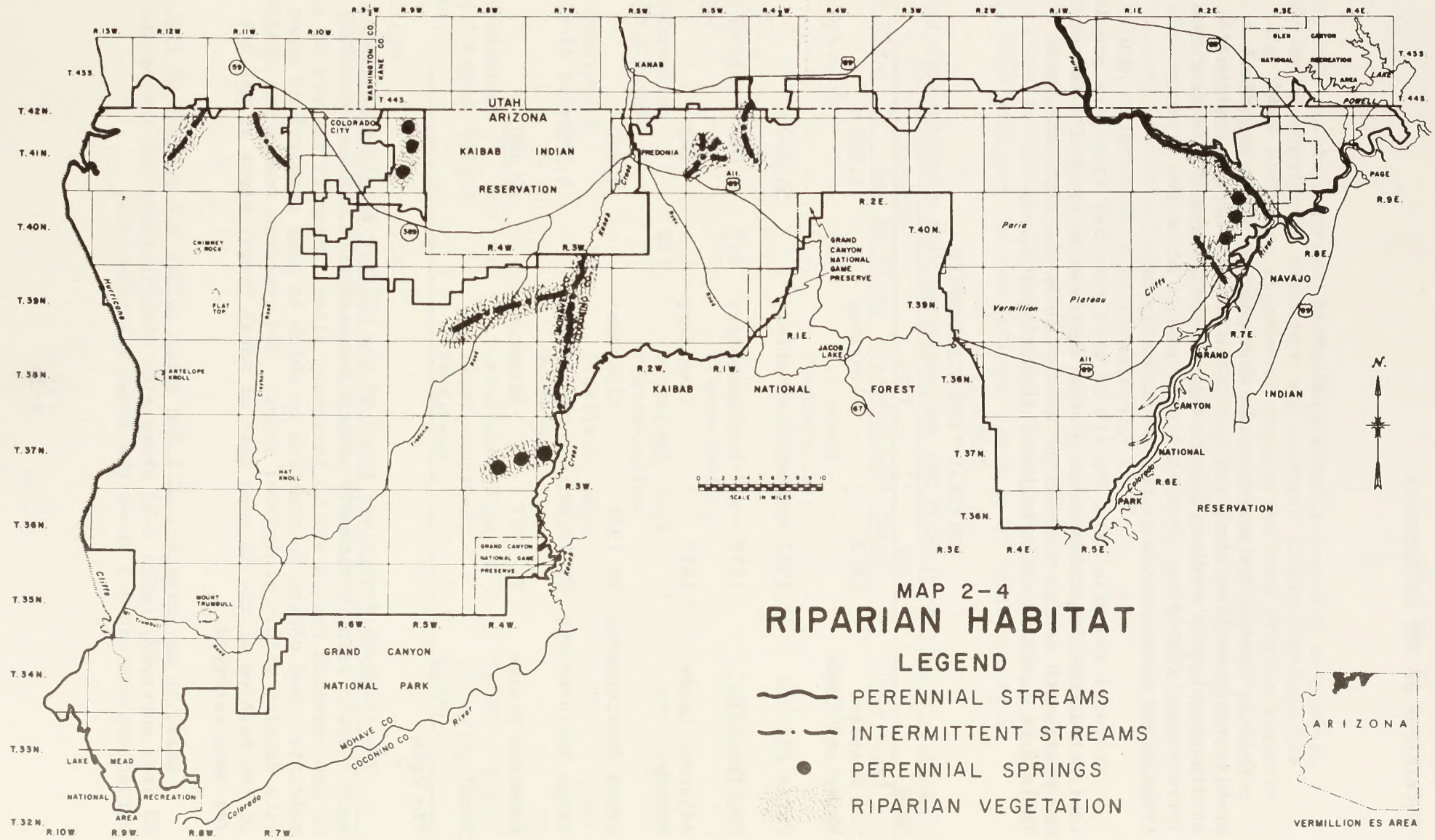
A riparian community or plant association is one that occurs in or next to a drainageway or flood plain and has species or life forms different from those of the immediately surrounding nonriparian climax (Lowe, 1964). The vegetation of a riparian community reflects the additional soil moisture available along a drainageway.

Riparian areas comprise small but important habitat types. The riparian vegetation of the ES area is associated with perennial and intermittent streams, reservoirs and dikes, and springs and seeps. (See map 2-4.) Characteristic plants occurring in these riparian areas include cottonwood, willow, arrowweed, and some exotic species such as saltcedar and Russian olive. Most of the riparian communities are in poor condition due to past livestock grazing, and reproduction of cottonwood and willow is often nonexistent.

Jahn and Threfethen (1972) state that "regardless of species, riparian vegetation is the most valuable wildlife habitat in Arizona." These areas are "oases" in the desert for wildlife species. Within riparian habitats native animals can usually find water and an important variety of cover and food elements. Quail, various swallows, bats, and amphibians are a few of the animals attracted to riparian habitats. The following table summarizes the present riparian habitat within the ES area.

RIPARIAN HABITAT BY LAND OWNERSHIP

TYPE	STATE	PRIVATE	FEDERAL	TOTAL UNITS
Perennial Streams	0	0	10	10 miles
Intermittent Streams	6	2	35	43 miles
Springs and Seeps	0	1	21	22 each



MAP 2-4

RIPARIAN HABITAT

LEGEND

- PERENNIAL STREAMS
- INTERMITTENT STREAMS
- PERENNIAL SPRINGS
- RIPARIAN VEGETATION

CULTURAL RESOURCES

Cultural resources are commonly discussed as sites and their prehistorical or historical value. Sites consist of any combination of artifacts (objects showing human usage or manipulation) and features (structures, fire pits, or rock art panels). All sites constitute a fragile and nonrenewable resource--human history.

Cultural resource data for the ES were compiled from five previous contract archaeological surveys, range improvement project clearances, and a research design planned and conducted by BLM archaeologists. Table 2-14 outlines these previous investigations.

TABLE 2-14
CULTURAL RESOURCE SURVEYS

Name	Year	Type	Acreage
Los Angeles Water and Power	1973	Clearance	2,327
Paria Plateau	1967 & 1968	Inventory	54,560
Mt. Trumbull	1975	Inventory	2,087
Adjacent Lands Survey	1977	Inventory	143
Range Improvements	FY 1977	Clearance	3,840
Range Improvements	FY 1978*	Clearance	4,270
Research Design	FY 1977	Inventory	20,480
Total			87,707

*To date

The research design was based on the cluster sampling approach, each cluster being a randomly selected square mile. The objective of the research design was to inventory sites, identify factors in site selection, and obtain information on which to base predictions about site density within ecological zones. The research design was limited to the portion of the ES area east of Kanab Creek, since it had not yet been surveyed.

Based on an inventory of 1,058 sites within 6.4 percent of the ES area surveyed, table 2-15 shows site distributions and ecological variables, and map 2-5 shows the areal distributions.

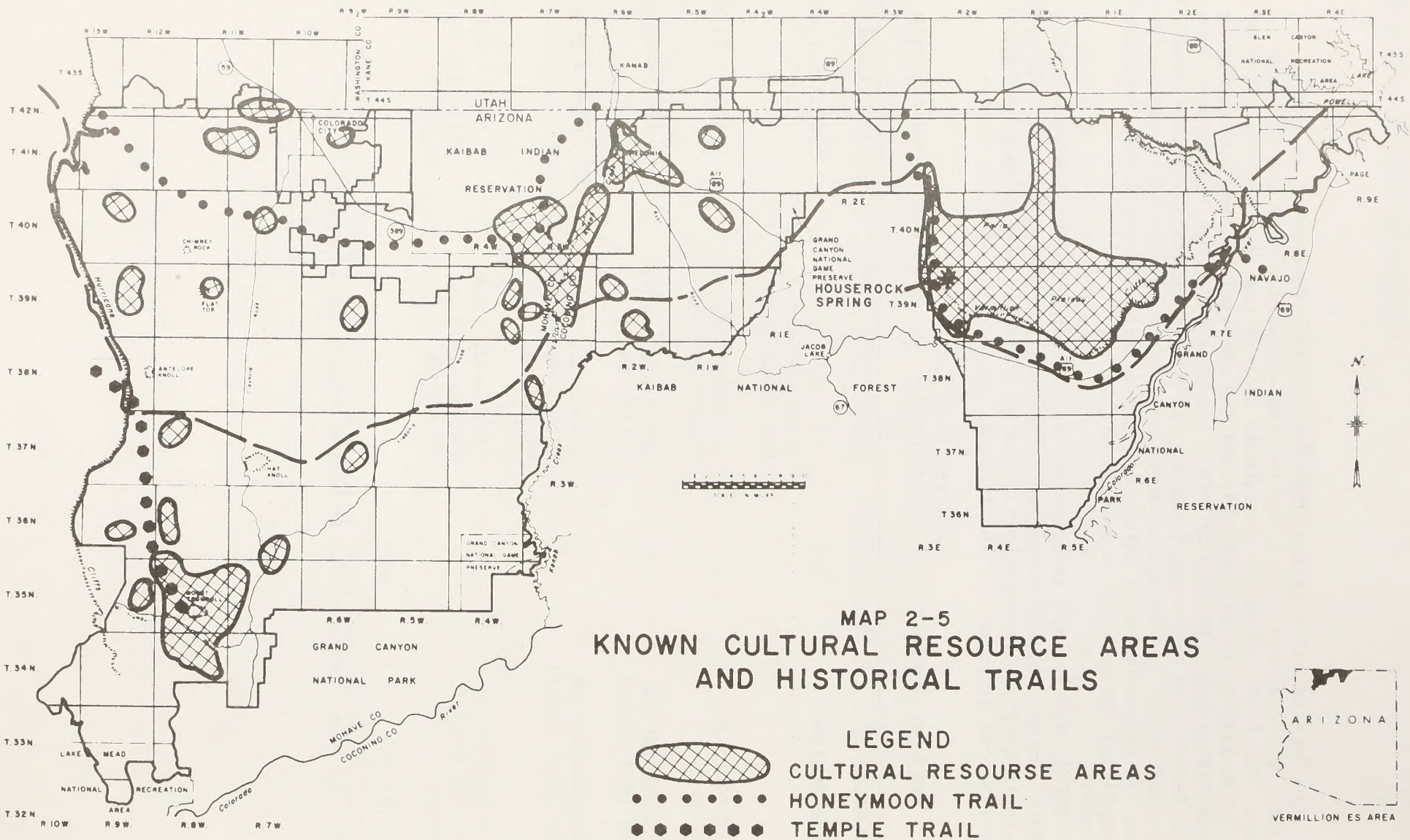
The data reveal a general pattern of sites increasing in number, variety, and complexity by elevation and eastward toward the Colorado River. The lower elevation grasslands contain the more fragile sites of the Paleo-Indian, Archaic people, and the seasonal hunting and gathering of the Puebloeans. Habitation sites (pueblos) occur at the higher elevations in the big sage, juniper, and pinyon ecotones. The farther east, the higher is the site density and the larger the habitation sites. A large number of sites were too fragile and too highly impacted by vandalism and grazing to be classified.

Within the ES area is one site listed on the National Register of Historic Sites, and two nominated archaeological districts. The Dominquez-Escalante Trail, Honeymoon Trail, Temple Trail, and House Rock Springs have all been proposed for the National Register of Historic Sites.

TABLE 2-15
CULTURAL RESOURCE SITE DISTRIBUTIONS AND PRESENT ECOLOGICAL VARIABLES

Type of Site	No. of Sites	Vegetational Zones	Elevational Range
Lithic Scatters	162	All zones - Predominately Grassland-Sage	3,600' - 7,800'
Lithic/Ceramic Scatters	145	Grassland-Sage Pinyon-Juniper	4,800' - 7,000'
Small Habitation Sites (0-5 Rooms)	215	Grassland, Sage, Pinyon-Juniper	4,400' - 7,200'
Medium Habitation Sites (6-15 Rooms)	67	Grassland, Sage, Pinyon-Juniper, Ponderosa	5,100' - 7,500'
Large Habitation Sites (16 Rooms or More)	41	Grassland, Sage, Pinyon-Juniper, Ponderosa	5,100' - 6,800' (Majority 6,100' - 6,800')
Total Sites	630		

Note: Excludes isolated lithic sites, cysts, and firepits.



MAP 2-5

KNOWN CULTURAL RESOURCE AREAS AND HISTORICAL TRAILS

LEGEND

- CULTURAL RESOURSE AREAS
- HONEYMOON TRAIL
- TEMPLE TRAIL
- DOMINQUEZ – ESCALANTE TRAIL

VERMILLION ES AREA

VISUAL RESOURCES

The BLM Visual Resource Management (VRM) system evaluates the landscape by the quality of its scenery (scenic quality ratings), the sensitivity of an area to visual change (visual sensitivity levels), and the distance of an area from viewing points (visual zones). Visual resource specialists map these characteristics and use them to compile a composite map on which they assign areas to one of five possible VRM classes. They then use VRM classes to determine the degree of allowable contrast for a proposed management activity or project.

VRM classes, their objectives, and required management practices are as follows:

CLASS I--Applies only to classified special areas, such as wilderness, primitive areas, natural areas, and similar situations where management is to be restricted. Legislation or policy establishes this quality standard. This class permits only natural ecological changes.

CLASS II--Changes in any of the basic elements (form, line, color, or texture) caused by management should not be evident in the characteristic landscape.

CLASS III--Changes in the basic elements (form, line, color, or texture) caused by management may be evident in the characteristic landscape, but the change 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.

CLASS V--Change is needed. This class applies to areas where the naturalistic character has been so disturbed that rehabilitation is needed to bring it back into character with the surrounding countryside.

Class V would apply to areas identified in the scenery evaluation where visual quality has been reduced because of unacceptable intrusions. Class V should be considered an interim short-term classification until one of the other objectives can be reached through rehabilitation or enhancement. The desired visual quality objective should be identified.

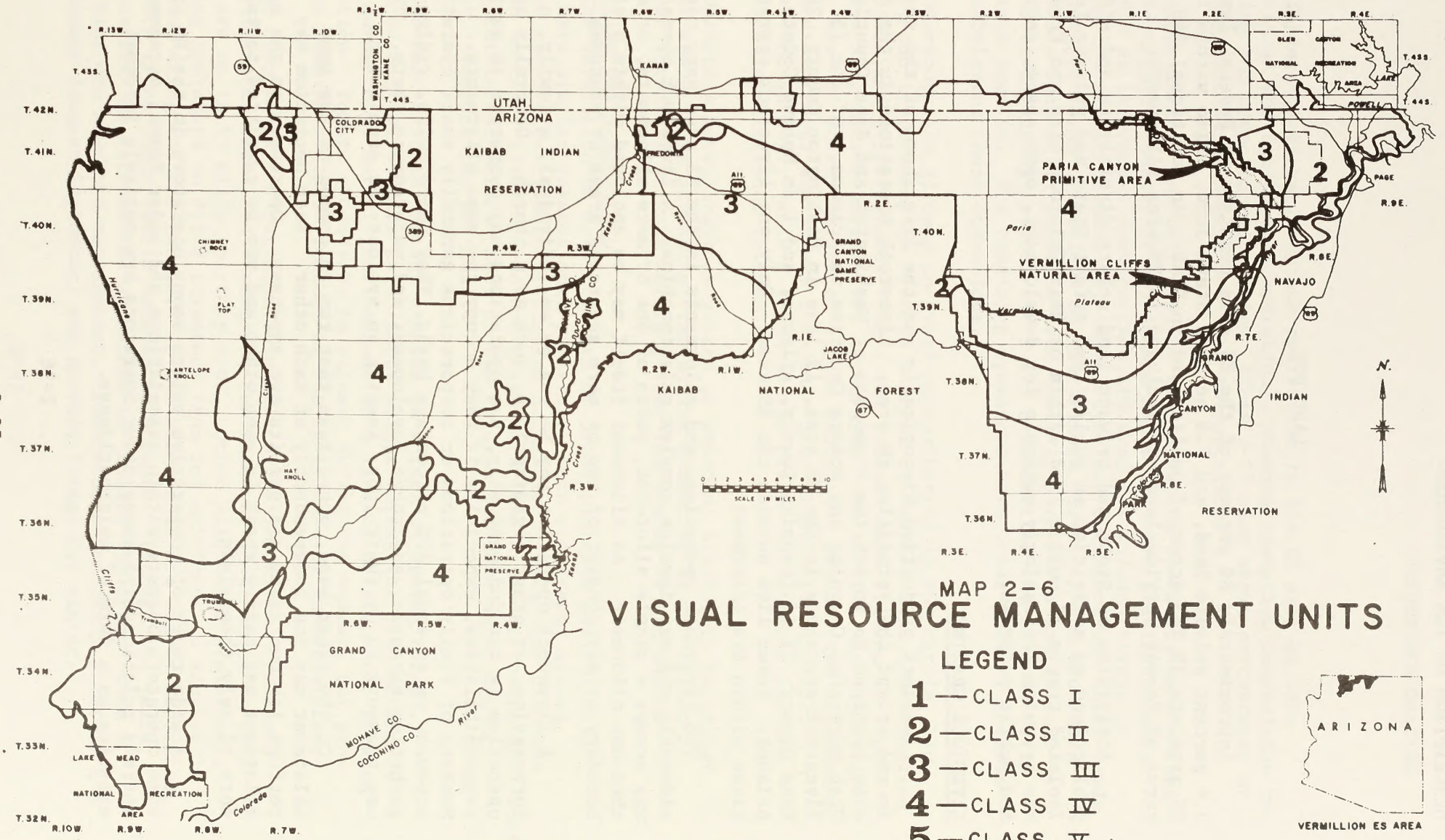
VRM classes for the ES area are delineated on map 2-6. Following is the approximate acreage in each VRM class:

VRM Class	Acreage
I	77,651
II	616,269
III	440,966
IV	445,618

Table 2-16 summarizes the approximate number of existing developments (intrusions) in each VRM class.

TABLE 2-16
EXISTING DEVELOPMENTS IN VRM CLASSES

	VRM Class			
Intrusion	I	II	III	IV
Roads (miles)	68	113	418	1157
Reservoirs	3	39	85	267
Cattleguards	2	5	17	33
Windmills	0	3	9	27
Wells	0	0	0	2
Fences (miles)	20	153	364	549
Pipelines (miles)	26	40	24	77
Catchments	0	3	1	11
Water storage tanks	1	3	3	10
Corrals	0	1	1	9
Springs	12	8	0	14
Troughs	18	44	32	110
Airfields	0	0	0	2



MAP 2-6

VISUAL RESOURCE MANAGEMENT UNITS

LEGEND

1—CLASS I
2—CLASS II
3—CLASS III
4—CLASS IV
5—CLASS V

VERMILLION ES AREA

LAND USE

Approximately 89 percent of the ES area consists of Federal lands, 3.4 percent private land, and 7.6 percent State land. Also within the ES area are 23,243 acres of public land in Utah. An additional 940 acres of Forest Service land are included in ES area allotments.

Activities on State and private land relate directly to and affect public land as activities on public land affect State and private land. Isolated tracts of public land within or near Colorado City and Fredonia are becoming increasingly valuable for development, open space, recreation, and public purposes.

LIVESTOCK GRAZING

Livestock production historically was the livelihood of the residents in and around the Vermillion ES area. Livestock operations in the ES area continue to impact the economies of Washington and Kane Counties in Utah more than Coconino and Mohave Counties in Arizona. Of the 75 livestock operators in the ES area, 19 live in Washington County, 26 in Kane County, 22 in Coconino County, Arizona, and 1 in Mohave County, Arizona. Seven live outside the ES area. Only one livestock operator lives within his allotment.

The livestock operations and allotments in the ES area vary considerably and may involve complex relationships. A livestock operation may occupy a single allotment, parts of one or more allotments, or more than one allotment. An allotment itself may be enclosed within a single boundary or may consist of two or more separated areas or pastures.

A livestock operation may be run by an individual, a family, a corporation, or other organizations, such as a church. Generally an operation is run independently, but operations may cooperate in various responsibilities, especially if they occupy the same allotments. Members of family operations or corporations generally share operating expenses on an equal AUM percentage basis. They share bulls, riding or gathering expenses, and range development and maintenance costs. They use teamwork to do their jobs, keeping an eye out for each other.

On the other hand, operations that run in common on the same allotment may run independently of each other. Each operation may perform its own tasks and pay its own expenses. Operators on the same allotment may hardly speak to each other and may be committed to taking care of only themselves.

A wide range of cooperation exists among operators in the ES area. Some operators operate within associations and under formal agreements, whereas relationships among other operators are entirely informal, existing as a form of neighborliness.

Table 2-17 lists livestock operations in the ES area by type (individual and family or corporation), showing operation composition by existing and proposed allotments. Table 2-17 also shows percentages of existing allotments included within an operation.

Approximately one half (38) of the livestock operators have either (1) additional private, or (2) leased lands or other grazing permits from BLM or the Forest Service that are used for raising forage or grazing livestock. Generally, these livestock operators use these lands as a part of their operations on the Arizona Strip. A few operators have lands completely separate from their Arizona Strip operations. Only 13 livestock operations are fully dependent on the Arizona Strip livestock permits. The remaining operators have other jobs or incomes that supplement their operations.

Operators are allowed to graze approximately 13,900 cattle, 130 horses, and 1,700 sheep on 1,407,476 acres of Federal land, intermingled with State and private land. The total Federal AUMs allowed is 130,677. This stocking rate averages 10.8 acres/AUM. The ES area has 115 allotments, many of which consist of single pastures. Seventy-two allotments are used yearlong, and 43 are seasonal--used principally in fall, winter, and spring. Table 2-18 shows the present allotments and the qualifications attached to them.

Operators move livestock grazed on seasonal allotments to higher Federal and private ground in Utah during summer or to the Kaibab National Forest in Arizona during either the summer or the winter.

Production Characteristics

The Vermillion ES area consists of broad plateaus and valleys, which have similar vegetational patterns. Such topography allows uniform grazing by livestock, limited primarily by water and distance between waters. Livestock do not graze waterless areas but overgraze areas having sufficient water. Most of the ES area has some water during current livestock use periods.

The most critical forage problem is a lack of spring forage. Cattle on most allotments gain little weight during the late spring or early summer of a normal year because of a lack of moisture for growing vegetation. Forage production is highest during the summer, but production remains variable because of the spottiness of thunderstorms.

To compensate for variable rainfall, approximately 20 operators have allotments scattered throughout the resource area, which in some cases are up to 55 miles apart by road. Other allotments are closer, allowing operators to drive livestock from one allotment to another if the other allotment has forage. If the allotments are widely separated, operators truck their cattle between allotments. Through the years, this pattern has allowed the operators to "follow the green" when a storm hits one area and not another. Such storms generally occur in the late summer (August-September) and provide forage for winter.

TABLE 2-17
LIVESTOCK OPERATIONS IN THE ES AREA

Livestock Operation	Existing Allotments in the Operstion	Share of the Existing Allotment %	Proposed Allotment
	Individual		
1	Antelope	50	Antelope
	Homestead	50	
	Lynn and Tone	33	
	Flat Top Well	19	
	Hurricane Rim	25	Temple Trail
2	Antelope	50	Antelope
	Homestead	50	
	Lynn and Tone	33	
	Flat Top Well	19	
	Hurricane Rim	25	Temple Trail
3	Antelope Spring	100	Antelope Spring
4	Atkin Well	100	Atkin Well
	White Pockets	78	
	Haslem Spring, AZ	100	
	Haslem Spring, UT	100	
5	White Pockets	33	Atkin Well
6	Badger Creek	100	Badger Creek
7	Beanhole	100	Beanhole
8	Buffalo Tsnk	100	Buffalo Tank
9	Button	100	Button
10	Cannan Gap	100	Cannan Gap
	Perkins, UT	100	
11	Cedar Knoll	100	Cedar Knoll
12	Chatterly	100	Chatterly
13	Cottonwood	50	Cottonwood
	Stateline	100	Stateline
14	Cottonwood	50	Cottonwood
	Wells	100	Wells
15	Cowboy Butte	100	Cowboy Butte
16	Coyote	100	Coyote
	Pine Hollow, UT	100	
17	Cram	100	Cram
18	Crosby Tank	100	Crosby Tank
19	Fern Tank	100	Fern Tank
20	Glazier Dam	100	Glazier Dam
21	Grama Point	100	Grama Point
22	Home Ranch	100	Home Ranch
23	Jacob Canyon	100	Jacob Canyon
24	Lamb Tank	100	Lamb Tank
	Water Canyon	100	
	Hack's Reservoir	100	
	Pipe Spring	32	Valley Wash
25	Hack Canyon	100	Lamb Tank
26	Lee's Ferry	100	Lee's Ferry
27	Findley-Heaton	100	Moonshine
	Moonshine	100	
	Gramma Springs	25	Gramma Springs
28	Sim's	100	Moonshine
	Gulch	100	Gulch
	Gramma Springs	25	Gramma Springs
29	Muggins Flat	100	Muggins Flat
30	Pigeon Tank	100	Pigeon Tank
	Swapp Tank	100	
31	Rider	100	Rider
	Muggins Flat, UT	100	
32	Rocket Pocket	96	Rock Pocket
	Yellowstone	90	
33	Rock Pocket	04	Rock Pocket
	Yellowstone	10	
34	Sunshine	100	Sage
	Sage	100	
35	Shinarump	100	Shinarump
36	Brown-Shumway	100	Shinarump
	Brown-Shumway, UT	100	
37	Cedar Ridge	100	Shinarump
38	Shuttleworth	100	Shuttleworth
39	Soap Creek	66	Soap Creek
40	Soap Creek	34	Soap Creek
41	Suicide	100	Suicide
42	Sunshine	100	Sunshine
	Highway	100	
43	Two Mile	100	Two Mile
44	Scotties Seep	100	Valley Wash
	South Bull Rush	100	
45	Pipe Valley	100	Valley Wash
46	White Sage	100	White Sage
47	Cove	100	Cove
48	Eight Mile Pass	100	Eight Mile Pass
49	Ferrin	100	Ferrin
50	Kanab Creek	100	Kanab Creek
51	Kanab Gulch	100	Kanab Gulch
52	Lost Spring Gap	100	Lost Spring Gap
53	Wahweep	100	Wahweep
	Family, Corporation, or Other Type		
54	Flat Top Well	19	Antelope
	Temple Trail	100	Temple Trail
	Rim	56	
	Hurricane Rim	25	
	Gallager	50	
	Cane Beds	60	Cane Beds
55	Flat Top Well	43	Antelope
	Lynn and Tone	33	
	Gallager	50	Temple Trail
	Hurricane Rim	25	
56	Cane Beds	40	Cane Beds
	Rim	44	
57	Clayhole	100	Clayhole
58	Ferry Swale	100	Ferry Swale
59	Frank's Reservoir	100	Frank's Reservoir
	Rock Reservoir	100	
60	Fuller Road	100	Fuller Road
	Frank's Reservoir	100	
	Utah Allotment	100	
61	Gunsight	100	Gunsight
62	Ceder Knoll	100	Hack Canyon
	Hack Canyon	100	
	Low Point	100	
	Meek's Reservoir	100	
	Gramma Springs	50	Gramma Springs
63	House Rock	100	House Rock
64	Jackson Tank	100	June Tank
	June Tank	100	
	Water Canyon	100	
	Twin Tank	100	
65	Big Springs Pipeline	50	Mt. Logan
	Cole Springs	100	
	Big Springs	100	
	Cold Springs	100	
	Little Springs	100	
	Little Oak Springs	100	
	Individual	100	
	Kenworthy	100	
	Head of Tuweep	100	
	Sunshine	100	
66	Big Springs Pipeline	50	Mt. Logan
67	Pratt Tank	100	Pratt Tank
68	Rock Canyon	100	Rock Canyon
69	Rock Canyon Tank	100	Rock Canyon Tank
70	Spooks Knoll	100	Spooks Knoll
	Johnson Run	100	
71	Tuweep	100	Tuweep
72	Pipe Spring	68	Valley Wash
	Valley Wash	100	
73	Vermillion	100	Vermillion
74	Wild Band	100	Wild Band
75	Harris Well	100	Harris Well

TABLE 2-18
EXISTING ALLOTMENTS

Allotments			Federal Land		Percent	
Proposed	No.	Existing	Acres	AUMs (Qualifications)	Federal Range	Season of Use
Antelope	3	Antelope	14,430	1,310	91%	YL
		Lynn & Tone	2,210	288	100%	YL
		Flattop Well	7,772	1,004	88%	YL
		Homestead	8,525	1,088	56%	YL
Antelope Spring	2	Antelope Spring	14,219	1,167	82%	YL
Atkin Well	11	Atkin Well	19,142	2,282	97%	YL
		White Pockets	3,450	264	100%	YL
		Haslem Spring, Az.	1,070	42	100%	YL
		Haslem Spring, Ut.	2,257	280	100%	10/16-4/30
Badger Creek	63	Badger Creek	5,876	205	91%	YL
Beanhole Well	59	Beanhole Well	18,960	2,555	91%	YL
Buffalo Tank*	58	Buffalo Tank	29,342	3,366	84%	YL
Button	47	Button	4,500	389	89%	11/15-5/31
Cane Beds	19	Cane Beds	12,040	460	78%	YL
		Rim	5,040	273	78%	10/1-5/30
Cannan Gap	16	Cannan Gap	4,760	268	72%	YL
		Perkins, Ut.	510	63	31%	12/1-6/30
Cedar Knoll*	40	Cedar Knoll	17,951	1,500	100%	11/16-6/15
Chatterly	46	Chatterly	6,140	467	85%	9/1-5/31
Clayhole*	6	Clayhole	158,544	15,896	89%	YL
Cottonwood	12	Cottonwood	3,760	310	92%	YL
Cowboy Butte*	36	Cowboy Butte	3,120	228	72%	5/1-11/30
Coyote	54	Coyote	29,560	3,168	88%	YL
		Pine Hollow, Ut.	5,669	533	70%	10/1-5/31
Cram	60	Cram	23,770	3,360	96%	YL
Crosby Tank	9	Crosby Tank	4,720	359	88%	YL
Fern Tank*	7	Fern Tank	48,269	6,263	94%	10/16-6/30
Ferry Swale	65	Ferry Swale	28,580	1,884	100%	YL
Frank's Reservoir	53	Frank's Reservoir	6,589	242	100%	11/10-5/15
		Rock Reservoir, Ut.	1,105	184	100%	11/10-5/15
Fuller Road*	52	Fuller Road	24,333	1,488	91%	YL
		Frank's Reservoir		81	96%	YL
		Utah Allotment	6,736	283	76%	YL
Glazier Dam	13	Glazier Dam	6,787	605	67%	YL
Grama Point	30	Grama Point	23,545	2,079	100%	10/16-6/10
Gunsight	44	Gunsight	7,230	563	100%	10/15-5/15
Hack Canyon	23	Cedar Knoll		1,611	85%	3/1-12/30
		Hack Canyon		1,231	95%	YL
		Loco Point	34,707	292	87%	YL
		Meek's Reservoir		468	100%	11/1-4/30
Home Ranch	62	Home Ranch	38,390	5,225	87%	YL
House Rock*	57	House Rock	17,584	2,226	94%	YL
Jacob Canyon	38	Jacob Canyon	3,200	217	82%	11/16-4/30
June Tank*	27	Jackson Tank	7,780	936	100%	YL
		June Tank	25,452	1,546	92%	10/1-6/30
		Water Canyon	30,000	3,258	98%	YL
		Twin Tank	29,400	4,040	93%	YL
Lamb Tank	22	Lamb Tank	1,820	272	56%	YL
		Water Canyon	3,120	300	79%	YL
		Hack's Reservoir	2,050	246	98%	YL
		Hack Canyon	4,250	444	98%	11/15-6/15
Lee's Ferry	64	Lee's Ferry	19,290	1,129	96%	YL
Moonshine	21	Findley-Heaton	3,955	295	100%	YL
		Sim's	2,560	276	100%	YL
		Moonshine	3,210	280	92%	YL

* Implemented AMP

TABLE 2-18 (cont.)

Allotments			Federal Land		Percent	
Proposed	No.	Existing	Acres	AUMs (Qualifications)	Federal Range	Season of Use
Mt. Logan	8	Big Spga.Pipeline	33,210	2,601	82%	{Sheep 10/1-3/30 {Cattle YL
		Cole Springs	9,370	573	94%	YL
		Big Springs	3,370	211	87%	YL
		Cold Springs	3,400	300	99%	5/15-11/1
		Little Springs	5,850	212	88%	5/15-11/1
		Little Oak Springs	5,570	325	87%	5/15-11/1
		Individual	5,130	421	77%	6/1-10/15
		Kenworthy	5,240	371	70%	6/1-10/15
		Head of Tuweep	4,280	512	77%	6/1-10/15
		Sunshine	6,820	840	92%	8/15-5/31
Muggins Flat	51	Muggina Flat	11,088	793	93%	YL
Pigeon Tank	26	Pigeon Tank	5,995	567	100%	YL
		Swapp Tank	9,373	980	100%	YL
Pratt Tank	45	Pratt Tank	19,903	1,486	90%	11/1-5/15
Rider	50	Rider	2,410	183	83%	11/1-4/30
		Muggins Flat, Ut.	722	84	17%	11/1-4/30
Rock Canyon	1	Rock Canyon	1,360	193	60%	10/1-5/15
Rock Canyon Tank	39	Rock Canyon Tank	11,255	933	100%	11/1-5/15
Rock Pocket	5	Rock Pocket	13,430	1,118	88%	YL
		Yellowstone	6,400	644	81%	YL
Sage	28	Sunshine	7,140	840	90%	YL
		Sage	3,350	264	90%	YL
Shinarump	48	Shinarump	1,100	41	67%	7/1-10/31
		Brown-Shumway	1,210	120	100%	11/1-4/30
		Cedar Ridge	1,420	132	100%	12/1-5/15
		Brown-Shumway, Ut.	279	27	100%	11/1-4/30
Shuttleworth	44	Shuttleworth	22,547	1,677	88%	YL
Soap Creek	61	Soap Creek	44,670	3,147	92%	YL
Spooks Knoll	37	Spooka Knoll	10,320	746	91%	YL
		Johnson Run	6,040	438	91%	YL
Suicide	42	Suicide	4,830	464	100%	YL
Sunshine	29	Sunshine	6,980	800	95%	YL
		Highway	1,460	88	95%	YL
Temple Trail	4	Temple Trail	9,363	2,470	94%	YL
		Gallager	6,264	888	73%	YL
		Rim	-	350	81%	10/1-5/30
		Hurricane Rim	20,843	992	90%	YL
Tuweep*	10	Tuweep	46,616	2,458	78%	YL
Two Mile	55	Two Mile	33,380	3,643	93%	YL
		Buckskin Gulch	5,650	371	100%	YL
Valley Wash	25	Valley Wash	2,706	304	81%	YL
		Pipe Spring	940	56	77%	YL
		Scottie's Seep	5,183	443	90%	YL
		South Bullrush	1,600	172	100%	11/1-2/28
		Pipe Valley	4,552	464	99%	YL
Vermillion*	56	Vermillion	109,994	13,986	90%	YL
Wells	14	Wells	4,650	530	90%	YL
White Sage*	43	White Sage	11,010	1,017	77%	6/1-10/31
Wild Band*	24	Wild Band	47,220	4,321	90%	YL
Less Intensive Management						
Cove	15	Cove	110	12	100%	YL
Eight Mile Paas	49	Eight Mile Pasa	440	36	100%	12/1-5/31
Ferrin	18	Ferrin	2,350	272	82%	YL
Gramma Springs	32	Gramma Springs	4,495	466	100%	11/1-4/31
Gulch	34	Gulch	3,400	176	100%	11/1-4/30
Harris Well	20	Harris Well	2,640	319	34%	YL
Kanab Creek	31	Kanab Creek	4,544	254	88%	10/1-5/31
Kanab Gulch	33	Kanab Gulch	3,700	210	100%	11/16-5/15
Lost Spring Gap	35	Lost Spring Gap	715	72	56%	11/1-5/15
Stateline	17	Stateline	580	29	19%	YL
Wahweep	66	Wahweep	15,459	1,248	100%	YL

Other operators "follow the green" within an individual allotment, if a storm hits in one part of the allotment and not another. This type of use generally benefits livestock, allowing them to increase their weights. It is detrimental to vegetation, however, since livestock graze vegetation during the most critical growing period.

The pinyon-juniper vegetation subtype has been extensively chained in the ES area, but success in increasing forage production has varied. Maintaining continued increased forage production is dependent on followup management. Early chainings undergoing no change in livestock management are being reinvaded by less desirable plants at an accelerated rate. On the other hand, chained areas being systematically rested are remaining static or continuing to improve in range condition. Production in some chained areas has not increased because treatment areas were not seeded to grass.

The following general production problems exist in the ES area:

1. Wide ranges in annual precipitation cause wide ranges in forage production and hinder the maintenance of regular stocking rates and proper (moderate) utilization (40-60 percent).

2. Grasslands provide poor winter grazing for livestock.

3. Yearlong grazing does not provide rest from grazing at critical plant growth periods. Yearlong grazing especially damages cool-season grasses and browse plants and does not allow for production potential.

4. Lack of dependable livestock waters creates unequal grazing across allotments when waters fail. Heavy to severe use occurs in watershed areas, whereas no use occurs in the area where a waterhole is dry.

ES area livestock operations are currently managed either under AMPs or without AMPs. Table 2-19 compares livestock characteristics under these two methods.

Range Improvements

All allotments have various types of range improvements. Plates 1-E and 1-W show the existing range improvements on public lands. Some improvements such as water developments, land treatments, fences, and erosion control structures were developed for managing the public lands and resources. Range improvements such as corrals, loading chutes, and dipping vats were developed for facilitating livestock management.

TABLE 2-19
LIVESTOCK CHARACTERISTICS UNDER AMP AND NON-AMP MANAGEMENT*

	AMP Allotments	Non-AMP Allotments
Percentage Calf Crop	82%	80%
Calf Selling Weights		
Current average weaning weight	405 pounds**	382 pounds
% sold at less than 400 pounds	48%	56%
% sold at more than 400 pounds	52%	44%
Death Rate	6%	5%

* Data gathered from ranchers, most of whom consulted only memory rather than written records.
** Calf weights in Clayhole allotment have declined since AMP implementation.

Generally operators have developed livestock facilitating improvements through permits issued by BLM. BLM generally has developed other improvements, such as erosion control structures and land treatments. Fences and water developments have been constructed either by BLM or by operators separately or by both BLM and operators through cooperative agreements. Operators have provided or constructed waters used as bases for grazing preferences.

Existing Non-AMP Allotments

Currently 98 allotments, involving 798,549 acres and 72,523 AUMs on Federal land are not managed under AMPs. Most of the non-AMP allotments (86) are cow-calf operations; 33 allotments have a small number (1 to 10) of horses with their cattle; and one operator runs 1,700 sheep on the Mt. Logan allotment in the fall, winter, and spring. Thirty-eight of these allotments are grazed seasonally, whereas 60 are grazed year-long. (See table 1-2 for existing allotments.)

BLM issues crossing permits to licensees (AMP or non-AMP) in accordance with regulations. These permits generally allow 1 to 2 days for ranchers to drive their cattle across other allotments, livestock being required to travel 10 miles per day. BLM issues approximately five such permits annually in the ES area.

BLM issues trespass notices under the following conditions (AMP or non-AMP):

- Livestock in the wrong pasture;
- Livestock in excess of the paid grazing license;
- Livestock on an allotment during an authorized period; and
- Livestock on an allotment before the payment of the grazing fee.

Existing AMP Allotments

The Arizona Strip District currently manages 17 allotments under 12 AMPs. Ten AMPs have been fully implemented: Clayhole, Cedar Knoll, Vermillion, Tuweep, Cowboy Butte, House Rock, Wild Band, Buffalo Tank, White Sage, and Fern Tank. On these allotments all facilitating measures necessary to allow rotation grazing are completed. Two AMPs remain incomplete in total implementation: June Tank and Fuller Road. Allotments under implemented AMPs involve 608,927 acres of public lands and 54,355 AUMs on Federal land. All are managed as cow-calf operations. Five are grazed seasonally, and seven are grazed yearlong.

RECREATION

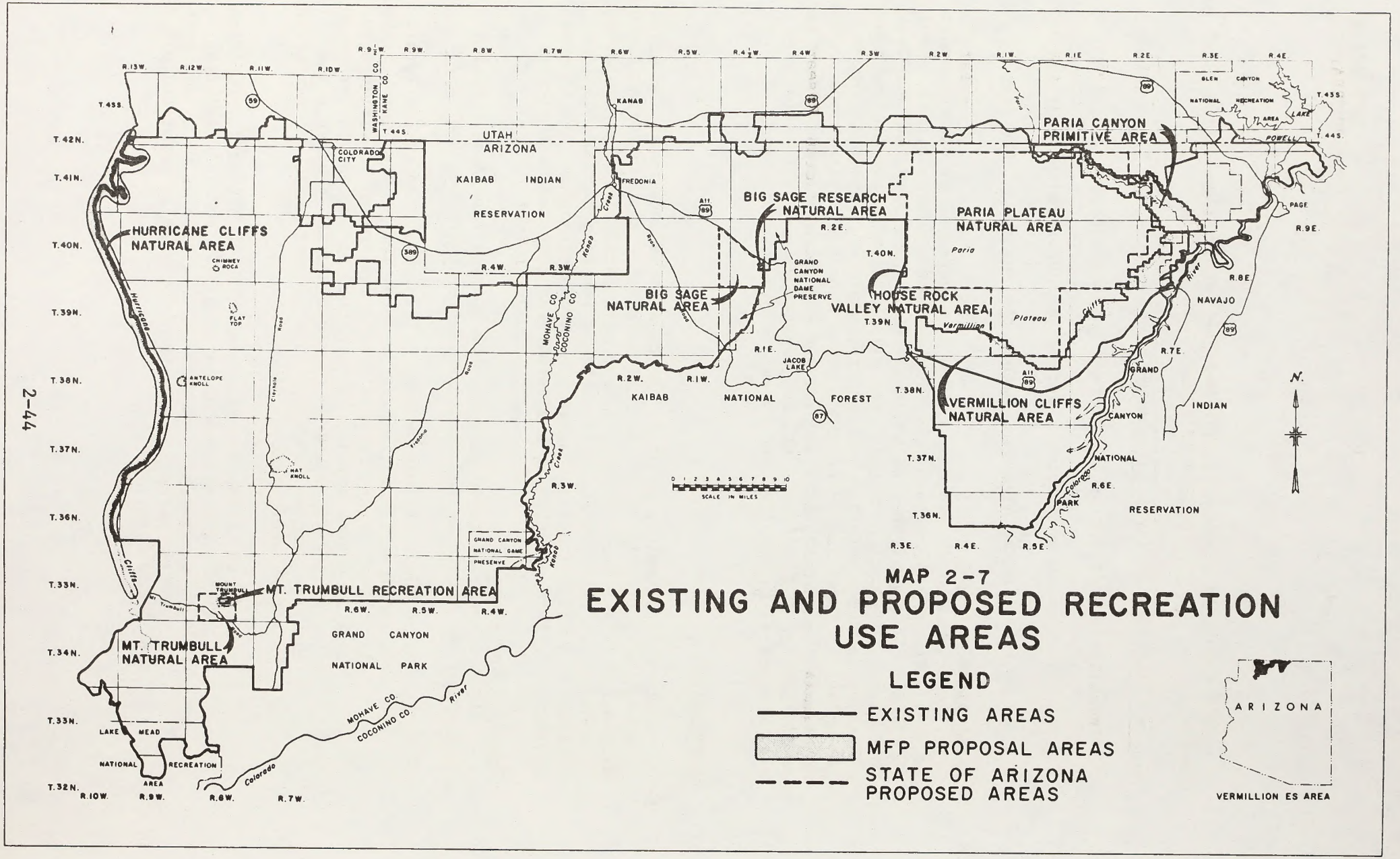
Although sparsely populated, the ES area is located in the midst of numerous recreation lands of national interest, including Grand Canyon National Park and Glen Canyon and Lake Mead National Recreation Areas. In contrast to these areas, which attract large numbers of visitors engaged in localized and intensively managed recreation, the ES area attracts visitors engaging in a diversity of dispersed activities.

Existing Use Areas

Three BLM-administered sites in the ES area have been formally designated for management of their recreation resources (map 2-7):

1. Paria Canyon Primitive Area - This area, comprising 27,515 acres along the Paria River between Lee's Ferry and U.S. Route 89 in Utah is the ES area's only designated primitive area. Here livestock grazing is permitted except in visitor concentration locations and developed areas (Whitehouse Ruins entrance station in Utah). The lower 11 miles of Paria Canyon have been overgrazed by livestock.

2. Vermillion Cliffs Natural Area - The 50,136-acre Vermillion Cliffs Natural Area is a spectacularly scenic attraction. The primary management objective of this area is to maintain its outstanding natural appearance. Grazing is permitted within the boundaries.



MAP 2-7

EXISTING AND PROPOSED RECREATION USE AREAS

LEGEND

- EXISTING AREAS
- MFP PROPOSAL AREAS
- STATE OF ARIZONA PROPOSED AREAS

TABLE 2-20
PROPOSED* ARIZONA NATURAL AREAS

Name	Size (acres)	Primary Interest	Function
Mt. Trumbull	2,840	Virgin ponderosa pine forest atop Mt. Trumbull and pinyon-juniper woodland on lower slopes.	Research, nondestructive recreation
House Rock	1,150	Nearly pure stands of big sage (Artemisia tridentata) exemplify the major plant associations of the Great Basin Desert.	Research
Big Sage**	5,400	Great Basin desertscrub dominated by a nearly pure stand of big sage (Artemisia tridentata).	Research
Paria Plateau	Undetermined	Excellent examples of pinyon-juniper communities with extensive stands of big sage understory. Numerous red sandstone outcrops dot the plateau and sand dunes are common. Numerous valuable archaeological sites also occur.	Research

* By the Arizona Academy of Science
** Expansion of existing 160-acre Big Sage Natural Area

3. Big Sage Research Natural Area - This 160-acre site was designated in 1972 as a control plot for a sagebrush treatment project on adjacent U.S. Forest Service lands. Livestock use has been managed at about the same level as the nearby Forest Service lands to show potential changes in vegetation composition.

In addition to these three formally designated sites, two additional areas are presently managed for their recreational value--the Honeymoon and Temple historical trails.

Proposed Designations

The Vermillion MFP recommends that two areas be formally designated for recreation management. In addition, the State of Arizona has identified four areas worthy of special designation. Map 2-7 shows the locations of these six sites.

1. Mt. Trumbull Recreation Lands - The Mt. Trumbull area offers good sightseeing and represents an Arizona Strip District "recreation destination." These lands have the highest concentration of recreation use within the ES area, offering primitive camping, hunting, sightseeing, hiking, and collecting (firewood, pine nuts, and Christmas trees). The Vermillion MFP proposes to designate the top of Mt. Trumbull as Type III Recreation Lands (natural environment area) to retain the natural, primitive character conducive to existing recreation use of the area, yet to permit management of other resource values consistent with Type III lands.

2. State of Arizona Natural Areas - The Arizona Academy of Science inventoried areas of the State worthy of preservation in their present condition. Of the 75 proposed natural areas inventoried, 4 are on public land within the ES area (table 2-20).

3. Off-Road Vehicle (ORV) Designations - The ES area's only ORV designation is for Paria Canyon Primitive Area, which is closed to all ORVs. The Vermillion MFP, however, recommends a designation (open, closed, or restricted) for all public lands in the resource area. On "open" areas and trails ORVs can be operated. "Closed" areas and trails are permanently or temporarily prohibited to all ORV use. In "restricted" areas, ORVs are subject to restrictions, such as types and numbers of vehicles, time of use, and areas or trails used. Restricted areas identified within the MFP limit ORV use to existing roads and trails.

After the preparation of the MFP, draft ORV regulations (43 CFR 6290 Off-Road Vehicles) were issued. "Restricted" areas are now known as "limited". Upon issuance of the final ORV regulations, the MFP-recommended designations will be reviewed and designations established in accordance with the ability of the land to withstand ORV use.

Recreation Developments

Public lands within the ES area have no existing developed recreation facilities, although the Mt. Trumbull Recreation Management Plan proposes to develop a primitive campground in the Mt. Trumbull/Nixon Spring area.

Present Visitor Use

The ES area represents a major semiprimitive open space recreation resource, which includes outstanding sightseeing, primitive, geologic, and archaeological-historical values.

An analysis of visitor use based upon the extensive phase of the Recreation Information System attributes 84,161, 12-hour visitor days to public lands during 1972. Of this total, more than 80 percent involved general sightseeing, deer hunting, and backpacking (table 2-21). All remaining visitor use (14,761 visitor days) involved more extensive recreation, such as hiking, nature study, photography, primitive camping, rock collecting, and off-highway sightseeing.

TABLE 2-21
1972 VISITOR USE

Activity	Visitor Days	Percent of Total
General Sightseeing	54,434	64.7
Deer Hunting	9,316	11.1
Backpacking (Paria Canyon)	5,650	6.7
Other	14,761	17.5
	84,161	100.0

Source: Antelope and Coconino Planning Units - URA Step 3

WILDERNESS

The Federal Land Policy and Management Act of 1976 (FLPMA), PL 94-579, mandates a review of all roadless areas of 5,000 acres or more that have wilderness characteristics as described in the Wilderness Act of 1964, PL 88-577. FLPMA further requires recommendations as to the wilderness suitability of those areas formally identified as natural or primitive before November 1, 1975. The results of this study are to be presented to the President by July 1, 1980. The Vermillion ES area has three such "instant" study areas: Paria Canyon Primitive Area, Vermillion Cliffs Natural Area, and Big Sage Research Natural Area. Other "potential" wilderness study areas are likely to meet the criteria as defined by the Wilderness Act. Completion of these studies, however, is not required before 1991.

ECONOMIC AND SOCIAL CONDITIONS

Assessing economic and social impacts requires data that best represent the economic and social conditions of an area. Such data for the Vermillion ES area may be best obtained from the Bureau of the Census' Kaibab Census County Division (CCD) of Coconino County, Arizona and the Mohave CCD of Mohave County, Arizona (map 2-8). These two CCDs cover the Arizona Strip--the area of Arizona north and west of the Colorado River. Most of those who work in the Arizona Strip, however, are residents of Utah rather than Arizona.

Moreover, aside from Fredonia and Colorado City, the ES area has no towns of any population significance. The cities of Page, Arizona and Kanab, Hurricane, and St. George, Utah provide most of the goods and services for those working in the ES area and provide the cultural and economic focus for the ES area.

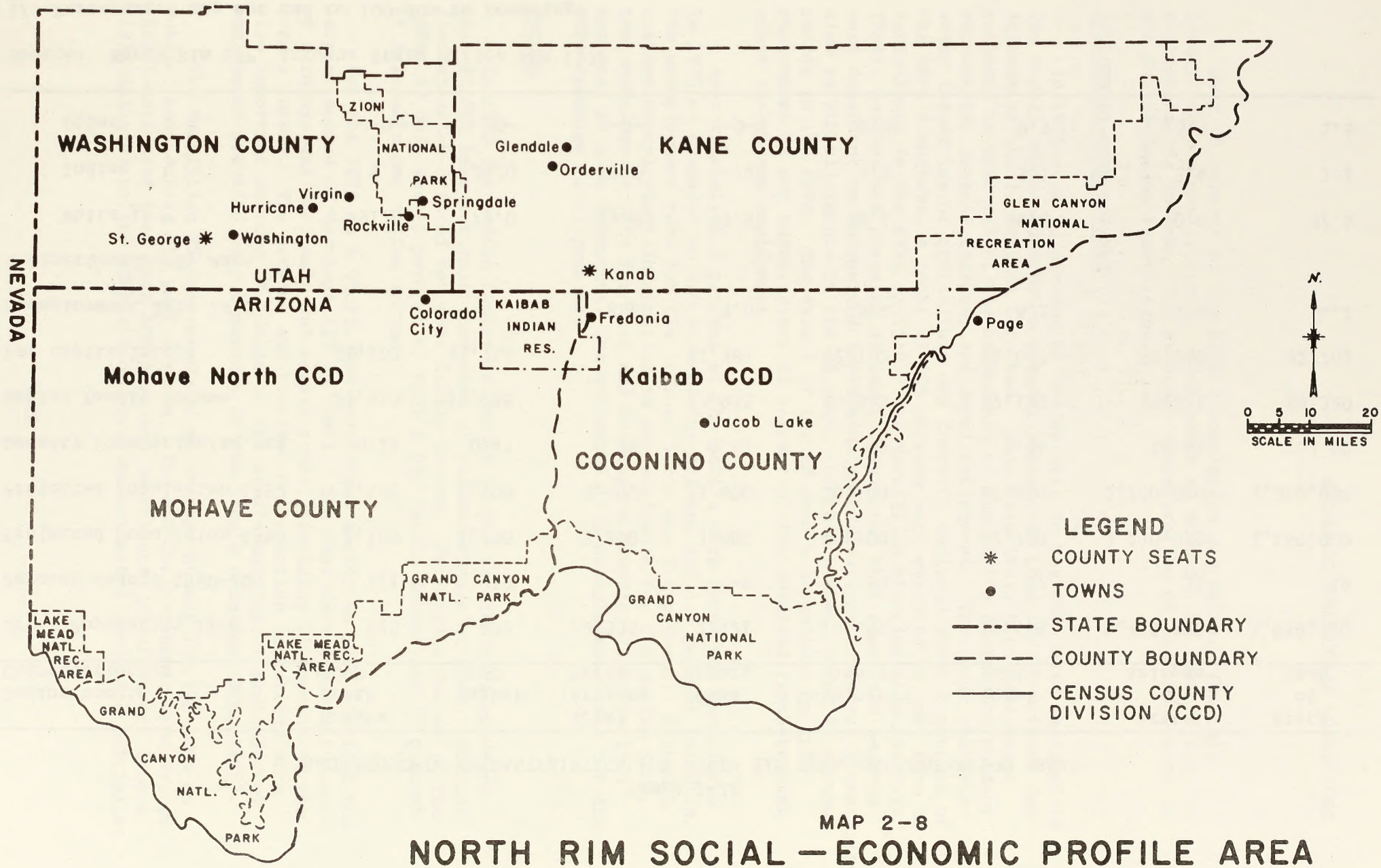
Because the region that would be affected by the proposed action extends beyond the ES area's boundaries, much of the data presented for the ES area will include Washington and Kane Counties, Utah as well as the entire Arizona Strip. This enlarged area will be referred to as the North Rim SEPA (Social-Economic Profile Area) since it is the same area studied in the North Rim Social-Economic Profile, a BLM planning document on file at the Arizona Strip District office in St. George, Utah. Table 2-22 presents socioeconomic data for North Rim SEPA and comparison areas.

POPULATION CHARACTERISTICS

The total 1970 population of the North Rim SEPA amounted to 18,425, of which 2,335 resided in the Arizona Strip and 2,200 lived in the Vermillion ES area. The remaining 16,000 lived in Utah, and over 10,000 of these people lived in St. George. Between 1960 and 1970 the SEPA's population increased by 27 percent. During the same period Arizona's population increased by 36 percent, and Utah's population increased by 19 percent.

The SEPA's population density is sparse, amounting to 1.64 persons per square mile. The State of Arizona has a density of 15.61 persons per square mile, and Utah has a density of 12.9 persons per square mile. Washington County had a density of 5.63 persons per square mile, the highest in the SEPA.

The U.S. Bureau of the Census classified the Arizona Strip and Kane County as being entirely rural, whereas Washington County had a population equally rural and urban.



MAP 2-8

NORTH RIM SOCIAL—ECONOMIC PROFILE AREA

TABLE 2-22
SOCIOECONOMIC CHARACTERISTICS FOR NORTH RIM SEPA AND COMPARISON AREAS

Socioeconomic Characteristics	Mohave North CCD	Kaibab CCD	Total Arizona Strip	Kane County	Washington County	Total SEPA	State of Arizona	State of Utah
Total Population 1970	926	1,409	2,335	2,421	13,669	18,425	1,770,900	1,059,300
Percent Change 1960-70	121	19		-9	33	27	36	19
Projected Population 1980	1,100	1,700	2,800	3,000	16,800	22,700	2,230,000	1,160,000
Projected Population 1990	1,400	2,100	3,500	3,600	20,400	27,500	2,700,000	1,310,000
Density Population/sq. mi.	0.18	0.47	0.28	0.62	5.63	1.64	15.61	12.90
Median Family Income	$5,615	$8,788		$7,935	$6,948	$7,132	$9,241	$9,320
Per Capita Income	$1,203	$1,744		$2,387	$2,102	$2,067	$2,945	$2,703
Unemployment Rate 1970			8.6	9.0	5.4	6.2	4.0	4.7
% Distribution by Race								
White 1/	91.0	79.0	83.8	99.8	98.4	96.6	90.6	97.4
Indian	9.0	21.0	16.2	.2	1.2	3.1	5.4	1.1
Other	-0-	-0-	-0-	-0-	0.3	0.3	3.9	1.5

Source: North Rim SEP, Arizona State Office BLM 1977

1/ Percentages may not add to 100 due to rounding.

Over 98 percent of the SEPA's population was white. The only identifiable minority group, which makes up most of the rest of the population, is Indian. The greatest concentration of Indians occurs in the Kaibab Indian Reservation.

EMPLOYMENT-UNEMPLOYMENT

In 1970 over 23 percent of the workers in the SEPA were employed in the retail trade industry--a greater percentage than the 18 percent for Arizona or the 17 percent for Utah. This relatively high percentage reflects to some extent the dependence of the SEPA's economy on outdoor recreation, general tourism, and local retirement. The basic resource-using industries of agriculture and forestry employed about 8 percent of the SEPA's workers. A total of 465 persons were employed in some form of agriculture in the SEPA in 1970. The Vermillion Planning Area Analysis (PAA), another BLM planning document, estimated that about 430 persons were dependent on income and employment generated from livestock operations tied to BLM allotments in the ES area. Of this number, about 92 percent reside in the SEPA. The extent of the ES area's dependency on this employment is not known, since 82 percent of the involved ranchers have other income and employment.

Approximately 6.2 percent of the SEPA's work force was unemployed in 1970 as compared to 4.0 percent for Arizona and 4.7 percent for Utah. The unemployment rate for the Arizona Strip was 8.6 percent. Although current unemployment information is not available for the entire SEPA, the unemployment rate for Kane and Washington Counties in early 1975 amounted to over 8 percent. The estimated 1975 unemployment rate for the SEPA amounted to 11 percent.

INCOME

In 1970 the median family income of $7,000 for the SEPA was more than $2,000 less per year than that of either Arizona or Utah. Similar discrepancies existed for mean family income. Per capita income in the SEPA, $7,067, was 75 percent of Utah's per capita income and 70 percent of Arizona's per capita income.

For the SEPA as a whole, the government sector in 1970 provided the largest source of earnings (27 percent). The next most important source of earnings was wholesale and retail trade, providing 21 percent of the area's income. The service and contract construction industries were also important sources of income to the area's earnings. Agricultural employment provided only 6 percent of the area's earnings (BLM, 1977).

The Vermillion ES area produced an average annual 108,736 AUMs on public lands during the past 5 years. The BLM Socioeconomic Data System (SEDS) estimated that each AUM produced contributed $5 of direct income (1976 dollars) to the SEPA's economy. The estimated livestock multiplier

for the area is 1.6 (BLM, 1977). The 108,736 AUMs produced on Federal lands in the Vermillion ES area would produce approximately $544,000 of direct income or $870,000 of direct and indirect income. An annual average of 125,650 AUMs was produced on Federal, State and private lands in the ES area during the past 5 years. The approximate direct income effect of these AUMs was $628,250, and the approximate total income effect was $1,028,500. The total income effect, however, constituted only 1.6 percent of the SEPA's total estimated earnings for 1976 but 27 percent of the SEPA's livestock earnings.

LIVESTOCK GRAZING OPERATIONS

Rancher Characteristics

Seventy-five livestock operations use BLM AUMs in the ES area. (See the Livestock section of chapter 2 for details on AUMs and allotments used by each operation.) Fifty-three of these operations are run by individuals, and 21 operations are family or corporation owned. One operation is a Mormon Church welfare project. At present 19 operators live in Washington County, 26 live in Kane County, 22 live in Coconino County, 1 lives in Mohave County, and 7 live outside these counties. For the family- and corporation-owned operations, this analysis assumes the billing address to be the place of residence.

A survey of 16 House Rock Valley-Paria Plateau permittees by the Bureau of Indian Affairs Navajo Land Selection EIS Task Force (1978) revealed information on ranchers representative of the SEPA, which can be used to describe the average SEPA permittee. The survey revealed that the average permittee is 58 years old and has a family size of six. Over 90 percent of the interviewed permittees were of the Mormon faith. Of those interviewed, 63 percent had income besides their ranch income.

Ranch Value

In the years since the passage of the Taylor Grazing Act (1934) and the first charging of fees for the use of public lands, the public lands have taken on defacto economic values greater than the fees charged. Ranches have been sold, and public land grazing permits have been sold along with the other ranching assets.

Permits have also been used as collateral for loans. The market value of a ranch operation in the ES area is difficult to estimate and depends upon many variables, including the location and condition of the land, the type of improvements on the land, and the amount of leased land. Recent information indicates that the current value of ranches in the area is $900 to $1,300 per animal unit (AU). If an AU has a value of $1,100, then the total value of ranches owned by BLM permittees would range from $11,518,100 to $13,431,000 ($1,100 times the 5-year average AUs licensed--10,471 AUs--or the maximum allowable AUs of 12,210 AUs). This estimate is based on averages and indicates a range of values for ranches in the ES area and does not reflect the value of any operation.

Ranch Economics

On the average, 78 percent of the AUMs of forage used by ES-area livestock operations grow on Federal lands.

Eighty-five percent of the operations in the ES area do not stock up to their allowable AUM level. Although the allowable AUM level on Federal, private and State lands for the area is 146,520 AUMs, the 5-year average of licensed AUMs has been 125,650. The reasons for the operators' lower use are unknown. An allotment's range might be too poor to permit use of the fully allotted amount, or livestock prices below the costs required to maintain a herd might force ranchers to reduce herd sizes.

Dickerman and Martin's (1967) study of ranches in Arizona indicated the returns that might be experienced by today's ES-area ranchers. Although this study is over 10 years old, the cost-return relationship it revealed is believed to still hold: the larger the operation, the greater the likelihood of a larger return to the operator. A ranch twice the size of another will thus often earn more than twice the smaller's income because of economies of scale. Economies of scale allow the larger operator to gain certain efficiencies that the smaller operator cannot and give the larger operator lower operating costs per unit.

Using empirical data from Arizona livestock operators, Dickerman and Martin (1967) abstracted three typical ranches of different sizes in the Arizona Strip. One ranch used 408 AUMs, another used 2,520 AUMs, and a third used 4,040 AUMs. The smallest operation lost 4.9 percent on its investment, the second largest operation about broke even, and the largest operation earned a profit on its operation.

On the basis of this study, ranch operations in the ES area can be grouped into three sizes. A small operation uses 408 AUMs of forage or less; a medium-sized operation uses 409 to 2,519 AUMs, and a large operation uses 2,520 AUMs or more. A large operation is considered to be at or above the breakeven level, being large enough to make a profit. The grouping of operations considers all AUMs used by the operation on Federal, State, and private land within the ES area as well as AUMs obtained outside the ES area by operations licensed to graze only seasonally within the area.

Of the 53 operations run by individuals, 18 (34 percent) are small, 26 (49 percent) are medium sized, and 9 (17 percent) are large. Only 9 operations, therefore, are at or above the 2,520-AUM breakeven level, and 44 operations (83 percent) are probably losing money.

Of the 22 other operations, 1 is small, 12 are medium sized, and 8 are large. Thirty-eight percent are at or above the breakeven level, and 62 percent may be losing money.

The distinction between individual-owned and other operations is made for two reasons: (1) each individual-owned operation represents a single-family unit, whereas the other 22 operations may represent ownership by more than one family unit; and (2) 41 percent of individual-owned operations have outside sources of income, whereas 86 percent of other operations have outside sources of income.

Table 2-23 summarizes the operations and relates the number of AUMs used by an operation to its dependence on BLM for grazing and the average percentage of the operations with outside income sources. This table reveals that for individually owned operations, as operation size increases, the percentage of AUMs on which the operation depends increases as well as the likelihood that the operation does not have outside sources of income. For the family- and corporation-run operation a similar pattern exists. The larger operations depend more on Federal lands for grazing than the medium-size operations. Moreover, only the "large" category has operations that lack outside sources of income.

TABLE 2-23
CHARACTERISTICS OF LIVESTOCK OPERATIONS IN THE ES AREA

Ranch Size*	Number of Operations	Mean % of Total AUMs Obtained From Federal Lands	Mean % of Operators with Outside Income Sources
		Individually Owned Operations	
Small	18	60	100
Medium	26	77	77
Large	9	81	56
		Family, Corporation, and Other Operations	
Small	1	90	100
Medium	13	72	100
Large	8	80	62

*Number of AUMs used. Small--408 AUMs or less; Medium--409 to 2,519 AUMs; Large--2,520 AUMs or more.

Government Revenues

Ranch properties in the ES area generate an insignificant part (less than 0.1 percent) of the total revenues for Mohave and Coconino Counties.

BLM revenues from grazing permits in the ES area are based on the Federal AUMs permitted for each allotment. At the current rate of $1.51 per AUM and with 108,736 Federal AUMs, the average total annual fees collected by BLM for grazing in the ES area (based on collections during the past 5 years) amount to $164,191.

The Federal Land Policy and Management Act of 1976 revised the allocation of grazing fee revenues. At least 25 percent of BLM's grazing fees are returned to the area where the fees are collected. The money is used for range rehabilitation and protection and improvement on the lands where the fees are collected. Another 25 percent of the fees can be directed by the Secretary of the Interior to be returned for range rehabilitation, but the Secretary is free to direct it to any of BLM's range lands. The State of Arizona also receives 12½ percent of the fees collected and returns them to Coconino and Mohave Counties, which make them available to the area for range improvements. On the basis of these guidelines, a minimum of $61,600 would be available for range improvements in the ES area.

SOCIAL ATTITUDES AND VALUES

Many individuals feel they would be impacted by the proposed action and are highly interested in it. These individuals can probably be best described as two distinct groups. One group consists of ranchers in the area. This group highly values independence, self-reliance, and hard work. These ranchers distrust outsiders, and outside activity, especially government. The second group consists of diverse individuals, differing substantially in background, values, and outlook. These individuals are essentially urban residents who may or may not live in the SEPA but who have an interest in wildlife, recreation, wilderness or other uses of the land that conflict with such traditional uses as livestock grazing (Miller, 1977).

The ranching group is bound together and to the community by common values and the Mormon religion. Historically the area was settled by Mormon immigrants. Much of the area is still centered on the Mormon religion, and membership in the Mormon Church has influenced the use of the land. The foremost influence is derived from the Mormon belief that mastery of the land and its natural resources is a sacred responsibility (Arrington, 1958; Little, 1976). In addition, the Mormon belief in communal cooperative communities has influenced the residence of ranchers. All but one operator in the ES area live in towns or villages as did the early colonizers, who were encouraged to do so by Brigham Young.

The Bureau of Indian Affairs Navajo Land Selection EIS Task Force (1978) interviewed 16 ranchers in the House Rock Valley and Paria Plateau who would be impacted by the Navajo land selection. Although the Navajo Environmental Statement presented little quantified data on attitudes, it revealed some significant attitudes that are representative of many of the ranchers of the Vermillion ES area:

- About half the ranchers interviewed described themselves as conservative, and the other half described themselves as moderate.

- Many ranchers feel that BLM is too bureaucratic and that their own long experience with their ranches makes them better managers of the range than the college graduates employed by BLM.

Many ranchers strongly believe that their children and grandchildren should enjoy the same lifestyle of spaciousness and freedom of choice that their parents enjoyed.

Ranchers in the ES area are believed to adhere to ranch fundamentalism, the attitude "that being a cattle rancher leads to a higher state of total well-being than an alternative mode of making a living and way of life could provide" (Smith and Martin, 1972). Placement of high value on lifestyle characteristics inherent in ranch fundamentalism explains why some ranchers seem to be satisfied with a low or negative return on their operation and why some ranchers rely on outside employment to maintain or subsidize their ranches.

The Federal Land Policy and Management Act of 1976 (FLPMA) clearly states that BLM will manage the public lands rather than dispose of them and establishes a policy of planning for multiple uses of the public lands. BLM's management of the public lands is in conflict with the ranchers' value of independence. Many ranchers see multiple-use management as a threat to their lifestyles.

BLM's planning system is designed to insure that all group needs are considered. The manager has to mediate competing uses of the public lands. The new urban groups that are interested in how lands like those in the Vermillion ES area are managed may or may not live in the SEPA. Many of the individuals of this group live elsewhere and belong to national groups like the Sierra Club, which try to represent the views of these individuals.

CHAPTER 3

ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

CHAPTER 3

ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

INTRODUCTION

Chapter 3 describes and analyzes the probable environmental impacts of the proposed action. This analysis is designed to be commensurate with the expected magnitude, intensity, duration, and incidence of impacts. The discussion gives special consideration to environmental components protected by law and other resources considered to be of particular importance to man and his environment.

Chapter 3 analyzes each impact by cause and effect and identifies and traces secondary impacts as far as practical. It analyzes temporary or short-term as well as permanent or long-term impacts. Short-term is defined as 8 years or less, (8 years being the period of implementation), and long-term refers to at least an additional 15 years after complete implementation (2002).

The proposed action is predicted to have no significant impacts on geology, topography, climate, air quality, and paleontological resources.

The following criteria were used to determine the nature of impacts identified:

Beneficial Impact: Beneficial and positive resource conditions would improve over existing conditions, or adverse resource conditions would improve and reverse any existing downward trends.

Adverse Impact: Beneficial and positive resource conditions would deteriorate, or resource conditions would not be expected to improve sufficiently to reverse an existing downward trend (or to improve a static adverse condition).

No Impact: Resource conditions are not expected to be beneficially or adversely affected, or beneficial and positive resource conditions would remain static.

The impact analysis has been based on the following assumptions:

1. The proposed action would be fully implemented as described in chapter 1.

2. BLM would complete monitoring studies as indicated and make adjustments as needed; grazing systems would be followed; and livestock would consume no more than 50 percent average of the current year's growth of forage.

3. Construction stipulations incorporated in the proposal would be effectively carried out and disturbance limited to that identified in the proposal.

4. The principal resource directly impacted by the proposed action would be vegetation. Any changes in vegetation production, condition, trend, and potential would affect other resources. Future forage allocations would consider land use plans, needs of other resources, and allocations in approximately the same proportion as shown on table 1-2.

5. Socioeconomic analyses were based on the assumption that livestock market conditions would remain constant.

6. Manpower and funds would be available to implement the proposal.

7. The operators would be able to fund and implement their parts of the AMPs.

IMPACTS ON VEGETATION

Overall, the proposed action would benefit vegetation in the ES area. Usable forage production on allotments managed under AMPs would increase from 105,033,600 pounds (131,292 AUMs) to 121,996,800 pounds (152,496 AUMs). Rest-rotation and deferred rotation grazing systems would improve all vegetation subtypes by one condition class, but the following subtypes when in poor condition would not improve: sagebrush (42,394 acres), pinyon-juniper (96,748 acres), desert shrub (17,124 acres), mountain shrub (3,165 acres, and conifer (5,062 acres). The acreage in good condition on less intensively managed allotments would also increase. Usable forage production, however, would remain the same because a continued down trend in acres under poor condition would not allow for an overall increase in production. Moreover, riparian vegetation (11,164 acres) would not improve, and 405 to 2,965 acres of vegetation would be permanently disturbed by heavy grazing around newly developed waters.

Changes in range condition, usable forage production, and species composition by allowment are summarized above; in appendixes 3-1, 3-2, 3-3, and in table 3-1. These conclusions are discussed in the following narrative. The time frame for changes in usable production, condition, and species composition is 15 years after implementation of the AMPs.

GRAZING SYSTEMS

Projected Range Condition and Species Composition

The following analysis of study data gathered from allotments under implemented AMPs provides the basis for projected changes in range condition and species composition (See appendix 3-5 for the methodology used.)

Tables 3-2 and 3-3 present summaries of range study data on allotments under implemented AMPs. Trend was determined by the category in which the majority of the plots in an allotment ranked (up, down, or static). Three allotments with implemented AMPs have not been evaluated for trend: June Tank, Wild Band, and Cowboy Butte.

The key species are generally black grama, galleta grass, squirreltail, wheatgrasses, winterfat, fourwing saltbush, cliffrose, and Indian ricegrass.

When the key species composition shows an upward trend, one of two situations is occurring: (1) key species are increasing in number and aream or (2) undesirable species are dying out while key species are remaining alive and static.

When the cover--live vegetation--shows an upward trend, all species are increasing in ground cover or area covered by live vegetation.

TABLE 3-1
IMPACTS ON FORAGE PRODUCTION, RANGE CONDITION, AND KEY SPECIES COMPOSITION

Subtype	Acres	Percent of ES Area	Average Total Production/ Acre	Usable Forage* Production/ Acre	Future** Usable Forage Production/ Acre	Range Condition						Key Species Composition (Average Percent			
						Percent Current			Percent Future**			Present		Future**	
						Good	Fair	Poor	Good	Fair	Poor	Grass	Shrubs	Grass	Shrubs
Grassland	449,623	28	380	94	108	38	59	3	95	5	0	41	10	50	15
Sagebrush	385,401	24	396	63	77	15	68	17	79	10	11	24	4	41	8
Pinyon-Juniper	358,327	23	443	52	54	13	58	29	16	57	27	17	6	21	8
Saltbush	164,681	10	400	63	77	13	76	11	70	23	7	24	14	34	24
Half Shrub	43,873	3	486	64	***	7	93	0	89	11	0	30	11	62	17
Desert Shrub	90,124	6	306	45	51	15	42	43	47	34	19	20	11	29	14
Greasewood	1,000	< 1	484	80	***	0	64	36	18	82	0	20	5	30	7
Mountain Shrub	3,638	< 1	446	48	***	0	13	87	13	0	87	5	10	7	10
Wet Meadow	170	< 1	1,500	349	***		100		100			60	0	65	0
Riparian	1,164	< 1	270	36	***			100			100	23	8	32	10
Creosotebush	1,700	< 1	405	35	***		No Data			No Data		10	10	15	10
Winterfat	6,780	< 1	427	101	***		100		100			35	15	42	20
Shadscale	9,740	1	270	31	***		100		100			20	17	30	22
Conifers	8,880	1	537	53	***		43	57		43	57	9	T	14	T
Annuals	4,156	< 1	450	49	***			100		100		21	11	29	16

* Air dry pounds
** 15 years after AMP implementation
*** Insufficient data to extrapolate

	Good	Fair	Poor		Good	Fair	Poor
Condition change by total acreage Current:	331,905	995,717	252,882	Future:	1,027,327	363,515	189,662
Condition change by average percent	21	63	16		65	23	12

TABLE 3-2
TREND, UTILIZATION, AND USE ON ALLOTMENTS WITH IMPLEMENTED AMPs*

Allotment	Trend		Utilization			Actual Use		
	Key Species Composition	Live Vegetation Cover	Years of Available Data	Years Above 55%	Years Below 55%	Years of Available Data	Years Above Carrying Capacity	Years Below Carrying Capacity
Fern Tank	Up	Static or Slightly Down	3	0	3 (51-55%)	3	0	3
Fuller Road**	Up	Down	3	0	3 (40-53%)	0	-	-
Tuweep	Up	Down	3	1 (66%)	2 (47-51%)	5	0	5
Clayhole	Up	Up	6	3 (61-74%)	3 (51-53%)	8	2	6
Buffalo Tank***	Down	Down	2	1 (62%)	1 (52%)	No data exist since AMP was only recently implemented.		
Cedar Knoll	Down	Up	5	3 (56-74%)	2 (48-51%)	5	2	3
House Rock	Down	Down	3	1 (72%)	2 (40-43%)	5	0	5
Vermillion Cliffs	Down	Down	3	3 (55-64%)	0	4	0	4
White Sage**	Down	Down	No data exist since AMP was only recently implemented.					

*The June Tank, Wild Band, and Cowboy Butte allotments are not included because they have not been evaluated for trend.
**AMPs not yet on rotation grazing. Data reflect the effect of nonrotation grazing only.
***AMP implemented for less than a year. Data reflect the effects of nonrotation grazing only.

TABLE 3-3
SUMMARY OF STUDIES ON ALLOTMENTS UNDER IMPLEMENTED AMPs

Allotment	Average Utilization (Percent)	Range of Utilization (Percent)	Years of Trend Data	Average % Increase of Key Species	(%) Range of Key Species Increase or Decrease	Key Species Composition	Cover (Live Vegetation)
Fern Tank	52	51-55	10	+13	+2 to +22	Up	Static or Slightly Down
Fuller Road	48	40-53	3	+10	-10 to +40	Up	Down
Tuweep	55	47-66	3	+1	-56 to +30	Up	Down
Clayhole	59	51-74	5	+5	-73 to +88	Up	Up
Buffalo Tank	57	52-62	3	+1	-10 to +13	Down	Down
Cedar Knoll	59	48-74	5	-13	-1 to -33	Down	Up
House Rock	51	40-72	6	-14	-100 to +84	Down	Down
Vermillion Cliffs	58	55-64	3	+3	-38 to +43	Down	Down
White Sage	-	-	3	-13	-58 to +17	Down	Down

When cover shows a downward trend, the total area of ground covered by live vegetation (desirable or undesirable) is decreasing. Thus, when key species composition is up and cover is down, undesirable species may be dying out while the key species (desirable) are static or increasing. When key species composition is down and ground cover is up, the key species (desirables) are dying out while the undesirables, (e.g. snakeweed) are remaining static or increasing in number and area.

The mostly downward trend on these allotments can be explained by utilization, actual use, and weather studies. These studies indicate that key species trend goes down when average utilization frequently surpasses 55 percent or in a recent year undergoes heavy use (70 percent or greater) under conditions of naturally erratic rainfall and frequent drought.

Average utilization on Clayhole, Fern Tank, Fuller Road, and Tuweep allotments has not exceeded 55 percent (or a recent year of high use) and shows an upward trend in key species, even with erratic rainfall. The Clayhole allotment shows an upward trend, with an average utilization of 59 percent. The last year of high use, 74 percent, however, occurred in 1970. Since then, reported utilization has averaged 55 percent. Thus, trend is up.

The House Rock allotment has had average utilization of 51 percent, but a 72 percent utilization occurred during a severe drought in 1977 in a downward trend.

Fern Tank had its trend read during the severe drought of 1977, and, with a history of moderate use (51-55 percent), showed an upward trend over a 10-year period.

These studies reveal that for a trend in key species to improve, utilization must be held to levels of 50 percent during wet or dry years. With lower utilization during all seasons, not just the growing seasons of various species, the trend would improve. Heavy use during the dormant season appears to be just as harmful as during the growing season.

The ES area's diversity of warm-season, cool-season and browse species, having widely differing phenological stages (figure 2-1), requires holding utilization to around 50 percent. Cool-season plants may be dormant when warm-season plants have just begun to grow. Warm-season plants, for example, may not get enough moisture to grow until late summer rains, when cool-season grasses have become dormant. Heavy use of the cool-season species during late summer would result in heavy use of the newly growing warm-season species, because of their succulence. This situation would be reversed in the late winter and spring.

Key browse species, such as cliffrose, fourwing saltbush, winterfat, and Mormon tea, present a special problem because they require 2 years to produce seed. Variable rains and phenologies require utilization on browse to be held to around 50 percent at all times.

Precipitation studies also reveal that past forage inventory methods have overestimated the amount of available forage. Most of the inventories were based on an annual 10 inches of precipitation, an amount higher than what actually occurs on three of the allotments. As more reliable precipitation data became available, they were used in more recent surveys and in correcting older survey data.

Rainfall data have been collected from gauges on the Clayhole allotment for 12 years. Table 3-4 presents these readings.

TABLE 3-4
INCHES OF RAINFALL RECORDED ON THE CLAYHOLE ALLOTMENT

Year	Rainfall	Year	Rainfall
1966	10.5	1972	7.2
1967	11.5	1973	10.0
1968	7.8	1974	5.2
1969	7.2	1975	9.2
1970	5.4	1976	5.6
1971	8.6	1977	6.9
		Average.....	7.9

Source: AMP study files, BLM Arizona Strip District office.

These data demonstrate the erratic pattern of rainfall in the Arizona Strip. Recent drought conditions occurred in 1974, 1976, and 1977.

The rest-rotation and deferred rotation grazing systems would improve all vegetation subtypes by one condition class. A range in poor condition would thus move to fair condition and a fair condition range would move to a good condition class. Exceptions to this improvement are discussed later in this section.

Again this prediction of improvement is based on range studies of allotments with implemented AMPs in the ES area (tables 3-2 and 3-3). These data demonstrate that, with utilization held to about 50 percent during the graze cycle of a grazing system, the key species in the vegetation composition of an allotment could increase up to an average of 13 percent over a 10-year period.

Percent increase, however, will vary in each allotment. Key species on some allotments would increase by only 5 or 10 percent due to site-specific conditions. A small change of 1 to 5 percent in key species could result from a range being in good condition, consisting of 90 percent key species, and having little room or likelihood for change. Little or no change in key species could be expected on ranges in poor condition and occupied by unpalatable brush with no understory of palatable species.

This lack of change would result because all available plant space is occupied by unpalatable species.

When the average utilization of a grazing cycle rises above 55 percent or when utilization in one year reaches 70 percent, the trend of key species would go down. If, however, heavy utilization has occurred more than 5 years before the most recent trend reading, the years of lower utilization would negate the effect of heavy use as illustrated by the Clayhole allotment (see page 3-7).

The grazing systems are designed to allow for different seasons of use and rest, allowing cool- and warm-season grasses and browse to build vigor and achieve seed ripe. Winter-spring use would reduce the vigor of cool-season grasses and browse. Livestock, however, would not graze warm-season grasses during the growing state, thus allowing an increase in grass and browse vigor and seed ripe. Summer and fall use would, in turn, allow cool-season grasses and browse to increase their vigor and to achieve seed ripe.

Sagebrush, pinyon-juniper, desert shrub, mountain shrub, and conifer acres in poor condition would remain in poor condition until some impact agent, such as land treatments or wildfire, breaks the dominance of the existing shrub canopy. Moreover, in most cases, those areas of pinyon-juniper (204,246 acres) and conifers (3,818 acres) in fair condition would not improve to good condition, regardless of grazing management. Rather, the conifers will dominate the area, since they constitute its climax vegetation (Humphrey, 1955; Paulsen, 1975; Heady, 1975; Vermillion Resource Area AMP study files, 1978.

The Gunsight allotment, for example, is similar to the allotments going into grazing systems, having 1,533,755 acres proposed for grazing systems. This allotment is expected to respond similarly to those allotments summarized in table 3-2 and discussed above because the amount of use, the grazing system, and the environmental conditions are similar. Gunsight allotment has 7,610 total acres (7,230 acres on Federal lands and 380 acres on State lands). The condition of the Federal land is as follows: 1,850 acres of grassland are in good condition; 2,620 acres of sagebrush are in poor condition, and 140 acres of pinyon-juniper are in poor condition.

The grassland subtype has a 50 percent key species composition and is thus in good condition. Grasslands would improve to a higher level of good condition as long as utilization does not exceed 50 percent during the graze cycle. (See appendix 3-3.)

On the basis of key species responses on allotments under implemented AMPs, an estimate of 5 percent increase in 15 years would mean that key species composition in the grassland subtype would increase from 50 to 55 percent. (See appendix 3-1.) The small percentage of improvement would result from the area's already being in good condition.

Key species in the sagebrush subtype would change sufficiently to improve the average condition to fair. Half the sagebrush acreage would move into good condition, but poor species composition would maintain the other half in poor condition. The sagebrush acreage in fair condition would increase its key species composition by 10 percent, but the key species composition of sagebrush acreage in poor condition would not change. The key species increase on the average for the total sagebrush acreage would amount to 5 percent (appendix 3-3).

The key species composition in the pinyon-juniper subtype would not change because this acreage is in a pinyon-juniper climax (Humphrey, 1950). Thus a species composition change could not occur unless land treatment or fire breaks the canopy dominance of the trees. Moreover, grazing systems have been found to have a negligible effect on the pinyon-juniper subtype (Gibbens and Fisser, 1975).

The Gunsight allotment would be managed under a two-pasture deferred rotation system. Treatment A would allow grazing from October 15 to April 15 on the new growth of cool-season grasses and browse, and permit warm-season grasses to complete their growth cycle without being grazed. Treatment B would allow grazing from October 15 to February 15 and permit cool-season grasses and browse to complete a entire growth cycle without being grazed. Again, livestock would graze warm-season grasses only during their dormant stage. Key species vegetation should improve under 50 percent utilization and growing season rest periods.

Projected Usable Forage Production

The rest-rotation and deferred rotation grazing systems would increase usable forage production with the change to a better range condition class. Thus, usable vegetation production would increase when a subtype moves from poor to fair or from fair to good.

Resource specialists estimated in the field future usable production per acre of the grassland, sagebrush, pinyon-juniper, saltbush, and desert shrub subtypes. They made such estimates on the basis of the current production of those existing types under good, fair, and poor conditions. (See appendix 3-5 for the methodology involved.) Specialists then extrapolated these estimates to those acres predicted to change or remain static. The other subtypes did not occur frequently enough in all three conditions to permit extrapolation of reliable data. See table 3-5 for the production per subtype per condition class.

TABLE 3-5
AVERAGE PRESENT USABLE PRODUCTION BY RANGE CONDITION AND VEGETATION SUBTYPE

	Air Dry Pounds Per Acre				
Subtype	Good	Percent Change*	Fair	Percent Change**	Poor
Grassland	109	26	81	40	49
Sagebrush	82	21	65	43	37
Pinyon-juniper	84	57	53	32	36
Saltbush	87	25	65	35	42
Desert shrub	108	67	36	17	30
Half shrub	56		75		--
Annuals	--		--		49
Meadow	--		349		--
Riparian	--		--		36
Winterfat	--		101		--
Greasewood	--		100		58
Mountain shrub	--		45		30
Conifer	--		--		53
Shadscale	--		31		--
Creosote	--		--		35

Source: Production data from survey writeup sheets. All production data were arrayed and averaged for each subtype under each range condition.
*Good to Fair or Fair to Good
**Poor to Fair or Fair to Poor

The Gunsight allotment, for example, has a grassland subtype in good condition, producing an estimated 68 pounds per acre (see appendix 3-2). By 1995, under the proposal, the grassland subtype is projected to produce 86 pounds per acre, an increase of 26 percent (table 3-5). (The same increase in production between fair and good condition was used since no other data exist from which to predict production increases: 81 ÷ 109 = .74, thus 26 percent; .26 x 68 = 18, thus 68 + 18 = 86 lbs/ac.)

The sagebrush subtype has a production figure of 53 pounds/acre and will increase to 58 pounds/acre. The increase is 10 percent or 5 pounds/acre over the sagebrush type. According to table 3-5, a 20 percent increase in production should occur, but since no production change would occur on half the sagebrush acreage, production would increase by only 10 percent. (Thus 53 x .20 = 10 lbs.; 10 lbs./acre x .5 = 5 lbs./acre increase in production; thus 53 + 5 = 58 lbs./acre.)

Production on pinyon-juniper acreage would not change, since it is in poor condition.

Although this impact analysis has discussed only three subtypes, the same procedure was used to project composition, condition, and production changes for all vegetation subtypes in the ES area. All subtypes and resulting impacts are summarized in table 3-1. As illustrated in table 3-1 present usable forage production on the major vegetation subtypes varies

from a low of 45 pounds per acre on the desert shrub subtype to 94 pounds per acre on the grassland subtype. Future usable forage production on these subtypes is estimated to increase to 51 pounds per acre and 108 pounds per acre respectively. Appendixes 3-1, 3-2, and 3-3 analyze specific allotments and subtypes.

AUMs are determined by dividing the pounds of forage by 800 pounds (the amount of feed per unit AUM) to get AUMs per acre. In summary, the usable forage production on the allotments under AMPs would increase from 105,033,600 pounds (131,292 AUMs) to 121,996,800 pounds (152,496 AUMs).

Riparian Vegetation

The proposed grazing systems would allow perennial grasses, forbs, and sedges to improve and increase on streambanks and around springs. Woody riparian vegetation, however, would not reproduce or recover on streambanks, since these grazing systems fail to provide enough rest for woody plant reproduction. These systems would also fail to prevent severe utilization of the riparian subtype during the graze cycle.

Observations in Colorado in a higher rainfall regime (18 to 25 inches) revealed that perennial grasses on streambanks and wash bottoms are about three times as dense under rest-rotation grazing as under season-long grazing. Woody riparian vegetation, however, responds little if at all to rest-rotation grazing (Hughes, 1978). A predicted poor woody riparian response would thus keep the riparian subtype in poor condition, although in an improved poor condition.

Threatened and Endangered Plant Species

The 25 threatened and endangered plants found in the Vermillion ES area are mostly pioneers, occurring on badlands, frail lands, or roadside cuts, which are seldom grazed by livestock. Moreover, these plants are unpalatable and occur on sites not typically used by cattle. Grazing and trampling should thus not significantly impact these plants or their habitats.

Range development construction would have no known impacts on threatened and endangered species because construction would not occur in any such species habitat or because a survey and modification of facilities would prevent any possible adverse impacts.

NONROTATION GRAZING ON FIVE HOLDING PASTURES

Nonrotation grazing on five holding pastures (involving 38,812 acres) in three allotments (Clayhole-Yellowstone Pasture, Fuller Road-Franks and Mountain Pastures, Two Mile-Corral and Cottonwood Pastures), would slightly decrease vigor, area, usable production, and numbers of cool- and warm-season grasses, browse, and desirable forbs. Range condition would remain static or move slightly down, but not enough to significantly change production or condition classes. Undesirable species of shrubs, half-shrubs, annual grasses, and forbs would increase slightly in vigor, area, and in numbers, since grazing would occur at the same time every year. Nonrotation grazing, however, would not impact the riparian subtype or threatened or endangered plants.

LESS INTENSIVE MANAGEMENT

Projected Range Condition, Species Composition, and Usable Production

Proposed stocking decreases of 737 AUMs would reduce the intensity of use and maintain warm- and cool-season grasses, forbs, and browse in a static condition or allow them to increase only slightly in vigor and trend.

Such upward trends have occurred on allotments, such as Fuller Road (before implementation of the grazing system in 1975), that are not under rest-rotation grazing but have been running with about a 30 percent reduction in normal livestock numbers. The trend plots demonstrate an upward trend in key species at average utilization below 55 percent. The severe drought of 1977, accompanied by grazing, however, reduced the ground cover of key species.

Conversely, Buffalo Tank has trend plots demonstrating the effect of nonrotation grazing under high utilization. Buffalo Tank's trend plots show a slight decrease in key species composition. Drought and high utilization (57 percent), however, have drastically reduced ground cover, and trend is down.

In summary, the following range condition changes would occur on allotments under less intensive management (46,659 acres).

Condition	From	To
Good	3,266 acres	4,666 acres
Fair	34,528 acres	33,128 acres
Poor	8,865 acres	8,865 acres

The usable forage production in these less intensively managed allotments would not change, but the continued down trend in acres under poor condition would not allow an overall increase in production.

Less intensive management would not impact threatened and endangered species because most are pioneer species, unpalatable to and seldom grazed by livestock.

The lack of rotation grazing would prevent the healing of sacrifice and livestock gathering areas.

Riparian Vegetation

Of the 53 miles of riparian habitat within the ES area, 7 miles along Kanab Creek would decrease in vigor and trend and would thus remain in poor condition. Grazing would continue to adversely impact woody riparian species.

LAND TREATMENT

The proposed action calls for chaining, spraying, or plowing of 19,699 acres of pinyon-juniper and sagebrush. A total of 12,930 acres would be seeded where the understory of herbaceous vegetation is inadequate to replace the removed woody vegetation.

Varying amounts of shrubs and trees undergoing the land treatments would be killed. The plant species seeded in the plowed area would respond to the lack of competition from other perennials, thus increasing the usable forage component (production) in the target area by several fold as allowed by the site conditions.

Double chaining of pinyon-juniper would kill between 28 and 95 percent of the target trees, for an average kill of 60 percent. The percentage of kill depends on the age and height of trees, the older and taller trees being more susceptible to the chain (Valentine, 1971).

Plowing with brushland plows effectively kills sagebrush. Single plowing can achieve up to an 80 percent kill, and double plowing can achieve up to a 95 percent kill (Valentine, 1971).

Spraying of sagebrush with 2-4D could kill from 50 to 95 percent of the target sagebrush.

On the basis of general observations, chainings, plowings, and sprayings on the Arizona Strip have been successful as stated above. These projects, however, have never been formally evaluated. Many projects have failed because no followup management or seeding was carried out when needed.

Where spraying and chaining have reduced the canopy of woody shrubs, the herbaceous and browse understory (usable forage production) would increase from 100 to 400 percent in accordance with the resulting site conditions (Heady, 1975).

The average usable forage production on land treatment areas (source: table 3-5) would increase as follows:

- On 8,550 acres of pinyon-juniper being chained, from 36 to 109 pounds per acre, 307,800 to 931,950 pounds of forage, or 384 to 1,164 AUMs;
- On 5,769 acres of sagebrush being sprayed, from 37 to 109 pounds per acre, or 214,452 to 628,821 pounds of forage, or 268 to 786 AUMs;
- On 5,380 acres of sagebrush being plowed, from 37 to 109 pounds per acre or 199,060 to 586,420 pounds of forage, or 248 to 733 AUMs.

These are average figures. Usable production would vary according to site conditions. (See appendix 1-1 for method of conversion from pounds to AUMs.)

The land treatment on the above acres would increase the number of acres in good condition by 19,699. Key species would increase variably by site. The species composition would vary among key species according to the species' abilities to survive in the sites.

Land treatment would not impact threatened and endangered plants or riparian vegetation.

RANGE IMPROVEMENT PROJECTS

Construction (site preparation, construction, and vehicular traffic) of range improvements would temporarily disturb 320 acres of vegetation. After construction of these projects, 405 to 2,965 acres of vegetation would be permanently disturbed, due mostly to new waters, which would allow previously ungrazed or lightly grazed areas to be grazed more heavily.

In summary, by 1995 acres in good condition would increase from 331,905 to 1,027,327; acres in fair condition would decrease from 995,717 to 363,515; and acres in poor condition would decrease from 252,882 to 189,662. The total usable forage production in the ES area would increase from 107,268,800 pounds (134,086 AUMs) to 124,232,800 pounds (155,291 AUMs) by 1995.

IMPACTS ON SOILS

To analyze the impacts of the proposed action on soils, the following assumptions were made:

- Each year 27 percent (426,736 acres) of the total area will be rested from livestock grazing.
- During the spring growing season 63 percent (995,717 acres) of the total area will be rested.
- During the summer growing season 49 percent (774,446 acres) of the area will be rested.

The proposed action would generally benefit the soils of the Vermillion ES area. The reduction of livestock AUMs by an average of 18 percent would increase ground cover (litter and vegetation), reduce soil movement, reduce raindrop impact, and decrease compaction, thus increasing the infiltration rate and water retention. Table 3-6 summarizes impacts by allotments and pastures, grouped into grazing systems.

EROSION

The proposed action would increase total ground cover and decrease soil erosion on 1,355,533 acres. Soil erosion would increase on 31,182 acres and remain the same on 20,761 acres. Infiltration rates would increase on 1,366,264 acres and remain static on 41,212 acres. Table 3-6 shows that an increase in ground cover and a decrease in compaction from livestock use would increase infiltration rates. Fine textured soils would respond fastest to this change in use. The three main fine textured soils in the ES area are the Shalet clay loam, the Tours silty clay loam, and the Navajo clay and silty clay loam.

Land Treatment

BLM resource specialists considered soil suitability for plowing, chaining, and spraying in proposing land treatment areas. Such areas occur in soil associations 2,3,5,7, and 8--those best suited for land treatment and having the highest potential for successful seeding.

The uprooting of 8,550 acres of pinyon-juniper through chaining in the Fuller Road, June Tank, Tuweep, and Shuttleworth allotments would disturb the soil in the short term but would benefit or have little effect on the soil if the slash debris is left in place and windrowed (Gifford and others, 1970). Studies in southern Utah have demonstrated no consistent decrease or increase in sediment yields following the clearing of pinyon-juniper and seeding to grass (Gifford, 1973).

The potential sediment yield for these areas would be 4.05 acre-feet per year until seedling establishment, in 2 Or 3 years.

TABLE 3-6
ANALYSIS OF IMPACTS ON SOILS

Grazing System	Area Affected	Acres	Changes in				Changes in Soil Erosion Sediment Yield (Acre Feet/Square Mile	
			Ground Cover and Litter	Organic Matter and Fertility	Compaction	Intensity Of Use	Short Term	Long Term
3-Pasture Rest-Rotation (22 allotments)	All allotments under system except pastures listed below	517,828	Increase slightly	Increase slightly	Decrease	8,640 AUM Decrease	Remain static	Decrease .02 to .05
	Yellowstone Pasture of Clayhole allotment	8,631	Remain static	Decrease slightly	Increase slightly	Remain static	Increase slightly 0 to .01	Remain static
	Johnson Run pasture of Button allotment	2,100	Remain static	Decrease slightly	Increase slightly	Remain static	Remain static	Remain static
	Franks and Mountain pastures of Fuller Road allotment	10,030	Remain static	Remain static	Remain static	Remain static	Remain static	Remain static
4-Pasture Rest-Rotation (8 allotments)	All allotments under system except those pastures listed below	255,435	Increase moderately	Increase moderately	Decrease	6,427 AUM decrease	Remain static	Decrease .02 to .05
	Cottonwood and Corral Valley pastures of Two Mile allotment	27,765	Decrease slightly	Decrease slightly	Remain static	Remain static	Increase .01 to .02	Increase in wind erosion .01 to .02
5-Pasture Rest-Rotation (3 allotments)	All	182,863	Increase slowly	Increase	Decrease	1,392 AUM decrease	Remain static	Decrease .02 to .05
6-Pasture Rest-Rotation (1 allotment)	All	34,707	Increase	Increase	Decrease	849 AUM decrease	Decrease .02 to .05	Decrease .02 to .05
3-Pasture Deferred Rotation (16 allotments)	All	279,568	Increase	Increase	Decrease	2,425 AUM decrease	Decrease .02 to .05	Decrease slightly 0 to .02
2-Pasture Deferred Rotation (4 allotments)	All allotments under system except those pastures listed below	45,339	Increase	Increase	Decrease	563 AUM decrease	Remain static	Decrease .02 to .05
	River pasture of Badger Creek allotment	3,417	Increase slightly	Decrease slightly	Increase slightly	Remain static	Remain static	Increase slightly 0 to .01
1-Pasture Rest-Rotation (1 allotment)	All	1,360	Increase	Increase slightly	Decrease	70 AUM decrease	Remain static	Decrease .02 to .05
Less Intensive (11 allotments)	All	38,433	Increase	Increase	Decrease	737 AUM decrease	Decrease .02 to .05	Decrease .02 to .05

A comparable impact can be anticipated from discing or plowing of 5,380 acres of sagebrush on the Fuller Road, Mt. Logan, Pratt Tank, Muggins Flat, Franks Reservoir, and June Tank allotments, where estimated annual sediment yield would amount to 2.7 acre-feet for the short term (2 or 3 years). Long-term impacts would be beneficial as soil-stabilizing ground cover becomes established.

A total of 5,760 acres of big sagebrush is scheduled to be sprayed and seeded to grass in the June Tank and Two Mile allotments. Since this method disturbs little or no soil cover and grass is seeded following the spraying, a beneficial impact and little increase of soil erosion are expected.

Construction

The installation of 173 miles of fence, 82 miles of pipeline, and seven cattleguards would have adverse, localized, and short term impacts. Increases in sediment yield would be insignificant after completion of construction. In addition, the 129 miles of two-track access trails needed for construction and maintenance of the water developments, fences, pipelines, and cattleguards would cause little increase in sediment yield in the area.

Water Facilities

BLM studies in the Arizona Strip indicate that about 4.5 acres would be seriously impacted and up to 35 acres less seriously impacted by trampling and compaction around each of the 90 proposed livestock and wildlife watering facilities. Estimated total soil erosion losses would thus range from 1.2 to 1.5 acre-feet per year, depending upon location, use, and climatic conditions.

The construction projects are scheduled over a period of 8 years on the various allotments, and total sediment yields would vary from year to year. Amounts, however, would be less than 2 or 3 acre-feet per year.

SEDIMENT YIELD

Under the proposed action annual sediment yield in the ES area would be reduced by an estimated 85.4 acre-feet or 10.3 percent, from 829.7 acre-feet to 744.3 acre-feet. Table 3-7 shows the existing and projected sediment yield by allotment. (See appendix 2-6 for methodology.)

The proposed action is estimated to decrease sediment entering the Paria River by 27,287 tons annually, a reduction of 10.5 percent from the present. Similar reductions can be predicted for other areas.

The weighted average annual sediment yield for all allotments would be reduced from 0.38 to 0.34 acre-feet per square mile per year.

TABLE 3-7

SEDIMENT YIELD* BY ALLOTMENT

Allotment	Existing Total Sediment Yield	Proposed Total Sediment Yield	Change From Existing Rate	Allotment	Existing Total Sediment Yield	Proposed Total Sediment Yield	Change From Existing Rate
Antelope	23.8	19.9	- 3.9	Pratt Tank	9.9	9.9	0
Antelope Springs	9.0	7.7	- 1.3	Rider	2.1	1.8	- 0.3
Atkin Well	16.1	13.4	- 2.7	Rock Canyon	1.7	1.4	- 0.3
Badger Creek	2.7	2.5	- 0.2	Rock Canyon Tank	6.0	5.8	- 0.2
Beanhole	11.4	11.4	0	Rock Pocket	10.8	10.1	- 0.7
Buffalo Tank	18.8	16.7	- 2.1	Sage	5.5	5.1	- 0.4
Button	2.6	2.5	- 0.1	Shinarump	2.1	1.8	- 0.3
Cane Beds	7.3	6.6	- 0.7	Shuttleworth	14.2	13.8	- 0.4
Cannan Gap	4.1	3.7	- 0.4	Soap Creek	54.0	44.0	-10.0
Cedar Knoll	9.5	8.7	- 0.8	Spooks Knoll	9.3	8.2	- 1.1
Chatterly	4.3	4.2	- 0.1	Suicide	2.6	2.5	- 0.1
Clayhole	100.4	92.1	- 8.3	Sunshine	3.1	2.8	- 0.3
Cottonwood	2.8	2.2	- 0.6	Temple Trail	19.4	18.1	- 1.3
Cowboy Butte	2.9	2.5	- 0.4	Tuweep	34.1	33.2	- 0.9
Coyote	22.6	20.0	- 2.6	Two Mile	18.3	17.0	- 1.3
Cram	19.9	15.1	- 4.8	Valley Wash	14.4	12.9	- 1.5
Crosby Tank	2.6	2.2	- 0.4	Vermillion	43.6	36.4	- 7.2
Fern Tank	24.3	24.3	0	Wells	2.7	2.6	- 0.1
Ferry Swale	8.5	7.6	- 0.9	White Sage	7.7	7.3	- 0.4
Frank's Reservoir	5.0	4.7	- 0.3	Wild Band	22.9	19.6	- 3.3
Fuller Road	21.2	20.1	- 1.1				
Glazier Dam	7.0	5.9	- 1.1	Less Intensive Management			
Grama Point	9.7	8.2	- 1.5	Cove	0.1	0.1	0
Gunsight	4.0	3.5	- 0.5	Eight Mile Pass	0.1	0.1	0
Hack Canyon	21.6	18.1	- 3.5	Ferrin	1.4	1.3	- 0.1
Home Ranch	13.7	13.7	0	Gramma Springs	1.8	1.5	- 0.3
House Rock	11.7	10.2	- 1.5	Gulch	1.3	1.3	0
Jacob Canyon	2.2	2.1	- 0.1	Harris Well	2.3	2.1	- 0.2
June Tank	42.0	37.6	- 4.4	Kanab Creek	1.7	2.0	+ 0.3
Lamb Tank	7.5	5.5	- 2.0	Kanab Gulch	2.0	1.9	- 0.1
Lee's Ferry	11.0	9.4	- 1.6	Lost Spring Gap	0.8	0.8	0
Moonshine	4.6	4.1	- 0.5	Stateline	1.5	1.3	- 0.2
Mt. Logan	57.8	53.2	- 4.6	Wahweep	4.6	4.4	- 0.2
Muggins Flat	7.1	6.9	- 0.2				
Pigeon Tank	8.0	6.7	- 1.3	TOTALS	829.7	744.3	-85.4

* In acre-feet per year
Change from existing rate -10.3 percent

Data derived from Denver Service Center adaptation of Pacific Southwest Inter-Agency Committee (1968) method of calculating sediment yields.

IMPACTS ON WATER RESOURCES

WATER QUANTITY

The decrease in livestock AUMs under the proposed action would increase ground cover as more vegetation is left by livestock. This increase in ground cover would decrease surface flow by a shielfing, binding, and filtering action, thus increasing water infiltration, particularly in soil associations 3,4,6, and 8 and to a lesser extent in the other areas (amounting to a total of 375,290 acres or 24 percent of the area). Increased infiltration would decrease the amount of water leaving the area. Livestock and wildlife watering facilities would also reduce slightly the amount of water entering streams by storing water that would otherwise leave the area during the higher intensity storms. The proposed action would create an estimated 60 acre-feet of new water storage or 10 surface acres of new water.

WATER QUALITY

The implementation of the proposed action would, overall, improve the water quality of the ES area. The anticipated sediment yield reduction of 85.4 acre-feet per year would decrease the amount of suspended solids proportionately (see table 3-7).

Increases in water infiltration rates, however, would slightly increase the total dissolved solids that eventually leave the region. (Field checks by local BLM personnel indicate that total dissolved are higher in the water from springs than that from surface runoff.) With the exception of the Paria River, data are not available to determine the amount of moved sediment eventually delivered downstream. Pages 2-12 and 3-18 show the present condition and future impacts to the Paria River.

U.S. Geological Survey records (1972-1976) for the Paria River at Lee's Ferry show the average specific conductance for this flow to be 1,114 micromhos/centimeter at 25 degrees C., a moderate level for livestock. The mineral content is largely dissolved sulfate and bicarbonate with significant amounts of sodium, calcium, and magnesium. During periods of high flow, the greater portion of this runoff can be attributable to the Utah portion of the Paria River drainage.

Under the proposed action, sagebrush on the June Tank and Two Mile allotments would be sprayed. The use of herbicides for this land treatment would insignificantly impact water quality in the ES area because of the use restrictions required by BLM and the Environmental Protection Agency (see page 1-21).

IMPACTS ON ANIMALS

To analyze the impacts of the proposed action on animals, the following assumptions were made:

- Overall livestock grazing pressure will decrease by 18 percent over present use.
- Average utilization of key forage plants will not exceed 50 percent in key areas.
- Sufficient forage has been allocated to satisfy demands for a reasonable number of big game animals.
- When additional AUMs of forage are available because of improved range conditions they will be allocated to livestock and big game in the same proportion as the proposal. (See appendix 1-1 for explanation.)
- Each year 27 percent of the total area will be rested from livestock grazing.
- During the spring growing season 63 percent of the total area will be rested.
- During the summer growing season 49 percent of the area will be rested.

On the basis of the above assumptions, the diversity and productivity of habitats are expected to improve. Livestock-wildlife competition would continue to decline as the proposal is implemented and the vegetation improves.

The proposed action is complex and its long-term impacts on the wild animal resource can only be estimated. The degree to which competition would decrease or habitats improve or the response of animals to these changes is not presently known. Table 3-8 summarizes the anticipated impacts of the proposed action on animal habitat and populations. Table 3-9 presents more detailed information on how portions of the proposed action would impact animal habitat.

TABLE 3-8
SUMMARY OF IMPACTS TO ANIMALS

Wildlife Species or Group	Habitat Change	Population Change	Present	Future
Pronghorn Antelope	529,531 acres would improve. 6,430 acres maintained in good condition or 98% of total habitat.	Clayhole Herd House Rock Herd	150 80	400 120
Bighorn Sheep	27,379 acres would improve or 100% of present habitat.		24	24
Mule Deer	735,898 acres would improve or 97% of total habitat.		2,200	4,000
Small Mammals	1,377,350 acres would improve or 98% of total habitat.	Populations are expected to increase.		
Carnivores	1,377,350 acres would improve or 98% of total habitat.	Populations are expected to increase.		
Birds	1,377,350 acres would improve or 98% of total habitat.	Populations are expected to increase.		
Merriam Turkey	14,600 acres would improve or 100% of total habitat.	Population is expected to increase.		
Waterfowl and Shorebirds	18 new reservoirs would be constructed.	Populations will remain at present low level.		
Fish	10 miles of fish habitat would improve or 100% of total habitat.	Population data are not available.		
Reptiles and Amphibians	1,377,350 acres would improve or 98% of total habitat.	Populations are expected to increase (except for 6 species of amphibians whose habitat would remain static).		
Arthropods	1,377,350 acres would improve or 98% of total habitat.	Populations are expected to increase.		
Threatened and Endangered Species	1,377,350 acres would improve or 98% of total habitat.	Population changes are unknown.		
Riparian Habitat	10 miles of perennial stream would improve, 43 miles intermittent stream would decline, 22 springs would decline.	Riparian habitat would decline.		

TABLE 3-9
IMPACTS TO ANIMALS

Action	Habitat Area Affected	Nature and Duration of Impact	Significance	Rationale
	PRONGHORN ANTELOPE			
Grazing Systems				
Rest Rotation	443,440 acres of antelope habitat would improve.	Beneficial Long term	High	Livestock competition would decrease due to forage allocation for antelope. Antelope fawn survival would increase. Desirable antelope forage plants, such as globemallow and Bigelow sage, would increase.
	8,631 acres of antelope habitat would decline in Yellowstone pasture of the Clayhole allotment.	Adverse Long term	Low	Oesirable forage plants would decline in this pasture because of spring grazing each year.
Oeferred Rotation	86,091 acres of habitat would improve.	Beneficial Long term	High	Competition for forage during spring and summer would decrease. Key species would increase.
Less Intensive Grazing Mansgement	Habitat would be maintained in present conditions on 6,430 acres in Harris Well allotment.	Beneficial Long term	Low	Additional forage would be made available to antelope through allocation of AUMs for their use.
Range Improvements				
Water	12 rain catchments 6 reservoirs 4 storage tanks 1 spring development 39 troughs 1 well	Beneficial Long term	Mod.	Additional available water would allow habitat expension (Autenrieth, 1978).
Fences	60 miles	Adverse Long term	Low	Free movement of antelope within habitat would be restricted (Spillett, 1967).
Summary				
	529,531 acres of habitet would improve. 6,430 acres would be maintained in good condition. 8,631 acres would decline. 40 new waters would be developed.	Beneficial Long term	High	98.4% of present antelope habitat would improve or be maintained in good vegetation condition. 844 AUMs have been allocated for antelope, providing sufficient forage for 352 antelope. 403 AUMs additional forage would be allocated to antelope when the population reaches 520. Antelope numbers would increase from 230 to 520. 60 miles of new fence would be designed so as to minimize any restriction of antelope movement. 40 new waters would improve the habitat and facilitate herd expansion.
	OESERT BIGHORN SHEEP			
Grazing Systems				
Rest Rotation	Vegetetion condition would improve on 11,240 acres (41% of habitat).	Beneficial Long term	High	Key plant species would increase.
Less Intensive Grazing	Grass would improve, end shrubs and forbs would remain atatic on 16,139 acres (59% of habitat).	Beneficial Long term	Mod.	Liveatock grazing would occur in winter and early spring, fevoring warm-season grasses, which are desirable for bighorns.
Livestock Grazing	Grazing will continue on 27,379 ecres on Gramma Springs, Gulch, Kanab Gulch, Kanab Greek, and Lamb Tank allotments.	Long term	High	Even though livestock use would declina and habitat improvement is expected, bighorn populations are unlikely to increase or return to their historic range in Gramma Springs, Lamb Tank, and Kanab Creek allotments (Webb, 1978). The presence of livestock in these narrow canyon habitats would continue to adversely affect bighorns.
	DESERT BIGHORN SHEEP (cont.)			
Summary				
	Vegetation in the habitat would remain the same or improve slightly. Livestock use would continue on all allotments.	Unknown Long term	Unknown	The present level of livestock use would decrease, and vegetation conditions should improve. Whether sheep would be significantly benefitted is not known because of their behavior characteristics. 128 AUMs would be allocated to bighorn sheep, a sufficient forage for the 24 sheep that use the area.
	MULE OEER			
Grazing Systems				
Rest Rotation	546,369 acres would improve.	Beneficial Long term	High	Competition would decrease; vegetation would improve in all summer range and in 95% of the winter range. (Mc. Trumbull HMP)
	7,767 acres would decline on Fuller Road allotment. 4,332 acres would decline on Two Mile allotment. 6,357 acres would remain static on Shuttleworth allotment. 18,456 total acres (all winter range)	Adverse Long term	Low	Habitat would decline because grazing systems are not providing for the needs of key deer plants.
Deferred Rotation	189,529 acres would improve.	Beneficial Long term	High	Vegetation would improve. Competition would decrease.
Less Intensive Grazing	4,565 acres would be maintained in present condition.	Beneficial Long term	Low	Forage has been allocated to meet wildlife needs. Present range condition would be maintained.
	580 acres in Stateline allotment would remain in fair condition.	Adverse Long term	Low	
Range Improvements				
Water	12 rain catchments 12 reservoirs 4 storage tanks 2 spring developments 58 troughs 4 wells	Beneficial Long term	Mod.	Deer habitats would improve and their range would expand.
Fences	112 miles	Adverse Long term	Low	Fences restrict free movement and pose hazards to deer.
Land Treatment Seeding	19,690 acres would improve. 12,930 acres would improve.	Beneficial Long term	High	Habitat diversity would increase. Forage plants would increase.
Summary				
	735,898 acres of habitet would improve. 12,930 acres would be reseeded. More water would be available for deer.	Beneficial Long term Areawide	High	Habitat conditions would improve. Competition with livestock would decrease (Mackie, 1976). Water supplies would increase, allowing more use of suitable habitat areas. Oeer numbers would increase from 2,200 to 4,000. 97.0% of habitat would improve. 0.6% of habitat would remain static. 2.4% of habitat would decline. 10.973 AUMs have been allocated to mule deer, an amount sufficient for 3,658 head. 1,027 AUMs additional forage would be allocated to deer when the populetion reaches 4,000.

TABLE 3-9 (cont.)

Action	Habitat Area Affected	Nature and Duration of Impact	Significance	Rationale
		SMALL MAMMALS		
Grazing Systems				
Rest Rotation	1,013,632 acres of habitat would improve.	Adverse Long term	High	Condition, vigor, diversity and production of plant communities would improve, resulting in more food and cover for small mammals (Pimlott, 1969).
	17,087 acres of habitat would decline or be maintained in an unsatisfactoty condition.	Adverse Long term	Low	Productivity of these areas might decline or be maintained at an unsatisfactory level.
Deferred Rotation	324,865 acres of habitat would improve.	Beneficial Long term	High	Condition, vigor, and productivity of plant communities would improve.
	2,459 acres of habitat would decline in the River pastura of the Badger Creek allotment.	Adverse Long term	Low	Productivity of this area would decline because proposed livestock use would not provide adequately for plant needs.
Less Intensive Grazing	37,853 acres of habitat would improve or be maintained in a satisfactory condition.	Beneficial Long term	Low	Productivity of these areas might increase slightly.
	580 acres will be maintained in unsatisfactory conditinn in the Stateline allotment.	Adverse Long term	Low	Area would not be allowed to improve over present condition.
Range Improvements				
Water	25 rain catchments 18 reservoirs 3 spring developments 97 troughs 5 wells	Beneficial Long term	Mod.	New water sources would benefit bats, shrews, rabbits, and porcupines. Water would be made available to all species at ground level.
Livestock Use Around New Waters	405 acres would be denuded, 2,745 acres would be adversely affected.	Adverse Long term	Low	405 acres of habitat would be destroyed, and 2,745 acres adversely impacted by livestock concentrations around water.
Vegetation Manipulation	8,550 acres would be chained. 5,760 acres would be sprayed.	Adverse Short term	Low	Small-mammal habitat would be temporarily destroyed and mammals killed or displaced by treatment practices.
	5,380 acres would be plowed. 12,930 acres would be seeded.	Beneficial Long term	Mod.	Small-mammal habitat would be improved in the long term as forage and cover plants improve. Small-mammal populations would greatly increase up to 600% in the treated areas (Mt. Trumbull RMP).
Summary				
	1,377,350 acres would be improved. 90 new waters would be created for wildlife.	Beneficial Long term	High	Habitat for small mammals would improve as the plant communities improve in production. Small-mammal populations are expected to increase in the diversity of species present.
		CARNIVORES (MAMMALS AND BIRDS OF PREY)		
Grazing Systems				
Rest Rotation	1,013,632 acres of habitat would improve.	Beneficial Long term	High	Habitat for carnivores and their prey species would improve as forage and cover plants increase.
	27,087 acres of habitat would decline or be maintained in an unsatisfactory condition.	Adverse Long term	Low	Productivity of these habitats would decline, resulting in fewer prey species.

Action	Habitat Area Affected	Nature and Duration of Impact	Significance	Rationale
	CARNIVORES (MAMMALS AND BIRDS OF PREY) (cont.)			
Deferred Rotation	325,865 acres of habitat would improve.	Beneficial Long term	High	Habitat for carnivores and their prey species would improve as forage and cover plants increase.
	2,459 acres of habitat would decline.	Adverse Long term	Low	Desirable food and cover plants would decline and might result in fewer prey species.
Less Intensive Grazing	37,853 acres would improve or be maintained in a satisfactory condition.	Beneficial Long term	Low	Changing seasons of use and reducing livestock use would allow these areas to improve. Prey species might increase slightly.
	580 acres would be maintained in an unsatisfactory condition in the Stateline allotment.	Adverse Long term	Low	Planned grazing use would maintain this area in its present fair condition.
Range Improvements				
Water	25 rain catchments 18 reservoirs 3 spring developments 97 troughs 5 wells	Beneficial Long term	Low	More dependable water would be available for the use of carnivores and their prey species.
Vegetation Manipulation	8,550 acres chained 5,760 acres sprayed 5,380 acres plowed 12,930 acres seeded	Beneficial Long term	Mod.	Prey species, especially the small mammals, would increase in treatment areas (Mt. Trumbull Habitat Management Plan).
Summary				
	1,377,350 acres would improve.	Beneficial Long term	High	Prey species would increase. Carnivores should also increase as the overall productivity of the habitat improves. The diversity of pray species would increase.
		BIRDS		
Grazing Systems				
Rest Rotation	1,013,632 acres of habitat would improve.	Beneficial Long term	High	Seed and insect food sources and cover for birds would improve. Ground nesting birds would be especially helped by the rested pasture. The quality of bird habitat would decline as forage plants decline.
	27,087 acres of habitat would decline or be maintained in an unsatisfactory condition.	Adverse Long term	Low	
Deferred Rotation	325,865 acres of habitat would improve.	Beneficial Long term	High	Food and cover would improve for birds.
	2,459 acres of habitat would decline.	Adverse Long term	Low	
Less Intensive Grazing	37,853 acres would improve or remain in a satisfactory condition.	Beneficial Long term	Low	Present habitat condition would be maintained or improve slightly.
	580 acres would be maintained in unsatisfactory condition in the Stateline allotment.	Adverse Long term	Low	Potential improvement in bird habitat would not be realized.
Range Improvements				
Water	25 rain catchments 18 reservoirs 3 spring developments 97 troughs 5 wells	Beneficial Long term	High	The new water sources would benefit birds requiring water. Water would be made available at ground level so as to benefit all species. Sacrifice areas would develop around new water sources because of livestock trampling. Ground and shrub nesting birds would be adversely impacted on 3,150 acres of habitat around the new water sources.

TABLE 3-9 (cont.)

Action	Habitat Area Affected	Nature and Duration of Impact	Significance	Rationale
		BIRDS (cont.)		
Vegetation Manipulation	8,550 acres chained 5,760 acres sprayed 5,380 acres plowed	Adverse Short term	Low	Land treatment would temporarily destroy bird habitat.
	12,930 acres seeded	Beneficial Long term	Low	The increased diversity of plant types and cover would benefit birds that prefer brushy or "edge" type habitats, such as chipping sparrows and Gambel's quail (Riffey, 1977). Land treatment projects would be designed to benefit birds.
Fences	173 miles of new fence	Beneficial Long term	Low	New perching sites would benefit such species as shrikes and kingbirds.
Summary				
	90 new waters would be developed. 1,377,350 acres would improve.	Beneficial Long term	High	Anticipated habitat changes would favor an increase in the density of birds and in the diversity of bird species. Species which require water or perching sites might extend their range. Gambel's quail and chukar populations are expected to increase in response to improved habitat.
		MERRIAM TURKEY		
Grazing Systems				
Rest Rotation	Habitat would improve on 14,600 acres of turkey range in the Tuwaap and Mt. Logan allotments.	Beneficial Areawide Long term	High	Grazing systems are keyed to needs of turkey. No grazing would be allowed in turkey nesting habitat until the completion of nesting. Seed and insect food supplies would increase.
Range Improvements				
Reseeding	900 acres of habitat would be reseeded.	Beneficial Long term	High	Quantity and quality of forage would increase. Cover conditions would improve.
Summary				
	Overall habitat would improve on 14,600 acres.	Beneficial Long term	High	Secondary objectives of AMPs are to improve turkey habitat. Turkey poult survival would increase, resulting in a higher population.
		WATERFOWL AND SHOREBIRDS		
Grazing Systems				
	The present limited waterfowl habitat would be maintained in a poor condition or improve only slightly.	Adverse Long term	Low	Livestock would continue to use all shoreline areas, and waterfowl habitat condition would remain in its present poor condition.
Range Improvements				
Water	18 reservoirs would be built.	Beneficial Long term	Low	These 18 reservoirs would create additional waterfowl and shorebird habitat.
Summary				
	Additional habitat would be created, but reservoirs would continue to provide little more than resting places for migrating birds.	Adverse Long term	Low	Additional habitat would be developed, but potential improvement in habitat would not be reached.

Action	Habitat Area Affected	Nature and Duration of Impact	Significance	Rationale
		FISH		
Grazing System				
2-Pasture Deferred Rotation	10 miles of aquatic habitat would improve.	Beneficial Long term	High	Livestock grazing along the Paria River would be restricted.
Range Improvement				
Fence 5 miles	10 miles of aquatic habitat would improve.	Beneficial Long term	High	Fencing would restrict livestock access to Paria River.
Summary				
	Existing fish habitat would improve.	Beneficial Long term	High	Secondary objectives of the Lee's Ferry AMP are to improve aquatic habitat.
		REPTILES AND AMPHIBIANS		
Grazing Systems				
Rest Rotation	1,013,632 acres of habitat would improve.	Beneficial Long term	Mod.	Improved condition of the habitat would benefit the reptiles and amphibians. Prey species would increase as cover improves (Busack and Bury, 1974).
	27,087 acres of habitat would decline or be maintained in an unsatisfactory condition.	Adverse Long term	Low	Habitat would deteriorate as the vegetation deteriorates. Areas in poor or fair condition would not change significantly.
Livestock Use Around New Waters	405 acres of habitat would be sacrificed, and 2,745 acres would be adversely affected.	Adverse Long term	Low	Livestock trampling around the new water sources would adversely affect habitat.
Deferred Rotation	325,865 acres of habitat would improve.	Beneficial Long term	Mod.	Reptiles and amphibians would benefit from improved vegetation conditions.
	2,459 acres of habitat would decline.	Adverse Long term	Low	Reptile and amphibian habitat would decline along with vegetation.
Less Intensive Grazing	37,853 acres would improve or be maintained in good conditon.	Beneficial Long term	Low	Habitat would improve only slightly. Populations would change little from present.
	580 acres would be maintained in unsatisfactory condition in the Stateline allotment.	Adverse Long term	Low	No improvement expected.
Range Improvements				
Water	18 reservoirs	Beneficial Long term	Mod.	The 18 reservoirs would increase potential habitat for amphibians.
	3 spring developments	Adverse Long term	Low	Spring developments might harm amphibian habitat. Reptiles and amphibians would decrease in sacrifice areas because of lack of cover.
Vegetation Manipulation	8,550 acres chained 5,380 acres plowed 5,760 acres sprayed 12,930 acres seeded	Adverse Short term	Mod.	Reptiles and amphibians would be displaced or killed during chaining and plowing.
		Beneficial Long term	Mod.	In the long term, reptile and amphibian habitat would improve as ground cover and plant diversity increase. Insect population would increase, resulting in a better food source.

TABLE 3-9 (cont.)

Action	Habitet Area Affected	Nature end Duration of Impact	Significence	Rationale
	REPTILES AND AMPHIBIANS (cont.)			
Summary				
	1,377,350 ecres would be improved. 18 raservoirs would be evaileble for wildlife.	Beneficial Long term	Mod.	Reptile and amphibien populations would increase because of improved habitat. Insect populations would increase the prey bese as a result of improved productivity of plant communities.
	ARTHROPODS			
Grazing Systems				
Rest Rotetion	1,013,632 acras of habitet would improve.	Beneficial Long term	Mod.	Habitat diversity and productivity would increase. Livestock use would decrease, resulting in a grester food supply being available for arthropods.
	27,087 ecres of habitat would decline or be maintained in unsatisfactory condition.	Unknown	Low	Grazing systems would not provide sdequately for plant needs in these areas.
Deferred Rotation	325,865 acres of habitat would improve.	Beneficial Long term	Mod.	Habitat diversity and productivity would increase as plant communities improve in vegetation condition.
	2,459 acres of habitet would decline.	Unknowo	Low	
Less Intensive Grezing	37,853 acres would improve or be maintained in satisfactory condition.	Beneficial Long term	Low	Habitat might improve slightly as the degree of livestock use decreases.
	580 acres would be maintained in unsatisfactory condition in the Stateline allotment.	Unknown	Low	
Range Improvements				
Water	25 rain catchments 18 reservoirs 3 spring developments 97 trougha 5 wells	Beneficial Long term	Low	Habitat diversity would increase as more water is available.
Vegetation Manipulation	8,550 acres chained 5,760 acres sprayed 5,380 acres plowed	Adverse Short term	Low	Habitat would be temporarily destroyed.
	12,930 acres seaded	Beneficial Long term	Mod.	Habitat diversity and productivity would increase as seeded plants are established. More types of forage and cover would result.
Summary				
	1,377,350 acres would improve. 90 new waters would be aveil-able for wildlife.	Beneficial Long term	Mod.	Arthropod populations would maintsin more stability, and species diversity would increase. Livestock use would decline, resulting in more plant material being available for exploitation by various arthropods (Lavigne and others, 1972).

Action	Habitet Area Affected	Nature end Duretion of Impact	Significance	Rationale
	THREATENED AND ENDANGERED SPECIES			
Grezing Systems				
Rest Rotation	1,013,632 acres of habitat would improve.	Beneficial Long term	Low	Habitat of threatened and endangered species would improve. Riparian habitet would improve slong the Psria River for the black hawk and peregrine felcon.
	27,087 acres of habitat would decline or be maintained in an unsatisfactory condition.	Unknown	Low	
Deferred Rotation	325,865 acres of habitat would improve.	Beneficial Long term	Low	Habitat of threatened and endangered species would improve as plant communities become more productive.
	2,459 acrea of hebitat would decline.	Unknown	Low	
Less Intensive Grazing	37,853 acres would improve or be maintained in satisfactory condition. 580 ecres would be maintained in unsatisfactory condition in the Stateline allotment.	Beneficial Long term	Low	Habitat of threatened and endangered species would be maintained in present condition or improve slightly.
Range Improvements				
Water	25 rain catchments 18 reservoirs 3 spring developments 97 troughs 5 wells	Beneficial Long term	Mod.	Habitat diversity would increase. Additional habitat for snowy egrets and black-crowned night herons would be created.
Vegetation Manipulation	8,550 acres chained 5,760 acres spreyed 5,380 acres plowed 12,930 scres seeded	Beneficial Long term	Low	Habitat diversity snd productivity would increase.
Summary				
	1,377,350 acres would improve. 90 new waters would be avail-able for wildlife.	Beneficial Long term	Low	Habitat conditions for threatened and endangered species would improve. The impact to these species would be low be-cause of the very limited habitat or potential habitat for these species. The occurrence of threatened and endangered species within the ES srea is rare.
	RIPARIAN HABITAT			
Grazing Systems				
	43 miles of riparian habitat might continue to decline, but 10 miles would improve as live-stock use is restrictad in Paria Canyon.	Adverse Long term Beneficial Long Term	Mod. Mod.	Grazing systems do not provide adequately for riparian habitat. Rest periods are insufficient for reproduction of trees such as cottonwoods.
Range Improvements				
Spring Developments	The 3 springs planned for development might decreasa the water evailable to riparian vegetetion around the springs.	Adverse Long term	Low	In some cases all available water is gathered and piped away from spring develop-ments, destroying riparian vegetation dependent on the springs.
Summary				
	43 milea of riparian habitet and vegetation sround 22 springs might continue to decline. 10 miles of habitat along the Paria River would improve.	Adverse Long term	Mod.	Proposed grazing systems might not provide enough protection for riparian areas, most of which are slready in poor condition.

PRONGHORN ANTELOPE

As range conditions improve under the proposed action, livestock-antelope competition would decline (Yoakum, 1975). The proposal would generally benefit antelope, which are expected to increase from 150 to 400 head within 15 years and spread into all available habitat in the Clayhole area. The Houserock Valley antelope herd is expected to expand from 80 to 120 head as range conditions improve. This expansion would provide greater opportunities for observation or hunting. Moreover, pronghorn antelope would have been restored to another portion of their historic range, a condition of ecological significance.

DESERT BIGHORN SHEEP

Rest-rotation grazing management would be applied to 41 percent of the present sheep habitat and is expected to improve habitat condition. The remaining 59 percent of the habitat would be managed less intensively, and improvement is also expected. Grazing would occur yearly during winter and early spring, periods favoring warm-season plants.

Even though livestock use would decline and habitats improve, bighorn sheep populations are unlikely to increase or return to their historic range in the Gramma Springs, Lamb Tank, and Kanab Creek allotments (Webb, 1978). The presence of livestock in these narrow canyon habitats would continue to adversely impact the sheep.

The 24 bighorn sheep are presently using only the lowest, most inaccessible portions of Kanab Creek. Under the proposed action this situation is expected to continue. The herd size and present area of use are expected to remain static.

MULE DEER

The proposed action would highly benefit mule deer habitat. More forage would be available for mule deer in the summer ranges, increasing fawn production and survival. The quality of the winter range would also improve. The net result would be an increase in the size of the deer herd and its production of surplus animals available for harvesting.

SMALL MAMMALS

The proposal would benefit small-mammal populations as food supplies increase and cover conditions improve. Some species that prefer lower successional plant communities created by present livestock use may decrease in number. Species preferring open areas may be replaced by those preferring cover.

Small-mammal populations are expected to increase in density of individuals and diversity of species represented in most habitats. This increase would enrich the prey base for some predators.

CARNIVORES (MAMMALS AND BIRDS)

Carnivores in the ES area would benefit from an increase in prey or food supply and are expected to increase in numbers. This increase would provide more carnivores for recreation use and harvest. The value of the annual fur harvest would increase, and birds of prey would also increase in response to improved food supplies.

BIRDS

The overall bird population of the ES area is expected to increase as a result of the proposed action. Food, cover, and water would be enhanced in most habitat areas.

Quail habitat would improve with increases in water, food, and cover, and the quail population is expected to moderately increase.

MERRIAM TURKEY

The proposed grazing systems, designed to meet turkey needs, would improve the 14,600 acres of existing turkey habitat in the ES area (see table 3-9). Grazing, for example, would be deferred each year until nesting is over. The systems would increase the forage productivity of the area, which would increase available insects critical for turkey poult diets. Grass seed production would also be increased, adding to the food supply.

The reseeding projects would provide additional food and cover for turkey use. Plants that are important turkey foods would be included in the seeding mixture. Turkey numbers are expected to increase as a result of the proposed action, providing more opportunities to hunt or view this bird.

WATERFOWL AND SHOREBIRDS

The proposed action would not improve the shoreline vegetation around existing reservoirs and other water impoundments (see table 3-9). Livestock would still have access to all shorelines, thereby minimizing any opportunities for improvement. The new water developments, however, would add 18 new resting and feeding areas for migratory birds.

The proposed action would adversely impact waterfowl and shorebirds because the potential improvement in habitat around reservoirs would not occur.

FISH

The proposal would benefit the aquatic habitat of the Paria River (see table 3-9). Restricting livestock use of the river bottom would increase riparian vegetation. Not enough data are available, however, concerning the needs of the fishes of the Paria River to predict any population changes.

REPTILES AND AMPHIBIANS

The overall long-term impact of the proposed grazing systems would benefit reptile and amphibian populations. Maintaining livestock utilization between 40 and 60 percent should improve plant species diversity and density, which, in turn, would increase the relative prey abundance for snakes, lizards, and toads.

The periodic rest of selected pastures should improve existing protective cover and promote additional cover for prey species such as perching birds, small mammals, and insects.

ARTHROPODS

The proposal would increase both total numbers and diversity of arthropod species. This increase, in turn, would enrich the food chain for birds, mammals, reptiles, and amphibians.

THREATENED AND ENDANGERED SPECIES

The proposed action is expected to improve habitat conditions for threatened and endangered species. Increases in plant production would provide better protective cover and food supplies for such species. Peregrine falcons and black hawks could benefit from higher prey densities of cottontail rabbits, song birds, game birds, small mammals, and reptiles, however this is not presently known.

RIPARIAN HABITAT

The deterioration of existing riparian habitat might continue under the proposed action except in the 10 miles of habitat along the Paria River, which would be restricted from livestock use (see table 3-9). Riparian areas are so small that, despite a reduction in grazing pressure, livestock would still concentrate around them.

Grazing systems would not provide enough rest to allow reproduction of cottonwood and willow trees.

The spring developments may adversely impact riparian habitat if all the water is gathered up and exported from present spring areas and none is left available for wildlife at the spring source.

IMPACTS ON CULTURAL RESOURCES

In analyzing the probable impact of the proposed improvements on the cultural resource data base, the BLM district archaeologist considered type of proposal, the nature and degree of primary and secondary impacts, the known or predicted site density in the area, and available mitigation measures.

The primary direct impact of grazing on cultural resources is the damage to fragile artifacts through trampling. Trampling would damage lithics, ceramics, and surface structures and destroy stratification by mixing the layers in the medium-to-coarse soils.

Table 3-10 summarizes the type and intensity of damage to 174 sites discovered by a BLM-conducted archaeological sampling survey of 20,000 acres randomly selected within the portion of the ES area west of Kanab Creek.

TABLE 3-10
DAMAGE TO CULTURAL RESOURCE SITES

Source of Damage	Number of Sites	Percentage of Total
Cattle Trampling	22	13
Cattle and Erosion	29	17
Natural Erosion	68	39
Vandalism	10	6
Other	4	2
No Damage	51	29

Although many variables are involved, the intensity of damage caused solely by cattle is assumed to be directly proportional to the number of AUMs per pasture. Thus, an 18 percent reduction in livestock use would cause a corresponding reduction in artifact damage. In the long term, damage could increase somewhat because of the estimated increases in production and the resulting increases in livestock use.

The required clearances outlined in chapter 1 would mitigate most range improvement conflicts before they occur. In the majority of proposed improvements, movement or realignment would be the proper mitigation.

The proposed land treatment is the only action that would significantly impact cultural resources. Three techniques of land treatment are proposed: chaining, plowing, and spraying. In some cases seeding using a range drill is also proposed.

Pinyon-juniper chaining would have a moderately adverse impact on unlocated structural sites and a high adverse impact on fragile surface sites. Heavy equipment and the dragging chain would considerably damage the soil surface and subsurface, mixing soil and breaking artifacts. Plowing sagebrush would have essentially the same impacts as chaining. The effect of chemical sprays on lithics and ceramics is unknown, but defoliation would have a highly adverse impact, exposing sites to more erosion and vandalism.

Table 3-11 identifies allotments on which proposed land treatment would adversely impact cultural resources. Most of the acreages involved are not known. An unsurveyed area has no known archaeological sites within 5 miles. Predictions are extrapolated from ecological variables, and site densities known to exist in similar ecotones at the same elevations as revealed by a BLM sampling survey completed in 1977. A site potentially eligible for the National Register of Historic Places may be unique in contributing to our historical knowledge of a specific time period, or collectively, (aggregate) sites may add to our knowledge about the adaptive strategies or demographic distribution of prehistoric peoples in the ES area. In this regard, academic or scientific institutions have conducted no intensive historical or scientific investigations within the ES area.

IMPACTS ON VISUAL RESOURCES

The proposed grazing systems and range developments would impact the visual resource of the Vermillion ES area, to an extent depending on the VRM class for the area in which the project or grazing system is proposed. Design restrictions should allow any project proposed in a VRM class IV area to meet long-term VRM objectives.

Proposed actions that would impact the visual resource in VRM classes I, II, or III are listed in table 3-12, along with their anticipated short- and long-term impacts. Table 3-13 summarizes the acreages visually impacted in each of these VRM classes.

GRAZING SYSTEMS

The implementation of proposed grazing systems would create an initial moderate contrast of texture between grazed and rested pastures. As range condition improves, visual quality of the scenery would generally improve, upgrading slightly to moderately the scenic quality in all VRM classes. In the long term grazing systems would benefit visual resources.

TABLE 3-11
ADVERSE IMPACTS OF LAND TREATMENT ON CULTURAL RESOURCES

Allotment Name	Allotment No.	Type of Project	Acres Impacted	Survey Status	Site Density Predicted Or Known 1/	Type of Site 2/	Eligible For National Register of Historic Places	Potential Adverse Impact
Fuller Road	52	Pinyon-juniper chaining	3,350	None	Predicted 1-3	Structural	Potentially	M
		Sagebrush plowing	2,000		Predicted 1-5	Fragile surface		H
Mt. Logan	8	Sagebrush plowing	1,120	None	Predicted 1-5 Known 2	Fragile surface Structural	3/ 4/	H
June Tank	27	Pinyon-juniper chaining	1,500	None	Predicted 1-3	Structural	Potentially	M
		Sagebrush plowing	2,500		Predicted 1-5	Fragile surface		H
		Sagebrush spraying	900		Predicted 1-5	Fragile surface		H
Pratt Tank	45	Sagebrush plowing	500	None	Predicted 1-5	Fragile surface	4/	H
Tuweep	10	Pinyon-juniper chaining	1,940	Partial	Known 1-5	Structural	Mt. Trumbull Archaeological	M
		Sagebrush plowing	960		Known 1-5	Fragile surface	District	H
Shuttleworth	44	Pinyon-juniper chaining	800	None	Predicted 1-3 Predicted 1-5	Structural Fragile surface	Potentially	M H
Muggins Flat	51	Sagebrush plowing	1,600	None	Predicted 1-3	Fragile surface	Potentially	H
Frank's Reservoir	53	Sagebrush plowing	160	None	Predicted 1-3	Fragile surface	Potentially	H

1/ Per square mile
2/ Structural sites include storage cists, firepits, roasting pits, pit houses, and pueblos. Fragile surface sites include lithic scatters, occasional finds of projectile points, and lithic/ceramic and pure ceramic scatters.
3/ Area to be included within redefined Mt. Trumbull Archaeological District.
4/ Has eligibility for National Register of Historic Places under National Park Service's concept of "Aggregate."
L = Low; M = Moderate; H = High

TABLE 3-12
IMPACTS OF RANGE IMPROVEMENTS ON VISUAL RESOURCES

Allotment	VRM I	VRM II	VRM III	Impact	Comments
Beanhole			1 Reservoir	-M	
Crosby Tank			6 Reservoirs	-M	
Hack Canyon			1 Catchment	-M	
Lee's Ferry	5 mi. Fence			-M	Developments would increase visual quality of Paria backpacking experience by eliminating cattle along trail.
Mt. Logan		1 Catchment		-H	High quality scenery next to Grand Canyon National Park.
		1,120 ac. Land treat.		-M	
		1,120 ac. Seeding		+M	
			1 Catchment	-M	
Muggins Flat			1,600 ac. Land treat.	-M	Land treatment would be visible from Alternate U.S. 89.
			1,600 ac. Seeding	+M	
Pratt Tank			500 ac. Seeding	+M	
Sage			1 Catchment	-M	
Shuttleworth			800 ac. Seeding	+M	On Grand Canyon Game Preserve.
Soap Creek	3.5 mi. Pipeline			-M	Partially in Vermillion Cliffs Natural Area.
Tuweep			2,500 ac. Land treat.	-M	Along major travel route to Tuweep overlook of Grand Canyon.
			960 ac. Seeding	+M	

M = Moderate, H = High, (+) = Beneficial, (-) = Adverse

TABLE 3-13
ACREAGE VISUALLY IMPACTED BY RANGE IMPROVEMENTS

VRM CLASS I:

5.0 mi. Fence (.5 acre/mile)	2.6 acres
3.5 mi. Pipeline (1 acre/mile)	3.5
	6.1 acres

VRM CLASS II:

1 Catchment (20 acres/each)	20.0
1,120 acres Land treatment	1,120.0
1,120 acres Seeding	
	1,140.0

VRM CLASS III:

3 Catchments (20 acres/each)	60.0
7 Reservoirs (20 acres/each)	140.0
4,100 acres Land treatment	4,100.0
3,860 acres Seeding	
	4,300.0 acres

TOTAL 5,446.1 acres

WATER DEVELOPMENTS

The creation of new waters--catchments, reservoirs, and troughs--would significantly impact visual resources in the long term. The short-term impacts of troughs would be slight, but the land disturbance of catchment and reservoir construction would be highly adverse, altering the form, color, and texture of the landscape. Such construction would impact 11 acres in VRM classes II and III. Reestablishment of vegetation would allow reservoirs to meet long-term VRM class II objectives, but the catchment proposed for the Mt. Logan allotment would not. Additionally, cattle use around waters would visually impact an area of approximately 20 acres. Such use would represent a moderately adverse long-term impact, affecting 20 acres in VRM class II and 200 acres in VRM class III.

The development of springs would create a highly adverse short-term impact by altering the form, color, and texture of the spring area. Again, reestablishment of vegetation would reduce this impact to a slightly adverse long-term impact that would meet VRM class II objectives. Fence construction and the pipeline associated with two spring developments in VRM class I areas, the Lee's Ferry and Soap Creek allotments, however, would be inconsistent with the VRM criteria that provide for only natural ecological changes in these class I areas. Moreover, MFP recommendations to protect the Vermillion Cliffs and the Paria Canyon Primitive Area from future development would preclude pipeline construction in the Soap Creek allotment and fence construction in the Lee's Ferry allotment.

RANGE FACILITIES

Only the fence proposed for the Lee's Ferry allotment (VRM class I) would not meet VRM objectives. The fence would not be easily seen, however, and would increase the quality of backpacking in Paria Canyon by eliminating cattle along the trail.

VEGETATION MANIPULATION

A highly adverse short-term impact would result from the chaining, spraying, and discing/plowing proposed for 1,120 acres in VRM class II and 5,400 acres in VRM class III. Table 3-12 identifies the locations of these actions. Altering the form, color, and texture of the landscape and increasing the contrast along the line between treated and untreated areas would significantly disturb visual qualities. The visual contrast would decrease over time as vegetation reestablishes, especially in seeded areas. The long-term impact would therefore be low to moderately adverse and would meet objectives for VRM class II.

IMPACTS ON LAND USE

LIVESTOCK GRAZING

Impacts of the proposed action on livestock grazing have been analyzed, but only those impacts deemed significant are discussed. The proposed action would not significantly change the current land use patterns of livestock grazing. The use of Federal lands in the ES area for livestock grazing would essentially remain the same, but the intensity of grazing on the lands would decrease initially from the present 5-year average. Over the long term, however, livestock grazing intensity would increase from the present 5-year average.

Adjustments in Livestock AUMs

As proposed by the AMPs, livestock use in AUMs would be adjusted to the initial stocking rate. This adjustment from the past 5-year average would involve an increase of 1,821 AUMs on 11 allotments, an initial decrease of 21,095 AUMs on 44 allotments, and an overall decrease of 18,464 livestock AUMs. Table 3-14 shows these initial adjustments by allotment, and table 3-15 summarizes these initial adjustments. The initial reductions would have short-term impacts, and the net loss or gain of AUMs after 15 years would be considered long-term impacts.

Over the short term, stocking rates that allow overgrazing of the range can produce greater livestock gains and more income to the ranchers. Over the long term, however, heavy stocking rates decrease the ability of the range to produce and sustain grazing. Fifteen years after implementation of the proposed action forage on 31 allotments would increase by 17,689 AUMs over the present 5-year average licensed use, and forage on 24 allotments would remain under the present 5-year average licensed use by 5,662 AUMs (see table 3-15).

In the implementation of less intensive management, initially 10 allotments would be reduced by 899 AUMs, and licensed AUMs on 1 allotment would increase by 162 AUMs from the 5-year average. No increases in livestock numbers at a later date are expected under less intensive management.

In areas proposed for intensive management, licensed AUMs would initially be reduced by 17 percent from the past 5-year average. Fifteen years after the AMPs are implemented, however, an AUM increase is expected to amount to 12 percent above the past 5-year average. On allotments proposed for less intensive management, AUMs would be reduced by 31.6 percent. Table 3-15 summarizes the AUM adjustments under the proposed action.

TABLE 3-14

LIVESTOCK IMPACTS (Federal Land Only)

Allotment Name	No.	Average 5-Year License (AUMs)	Initial Livestock Stocking Rate (AUMs)	Adjusted (AUMs)	Percent Change	Changed Season Of Use	Estimated Increased AUMs Livestock (15 Years)	Annual Net Loss Or Gain From 5-Year Average After 15 Years	Estimated Livestock Stocking Rate After 15 Years
Antelope	3	3,356	2,188	-1,168	35	No	1,807	+ 639	3,995
Antelope Spring	2	1,114	787	- 327	29	No	605	+ 278	1,392
Atkin Well	11	2,378	2,291	- 87	4	YL	312	+ 225	2,603
Badger Creek	63	111	96	- 15	14	No	1	- 14	97
Beanhole	59	971	1,325	- 354	27	No	660	+1,014	1,985
Buffalo Tank*	58	2,894	2,086	- 808	28	No	1,390	+ 582	3,476
Button	47	297	260	- 37	12	No	98	+ 61	358
Cane Beds	19	611	610	- 1	0	No	470	+ 469	1,080
Cannan Gap	16	328	202	- 126	38	YL	189	+ 63	391
Cedar Knoll*	40	912	774	- 138	15	No	276	+ 138	1,050
Chatterly	46	457	327	- 130	28	No	104	- 26	431
Clayhole*	6	15,764	13,020	-2,744	17	No	6,679	+3,930	19,699
Cottonwood	12	310	218	- 92	30	No	122	+ 30	340
Cowboy Butte*	36	86	227	+ 141	38	No	80	+ 145	307
Coyote	54	2,834	1,566	-1,268	45	YL	614	- 654	2,180
Cram	60	2,837	1,727	-1,110	39	No	836	- 274	2,563
Crosby Tank	9	359	173	- 186	52	4/1-11/30	73	- 113	246
Fern Tank*	7	4,988	5,114	+ 126	2	No	111	- 171	5,225
Ferry Swale	65	1,124	1,225	+ 101	8	10/15-5/31	601	+ 702	1,826
Frank's Reservoir	53	426	182	- 244	57	No	42	- 202	224
Fuller Road*	52	1,281	1,243	- 38	3	No	1,298	+1,260	2,541
Glazier Dam	13	600	516	- 84	14	No	530	+ 446	1,046
Grama Point	30	2,085	2,059	- 26	1	No	235	+ 209	2,294
Gunsight	41	561	421	- 140	25	10/15-4/30	86	- 54	507
Hack Canyon	23	3,602	2,753	- 849	24	YL	676	- 173	3,429
Home Ranch	62	4,926	3,643	-1,283	26	No	659	- 624	4,302
House Rock*	57	1,581	1,722	+ 141	8	No	613	+ 639	2,335
Jacob Canyon	38	108	140	+ 32	23	1/1-4/30	59	+ 91	199
June Tank*	27	7,824	7,132	- 692	9	YL	1,656	+ 964	8,788
Lamb Tank	22	979	418	- 561	57	YL	339	- 222	757
Lee's Ferry	64	526	314	- 212	40	11/15-5/15	120	- 92	434
Moonshine	21	830	526	- 304	37	No	220	- 84	746
Mt. Logan	8	5,689	4,009	-1,680	30	YL	1,369	- 311	5,378
Muggins Flat	51	428	388	- 40	9	10/16-5/31	150	+ 110	538
Pigeon Tank	26	1,489	1,236	- 253	17	11/1-5/31	89	- 164	1,325
Pratt Tank	45	255	580	+ 325	66	10/1-4/15	150	+ 475	730
Rider	50	217	130	- 87	40	No	83	- 4	213
Rock Canyon	1	192	122	- 70	36	No	144	+ 74	266
Rock Canyon Tank	39	248	597	+ 348	58	11/1-5/15	363	+ 712	960
Rock Pocket	5	1,759	1,762	+ 3	0	No	1,096	+1,099	2,858
Sage	28	789	864	+ 75	9	No	105	+ 180	969
Shinarump	48	293	243	- 50	17	9/1-5/1	47	- 3	290
Shuttleworth	44	924	900	- 24	3	No	670	+ 646	1,570
Soap Creek	61	2,689	1,711	- 978	36	No	798	- 180	2,509
Spooks Knoll	37	623	427	- 196	31	9/1-3/31	460	+ 264	887
Suicide	42	319	200	- 119	37	11/15-4/15	16	- 103	216
Sunshine	29	707	608	- 99	14	10/15-6/15	80	- 19	688
Temple Trail	4	4,303	3,098	-1,205	28	No	1,607	+ 402	4,705
Tuweep*	10	1,781	2,113	+ 332	16	No	1,032	+1,246	3,145
Two Mile	55	3,934	2,823	-1,111	28	No	554	-1,013	3,377
Valley Wash	25	1,421	1,053	- 368	26	No	566	+ 198	1,619
Vermillion*	56	7,653	6,703	- 950	9	No	1,194	- 325	7,897
Wells	14	419	192	- 227	54	No	115	- 112	307
White Sage*	43	281	478	+ 197	41	No	333	+ 398	811
Wild Band	24	3,412	2,420	- 513	17	No	267	- 725	2,687
TOTALS		106,406	87,942				32,849		120,791
Less Intensive									
Cove	15	12	10	- 2	17	11/1-3/31	N/A	N/A	10
Eight Mile Pass	49	36	15	- 21	58	12/1-2/28	N/A	N/A	15
Ferrin	18	272	126	- 146	54	9/1-5/31	N/A	N/A	126
Gramma Springs	32	466	108	- 358	77	No	N/A	N/A	100
Gulch	34	151	90	- 61	40	No	N/A	N/A	98
Harris Well	20	319	272	- 47	15	No	N/A	N/A	272
Kanab Creek	31	209	91	- 118	57	10/1-4/30	N/A	N/A	91
Kanab Gulch	33	202	77	- 125	62	11/16-4/1	N/A	N/A	77
Lost Spring Gap	35	64	48	- 16	25	11/1-4/30	N/A	N/A	48
Stateline	17	29	24	- 5	17	No	N/A	N/A	24
Wahweep	66	570	732	+ 162	28	No	N/A	N/A	732
TOTALS		2,330	1,593						1,593
GRAND TOTALS		108,736	89,535						122,384

* Implemented AMP

TABLE 3-15
INITIAL ADJUSTMENTS IN LIVESTOCK AUMs FROM 5-YEAR AVERAGE (FEDERAL ONLY)

INTENSIVE GRAZING MANAGEMENT		
Increases	Acres	AUMs
11 Allotments	219,857	1,821
Reductions		
44 Allotments	1,149,186	21,095

LESS INTENSIVE GRAZING MANAGEMENT		
Increases	Acres	AUMs
1 Allotment	15,459	162
Reductions		
10 Allotments	22,974	899

SUMMARY TOTAL FOR ES AREA (AUMs)			
	INTENSIVE	LESS INTENSIVE	TOTAL
Total Grazing Preference	127,583	3,094	130,677
Average 5-Year Licensed Use	106,406	2,330	108,736
Proposed Initial Stocking Level	87,942	1,593	89,535
Proposed Initial Reduction	18,464	737	19,201
Estimated Increased AUMs After 15 Years	32,849	0	32,849
Estimated Total Stocking Level After 15 Years	120,791	1,593	122,384

Changes in Livestock Handling Procedures

Intensive management of grazing would require livestock to change their regular grazing habits and force them to adapt to new terrain, new forage and water sources, and increased concentrations. In the short term this adapting to new systems would cause weight losses.

Of the 55 proposed allotments, 22 would be formed from 71 existing allotments. These 22 allotments could be neither traded nor exchanged between operators. Four of these proposed allotments, containing 16 existing allotments, would combine permittees who do not presently operate in common. (The remaining 33 AMPs would retain their present boundaries.) Combining 16 allotments into 4 allotments (Shinarump, Valley Wash, Lamb Tank, and Moonshine) containing 40,059 acres of Federal lands, would involve 11 livestock operators and would require the adoption of new livestock handling procedures.

Changes in Breeding Practices

Allotments proposed for combining could contain operations that graze different breeds of cattle, crossbreds, and grades of bulls. Licensees generally strive to improve or upgrade the quality of their herds and often prefer one breed of bull over another. When livestock of different breeds are grazed together, crossbreed calves are likely to result. Although such crossbreeding may be desirable to one operator, it can be highly undesirable to the operator producing a certain breed of livestock.

Licensees attempting to upgrade their present herd would also be adversely affected by an allotment combination that mixes registered and nonregistered herds. Without control over the quality of bulls used by ranchers in the community allotments, inferior bulls could produce inferior calves, adversely impacting some operators. This situation could affect the 11 operations were they to decide to run registered bulls.

Combining operators with seasonal breeding and yearlong breeding programs would also create problems for the seasonal breeder. Calves could be born throughout the year. Licensees preferring seasonal breeding generally do so for the following reasons:

- It insures a single calving season (generally spring).
- It permits all calves to be worked (branded, etc.) at the same time.
- It insures uniformity of calf weights and ages at weaning and shipping time.

Operators that breed livestock on a seasonal basis would not be satisfied if combined with operators that leave bulls with the herd yearlong.

Grazing Systems

Changes in Livestock Forage Species

Changes in season of use would benefit vegetation in the long term by providing physiological rest for plant development and by increasing the percentage of desirable livestock forage species. The change in season of use through intensive grazing management can favor cool- or warm-season plants or browse, depending upon the season of non-use. The proposed action would change the season of use on 20 allotments, mostly involving increases in the percent of cool-season grasses and browse by implementing rest-rotation and deferred rotation grazing. (See AMP objectives in appendix 1-2.) To increase the percentage of cool-season and browse species, grazing systems have been designed to allow as much rest as feasible during the spring growing season and to provide rest for browse during a full year and an additional growing season.

On the basis of chapter 3 vegetation data, key forage species are expected to increase substantially. (See appendix 3-3 for estimated key species increases by allotment.) This adjustment, along with the improvement in range condition, is expected to increase total usable forage production for livestock by 12,483 AUMs over the present 5-year average licensed use in the intensively managed areas (allotments under AMPs). This increase would amount to 32,849 AUMs more than the initial proposed stocking rate.

Changes in Livestock Performance

The proposed initial stocking rate would generally allow more forage for each grazing animal. The lower stocking rate, coupled with the grazing system, over time would improve range conditions and increase the more desirable forage species for livestock. Over the long term, livestock performance would improve as range conditions improve and livestock become accustomed to being handled regularly. This improvement would allow for increased weight gains, increased calf crops, and reduced death losses (table 3-16).

Over the long term, livestock performance should increase on the 35 allotments proposed for rest-rotation grazing (containing 1,040,719 acres of Federal land). Heady (1975) reported that rest-rotation grazing systems have been used widely and successfully in range reclamation and can be expected to show increased livestock production.

The 20 allotments proposed for deferred rotation grazing systems (328,344 acres of Federal lands) can be expected to show smaller advantages in livestock performance than allotments proposed for rest rotation. Deferred rotation grazing systems, however, are often more practical for ranchers, since they allow use of all pastures each year.

TABLE 3-16
SUMMARY OF ANTICIPATED LIVESTOCK PERFORMANCE IMPACTS

Allotments With Anticipated Increased Percent Calf Crops

Grazing System	No Change	1%	2%	5%	10%	15%	20%
Rest Rotation	3	1	0	17	8	2	1
Deferred Rotation	2	0	1	11	2	1	0

Allotments With Anticipated Increased Weaned Calf Weights (lbs.)

Grazing System	No Change	0-24	25-49	50-74	75-99	100-125
Rest Rotation	0	2	6	15	7	2
Deferred Rotation	0	2	7	8	0	0

Allotments With Anticipated Decreased Animal Death Rates (%)

Grazing System	No Change	1%	2%	3%	4%	5%	5%-7%
Rest Rotation	3	17	9	3	0	0	1
Deferred Rotation	3	7	4	1	0	1	0

Allotments With Anticipated Increased Cull Cow Weights (lbs.)

Grazing System	No Change	0-24	25-49	50-74	75-99	100-125
Rest Rotation	0	2	6	15	7	2
Deferred Rotation	2	2	7	8	0	0

Expected calf crop proposals vary from 0 to 20 percent under the same proposed grazing system because some operations already obtain excellent calf crops, and their potential to improve is slight. With implementation of a rest-rotation grazing system, however, calf crops would improve on an average of 5 to 10 percent.

Calf crops are expected to increase by approximately 5 percent with implementation of a deferred rotation grazing system. Part of this increase would occur because the systems would require operators to spend more time on the ground with their livestock. They would be able to better care for their animals, monitoring animal quality, breeding, and health (Heady, 1975). A well managed grazing plan usually means a well managed ranch. Moreover, the improvement of range condition (appendix 3-1) would provide more higher quality forage for increased livestock weights.

The proposed action would combine 11 operators that have not previously run livestock together. Two operators would run livestock on the Moonshine allotment. Both presently run Hereford, Charolais, and Simmental cattle, with yearlong breeding practices and no purebred livestock. This combination would not adversely affect livestock handling procedures on this allotment.

Two operators would also run livestock on the Lamb Tank allotment. Both run Hereford cattle, but one operator also runs a Charolais-Hereford cross. One operator also runs some (two at present) purebred bulls for upgrading livestock. Both operators run a yearlong breeding program. Combining these two operations on one allotment would require the adjustment of breeding programs by one operator or the other.

Four operators would run Hereford cattle on the Valley Wash allotment, but two would also run Angus cattle or a Hereford-Angus cross. All operators use a yearlong breeding program, and none run purebred cattle. Two operators would be slightly affected by combining operations that run Hereford and Angus cattle, and new handling procedures would be required for at least two of the operators on the allotment.

Finally, three operators would run Herefords, Hereford-Simmental, Hereford-Angus, and Hereford-Charolais crosses on the Shinarump allotment. One operator, as well, would run a few purebred registered cattle. Two operators have a spring breeding program, and one operator has a yearlong breeding program. In addition, all three operators at present have different grazing seasons, varying from September 1 to May 15. The proposed grazing season for the allotment is from September 1 to April 30. All three operators on the Shinarump allotment would thus be required to adjust their livestock handling procedures.

Range Improvements

Changes in Livestock Operator Costs and Workload

The construction and development of the proposed range improvements, except those totally funded by BLM, would increase workloads and expenses to the livestock operators. These additional costs would be a short-term impact, whereas increased maintenance costs would be a long-term impact. Additional waters and the improved distribution of livestock, however, would provide additional benefits in improved livestock performance.

Intensive livestock management requires more work by the operators to move livestock regularly as called for by the grazing systems. Since 82 percent of the operators in the ES area manage their units on a part-time basis, many operators might not have the time for the additional workload required. By having to spend more time supervising their livestock operations, however, licensees could better care for their livestock.

Generally, allotment combinations require less time and work of the individual operator. If personal conflicts arise and operators cannot work together as a group, operators would work livestock on an individual basis rather than by group effort. This excessive handling of livestock would cause some weight losses. The impact due to personal conflicts between operators cannot be quantified but would be adverse and long term.

RECREATION

Existing and proposed designated areas were evaluated to assess the long-term impacts of the proposed action. The results of this analysis are summarized in table 3-17. Additional but less significant impacts than those shown on table 3-17 would occur. Implementation of the proposed grazing systems, for example, would generally improve sightseeing by decreasing livestock numbers and increasing vegetation density and species composition. Similarly, certain improvements, such as pipelines, might impart significant short-term impacts but have less serious long-term impacts, because of natural processes or mitigative measures. Thus, all adverse or beneficial impacts of a less than moderate degree are not included.

Both the grazing management systems and proposed range developments were evaluated to determine whether they would preserve in a natural condition or restore the values for which the areas are to be established.

The varying degrees of impact were defined using the following criteria:

Moderate Impact--The action would beneficially or adversely change the quality of the natural values for which the area is to be established.

High Impact--The action would have an adverse impact sufficient to eliminate those natural values for which the area is to be established or a beneficial impact sufficient to restore or preserve the natural values for which the area is to be established.

Range developments also were evaluated to determine whether their location and function would affect the quality of the natural values for which the proposed area is to be established. This evaluation revealed that land treatments and those developments supplying water to livestock would most seriously affect natural values.

Livestock severely deplete forage within a 250-foot radius of water sources and less severely deplete forage within an additional 450-foot radius. Livestock grazing would change plant composition and density, and jeopardize the scientific and educational value of approximately 35 acres around each water source.

TABLE 3-17
LONG-TERM IMPACTS ON EXISTING AND PROPOSED DESIGNATED AREAS

Area Impacted	Allotment	Action	Units	Impact	Comment
EXISTING					
Paria Canyon Primitive Area	Lee's Ferry	Fence (Spring development)	1 each	M+	Fencing associated with spring development would restrict livestock from a heavily used recreation area and make potable water available in a hot, dry portion of the canyon, although aethetically the impacts would be adverse.
Vermillion Cliffs Natural Area	Soap Creek	Pipeline	6.0 miles	M-	Pipeline would originate at base of cliffs and run to U.S. 89A. Pipeline would change the quality of natural values (sightseeing) for which the area was established.
PROPOSED					
House Rock Valley-State of Arizona Natural Area	Two Mile	Roads	3.0 miles	M-	
		Land treatment (spraying)	2360 acres	H-	Action would have an adverse impact sufficient to eliminate those natural values for which the area is to be established--research natural area.
Paria Plateau-State of Arizona Natural Area	Vermillion	Pipeline	6.0 miles	M-	
		Roads	6.0 miles		
	Two Mile	Land treatment	2360 acres	H-	T.40N, R.4E. affected by action, which would have an adverse impact sufficient to eliminate those natural values for which the area is to be established--research natural area. Only portion of Sec. 18.
		Roads	3.0 miles	M-	
	Home Ranch	Catchment	1 each	H-	Water sources induce highly adverse impact by livestock congregating around water supply and consuming all available forage for a radius of several hundred feet.
		Trough	8 each	H-	
		Pipeline	8.5 miles	M-	
		Roads	8.5 miles	M-	

M = Moderate, H = High, (+) = Beneficial Impact, (-) = Adverse Impact

The land disturbance of pipeline construction would have a moderately adverse impact on research natural areas. Similarly, a network of roads through such an area would alter natural values by compacting the soil, and changing drainage and erosion patterns and vegetation species composition and densities along the right-of-way. Roads, therefore, represent a moderately adverse impact on natural values.

Land treatments, such as spraying, would eliminate a site's further consideration as a research natural area since they would effectively alter natural processes. The proposed House Rock Valley Research Natural Area coincides with the area to be sprayed on the Two Mile allotment. Since the primary interest is the surrounding pure stand of big sage, (Artemisia tridentata), which exemplifies one of the major plant associations of the Great Basin Desert, spraying would destroy the natural values for which the natural area is to be established.

Recreation Uses and Amounts

Because recreation in the ES area is generally primitive and dispersed, each activity identified in BLM's Recreation Inventory System was evaluated to determine whether the proposed action would beneficially or adversely affect the quality rating, recreation opportunity, or visitor use of each activity. Overall, the long-term effects of the proposed action would be beneficial. Table 3-18 summarizes the long-term impacts of the proposed action on the more important recreation activities occurring within the ES area.

WILDERNESS

BLM has not initiated a wilderness study effort in the Arizona Strip as mandated by Section 603 of the Federal Land Policy and Management Act of 1976. Except for Paria Canyon Primitive Area, Vermillion Cliffs Natural Area, and Big Sage Natural Area, no wilderness study areas have been identified in the ES area. Most likely many of the components of the proposed action would be located outside wilderness study area boundaries and would never fall within a potential wilderness area. Other components, however, might. Until the study boundaries have been determined, one cannot assess the impact of the proposal on specific areas.

The Department of the Interior's interim management policy is to continue multiple-use and to preserve the wilderness potential of areas designated for wilderness study. This policy will apply from October 21, 1976 until (1) Congress declares an area unsuitable for wilderness or, (2) the inventory process determines that an area lacks wilderness characteristics. In either case, other types of multiple-use management can proceed. Thus, to avoid jeopardizing existing wilderness qualities, some development identified in the proposed action will be delayed pending the required wilderness inventory and review.

TABLE 3-18
LONG-TERM IMPACTS ON RECREATION

Activity	Quality	Opportunity	Visitor Use	Comment
Hunting				
Big Game	M+	M+	M+	Antelope numbers might increase 100%; mule deer are expected to increase 100% in the Mt. Trumbull area and 50% in all other areas. Bighorn sheep and livestock are not compatible, and therefore quality, opportunity, and visitor use would remain at about present levels.
Small Game	M+	M+	M+	This activity involves waterfowl, for which the impacts should be insignificant.
Sightseeing				
Archaeology	M-	M+	L+	Intrusions within view of an archaeological site would lower the quality of the experience. Construction of an additional 128.8 miles of roads would improve opportunity. Improved access to sites, however, would increase vandalism and therefore decrease resource values. Thus, quality would be reduced significantly. Visitor use would increase slightly.
Primitive Experiences	M-	M-	L-	Intrusions such as catchments and roads would degrade primitive values but would only slightly affect present low visitor use.
Off-Road Vehicle Use	M-	M+	L+	Construction of an additional 128.8 miles of roads would significantly improve the opportunity for ORV use. Visitor use would remain low but increase slightly, while quality of the recreation experience would decline due to low-visibility fence hazards and an additional 172.5 miles of new fences. No new roads would be constructed in closed areas.

Low = Low, M = Moderate, H = High, (+) = Beneficial impact, (-) = Adverse impact

Although grazing is permitted within wilderness areas, certain developments supporting grazing might be prohibited. Such developments as reservoirs, pipelines, roads, and fences impair wilderness qualities to varying degrees. The impact of fences, for instance, in a potential wilderness area perhaps may be mitigated rather easily should the area become a designated wilderness. In that case, fences would have a low adverse long-term impact on wilderness values. Roads, on the other hand, more permanently affect soil compaction, drainage and other resources. These impacts cannot be as easily mitigated, if at all. Although a road might be removed from use, scarified, and reseeded, the existence of that road might be apparent for many decades. Road construction, then, might impart a highly adverse impact on wilderness values.

IMPACTS ON ECONOMIC AND SOCIAL CONDITIONS

In the long term the proposed action would slightly benefit earnings and employment in the North Rim SEPA, and livestock and recreation earnings and employment would increase slightly. The impact of construction on earnings and employment would be temporary, slightly increasing employment and earnings for the area.

The proposed reduction in stocking rates is expected to highly impact livestock operations. In addition, 50 operators would have to share the cost of range improvements, totalling $268,151. Fifteen years after the implementation of the proposed action, however, this impact would be lessened by increases in AUMs and improvements in livestock production.

This section quantifies information for the areawide impacts to income, employment, and tax base. Site-specific impacts to individual operators cannot be quantified because of a lack of site-specific financial data. Therefore, only a comparative analysis of livestock operations can be made.

POPULATION

The proposed action would only minimally impact population, since population changes are likely to result from growth in the economic base of the area rather than from the proposed action.

EMPLOYMENT

The initial reduction in stocking rates and the 8-year implementation phase of AMPs would slightly increase employment in the short term. Construction employment would peak in the fifth year with 15 full-time employment equivalents (FTEEs) and then decrease to 3 FTEEs by the eighth year. Agricultural ranch employment would decline during the first 6 years because of the overall cut in ranch size. Initially, the ranch employment would decline by as much as 15 FTEEs, but employment would increase by the sixth year. If the 1970 agricultural employment of 465 is representative of present employment, the reduction would amount to as high as 3 percent of the agricultural work force in the area.

Within 15 years after AMP implementation employment in the SEPA would increase by 33 FTEEs. Though less than 1 percent of the SEPA's employment, this increase would be permanent, resulting directly from increases in ranch operation employment (18 FTEEs), increases in recreation use (6 FTEEs), increases in BLM staff (3 FTEEs), and increases in construction, operation, and maintenance employment (1 FTEE). The multiplier effect of the creation of these FTEEs would add five additional FTEEs.

INCOME

During the 8-year implementation phase, the short-term impacts from the construction of range improvements on income in the SEPA would be beneficial. The total direct and indirect income effect would peak at $191,000 in the first year. This amount is less than 1 percent of the area's income.

Ranch earnings would decline in the short term because of the reduction in AUMs. The initial stocking rate for all lands in the ES area would decline from the 5-year average of 125,656 to 101,203 AUMs. Assuming $5 (the estimated commercial value of an AUM in Arizona) in direct income for each AUM and a 1.637 income multiplier, the existing livestock-related earnings would drop from $1,028,445 to $828,347--a loss of $200,098. This reduction would amount to 4.7 percent of livestock earnings for the SEPA.

In the long term, total net SEPA income would increase by $663,000, resulting from the salaries of the three new BLM employees, from increases in recreation use, and from increased livestock earnings. By the fifteenth year estimated livestock earnings would increase by $287,200 and recreation-related income by $75,500. The improvement in the quantity and quality of existing forage and improvements in calf weights, cow cull weights, and reduced death loss would increase net livestock earnings. Increases in recreation use would result from increased hunter days and visitor use days.

During the first 6 years of implementation, livestock income would decline at a declining rate. After 6 years, however, livestock income would begin to increase. To better understand the net effect of the livestock income increase, the change can be averaged over a 50-year period, assumed to be the life of the proposed action after implementation. The net average annual income increase to livestock earnings for the SEPA would be $204,700, including the multiplier effect. The net average annual total income impact to the area would be $455,600, including the multiplier effect.

Modern income analysis shows that certain changes in local production will cause changes by a multiplitive amount--by an amount greater than the initial change. The income multiplier used here is a "Keynesian" type, based on the propensity to locally consume local production. It was estimated for the North Rim SEPA by BLM's Socio-Economic Data System.

LIVESTOCK OPERATIONS

Ranch Values

The existing value of ranch operations in the ES area was estimated to range from $11,518,000 to $13,431,000, depending on the number of animal units (AUs) used in the estimate--the 5-year average of licensed use--10,471 AUs--or the maximum allowable use of 12,210 AUs. The initial reduction rate would decrease the allowable use to 8,434 AUs and reduce the value of ranch operations, and the rancher's ability to borrow funds. The new stocking rate would reduce ranch values to $9,277,000, a decrease of between $2,241,000 and $4,154,000.

Fifteen years after implementation of the proposed action, however, the value of ranches would be approximately equal to present ranch values based on maximum allowable use--$13.4 million. This increase in ranch value would result from the increase in AUMs over the initial stocking rate and the improvements in the quality of existing forage with improved calf weights and calf crops and reduced death loss. These estimates are based on averages for ranch operations in the ES area and do not reflect values of any particular operation in the area.

Ranch Economics

The initial adjustment to livestock stocking rates would financially burden many operators. The extent of this burden would depend on the existing economic condition of the operation, rancher options (such as grazing other lands in Utah to compensate for cuts in AUMs), and on the general financial situation since many ranchers subsidize their operations. The lack of financial data on individual operations and on the availability of additional lands to compensate for reduced AUMs allows only a comparative analysis of impacts by ranch size.

Table 3-19 compares ranch size to the mean percentage change in initial livestock AUMs for individual and family- or corporation-run operations and reveals that the small operations would undergo the largest average initial reductions. The medium-sized family and corporation operations would undergo the lowest percent reduction. A comparison of mean percentage of reduction to the percent of livestock operations having outside sources of income (table 2-27) reveals that more large operations tend to lack outside source of income than smaller operations. The larger operations, then, might have more difficulty adapting to initial reductions. Moreover, table 2-27 shows that large operators tend to be more dependent on AUMs from Federal lands than the smaller operations.

TABLE 3-19
ECONOMIC ASSESSMENT OF LIVESTOCK OPERATIONS BY SIZE AND TYPE

Ranch Size*	Mean % of Initial Adjustment in Livestock AUMs	Mean % Change in Livestock AUMs 15 Years After AMP Implementation	Mean Operator Costs for Range Improvements	Mean Livestock Production Benefits**
		Individual Operations		
Small	-28	-14	$ 800	$ 200
Medium	-19	17	2,700	2,000
Large	-23	-07	9,300	5,600
		Family, Corporation, and Other Operations		
Small	-25	12	$2,000	$1,100
Medium	-05	42	6,600	2,000
Large	-20	05	2,300	5,500

*Number of AUMs used. Small--408 AUMs or less; Medium--409 to 2,519 AUMs; Large--2,520 AUMs or more.
**Includes improved calf weights, better calf-crop percentages, improved cull weights, and reduced death loss.

Table 3-19 shows the mean average change in livestock AUMs 15 years after the implementation of the proposed action. On the average the AUMs permitted for small and large individual operations would remain below the 5-year average licensed AUM use before implementation of the proposed action. On the other hand, the other operations would increase their AUMs. The large individual-run operations, being highly dependent upon BLM AUMs and including operations that lack outside sources of income, would be the group most highly impacted by adjustments in carrying capacity.

Along with increases in AUMs expected 15 years in the future, additional returns would be expected from improvements in the quality of forage and in the general management of livestock that are made possible by range investment. Higher quality forage and better management are expected to yield gains in calf weights, calf-crop percentages, cull cow weights, and reductions in death losses. A summary of livestock performance benefits expected 15 years after AMP implementation by ranch size appears in table 3-19. These benefits are based on a quantification of the information summarized in table 3-16. Although the average large individual operation would lose AUMs in the future, additional livestock production benefits expected in the future may offset the loss of income from the reduction in AUMs. The average large individual operation can expect an additional $5,600 in income. Data are not available to estimate the ability of individual operators to tolerate temporary losses until long-term benefits become available.

Another impact on livestock operations would involve sharing costs for range improvements. Table 3-19 presents the average costs of private investments by operation size. Given the low returns (if any) for investments, ranch operations might have difficulty affording their share of improvement costs.

As with adjustments in carrying capacity, the large operation would be the most highly impacted by its share of private costs for range improvement construction. The average private cost for a large individual operation would be $9,300, whereas the costs for other operations would average less than $3,000.

GOVERNMENT REVENUES

Since livestock operations in the ES area form an insignificant part of the counties' revenues, the proposed action's impacts on county revenues have not been estimated.

BLM's revenues in the short term would decrease because of changes in stocking rates. The existing 5-year average of Federal AUMs yield $164,191 in revenues; under the new stocking rate the revenue would drop to $135,198. Fifteen years after implementation, however, the revenues should rise to $188,600, an increase of $24,400 over the existing amount collected.

SOCIAL ATTITUDES AND VALUES

The discussion of social attitudes and values is based on generalizations obtained from interviews with people familiar with the two groups and on information from the BLM's Vermillion Planning Area Analysis.

The proposed action would not change the values held by the rancher or urban resident group, but it would affect attitudes and expectations toward BLM. The increase in recreation opportunities, the allocation of AUMs for wildlife, and the safeguards to protect cultural resources would meet many of the urban group's expectations for the proper use of public lands.

On the other hand, four components of the proposed action would worsen the ranchers' already negative attitudes toward BLM:

- Implementing AMPs, as representing multiple use of public lands;
- Proposed changes in livestocking rate;
- Private costs of range improvements; and
- Combining operations in the same allotment.

The multiple use concept threatens the operators' values of independence and their traditional use of the land. The change in management required to implement AMPs also threatens the operators' value of independence and traditional methods of operation.

The changes in stocking rates and the cost of range improvements might cause economic and financial losses to some operations, both in ranch income and in the ability to borrow funds. Some operators might be forced to sell their operations, to seek other ways of earning a living and to maintain a different lifestyle elsewhere. The operator would be likely to view any change in lifestyle to represent a lowering of his total well being.

The social problems that can arise from having different operators working on the same allotment are discussed in the section on livestock grazing land use. Any potential conflict among operators could lead to some economic loss or the need for an operator to sell his share of the allotment. The potential exists that an operator will sell, but the important impact would be that any conflict among users in combined AMPs could cause negative attitudes toward the proposed action and could jeopardize implementation of the AMPs.

The long-term impacts on the attitudes of the ranching group would still be adverse but somewhat lessened. In the future the economic situation of the livestock operators would improve because of a more stable forage supply and improvements in the quality of existing AUMs. Any improvement in the livestock operation's economic situation improves the likelihood of the operator maintaining his lifestyle.

4

CHAPTER 4

MITIGATING MEASURES

CHAPTER 4

MITIGATING MEASURES

The measures discussed in this chapter would reduce or eliminate adverse impacts identified in chapter 3. This chapter analyzes each measure in relation to a specific component of the proposed action. All measures are considered feasible under existing technology and will be required if the proposed action is approved.

The resources not discussed in this chapter would have no mitigatable impacts. Impacts identified in chapter 3 that cannot be mitigated are discussed in chapter 5.

TABLE 4-1
MITIGATING MEASURES

Resource	Adverse Impact	Mitigation	Result of Mitigation
Vegetation	Deterioration of riparian subtype	All 1,164 acres of riparian subtype will be fenced. The remaining acres of scattered riparian will be fenced if protection is required.	Fenced riparian subtypes in time will have improved woody and herbaceous components.
	Unidentified potential impacts on proposed threatened and endangered species	BLM will continue to study and inventory proposed threatened and endangered plant species. Grazing system and range improvements will be adjusted according to needs of subject species.	Managers will gain a better understanding of these species and will be better able to protect them.
	Unidentified potential impacts on vegetation	An undetermined number of exclosures (20 to 100 acres each) will be constructed on range sites of selected allotments.	Exclosures will aid in determining whether grazing systems are meeting objectives and assumptions of the AMPs. Large enclosures will provide (1) relict areas for comparisc purposes in which native vegetation can develop in the absence of livestock grazing and (2) areas to provide information on vegetation production and trend.
Animals	Incompatibility of livestock grazing with bighorn sheep use of habitat in Gramma Springs, Gulch, Kanab Gulch, Kanab Creek, and Lamb Tank allotments.	BLM will begin studying bighorn sheep and livestock use of allotments to determine extent of problem. On the basis of study results livestock use will be adjusted to provide for bighorn sheep needs.	Study will determine whether complete removal of livestock is needed or some compromise is feasible.
	Maintenance of waterfowl habitat in poor condition because of continued livestock use of shorelines	A few reservoirs will be fenced on an experimental basis to determine the magnitude of improvement for waterfowl.	Study will determine response of shoreline vegetation to protection from grazing and trampling.
Livestock Grazing	Conflicts in livestock breeding practices resulting from combining allotments	If 11 permittees cannot agree to breeding practices on community allotments, the District Manager will specify class, breed, and grade of livestock to be used on allotments.	All livestock within each community allotment will be of the same class, breed, and grade. Average quality of livestock will improve, and permittee conflicts within these allotments will decrease.
	Increased workload and expenses for construction and maintenance of range improvements and increased integrity of management	BLM will pay for increased percentages or total costs for construction and development projects and will be responsible for partial maintenance of some projects.	Increased workload and expenses based on permittee contributions to range improvements will be reduced proportionately to amount that BLM's contributions are increased.
Recreation	Elimination of natural values in the Paria Plateau and House Rock proposed State of Arizona Natural Areas by (a) 20.5 miles of new two-track roads and 14.5 miles of pipeline, (b) 2,360 acres of sagebrush spraying, and (c) 1 catchment and 8 troughs	BLM will identify other potential natural areas with the same values as the Paria Plateau and House Rock areas and give the State the option of proposing new natural areas.	Affected proposed natural areas will be relocated in other areas representative of values for which designation is proposed.

5

CHAPTER 5

UNAVOIDABLE ADVERSE IMPACTS

CHAPTER 5

UNAVOIDABLE ADVERSE IMPACTS

Chapter 5 discusses the unavoidable adverse impacts that would result from implementation of the proposed action--adverse impacts remaining after application of the mitigating measures described in chapter 4.

Such impacts are often referred to as "residual" impacts. They are unavoidable mainly because either (1) the proposed action directly conflicts with another value or values, or (2) the cost of mitigation would be prohibitively high.

VEGETATION

HOLDING PASTURES

The five holding pastures (38,812 acres) would have a slightly down or static trend, but would remain in their present condition class. Yellowstone pasture of the Clayhole allotment is in good condition. Franks and Mountain pastures on Fuller Road allotment are in poor condition, while Corral and Cottonwood pastures in Two Mile allotment are in fair condition.

LESS INTENSIVE MANAGEMENT

The 46,659 acres of less intensive management allotments would show very little change in range condition with only 1,400 acres moving from fair condition to good condition, while poor condition acres would remain the same.

VISUAL RESOURCES

RANGE IMPROVEMENT CONSTRUCTION

Vegetation removal, soil disturbance, and placement of range improvement structures on the landscape would have adverse visual impacts. Although BLM policy requires design restrictions and stipulations to minimize the intrusive effect, the presence of structures and disturbances would represent unavoidable visual impacts. Thus, all adverse impacts identified in table 3-12 would be unavoidable.

LAND USE

LIVESTOCK GRAZING

The initial reductions in animal unit months (AUMs) would have the following long- and short-term adverse impacts on livestock operations:

Short term: 1. Reduction from grazing preference = 41,142 AUMs or 31 percent.

Long term: 2. Reduction from grazing preference = 8,291 AUMs or 6 percent.

Short term: 3. Reduction from past 5-year average licensed use = 19,201 AUMs or 18 percent.

Long term: 4. Increase above 5-year average licensed use 15 years after implementation = 13,640 AUMs or 11 percent.

The additional time and labor involved in constructing and maintaining range improvements and in moving livestock would increase costs to operators for implementing grazing systems.

Other unavoidable adverse impacts could occur to seven operators, who, because of combined allotments, might have to graze nonpreferred breeds of livestock.

RECREATION

If implemented, the proposal to construct 2 miles of pipeline within the boundaries of the Vermillion Cliffs Natural Area would create an unavoidable adverse impact. Despite design restrictions that would minimize the intrusions, no measures would effectively mitigate the adverse impacts on the outstanding scenery the area was established to protect.

Intrusions within view of an archaeological site would lower the quality of archaeological sightseeing.

Roads, fences, water sources, land treatments, and other man-caused alterations of the natural environment would unavoidably degrade primitive values.

ECONOMIC AND SOCIAL CONDITIONS

With one exception, the adverse economic and social impacts identified in chapter 3 cannot be mitigated and are unavoidable. The exception involves the operation's share of proposed improvements on public lands, which BLM will pay. These payments would reduce the total operators' share of improvement costs to $39,050.

CHAPTER 6

6

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

CHAPTER 6

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Chapter 6 analyzes the trade-offs between short-term use and long-term productivity of individual resources affected by the proposed action (table 6-1). For this analysis, short-term refers to the 8-year period of AMP implementation (1980-1988), and long-term refers to the period of time from initiation of AMP implementation to the year 2002, when the environmental effects of the proposed action on productivity should be apparent.

TABLE 6-1
SHORT-TERM USE VERSUS LONG-TERM PRODUCTIVITY: TRADE-OFFS

Resource	Short Term	Long Term	Trade-Offs	Net Effect On Reaource Over The Long Term
Vegetation	320 acres of vegetation would be destroyed due to range improvement construction to implement grazing systems.	After construction of these projects, 405 to 2,965 acres of vegetation would remain in various degrees of disturbance due to new waters servicing previously lightly and ungrazed areas.	Construction of new on-range improvements, especially waters, would aid in implementing rotation grazing systems, helping to better distribute livestock and allowing the vegetation reaource to improve in species composition, density, and trend. The tradc-off would be 405 to 2,965 acres disturbed due to new areas serviced by waters. These areas would heal or partially restore during reat periods.	Improvement
	8,550 acres of pinyon-juniper would be destroyed due to chaining, 5,769 acres of sagebrush would be destroyed due to spraying, and 5,380 acres of sagebrush would be destroyed due to plowing.	The acres of land treatment would increase the usable forage component from 100% to 400% in the chaining and spraying area. The usable forage component from plowing would increase by several fold. Diversity of species composition would increase.	In exchange for disturbing vegetation on 19,699 acres, the land treatment would improve the usable forage component on low production acres and balance carrying capacities to facilitate the effectiveness of the grazing systems. Brush monotypes would be replaced by a diverse community.	Improvement
	On the acres grazed in the critical periods (spring - early summer) the concentration of livestock would interfere with vigor, health, production of seed, and the establishment of new seedlings. The concentration of livestock would also increase soil disturbance, restricting root growth and the infiltration of water needed for plant growth.	On the acres under a grazing system, key grasses, forbs, and browse would increase in species composition, and areas of deterioration would increase in ground cover. The increased cover would increase litter, which would help in retaining soil moisture, adding soil nutrients and providing plant vigor. These improvements would occur as a result of proper use, alternating season of use, and rest from grazing.	The trade-off described under the short term would result in improved vegetation vigor, trend, and production as a result of rotation grazing systems, reduction in livestock numbers, or both.	Improvement
Water Resources	Sediment yield would slightly increase as a result of compaction around the 90 proposed watering facilities.	Sediment yield around existing watering facilities would decrease as new waters are added in pastures where livestock were concentrated around old watering facilities.	Short-term increases in aediment yield would be compenaated for by long-term decreases in aediment yield.	Improvement
Soils	A slight increase in soil loss would result from (1) land treatment on 19,690 acres, (2) construction of 173 miles of fence, 82 miles of pipeline, 7 cattleguards and 129 miles of two-track access trails.	Eroaion would decrease as vegetation becomes established and gains vigor and construction projects are completed.	Short-term increases in soil loss would be traded off to develop the grazing program. In the long term the grazing program would reduce soil sediment loss by 86 acre-feet per year.	Improvement
Wildlife	Construction of range improvements would reduce wildlife habitat, most significantly 19,690 acres from land treatment. The 173 miles of new fence would restrict wildlife movement, especially until the animals adjust to their location. Competition for forage may increase as cattle are concentrated in smaller areas. New water developments would increase competition in the surrounding habitat.	The anticipated increase in vegetation would improve habitat. Livestock-wildlife competition would decrease. New water sourcea would improve habitat, but sacrifice areas around the waters would continue to exist. The 173 miles of new fence would continue to restrict big-game movements. Livestock would continue to use bighorn sheep habitat in the Kanab Creek drainage, possibly precluding any increase in sheep numbers.	Livestock grazing would continue in virtually all wildlife habitat, but the intensity of uae would decrease by 19% and livestock would be managed to allow vegetation to improve. Livestock use would be heavier in aome presently "light use" areas, but would decrease in other areas.	Improvement

TABLE 6-1 (cont.)
SHORT-TERM USE VERSUS LONG-TERM PRODUCTIVITY: TRADE-OFFS

Resource	Short Term	Long Term	Trade-Offs	Net Effect On Resource Over The Long Term
Cultural Resources	Only land treatment would have adverse impacts. Inventory as a result of project clearance would provide some short-term gains in the resource data base.	The adverse effects of trampling by livestock would be slightly reduced. Unintentional destruction or damage to unlocated surface and subsurface sites cannot be mitigated. Mitigation archaeology would have a long-term adverse impact on the resource data base.	Permanent depletion of the data base would outweigh the short-term gains in knowledge. Mitigation archaeology would contribute additional knowledge, but because of limited funding, resources, and time, its gains would be small.	Deterioration
Visual Resources	All proposed construction (roads, water developments, land treatments) would have short-term adverse impacts on visual resources because of soil or vegetation disturbance. 7,175 acres would be adversely impacted in the short term.	Permanent adverse visual contrasts would occur around all water sources and roads where revegetation would not occur. A fence within Paria Canyon Primitive Area (Lee's Ferry allotment) and a pipeline within the Vermillion Cliffs Natural Area (Soap Creek allotment) would create permanent visual intrusions in VRM Class I scenery areas. The proposed seedings following land treatments would improve scenic quality in the long term. A long-term adverse visual impact would occur on 126 acres.	Greater visual contrast in localized areas such as reservoirs would be traded for implementation of grazing systems that would improve the overall appearance of the visual resource.	Improvement
Livestock Grazing	Reductions in livestock numbers would reduce livestock-wildlife competition for forage. The initial reduction in livestock would reduce incomes and ranch values in some allotments. Short-term reductions (1-15 years after implementation) would amount to loss of 21,103 AUMs. A short-term loss of cow and calf weights would occur during system implementation.	Vegetation would increase, making additional forage available for livestock. Range condition and trend would improve with the livestock numbers adjusted to proper carrying capacity. Within 15 years of implementation 32,849 AUMs could be allowed back to livestock grazing, still a decrease of 11,746 AUMs from present 5-year average. A long-term increase would occur in calf weaning weights, percent calf crops, cow and calf weights. Death losses would decline over the long term.	The initial reductions in livestock numbers would be traded for increased vegetation cover, improved wildlife habitat, watershed protection, recreation opportunities, and a reduction in loss of cultural and historic resources.	Improvement
Recreation	Recreation use in the short term would be reduced by lowered sightseeing opportunities and quality, access limitations imposed by construction, and short-term losses in wildlife habitat.	Improved access as a result of additional road construction would benefit ORVs as well as general sightseeing and other leisure activities. Big- and small-game hunting should improve as a result of habitat improvement. Primitive values would be lost in the long term as a result of the proposal's altering of the natural environment. The fence in Paria Canyon Primitive Area (Lee's Ferry allotment) would represent a long-term adverse impact on scenic qualities of the lower portion of the canyon. The improved availability of water in a hot, dry portion of the canyon would have a beneficial long-term impact.	Primitive values would be traded for improved access and improved vegetation appearance as a result of implemented grazing systems. Fence construction in Paria Canyon would separate cattle from recreation use concentration areas, minimizing conflicts with livestock, improving the spring as a water source and thereby improving the overall quality of a recreation experience in this area. Visual resources would degrade somewhat as a result.	Improvement
Economic and Social Conditions	Construction and maintenance of range improvements would require expenditures. Operations would lose income from decreases in allowable livestock use.	The productivity of livestock operations in the ES area would be improved by providing a reliable forage supply. Quantity of livestock forage would increase, and quality would improve. In the long term, livestock operation earnings would increase.	The expenditure of dollars and labor in the short term would be trade for long-term increases in quantity and quality of livestock forage, resulting in increased ranch income and value.	Improvement

CHAPTER 7

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

7

CHAPTER 7

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

This chapter identifies the irreversible and irretrievable commitment of resources resulting from the proposed action. The term "irreversible" is defined as what is incapable of being reversed: once something is initiated, it would continue. The term "irretrievable" means irrecoverable: once something is used, it is not replaceable.

The 60 acres that would be occupied by the proposed water developments would lose their capacity to produce vegetation for the life of the development. Except for the actual material destroyed or removed at the time of improvement construction and land treatment, none of the impacts on vegetation would be irreversible or irretrievable. Loss of forage for the area removed from production would amount to approximately 5 animal unit months (AUMs) annually for the life of the proposed projects.

Removal of vegetation cover due to implementation of range improvements would cause the loss of 17.4 acre-feet of soil, which would be considered irretrievable, assuming the soil surface would stabilize in 2 years.

Proposed livestock grazing and range developments could disturb certain cultural resources, either through direct impact or through vandalism. Once disturbed, historical and archaeological sites, as well as artifacts, are no longer available for future study. Such losses can create a data gap in the history of an area, which can be considered an irretrievable commitment.

The proposed action would involve the commitment of material associated with the proposed improvements. Once installed, these materials would basically be irretrievably committed, although some of the materials might have salvage value.

The major irreversible and irretrievable commitment would involve the costs of installation, maintenance, and administration of the proposal. Once the expenditures are made, those particular funds would not be available for other alternative public programs. An additional irretrievable commitment would be the labor associated with the proposal. Labor, too, once expended could not be retrieved.

CHAPTER 8

ALTERNATIVES TO THE PROPOSED ACTION

CHAPTER 8

ALTERNATIVES TO THE PROPOSED ACTION

INTRODUCTION

Chapter 8 addresses the following four alternatives to the proposed action:

1. No Action

2. Elimination of Livestock Grazing on Public Lands

3. Stocking Level by Condition Class

4. Benefit/Cost

The range development design restrictions identified in chapter 1 apply to all four alternatives. Specific resource mitigating measures addressed in chapter 4 apply to alternatives 3 and 4.

Between the no-action alternative and elimination of grazing is a broad spectrum of possible alternatives. The proposed action and the four alternates to it provide the decisionmaker with analyses of five alternatives along the spectrum.

Chapter 8 describes each alternative and the anticipated significant impacts to resources. Table 8-1 compares the estimated long-term impacts of the proposed action with those four alternatives.

Table 8-2 summarizes the impacts of the proposed action and all alternatives on vegetation.

TABLE 8-1
COMPARISON OF LONG-TERM MAJOR IMPACTS OF THE PROPOSAL AND ALTERNATIVES

Environmental Element	Unit	Present Status	Proposed Action	Alternative 1 No Action	Alternative 2 Elimination of Grazing	Alternative 3 Stocking by Condition Class	Alternative 4 Benefit/Cost
Vegetation							
Range Condition	Acres						
Good		331,905	1,027,327	646,509	837,667	1,142,307	1,027,327
Fair		995,717	363,515	610,508	489,956	208,064	363,515
Poor		252,882	189,662	323,487	252,881	230,133	189,662
Production	Pounds*	95.2 million	122.3 million	96.7 million	95.4 million	148.5 million	122.3 million
Soils							
Disturbance	Acres	14,600	23,240	0	1,762	23,240	23,240
Sediment Loss	Ac.Ft./Year	830	744	950	705	747	744
Critical or Severe Erosion Condition	Acres	64,334	26,727	91,061	19,816	26,727	26,727
Wildlife	AUMs	0	14,069	0	119,264	16,866	14,047
Mule Deer	Number	2,200	4,000	1,500	4,500	5,000	4,000
Bighorn Sheep	Number	24	24	20	100	24	24
Antelope	Number	230	550	200	600	650	550
Riparian Habitat	Condition	Poor	Improve	Decline	Improve	Improve	Improve
Livestock Grazing	AUMs	108,736	122,384	130,677	0	146,710	122,191
Calf Crops	Change %		+ 7	- 5	N/A	+ 8	+ 7
Calf Weaned Weights	Change Pounds		+ 56	- 25	N/A	+ 67	+ 56
Cull Cow Weights	Change Pounds		+ 56	- 25	N/A	+ 67	+ 56
Death Loss	Change %		- 3	+ 2	N/A	- 5	- 3
Economics							
Employment	Change in FTEEs	--	+ 33	No change	- 91	+ 48	+ 33
Income from Livestock	Change $	--	+$204,700	- $79,000	- $870,000	+$297,700	+$204,700
Ranch Values	Change $	--	No change	- $1.2 million	-$11.8 million	+$4 million	No change
Revenue	Change $	--	+ $24,400	No change	- $164,191	+$ 61,100	+ $24,400
Social Conditions							
Attitudes and Values		Conflict between different publics and BLM	Decrease in conflicts	Decrease in conflicts	Significant increase in conflicts	Decrease in conflicts	Decrease in conflicts
Rancher Lifestyle		Existing lifestyle (see chapter 2)	Lifestyle minimally jeopardized	No change	Lifestyle significantly jeopardized	Lifestyle moderately jeopardized	Lifestyle minimally jeopardized

* Pounds of usable air-dry livestock forage

TABLE 8-2
IMPACT OF THE PROPOSED ACTION AND ALTERNATIVES ON VEGETATION

Alternatives	Acres	(Percent) Average Key Species Composition				(Percent) Range Condition						Average Usable Production/Acre (Pounds)	
		Current		Future		Current			Future				
		Grass	Shrub	Grass	Shrub	Good	Fair	Poor	Good	Fair	Poor	Current	Future
No Action													
Implemented AMP Areas	674,305	27	7	33	12	16	74	10	69	22	9	75	83
Continuous Grazing Areas	906,199	24	9	23	8	21	53	26	20	51	29	55	55
Elimination of Grazing	1,580,504	24	9	32	11	21	63	16	53	31	16	66	60
Stocking by Condition Class	1,580,504	24	9	40	14	21	63	16	72	17	11	66	94
Proposed Action	1,580,504	24	9	32	14	21	63	16	65	23	12	66	75

Source: Appendixes 3-1, 3-2, 3-3, and table 3-2

NO ACTION

The no-action alternative proposes no change in grazing from the present. Livestock stocking rates would be limited to the recognized active privileges, 130,677 AUMs, and season of use identified in table 1-2. The 12 AMPs already implemented would continue in operation and would be monitored and modified as needed to reach management objectives (see table 1-2). No new range improvements would be authorized except those needed for the orderly use of the range, those needed to replace or maintain existing facilities, and those needed to fully implement the existing AMPs. Other resource programs would continue to be managed to meet MFP objectives.

Consideration of all probable impacts of this alternative reveals that it would not significantly impact climate, air quality, geology, topography, and paleontological resources.

VEGETATION

Grazing Systems

Implemented AMPs

The no-action alternative would allow 674,305 acres on the 12 allotments under implemented AMPs to continue to improve or begin improving in condition and production.

Using the same methodology to analyze vegetation changes as used in the chapter 3 analysis, resource specialists applied percent changes shown in table 3-3 to each vegetation subtype and projected the following future (15 years after implementation) changes in key species composition for allotments under implemented AMPs:

Vegetation Subtype	Average % Increase in Key Species Composition	
	Grasses	Shrubs
Grassland	9	5
Sagebrush	17	4
Pinyon-Juniper	3	2
Saltbush	10	10

The key species composition for the other subtypes would be similar to those expected under the proposed action (table 3-1). The average key species composition increases on AMP allotments would amount to 6 percent for grasses and 4 percent for shrubs (table 8-2).

This improvement would occur as long as utilization is held to an average of 50 percent during the graze cycles (see table 1-2). Such utilization would compensate for large yearly fluctuations in precipitation and allow an upward trend even during drought. On the basis of increases and decreases of grasses and shrubs on allotments under implemented AMPs (with less than 55 percent utilization), both key grass and key shrub species would increase by an average of 6 percent (see appendix 3-4). The percent of acres in good condition would increase by 53 percent, and the percent of acres in fair and poor condition would decrease by 52 and 1 percent respectively. Average usable production for vegetation subtypes on allotments managed under implemented AMPs would increase as follows:

Vegetation Subtype	Increase (in Pounds/Acre) From	To
Grassland	94	108
Sagebrush	52	54
Saltbush	63	77
Desert Shrub	45	51
Pinyon-Juniper	No change	

Thus, the usable forage production on allotments under implemented AMPs would increase by an average of 8 pounds per acre. (See table 8-2 for acreages.) In 1995, allotments under implemented AMPs would produce 46,880,800 pounds (58,601 AUMs) of forage, and the total ES area would produce 967,216,000 pounds of forage (120,902 AUMs). See appendix 3-4 for the methodology for projecting usable forage production.

Continuous (Season-Long) Grazing

The continuation of season-long grazing on 906,199 acres of Federal, State, and private lands would maintain a static condition or cause variable degrading of vegetation. Livestock would heavily and continuously graze preferred species and favorite grazing locations, thereby severely impacting these species and areas.

On continuous grazing allotments key species composition would remain static or slightly decrease (less than 1 percent) on all subtypes except for the grassland and sagebrush types. On the grassland subtype key grass species would decrease by 6 percent, and key shrub species would decrease by 2 percent. On the sagebrush subtype key grass species would decrease by 2 percent, and key shrub species would decrease by 1 percent. The static or slight decrease in condition (suggested by data from the Buffalo Tank allotment) would result from continuous high utilization (over 55 percent).

Usable forage production would not change, since species composition and trend would basically remain static.

Resource specialists assessed by subtype all vegetation changes expected under this alternative and averaged the resulting data (table 8-2). In 1995, allotments under continuous grazing would produce 49,890,800 pounds (62,301 AUMs) of forage. (Source: appendixes 3-2 and 3-4.) See the discussion of Buffalo Tank allotment under Less Intensive Management in chapter 3, Vegetation.

Project Construction

To fully implement the existing AMPs, the following projects would have to be completed: 24 miles of fence, three catchments, one well, 9 miles of pipeline, and nine troughs. The construction would initially disturb 27 acres, but increased livestock use around new water developments would disturb 455 acres over the long term.

Land Treatment

On allotments with implemented AMPs, 13,130 acres would undergo land treatment and disturbance; 7,660 acres are planned for seeding. Over the long term these acres would revegetate with seeded or native species. The target species (5,650 acres of pinyon-juniper and 7,780 acres of sagebrush) would be eliminated or reduced.

Riparian Vegetation

Under the no-action alternative riparian vegetation would continue to degrade, and only a remnant of this subtype would survive.

SOILS

Erosion

Under the no-action alternative, vegetation and litter would decrease slightly on all soil associations with the exception of soil association 1. Surface soil structure and water infiltration would also decline, particularly on soil associations 2 and 4, because the finer textured surface layers of these associations are more susceptible to damage from trampling and reduce ground cover. Areas around existing water sources would also be vulnerable to erosion, since little improvement of ground cover could be expected under this alternative.

The reduction in vegetation and litter would increase sediment yield by 15 percent or about 120 acre-feet per year (BLM range data).

Land Treatment

Except on allotments under implemented AMPs, long-term beneficial impacts resulting from the establishment of better ground cover would not be realized. The short-term adverse impacts of land treatment, however, would be less than under the proposed action. For 2 or 3 years about 2.7 acre-feet of sediment would remain in place and not be lost as under the proposed action.

Project Construction

Although project construction would be considerably less than that planned under the proposed action, it would only slightly decrease sediment yield over that expected under the proposed action.

Water Facilities

Areas around most existing water facilities would continue to deteriorate slightly, since livestock concentrations would not be significantly reduced.

WATER RESOURCES

Grazing Systems

The vegetation trend on allotments under implemented AMPs is expected to move upward, and range condition is expected to improve, decreasing surface runoff and increasing infiltration. Such conditions would slightly increase the percentage of annual precipitation being used by plants and recharging the ground water. Except for decreasing sediment, this change would little affect the quality of surface runoff. The small increase in infiltration would slightly increase the mineral content of ground water discharge.

Continuous (Season Long) Grazing

Vegetation trend would be slightly down on allotments lacking implemented AMPs. A continuation of this trend would gradually and slightly increase surface runoff, decreasing infiltration and ground water recharge. As a result, the sediment content of surface runoff would slightly increase, and total dissolved solids in ground water would slightly decrease.

ANIMALS

Under the no-action alternative livestock and wildlife would continue to conflict, and habitats would further deteriorate from heavy and continuous grazing. Wildlife and livestock would increasingly compete for forage as habitats become less productive. In most areas, however, present wildlife numbers have already stabilized at a low level, and populations would not significantly decline. The continuation of present livestock grazing would keep wildlife populations at their current low levels and prevent their reaching natural potentials.

The survival rates of mule deer and antelope fawns would continue to be low when compared to those in more optimal habitats. Bighorn sheep would continue to exist only in the most remote sections of Kanab Creek.

Table 8-3 summarizes the impacts of the no-action alternative on animals or groups of animals.

CULTURAL RESOURCES

By allowing livestock use equal to past levels or above, the no-action alternative would increase the damage to artifacts. Damage, however, is expected to increase at a slower rate because fewer sites and artifacts remain to be damaged. Further deterioration of range condition would worsen adverse impacts through the effects of erosion.

TABLE 8-3
NO-ACTION ALTERNATIVE IMPACTS ON ANIMALS

Wildlife Species or Group	Habitat Change (Based on present vegetation trends -- Table 2-2)	Population Change	
		Present	Future
Pronghorn Antelope	Clayhole herd: 111,729 acres of habitat would decline.	150	150
	House Rock herd: 196,694 acres of habitat would improve.	80	50
	236,679 acres of habitat would not change.		
Bighorn Sheep	27,379 acres of habitat would remain in present condition (31% poor, 69% fair).	24	24
Mule Deer	176,560 acres of habitat would decline.	2,200	1,500
	30,469 acres of habitat would improve.		
	539,580 acres of habitat would not change.		
Small Mammals	380,019 acres of habitat would decline.	Populations are expected to decrease.	
	225,196 acres of habitat would improve.		
	802,261 acres of habitat would not change.		
	Less food and cover would be available.		
Carnivores	380,019 acres of habitat would decline as prey species decrease in number.	Populations are expected to decrease.	
Birds	380,019 acres of habitat would decline.	Species diversity is expected to decline as well as overall populations.	
	225,196 acres of habitat would improve.		
	802,261 acres of habitat would not change.		
Merriam Turkey	7,800 acres would remain in fair condition.	Population is expected to remain static.	
	6,800 acres would remain in poor condition.		
Waterfowl and Shorebirds	All habitat would remain in poor condition.	Population is expected to remain at present low level.	
Fish	10 miles of perennial stream would continue to be heavily impacted by livestock.	Effect on fish population is not known.	
Reptiles and Amphibians	380,019 acres of habitat would decline.	Populations are expected to decline.	
	225,196 acres of habitat would improve.		
	802,261 acres of habitat would not change.		
Arthropods	380,019 acres of habitat would decline.	Population changes are not known.	
	225,196 acres of habitat would improve.		
	802,261 acres of habitat would not change.		
Threatened and Endangered	380,119 acres of habitat would decline.	Population changes are not known.	
	225,196 acres of habitat would improve.		
	802,261 acres of habitat would not change.		
Riparian Habitat	10 miles of perennial stream habitat would decline; 43 miles of intermittent stream habitat would decline; and 22 spring habitats would decline.	The total acres of riparian habitat would decrease.	

The same design restrictions outlined for range developments in the proposal would be required for improvements anticipated under this alternative. The anticipated impacts would also be the same because fewer sites and artifacts remain to be disturbed.

VISUAL RESOURCES

Adverse visual impacts on non-AMP allotments would be potentially greater than under the proposed action because vegetation reductions on these lands would cause visual contrast along fence lines. Soil disturbance and vegetation declines due to continued use would cause more intensive vegetation contrasts between AMP and non-AMP allotments than would occur under the proposed action.

Visual impacts resulting from projects on allotments under implemented AMPs would be similar to those of the proposed action. Fewer projects would exist in the area as a whole than under the proposed action, however, because few BLM range improvements would be constructed on non-AMP allotments.

LAND USE

Land Use Characteristics

The principal land use within the ES area--grazing--is expected to remain in the same relative acreage as at present. Any land use changes would depend on variable political, economic, or environmental considerations that cannot be accurately predicted.

Coconino and Mohave Counties appear to be trying to diversify their economic bases, and land use controls are expected to continue. These planning and zoning controls, however, are not expected to involve the public lands, which are used for grazing. Some private lands near Fredonia, Colorado City, or Cane Beds may be affected.

Livestock Grazing

Under the no-action alternative overgrazing of ranges would continue, especially near developed waters. Range conditions would continue to decline over large areas, slightly decreasing livestock production.

The current pattern of livestock grazing is not expected to change in the next 15 to 25 years. Grazing use intensity could increase above the 5-year average of 108,736 to 130,677 AUMs, since operators presently have this option. Operators would continue to sell and exchange land and transfer grazing licenses, but nearly all lands are expected to remain under livestock grazing.

Range Improvements

Present livestock management practices would remain unchanged. On allotments with implemented AMPs, range improvements identified as necessary and having favorable benefit/cost and environmental analyses would be completed. Such improvements would include land treatments, fencing, and water developments. The only other range improvements authorized would be those needed to maintain and replace existing projects and those needed for the orderly use of the range.

Livestock Performance

Livestock production would remain at about the same level or be slightly reduced from the present situation, with year-to-year fluctuations due to climate. Under the present range conditions, percent calf crops would decline by an estimated 5 percent if full qualifications are used. Calf weaning weights and cull cow weights would decline by approximately 25 pounds per animal, and death losses would increase 2 to 3 percent. More competition for existing forage would occur. Those allotments in less than good condition and with downward trend would produce less forage, adversely affecting the condition of livestock. Cow and calf weights would be expected to drop, as would the percent calf crops. Cows with poor vigor or in poor condition could be expected to give birth to more stillborn calves or weaker calves, increasing the change for higher death losses.

Recreation

Continuing present management on allotments not under AMPs would further deteriorate recreation resources and limit future options for almost all types of outdoor recreation. Continued soil erosion in areas of poor soil condition and vegetation decline on non-AMP allotments would lower aesthetic qualities and decrease opportunities for hunting, sightseeing, hiking, and camping. Erosion of fragile soils would limit off-road vehicle (ORV) use. Reductions in wildlife diversity and maintenance of low population levels would limit hunting and opportunities to view wildlife. In addition, proposed range developments would unavoidably destroy primitive values.

BLM would not provide the necessary intensive support for the potential natural areas identified in chapter 2 and areas having primitive values, leaving them inadequately protected. In addition, range developments in the AMP allotments and regression from natural conditions in the proposed natural areas would degrade primitive values by reducing vegetation cover, by changing species composition, and increasing soil erosion and soil compaction.

Adverse impacts to potential natural areas could be mitigated by immediate designation to protect threatened values.

Wilderness

The no-action alternative would little impact wilderness values except on the 12 allotments where AMPs would continue in effect. Developments, such as reservoirs and roads, necessary to implement fully those AMPs could substantially alter the value of an area for wilderness designation. The Federal Land Policy and Management Act of 1976, however, directs that developments that would impair wilderness qualities not be permitted until wilderness studies as directed by that act are completed. The impacts of no action would thus be the same as for the proposed action until wilderness studies are completed.

ECONOMIC AND SOCIAL CONDITIONS

Population, Employment, and Income

By 1990 the North Rim SEPA's population will reach an estimated 38,940. The characteristics of this population increase will follow trends established between 1960 and 1970. No change is expected in either the size or characteristics of the ranching community. Employment would probably increase with the population. With population and employment, total personal income in the SEPA is also expected to increase. The $377,000 spent for range improvements on allotments under implemented AMPs in the short term would slightly increase employment and income.

Livestock Grazing Operations

The total number of operators in the ES area is expected to remain the same, and over 80 percent of the ranchers are expected to continue subsidizing their operations with other sources of income.

As discussed in chapter 2, the value of ranch operations depends on many variables, including the location and condition of land involved. A decline in the range on some allotments would decrease the value of the ES area's ranches from an estimated $13.4 million to $12.2 million. In addition, the poorer range would cause an average annual livestock income decrease of $79,000.

Future livestock prices and their impacts on individual operators are difficult to predict. Operators are expected to run their ranches as they have in the past, but ranch returns might decline as range conditions on allotments decline.

Government Revenues

BLM revenues from Federal AUMs are also not expected to change unless the fee of $1.51 per AUM changes in the future.

Social Attitudes and Values

The values of the two groups described in chapter 2 would not change in the future. As each group becomes more aware of the other's wants and needs concerning the public lands, however, these groups might gain a better understanding of the manager's role in mediating their diverse demands.

MITIGATION AND RESIDUAL IMPACTS

To mitigate the no-action alternative's adverse impacts on vegetation, animals, and livestock grazing, BLM could reduce livestock numbers to the range's carrying capacity and maintain utilization at 50 percent. Other measures to mitigate adverse impacts on vegetation would be the same as would be applied under the proposed action. These measures would improve vegetation. Wildlife resources and livestock performance would improve accordingly.

The no-action alternative's unavoidable adverse impacts on soils, animals, and cultural resources would be the same as those expected under the proposed action, as would the residual impacts of range improvements on visual resources. The adverse impact of land treatment would be the same as under the proposed action except that under the no-action alternative such treatment would involve 13,130 acres (rather than the 19,690 acres under the proposed action), 7,660 of which would be reseeded.

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Trade-offs between short-term uses and long-term productivity of resources on allotments under implemented AMPs would be the same under the no-action alternative as under the proposed action, since both alternatives would treat these allotments similarly. Trade-offs, however, would be different for the no-action alternative should this alternative's proposed mitigation be implemented.

Under the no-action alternative, range improvement construction would disturb 27 acres in the short term, and livestock use around waters would disturb up to 455 acres of vegetation in previously ungrazed or lightly grazed areas. This disturbance would be traded to implement the 12 AMPs, which over the long term would improve overall vegetation condition.

Most of this alternative's trade-offs involve resources on allotments not managed under AMPs, in which the maintenance of current grazing practices (no-action) would be traded for the following long-term deteriorating or static conditions:

- Vegetation: a lack of improvement in vegetation resources and a static or downward trend.
- Soil: increases or no decrease in soil erosion.
- Water Resources: 80 acre-feet per year increase in sediment yield over that at present.
- Animals: continuing static conditions or decline in populations, diversity, and habitat of wildlife.
- Cultural Resources: the same deterioration as would occur under the proposed action.
- Visual Resources: static conditions but little change from the present.
- Livestock Grazing: decreases in livestock performance.
- Recreation: primitive values maintained in present state.

On allotments without implemented AMPs a lack of short-term socio-economic changes would be traded for a $1.2 million long-term decrease in ranch values and a decrease in livestock performance leading to an average annual livestock income decrease of $79,000. Should this alternative be mitigated by a reduction of livestock use to carrying capacity and maintenance of utilization at 50 percent, short-term economic losses would be traded for a long-term increase in livestock income and possible increases in ranch values or at least maintenance of present ranch values.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible and irretrievable commitments of resources under the no-action alternative would be the same as under the proposed action with the following exceptions:

- Considerably less money would be irretrievably committed to range improvements than would be committed under the proposed action.

- Only 1.8 acres would be permanently committed to water developments in contrast to the 55.6 acres under the proposed action.

- If the soil stabilizes within 2 years after implementation of range improvements, such implementation would result in the irretrievable loss of 0.52 acre-feet of soil rather than the 17.4 acre-feet loss expected under the proposed action.

ELIMINATION OF GRAZING ON PUBLIC LANDS

This alternative would eliminate livestock grazing on the public lands in the ES area. Grazing trespass would be controlled by range use supervision and extensive fencing to separate private and State lands from the public land. Arizona State law would require BLM to survey and fence approximately 762 miles of State and private land boundaries to prevent livestock trespass on public land. Existing range improvements on public land not benefiting or supporting multiple-use management would be removed and the surface disturbance rehabilitated.

This alternative is predicted to have no significant impacts on climate, air quality, topography, geology, and paleotological resources.

VEGETATION

Species Composition and Condition

During the first 10 years after the elimination of grazing on public lands vegetation species composition and condition would improve. Afterwards, however, condition would variably degrade depending on the site. Condition would then stabilize.

Studies by Michaels and others (1967), Jameson, Williams, and Wilton (1962), and Thatcher and Hart (1974) all demonstrated, on areas next to and within the Arizona Strip District, that where surface soils consist of sandy gravelly loams, good key species composition occurred under no grazing. On the other hand, platy and vesicular surface soils (poor soil conditions) would not support significant quantities of key species, even when relieved of grazing.

Specialists used line intercept transects to analyze vegetation within and outside three 1-acre exclosures, established in 1951 in desert grassland and saltbush vegetation subtypes in the Clayhole allotment.

The transects in the north and south exclosures were read in 1951, 1952 and 1953 and again 25 years later in 1978. The middle exclosure was read in 1951, 1952, 1953, 1960, and 1978. Since the middle exclosure has had more frequent readings and readings somewhat closer to the ES time frame of 15 years, it has been used to project the species composition and range condition under elimination of grazing. Although this exclosure has serious limitations for projections of species composition, it is a shred of evidence in an otherwise large void.

The interior transect of the middle exclosure revealed a fivefold vegetation density increase from 1951 to 1960 but a 50 percent density decrease from 1960 to 1978. In 1951 species composition was 33 percent galleta, 17 percent alkali sacaton, and 50 percent fourwing saltbush. In 1960 the species composition was 90 percent galleta, 3 percent alkali sacaton, and 7 percent snakeweed. By 1978, the species composition was

69 percent galleta, 19 percent alkali sacaton, 6 percent squirreltail, and 6 percent cactus. The main shift involved the loss of fourwing saltbush from the transect. The overall reduction in key species amounted to 6 or 7 percent.

In addition, the other exclosures both showed decreases in density (39 percent and 60 percent) from their last readings 25 years before and decreases in their species composition.

The middle exclosure demonstrated what the production studies discussed later in this section also demonstrated: after an area is excluded from livestock grazing its species composition and condition on subtypes subject to improvement improve during the first decade but then stagnate to varying degrees during the years thereafter.

To project key species and condition change, expected key species composition 10 years after implementation (equal to key species and condition levels under the proposed action 15 years after implementation) was reduced by 6 percent on the subtypes subject to decline 10 years after the elimination of grazing. These reduced percentages were then combined with percentages for subtypes not expected to change. The average key species composition for the ES area under this alternative was calculated to increase to 32 percent for key grass species and to 11 percent for key shrub species (table 8-2). Consequently, the average range condition for the area would improve to 55 percent good and 31 percent fair. Sixteen percent of the area would remain in poor condition.

These exclosures also appear to have a much denser vegetation cover than surrounding areas, due to grazing on the outside. The interior of exclosures have a heavy dead plant litter load due to a lack of grazing.

Production

Forage production after elimination of grazing would trend up for about 10 years and then degrade or stabilize. This projection is supported by the following studies.

The 1972 San Luis (New Mexico) Watershed Study (BLM, 1978) demonstrated how forage production increased during the first 10 years after the elimination of grazing on an area. In fact, major perennial grasses increased from 424 pounds per acre in 1964 to 431 pounds per acre in 1971 in a nongrazing area.

Other studies reveal how production decreased under longer time frames. Texas Tech University (1976) compared Rio Puerco grazing allotments to sites ungrazed since 1909 in Chaco Canyon National Monument (all in New Mexico) for the effect of grazing and nongrazing on production. Investigators found that long-term nongrazing reduced the weighted average total vegetation ground cover by 22 percent. They also found that litter remained unchanged and bare ground increased by 15 percent on the ungrazed sites.

Finally, Reardon and Merrill (1976) found that, in Texas, forage yields and litter accumulations were lower on areas experiencing no grazing than on areas undergoing deferred rotation grazing and light grazing over a 20-year period. After 20 years the ungrazed exclosure produced 19 percent less forage than the area under deferred rotation grazing. Their research suggests that plants that decrease with the elimination of grazing require some form of grazing to retain their vigor and productivity.

BLM specialists reduced the 1995 projected forage production under the proposed action--122,322,400 pounds (152,903 AUMs)--by the weighted average of 22 percent--the decrease in total vegetation cover found in the Texas Tech University (1976) study and the Rio Puerco Final Grazing Environmental Statement (BLM, 1978). The result was 95,411,200 pounds (119,264 AUMs)--the annual forage projected to be produced in 1995 on Federal lands in the ES area in the absence of livestock grazing.

Riparian Vegetation

Under this alternative riparian vegetation would improve, moving into good condition. Both the woody and herbaceous component of this subtype would benefit from the absence of livestock grazing.

Fence Construction

The 762 miles of fence that would have to be constructed around unfenced public lands to prevent livestock trespass would temporarily disturb 381 acres and permanently disturb 76 acres.

SOILS

Erosion

Except for lightly grazed soil association 1, the soils of the ES area would increase in vegetation and litter and improve in surface soil structure because of reduced trampling and increased infiltration. Soil associations 2 and 4 would particularly improve because of their fine textured surface layers.

Sediment Yield

Under this alternative sediment yield would remain about the same as under the proposed action on soil associations 1 and 3, and would decrease slightly on other associations. Overall, sediment yield would decrease from 830 to 705 acre-feet per year (see table 8-1).

Construction

Construction of 762 miles of fence would increase sediment yield by about 2 acre-feet per year for 2 or 3 years following construction but would cause only insignificant permanent losses on 76 acres.

WATER RESOURCES

Grazing animals remove protective plant material and compact the soil surface, reducing infiltration. Leithead (1959) found runoff to increase as range condition deteriorated. Moreover, he found that a range site in good condition absorbed moisture five to six times faster than the same range in poor condition.

Hendricks (1942) found that semiarid rangeland could more effectively use rainfall if grass litter were allowed to accumulate. Such litter retards runoff, permitting greater infiltration and decreasing sediment yield.

In a comparison of granular surface soil and high percentage perennial grass vegetation at Boysag Point (an ungrazed site in the Grand Canyon) with a grazed site on the Kanab Plateau, Michaels and others (1967) found lower erosion and runoff and higher infiltration on the ungrazed site.

An increase in vegetation cover resulting from the elimination of grazing would slightly decrease surface runoff and sediment. This trend is expected to respond according to the rate of increase in vegetation cover.

The reduced demand upon groundwater resulting from eliminating grazing would be small and relatively insignificant. Infiltration rates and recharge to ground water would increase slightly.

ANIMALS

The elimination of livestock grazing on public lands in the ES area would dramatically affect wildlife, since the major herbivores would be removed from the range. Livestock-wildlife competition for forage would cease, and habitat conditions would begin to improve. The most rapid improvement would occur in the 1,164 acres of riparian habitat. Areas around stock reservoirs would begin to revegetate, improving waterfowl habitat. Water supplies, however, would decline unless BLM begins to maintain all 439 existing waters. Although eliminating grazing would require 762 miles of new fences, 1,086 miles of existing fence restricting wildlife movement would be removed for a net reduction of 324 miles of fence.

Of all the alternatives, eliminating grazing on public lands would most rapidly improve wildlife habitat for at least the first 10 years. After 10 years, however, the Stocking Level by Condition Class alternative might begin to improve habitat the most. (See table 8-1 for a comparison of alternatives.)

Populations of large mammals would generally increase. Pronghorn antelope populations would increase to approximately 600. Desert bighorn sheep would be most favored and would likely reinhabit much of their lower historical range and increase their numbers to approximately 100. Mule deer numbers would be expected to increase to approximately 5,000.

Habitat for threatened and endangered species would improve as vegetation communities progress toward pristine conditions.

Wildlife would no longer compete with livestock on public lands, but BLM would lose the opportunity to manipulate vegetation to favor wildlife through managed livestock grazing. Moreover, the productivity of some areas might stagnate after 10 years. (See the Vegetation section for the Elimination of Grazing on Public Lands alternative.)

CULTURAL RESOURCES

The elimination of livestock grazing on public lands will eliminate cattle damage to artifacts and other cultural data. The 762 miles of legal boundary fence, however, would be difficult or impossible to relocate to avoid cultural resources. Depending on the number of sites encountered, the costs to the BLM for scientific salvage could be substantial. Moreover, salvage of archaeological sites could preclude the use of new methods and technology that might be developed in the future. Such salvage would thus result in the loss of data.

VISUAL RESOURCES

The elimination of livestock grazing would generally benefit visual resources. Existing range improvements would be removed, and the sites previously occupied by these facilities would gradually improve and blend in with undisturbed areas. Even with rehabilitation, however, range improvement sites would be noticeable. The removal of livestock from riparian areas would eliminate streambank trampling, enabling vegetation to reestablish and thereby improving visual quality. Less visual disturbance would accompany reduced erosion rates.

A general improvement of the vegetation cover throughout the ES area would enhance the general texture of the landscape.

The 762 miles of new fence would intrude on this natural landscape. Additionally, a vegetation contrast would be apparent where private and State grazing lands adjoin nongrazed public lands.

LAND USE

Elimination of grazing on public land would change the dominant use of the public land from livestock production to recreation. Ending livestock-wildlife competition would increase large-mammal populations to the following levels: mule deer--5,000, antelope--600, and bighorn sheep--100, and increase recreation uses, such as hunting and sightseeing.

In the ES area, livestock would continue to graze approximately 30 blocks of State and private land, ranging in size from 2 to 11 square miles. Smaller areas would probably not be grazed, however, because the few cattle that could be raised on them would not justify the expense of fencing the land and providing water.

Livestock Grazing

Eliminating livestock grazing on public lands would adversely affect all livestock operators in the ES area. All operators depend to some degree on public lands, since private lands owned by operators are inadequate to completely support their livestock herds. Thirteen operators have no source of income outside their livestock operations and would be forced to find other means of support. The remaining operations would be severely disrupted and would have difficulty remaining in business. To stay in business these operators would have to buy or lease other private or State lands. Some operators could sell to each other, and a few might build up economical livestock units. The number of operators that could stay in business cannot be determined.

Elimination of grazing on public lands would result in the loss of active privileges amounting to 130,677 AUMs.

Recreation

This alternative would generally enhance outdoor recreation. Sightseeing and camping would increase with the improvement in scenery and in the quality of the range. Wildlife would benefit from the elimination of competition, increasing to natural pregrazing levels. Thus, hunting and wildlife viewing opportunities would improve. The removal of range improvements and the overall improvement in range conditions would enhance primitive experiences. In addition, the scientific and educational values of the proposed natural areas would be preserved, except for research opportunities relating to grazing and grazing impacts.

The removal of 1,086 miles of existing fences would somewhat offset the 762 miles of required new fences. The new fencing would alter recreation patterns, particularly those of ORVs, and hinder or restrict access to tracts of public lands next to State and private lands. Moreover, by separating State and private lands from public lands, fencing would degrade primitive and open space values and interfere with big-game movements, therefore degrading hunting and sightseeing quality.

WILDERNESS

This alternative would greatly enhance the wilderness character of the entire ES area. Existing range improvements on public lands would be removed and the sites restored to near natural conditions. On the other hand, the addition of 762 miles of fence to prevent trespass on public lands would represent a man-made intrusion on the natural landscape, adversely affecting the open space values associated with wilderness experiences. This impact would be partially offset by the removal of all or most of the 1,086 miles of existing fences. Federal actions that would impair wilderness qualities, however, are not allowed by law until completion of wilderness studies as described in chapter 2.

ECONOMIC AND SOCIAL CONDITIONS

Employment

Employment in the SEPA would continue to expand according to present trends. The growth in recreation and tourism , however, would continue despite the decline of livestock grazing. The amount of decline in ranch employment would depend on the number of operations forced out of business. Ranch employment could decline by as much as 91 full-time employment equivalents (FTEEs).

An estimated 430 persons in the SEPA depend directly or indirectly on ES-area livestock grazing for employment and income (including dependents of workers). The extent of dependency for these people, however, is not known, since over 80 percent of the operators that would be impacted by this alternative have other income sources. Agricultural employment represents about 8 percent of the SEPA employment. The potential decline in ranch employment represents about 1 percent of the SEPA's employment or 15 percent of its agricultural employment.

Income

Earnings in the SEPA would decrease slightly with elimination of grazing. AUMs on public lands in the ES area produce an estimated annual $870,000 of direct and indirect income for the SEPA. Elimination of grazing on these lands would eliminate these earnings, about 1 percent of the SEPA's total. The reductions in earnings would be offset slightly during the first 5 years by the expenditure of $1,524,000 for new fencing, but the annual loss of $870,000 would be a long-term impact.

Livestock Grazing Operations

Ranch Value

Eliminating grazing on public lands would reduce the size of and decrease the value of ranch operations and reduce the operator's ability to borrow funds. Ranch value would decrease from $13.4 to $1.6 million.

Ranch Economics

This alternative would decrease the total number of livestock operations in the ES area and would economically hurt all operations. The number of operations able to stay in business is not known. Some operators could buy or lease other AUMs, whereas many operators would sell the remaining parts of their operations.

Table 2-23, Characteristics of Livestock Operations in the ES Area, displays the percent of total AUMs obtained from Federal lands by ranch size. Each ranch size (small, medium, and large) is dependent on Federal lands for between 60 and 90 percent of its AUMs. Operations obtain an average of 78 percent of forage from Federal lands. The large operations tend to be the most dependent and would tend to be most hurt by eliminating grazing. Only 13 operators lack outside sources of income that could help reduce hardships.

Government Revenues

BLM has collected an average annual $164,191 in grazing fees in the ES area over the past 5 years, an amount it would lose if grazing were eliminated on public lands.

Social Attitudes and Values

The adjustment to the elimination of grazing on public lands would cause economic hardships for operators and threaten their ability to keep their operations and maintain their lifestyles. Already existing negative attitudes toward BLM and the Federal government would worsen as a result of these hardships.

MITIGATION AND RESIDUAL IMPACTS

Most of the adverse impacts expected under this alternative would not be mitigated and must be classed as unavoidable. BLM, however, would maintain all existing waters and construct all new fences to minimize hindering deer and antelope movement.

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Eliminating livestock grazing from public lands would involve the following trade-offs between short- or long-term uses of resources and long-term productivity:

- The short-term vegetation disturbance by fence construction would be traded for a long-term improvement in vegetation vigor and trend in acres under good condition. The total area under poor condition, however, would increase by 136,114 acres.

- Short-term increases in sediment loss due to fence construction would be traded for long-term reductions in sediment loss.

- Elimination of livestock use would be traded for improvement in wildlife habitat.

- Loss of cultural data during fence construction would be traded for the elimination of livestock damage to cultural resource sites.

- Visual intrusions created by the construction of 762 miles of boundary fence would be traded for the visual improvements accompanying with the removal of fences and other range improvements.

- Changed recreation access patterns caused by the addition and elimination of fences would be traded for benefits to wildlife, primitive experiences, scenery, and related recreation opportunities.

- The intrusion of fencing on the landscape would be traded for the enhanced wilderness character of the area.

- Loss of income and employment caused by the elimination of grazing would be traded for benefits to vegetation, soils, wildlife, cultural resources, visual resources, recreation, and wilderness.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Fence building would involve a commitment of materials and labor. Once installed, fence materials would be irretrievable unless salvaged. Moreover, once expenditures are made, these funds would not be available for other public programs.

The major irretrievable commitment of resources would involve the proposed change in land use. Once livestock grazing is eliminated, public lands would not be used for beef production. Although reversible, this loss would be irretrievable and would continue as long as livestock grazing is not permitted on public lands.

STOCKING LEVEL BY CONDITION CLASS

The stocking level by condition class alternative would set the stocking level in relation to the average condition and apparent trend of the allotment. The maximum level of use would not exceed 55,039 AUMs for the ES area. This alternative is offered because it would allow ranges in poor or fair condition to recover faster than they would under the proposed action.

The following criteria would be used for setting the initial stocking levels:

A. Condition good, apparent trend stable or up--the initial stocking rate would be the same as the stocking rate of the proposed action. Utilization of key forage species would average approximately 50 percent (see chapter 1).

B. Condition fair, apparent trend up or condition good and apparent trend down--the initial stocking rate would be 80 percent of the stocking rate of the proposed action. Expected utilization of key forage species would average approximately 40 percent.

C. Condition poor, apparent trend up or condition fair, apparent trend stable or down--the initial stocking rate would be 60 percent of the stocking rate of the proposed action. Expected utilization of key forage species would average approximately 30 percent.

D. Condition poor, apparent trend stable or down--grazing would be deferred for a minimum of 5 years.

The resulting initial livestock stocking rates by allotment are listed in table 8-4.

The AMPs proposed in chapter 1 would be implemented as scheduled, except on allotments deferred from grazing until the apparent trend is up.

All allotments would be analyzed at the end of each grazing cycle. (See chapter 1 for type of grazing system and cycle.) Stocking rates would be adjusted only when the studies show an improvement in condition and apparent trend.

This alternative is predicted to have no significant impacts on climate, air quality, topography, geology, or paleontological resources.

TABLE 8-4
INITIAL LIVESTOCK STOCKING UNDER STOCKING BY CONDITION CLASS

Allotment*	AUMs	Percent of proposal's initial stocking rate	Allotment	AUMs	Percent of proposal's initial stocking rate
Hack Canyon	1,652	60	Wild Band	1,452	60
Atkin Well	1,375	60	Rock Canyon	98	80
Tuweep	Defer		Button	208	80
Vermillion	4,022	60	Chatterly	Defer	
Cannan Gap	Defer		Ferry Swale	735	60
Cowboy Butte	136	60	Frank's Reservoir	109	60
Cram	1,036	60	Glazier Dam	310	60
Fern Tank	4,091	80	Grama Point	1,235	60
Mt. Logan	Defer		Home Ranch	3,643	100
Soap Creek	1,027	60	Jacob Canyon	84	60
Temple Trail	1,859	60	June Tank	4,279	60
Two Mile	1,694	60	Pigeon Tank	1,236	100
Antelope	1,313	60	Rock Canyon Tank	358	60
Antelope Spring	787	100	Rock Pocket	1,057	60
Beanhole	795	60	Rider	Defer	
Buffalo Tank	1,669	80	Sage	518	60
Cane Beds	366	60	Shinarump	146	60
Cedar Knoll	464	60	Sunshine	365	60
Clayhole	10,416	80	Badger Creek	58	60
Cottonwood	131	60	Gunsight	253	60
Coyote	940	60	Lee's Ferry	188	60
Crosby Tank	Defer		Spooks Knoll	Defer	
Fuller Road	Defer		Cove	6	60
House Rock	1,033	60	Eight Mile Pass	Defer	
Lamb Tank	251	60	Ferrin	Defer	
Moonshine	316	60	Gramma Springs	65	60
Muggins Flat	233	60	Gulch	54	60
Pratt Tank	348	60	Harris Well	272	100
Shuttleworth	540	60	Kanab Creek	Defer	
Suicide	120	60	Kanab Gulch	46	60
Valley Wash	1,053	100	Lost Spring Gap	29	60
Wells	115	60	Stateline	14	60
White Sage	287	60	Wahweep	439	60
			TOTAL	55,326	

*Listed in the same order as in table 1-2.

VEGETATION

Range Condition

The stocking level by condition class alternative would implement rotation grazing systems and reduce livestock numbers by about 40 percent from those of the proposed action. It would thus accelerate the improvement of species composition, condition, and production and bring about the changes expected under the proposed action within 10 years after implementation rather than 15 years. Fifteen years after the implementation of this alternative 148,567,200 pounds of forage would be produced in the ES area.

Of all the alternatives, this one would improve vegetation the most. Key grass species would increase by 16 percent, and key shrub species would increase by 5 percent. The number of acres in good condition would increase by 51 percent; the number of acres in fair condition would decrease by 46 percent; and the number of acres in poor condition would decrease by 5 percent. Usable forage production would increase by 17 pounds per acre.

The preceding predictions are based on Gibbens and Fisser's (1975) study in Wyoming, in an area of 8 to 12 inches of rainfall but with a temperature regime much lower than that of the Arizona Strip. This study found the utilization over a 5-year period to average 36 percent on the perennial grasses and 26 percent on perennial grasses and browse combined. The average percent increase in composition was 34 percent for key grasses, 23 percent for forbs, and 1 percent for shrubs in pastures, excluding the exclosure study areas.

Thus under the stocking level by condition class alternative, with a projected average 40 percent reduction in livestock below the estimated carrying capacity at 50 percent utilization, average utilization would be reduced to 30 percent. Since the Arizona Strip is more droughty than the study area in Wyoming, a smaller percentage increase in grass, forbs, and shrubs is expected. This analysis uses a 34 percent overall increase in key species (see table 8-2). The 34 percent change was applied only to acreage on subtypes subject to increase. When areas subject to increase, however, are combined with areas not subject to increase, the overall increase drops from 34 to 10 percent.

Riparian Vegetation

This alternative would have the same impact on riparian vegetation as would the proposed action: herbaceous but not woody vegetation would improve. As mitigation, BLM would fence all riparian areas on Federal land and pipe water for livestock from these areas to nearby troughs.

SOILS

Erosion

Vegetation and litter, soil surface structure, and water infiltration would improve slightly on all soil associations except associations 1 and 3. Soil association 1 would remain static because of limited livestock use on the association's steep slopes. Soil association 3 would remain static or improve slightly because the sandy surface layers are only slightly affected under this degree of management change.

Sediment Yield

Erosion and sediment yield would decrease slightly. Soil associations 2 and 4 would improve the most because their heavier surface layers would have a higher response to an increase in litter and soil structures than the other associations. Soil association 1 would improve the least because it occurs on steep slopes where livestock use is already low and little change would occur.

Overall sediment yield would decline by 10 percent, a reduction of about 83 acre-feet per year. (See table 8-1.)

WATER RESOURCES

Water Quantity

The stocking level by condition class alternative would accelerate the improvement in vegetation cover and litter. Improved surface conditions and soil structure would increase water infiltration rates and soil structure, slightly decreasing surface runoff and sediment. This trend is expected to respond according to the rate of increase in vegetation cover. Recharge to ground water would increase.

Water Quality

Overall this alternative would improve the water quality of the ES area. The anticipated sediment reduction of 83 acre-feet per year would decrease the amount of suspended solids leaving the area. Increased infiltration rates would slightly increase the amount of water entering aquifers and increase total dissolved solids in ground water as it emerges from springs. (Field checks by BLM personnel indicate that total dissolved solids are higher in water from springs than in surface runoff.)

ANIMALS

Setting stocking levels by condition and trend would improve habitats the most rapidly of all alternatives and would probably result in a 10 to 20 percent higher potential wildlife population than would the proposed action. The poorest condition areas would be deferred from grazing for 5 years, removing livestock from 207,777 acres of habitat. Grazing on the remaining 1,199,699 acres would be reduced by 32 percent.

This alternative's impact on animals would be similar to the proposed action's, but it would meet objectives in 10 years after implementation rather than in 15 years as under the proposed action. Within 10 years, pronghorn antelope numbers could increase from 230 to 400 head, and mule deer numbers could increase from 2,200 to 4,000 head.

Wildlife-livestock competition for forage would decline, since expected utilization would amount to 30 percent. Reduced livestock competition would allow higher fawn survival for antelope and mule deer and more abundant cover and food for most wildlife groups. In addition, habitat conditions for endangered, threatened, and sensitive species would improve at a faster rate than that expected under the proposed action.

CULTURAL RESOURCES

Trampling would continue to damage cultural resources but at a lesser rate than at present or under the proposed action. In the long term this alternative would apply the same stocking rates and undergo the same impacts as expected under the proposed action. Range development practices and resulting impacts would also be the same as expected under the proposal.

VISUAL RESOURCES

Long-term impacts of this alternative would be the same as those projected for the proposed action. Short-term impacts would depend on the length of deferments of grazing on allotments with downward trends. Immediate reductions in stocking levels would more quickly improve vegetation appearance and reduce fence line contrasts. As the AMPs are implemented, these improved aesthetic conditions would degrade to the level of conditions expected under the proposed action.

LAND USE CHARACTERISTICS

Although the stocking level by condition class alternative would reduce livestock numbers and grazing intensity in the short term, in both the short and long terms, livestock grazing would continue to be the primary use of the public lands. The 11 allotments deferred from grazing for 5 years would improve in range condition and would then be grazed by livestock.

Livestock Grazing

This alternative would initially reduce livestock levels by 50 percent over the stocking level of the proposed action, allowing no more than 55,326 AUMs for livestock. After 15 years, however, the ES area would produce an estimated 146,710 AUMs of forage for livestock, exceeding the 108,736 AUMs being used at present. Moreover, key species would increase by an average of 34 percent, providing more high-quality forage for increased livestock production.

Livestock Operations

This alternative would defer 11 allotments from grazing for 5 years and reduce grazing by 40 percent on 45 allotments, forcing most if not all of these operations out of business. The operations on the five allotments whose grazing would be reduced by 20 percent would probably be able to continue, since they would probably find additional forage to compensate for their loss in AUMs. Nevertheless, these operations would have to adjust handling procedures. Livestock operations on the five allotments whose stocking levels would be the same as under the proposed action would be affected as they would under the proposed action.

Livestock Performance

The reduction in stocking levels would improve livestock performance. Table 8-5 shows how moderate grazing can improve livestock performance over that of close grazing. With utilization declining to an average of 30 percent, livestock in the ES area should perform somewhat better than the livestock under moderate grazing in table 8-5. The stocking level by condition class alternative would improve performance over the present situation by 20 percent. Percent calf crops would increase by 8 percent; cull cow weights and weaned calf weights would increase by 67 pounds. Death loss would decrease by 5 percent.

TABLE 8-5
CLOSE AND MODERATE GRAZING AND LIVESTOCK PERFORMANCE

	Close Grazing 70-80%	Moderate Grazing 40-50%
Cows	400	340
Heifers	40	34
Calves	50	40
Bulls	25	18
Yearling Heifers (weight)	600	650
Percent Calf Crop	75	83
Weaning Weights	350	385
Average Weight Cull Cows	750	900
Average Weight Cull Bulls	1,200	1,400
Total Beef Sold (pounds)	126,500	129,870

Source: Arizona Inter-Agency Range Committee 1972, 1973

Recreation

This alternative differs from the proposed action in the time over which the AMPs would be implemented. In the long term, therefore, this alternative and the proposed action's impacts on recreation would not differ significantly. In the short term, however, deferments and immediate reductions in stocking levels would improve range condition faster than measures of the proposed action.

Moreover, other significant short-term impacts would be associated with this alternative. Immediate reductions in stocking levels corresponding to the average condition and apparent trend of the allotment would yield short-term improvements in scenery in direct proportion to the amount of reduction and the length of the period of reduction. Wildlife numbers would increase 10 to 20 percent, creating additional short-term opportunities to hunt and observe wildlife. Construction of range developments proposed in the AMPs would cause the same loss of primitive values as would the proposed action.

Wilderness

Temporary and permanent impacts of this alternative on wilderness values would be the same as under the proposed action. The Federal Land Policy and Management Act, however, prohibits the implementation of any action that would impair or otherwise jeopardize the wilderness character of any area before completion of the wilderness study effort.

ECONOMIC AND SOCIAL CONDITIONS

Employment

The reduction in initial livestock stocking rates would reduce employment by as much as 39 FTEEs, about 8 percent of agricultural employment in the SEPA and 1 percent of total employment in the SEPA. The employment impacts from the construction of range improvements would be similar to those of the proposed action. The long term employment impact in the SEPA, however, would amount to an increase of 48 FTEEs.

Income

Ranch earnings for the SEPA would temporarily decline because of the reduction in AUMs used. The initial stocking for all lands in the ES area would decline from the present 5-year average of 125,650 to 61,900 AUMs. The existing earnings would drop from $1,028,500 to $506,600, a loss of $521,900.

The long-term increases in net average annual income relating to ranch operations, recreation, and BLM employment would be $557,600, an amount higher than that expected under the proposed action. The net average annual income increase to livestock earnings for the SEPA would be $297,700. The higher overall increase would occur because more AUMs would be produced in the future. In addition, the range would recover more quickly and even higher increases in calf weights and calf crops and decreases in death losses are expected.

Livestock Grazing Operations

Ranch Value

The initial stocking under this alternative would decrease ranch values to $5.7 million, a decline in value of between $6 million and $7.8 million, depending on how many animal units are used in the estimate: the 5-year average number of livestock grazed or the maximum allowable 12,210 AUs. The long-term impact of this alternative to ranch value would be higher than the existing ranch values, $17.4 million.

Ranch Economics

The initial adjustments in livestock stocking rates would financially burden operators and likely force some to sell their operations. Table 8-6 shows the proposed livestock reductions by operation size.

TABLE 8-6
LIVESTOCK REDUCTIONS BY OPERATION SIZE

Ranch Size	Mean % of Initial Reduction in Livestock AUMs
Individual Operations	
Small	67
Medium	50
Large	43
Family, Corporation, and Other Operations	
Small	25
Medium	50
Large	43

The operators most hurt by this alternative would be those on whose allotments grazing would be deferred. Table 8-7 relates the size of operations proposed for deferred grazing to the mean percentage dependence of size groups on Federal AUMs and on outside income sources.

TABLE 8-7
RANCH* DEPENDENCE ON FEDERAL AUMS AND OUTSIDE INCOME

Ranch Size	Number of Operations	Mean % of total AUMs Obtained from Federal lands	Mean % of Operators with Outside Income Sources
		Individual Operations	
Small	4	78	100
Medium	3	48	100
Large	-	-	-
		Family, Corporation, and Other Operations	
Small	-	-	-
Medium	2	90	100
Large	2	58	50

*Includes only operations on whose allotments grazing would be deferred under the stocking level by condition class alternative.

The medium-sized family or corporation operation would have the highest dependency on the AUMs that would be deferred under this alternative. All operations with deferred grazing would be hurt, since unlike other operations still able to use some AUMs, these operations could use none of the AUMs until the allotments improve.

The private share of range improvement costs would be the same under the Stocking Level by Condition Class alternative as under the proposed action. Potential increases in AUMs would be greater than that expected under the proposed action. The improvement in quality of forage would be greater for this alternative and would increase operators' average income 10 percent above that expected under the proposed action.

Government Revenues

In the short term BLM's revenues would decrease from $164,191 to $82,254 because of reductions in the stocking rate. In the long term, however, BLM's revenues would increase by $61,100.

Social Attitudes and Values

The ability of operators to keep their operations would be threatened by this alternative's large reductions in stocking rates. To the extent that this alternative would cause more operators to sell out and change their lifestyles, it would promote more negative feelings toward BLM.

MITIGATING MEASURES AND RESIDUAL IMPACTS

The mitigating measures under this alternative would be the same as under the proposed action, as would the unavoidable adverse impacts, with the exception of economic and social impacts to livestock grazing. Unavoidable adverse impacts would be more severe, since more livestock operators are likely to be put out of business under this alternative than under the proposed action.

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The trade-offs between short-term use and long-term productivity under this alternative would be the same as those under the proposed action with the following exceptions:

- A short-term increase in soil loss would be traded for the development of the grazing program, which over the long-term would reduce soil loss by 83 acre-feet per year.

- Short-term deferment of grazing and AUM reductions amounting to a 55,315 loss in AUMs and short-term decreases in cull cow and calf weights would be traded for long-term improvements in range condition and production and a 66,670 increase in available AUMs, some of which would be allotted to livestock.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible and irretrievable commitments of resources under this alternative would be the same as under the proposed action.

BENEFIT/COST ALTERNATIVE

Under the benefit/cost alternative, the AMPs of the proposed action would be altered to make them cost effective: their benefit/cost ratios equal to 1 or greater. Only two AMPs would have to be changed, those for the Muggins Flat and Sage allotments. Initial stocking rates on both allotments, however, would remain the same as under the proposed action. Careful analysis of these two AMPs reveals that the impacts of this alternative would not significantly differ from those expected under the proposed action with the following exceptions:

- On the Muggins Flat allotment the proposed 1,600 acres of sagebrush treatment would be reduced by 900 acres to 700 acres, which in the long term would reduce the estimated increase in AUMs by 93, from 355 to 262 AUMs. Thus, 900 fewer acres would be visually disturbed, and the chance of damaging unidentified archaeological sites on these acres would decrease. Although in the long term the allotment would not produce as many AUMs as under the proposed action, it would produce more AUMs than at present or under the no-action alternative.

- On the Sage allotment, the proposed water catchment and its disturbance of 1.5 acres would be eliminated, and the operator would have to continue hauling water during dry periods. All benefits would remain the same as expected under the proposed action, including the estimated increase in AUMs.

- The benefit/cost alternative would reduce range improvement costs by $57,840 (all BLM), a 4 percent decrease from the total ($1,413,338) for the proposed action.

MITIGATING MEASURES AND RESIDUAL IMPACTS

The benefit/cost alternative would apply the same mitigating measures as the proposed action and, with the preceding exceptions, would have the same unavoidable adverse impacts.

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

This alternative's short-term uses versus long-term productivity would be the same as outlined in table 6-1 except that, to attain more cost-effective AMPs, decreases in acres and costs of range improvements (and associated benefits to soils, visual resources, and cultural resources) would be traded for a smaller long-term increase in AUMs.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The benefit/cost alternative's irreversible and irretrievable commitments of resources would also remain the same as for the proposed action except for the 1.5-acre decrease in area occupied by proposed water developments and the 4 percent decrease in the total cost of range improvements.

CHAPTER 9

CONSULTATION AND COORDINATION

CHAPTER 9

CONSULTATION AND COORDINATION

ES PREPARATION

This draft environmental statement (DES) was prepared by an interdisciplinary team of natural resource specialists from BLM's Arizona State Office and Arizona Strip District office. These specialists applied their expertise in botany, wildlife biology, soils, range management, visual resources, cultural resources, outdoor recreation, geology, hydrology, and socioeconomics. BLM's Washington Office and Arizona State Office provided periodic review.

CONSULTATION AND COORDINATION IN PREPARATION OF THE DRAFT ES

During preparation of the DES, other State and Federal agencies, as well as universities with special expertise relating to the proposed action, were contacted for information. Records of contacts are on file in the Arizona Strip District office.

The Arizona Strip District issued news releases describing the ES and requesting the contribution of interested individuals and groups. As a follow-up to the news releases, the District wrote letters to a broad spectrum of resource users, groups, individuals, and agencies. These letters described the Vermillion ES and requested information, opinions, and suggestions on its preparation.

The Arizona Strip District also prepared a slide series and accompanying discussion of the ES and presented it to interested clubs and organizations.

COORDINATION IN THE REVIEW OF THE DRAFT ENVIRONMENTAL STATEMENT

Comments on the DES will be requested from the following agencies and interest groups:

Federal Agencies

Advisory Council on Historic Preservation
Department of Agriculture-Soil Conservation Service
-Forest Service

Department of Interior

Bureau of Reclamation
Bureau of Mines
National Park Service
Heritage Conservation and Recreation Services
U.S. Fish and Wildlife Service
Bureau of Indian Affairs
U.S. Geological Survey

Environmental Protection Agency

State Agencies

Arizona State Clearinghouse
Arizona Natural Resource Conservation Districts
Governor's Commission on Arizona Environment
Indian Affairs Commission
Arizona Game and Fish Department
Arizona State Parks Board
Agriculture and Horticulture Department
Arizona Department of Transportation
Office of Economic Planning and Development
Arizona State Land Department
Utah State Clearinghouse
Utah State Historic Preservation Officer
Utah State Engineer
Utah State Division of Natural Resources
Utah State Office of Planning and Coordination
Utah State Division of State Parks
Utah State Division of Wildlife Resources
Utah State Division of Lands

Local Governments

District IV Council of Governments
Northern Arizona Council of Governments
Mohave County Board of Supervisors
Coconino County Board of Supervisors
Mohave County Extension Service
Coconino County Extension Service
Mohave County Planning Department
Washington County Commission
Washington County Officials and Planners
Kane County Commission
Kane County Planning Commission

Other Organizations

Sierra Club
Izaak Walton League
Wildlife Society
Arizona Cattle Growers Association
Arizona Wool Growers Association
Arizona Conservation Council
Arizona Desert Bighorn Sheep Society, Inc.
Arizona Farm Bureau Federation
Arizona Wildlife Federation
Arizona Wildlife Society
Audubon Society
Natural Resources Defense Council, Inc.
Public Lands Council

Other Organizations (cont.)

Defenders of Wildlife
Pacific Legal Foundation
Environmental Clearinghouse
Utah Environment Center
Mohave County Livestock Association
Mohave County Farm Bureau
Utah Cattlemen's Association
Utah Wool Growers Association
Washington County Cattlemen's Association
Washington County Farm Bureau
Fredonia and Littlefield Resource Conservation Districts

Arizona Congressional Delegation

Utah Congressional Delegation

Interested Individuals

Copies of this draft environmental statement will be available for public inspection at the locations listed below:

Bureau of Land Management Offices

Washington Office of Public Affairs
18th and C Streets, N. W.
Washington, D. C. 20240
Phone: (202) 343-4151

Arizona State Office
2400 Valley Bank Center
Phoenix, AZ 85073
Phone: (602) 261-3873

Arizona Strip District Office
196 E. Tabernacle
St. George, UT 84770
Phone: (801) 673-3545

A public hearing will be held in Fredonia, Arizona. Details on the hearing will be published in the Federal Register and in local newspapers.

APPENDIXES

A

APPENDIX 1-1
METHODOLOGY USED IN DETERMINING USABLE FORAGE FOR GRAZING ANIMALS (MEASURED IN AUMs) FOR THE VERMILLION ES AREA

This appendix summarizes methods and procedures used in determining allowable grazing capacity in the Vermillion ES area. It will first discuss the method used to determine stocking rates and then the procedure for allocating wildlife forage and the method for determining potential increases in usable forage.

DETERMINATION OF USABLE FORAGE PRODUCTION

The Arizona Strip District completed a vegetation inventory of the Vermillion Resource Area in 1977, using the forage production method of survey. Before, and in conjunction with this inventory, Phase I Watershed Studies were completed. The Vermillion Resource Area URA was completed in 1973. It provided a data base for use in determining forage production and allocation. Much of the Vermillion ES area was surveyed for forage production in conjunction with the Phase I Watershed Studies completed in 1975. Before the writing of AMPs the remainder of the area was surveyed or rechecked on an allotment-by-allotment basis, involving vegetation data gathering and analysis and determination of forage production and allocation.

BLM resource managers used URA maps of vegetation and soil types and aerial photos to help determine vegetation subtypes. They used on-the-ground surveys and aerial photographs to further refine the vegetation typing. They distinguished the following vegetation subtypes: short grassland, riparian, wet meadow, sagebrush, saltbush, half-shrub, desert shrub, mountain shrub, pinyon-juniper, ponderosa pine, annual, steep and rocky, barren, and inaccessible.

Resource managers assessed usable forage production in the various subtypes by the forage production inventory method (Jensen, 1977), which determines the amount of forage produced by the amount of moisture an area receives.

The Arizona Strip District employed this method only after several years of trial and study by the district and others, who found a good correlation between herbage yield and annual precipitation. The major study drawn upon was conducted by Hutchings and Stewart (1953) at the Desert Experimental Station in western Utah, about 80 to 100 miles north of the Arizona Strip District. In another study, Sharp (1970) found results similar to those of Hutchings and Stewart and to Arizona Strip clipping studies.

This method employs the idea that in the arid to semiarid Southwest, any given area will produce an average of 45 pounds of air dry plant material per acre, per inch of rainfall received, provided no production limitations or special conditions exist. Such conditions or exceptions might include high alkalinity, salt flats, Moenkopie badlands, high rock content, extremely sandy soils, subirrigated land, or saline meadows.

The method provides for the above conditions by the use of production adjustment figures subtracted from the average production of 45 pounds per acre per inch of moisture. For subirrigrated areas, values are added onto the average production figure.

The 45 pounds per acre figure was derived through extensive studies and research of similar studies. A study area was selected in extreme southwestern Utah and used for 6 years, 1964-1970. Precipitation data were recorded on the site and clipping studies conducted at peak production time each year to determine the correlation between production and amount of rainfall. Several other sites in southern Utah were clipped as well as sites on the Arizona Strip to help determine the rainfall-production correlation as well as the effects of special soil conditions on production.

Range specialists determined vegetation species composition in the following manner. They determined the vegetation subtype boundary by investigating the area and using aerial photographs. They then made ocular estimates of relative species composition by selecting a sample area that seemed to be representative of the larger area and by walking the sample area to determine the relative species composition. If the type were large or varied, several such sample areas might have been surveyed and the results averaged.

To further aid in species composition estimates, the specialists might have run one or more pace transects, consisting of 100 points. In such transects each point represents 1 percent of the total (100 points = 100 percent). Upon determining the percent composition, the specialists recorded the data on the vegetation writeup sheet under the following headings:

Key: Most important livestock and wildlife forage species--increase under good range management. In some cases they are not the most important species to wildlife.

Undesirable: Plants with little or no forage or watershed value--decrease under good range management.

Intermediate: Plants mediocre in forage value--may increase or decrease under good range management.

This procedure was completed for each vegetation subtype within each of the allotments in the Vermillion ES area. Data gathered in this process included vegetation by species, usable forage vegetation by species, special production limitations (i.e. rocky areas, frail land, alkaline or salty soils, and erosion condition), site variability, apparent condition and trend, utilization of major perennial vegetation species, class of livestock, evident wildlife species and use, distribution, dry areas, improvement possibilities, poisonous plants, and elevation. Phase I Watershed Studies were consulted to gather additional information on litter, bare ground, large and small rock, erosion rates, exposure, effective root depth, and soil type and texture at effective root depth (below 4 inches).

Resource specialists determined range suitability through utilization deductions or a percent yield adjustment of available forage. They adjusted for steep slopes, erosion hazards, rocky surfaces, and high percentages of bare ground. Areas with conditions extremely unsuitable for livestock grazing were so identified and given no production credit. For the remaining areas, specialists used professional judgment (based on the proper use of the areas and knowledge of livestock grazing) and the following general guidelines in applying utilization deductions.

A. Slope (Degrees)	% Adjustment
< 6	0
6-15	0-10
16-25	10-25
26-35	26-50
36-45	51-80
>46	81-100

B. Rocks	% Adjustment
< 10%	0
11-25%	0-5%
26-50%	5-20%
50-75%	20-50%
75-100%	50-100%

C. Erosion	% Adjustment
Stable and slight	0
Moderate	0-25%
Critical	30-55%
Severe	60-100%

Rather than designating these areas as unsuitable for grazing, specialists made percentage utilization deductions, deducting these percentages from the normal total production of the area. These deductions allow grazing at a lower intensity, except on the 43,521 extremely unsuitable acres previously mentioned.

The amount of rainfall received by each given area was determined from data compiled on each of the 17 rain gauges located within the Vermillion ES area, plus information obtained from five weather stations in communities within the ES area. Where data were not available on or near the allotment, isohyetal lines from maps prepared by the U.S. Weather Service were used to determine rainfall received in a particular area.

The percent composition of the vegetation recorded under the headings Key, Undesirable, and Intermediate was calculated by grouping vegetation in 5 percent increments as to growth form, forage value, and physiological requirements. Total composition equaled 100 percent.

Proper Use Factors (PUFs) were then assigned to the different categories. A PUF represents that portion of a plant or group of plants' annual production, by weight, in relation to another plant or group of plants' annual production, that can be utilized without affecting plant productivity. Certain forage species or groups of species are preferred above others and vary from 0 to 50 according to preference of grazing animals, plant availability, and season of use.

The plant species grouped as key species are usually assigned a total PUF of 50 percent since these are the most preferred plants. Those plants considered undesirable are generally given no use, and those considered intermediate assigned PUFs ranging from 5 to 30 percent. The percent composition is multiplied by the PUF to get the percent proper use. Percent proper use of key species is added to the percent proper use of the Intermediate species to get the total percent proper use. The next step is to determine the total plant production in pounds per acre per year of the specific area by multiplying 45 pounds per acre by average annual rainfall, less any production adjustments.

Having arrived at a production figure, the specialists determined the usable forage production by multiplying the total percent proper use by the total or adjusted plant production. The resulting figure is the amount of air dry forage produced per acre per year, which grazing animals may use in an average year. Because this figure represents average production and there are as many years below average as above average, the average annual forage production was reduced by 25 percent to allow for the below average years. The stocking rate is thus 75 percent of average production.

This adjustment allows for the below average years as well as the drought years that occur periodically. Little livestock adjustment is thus needed even in unusual years. This 75 percent of average stocking rate was borne out by clipping studies conducted during the formulation of this forage production method and also by other research studies that were evaluated during the formulation of the method. (See description of forage production method on file in the Arizona Strip District office.)

This 75 percent of annual forage production figure is then divided into 800 pounds, the amount of air dry forage needed to sustain one cow and one calf or equivalent for one month. The resulting quotient is expressed in acres/AUM. Acres per AUM divided into the total acres in the type yields total AUMs for the type. (See attached vegetation analysis form for computations.)

The following computations were made for each vegetation type in each allotment.

1. PUF x Percent Composition = Percent Proper Use. (This step was performed for key species and intermediate species.)

2. Percent Proper Use of Key Species + Percent Proper Use Intermediate = Total Percent Proper Use.

3. Precipitation x 45 lbs. + any production adjustments = Total Production.

4. Total Production x Total Percent Proper Use = Estimated Forage Production.

5. .75 x Estimated Forage Production = Stocking Rate.

6. 800 lbs. divided by Stocking Rate = Acres/AUM.

7. Total Acres of Type ÷ Acres/AUM = Total AUMs Per Type.

8. The number of AUMs produced in each type in the allotment were then totaled to get the total AUMs for the allotment.

The vegetative analysis form on the following page illustrates the calculation of usable forage production using the following procedure:

- The second listing under the species column lumps Sihy, Orhy, Agsm, and Stco as constituting 5 percent of species composition. This 5 percent or .05 is then multiplied by the PUF of .15 for livestock and .05 for wildlife, resulting in a product of .0225 for livestock and .0025 for wildlife. Similar calculations are made for all species listed in the species column. For each calculation, applicable PUFs are used.

- The percent proper use figures for all species with PUFs are added up, totaling .1225 or 12 percent for livestock and .0575 or 6 percent for wildlife.

- These sums are then multiplied by 495 pounds/acre--the total vegetation production under 11 inches of annual precipitation: 12% x 495 lbs. = 59.4 = total pounds of usable production.

AS-01-4412-22
2/7/72

VEGETATIVE ANALYSIS

Aerial Photo No. Date

Examiner Write up No. Type Key Area Location

Species	Composition Type	Composition Key A.	Potential Type	Potential KeyA	Condition Type	Condition KeyA	P.U.F Lvstk	P.U.F Wldlf	% Proper Use Lvstk	% Proper Use Wldlf	Potential P.U. Lvstk	Potential P.U. Wldlf
Key	25		45									
Siny-Orhy Agsm-Stco	5		15				.15	.05	.0225	.0025	.0675	.0075
Bogr-Hija	15		20				.45	.05	.9675	.0075	.0900	.0100
Cost-Quga	5		10				.25	.25	.0125	.0125	.0250	.0250
Undesirable	35		25									
P-J	20		20									
Gusa	15		5									
Opum	.1											
Other	40		30									
Artr	25		20				.05	.10	.0125	.0250	.0100	.0200
Penst	5		5				.05	.10	.0025	.0050	.0025	.0050
Chryso	10		5				.05	.05	.0050	.0050	.0025	.0025
TOTAL	100%	100%	100%	100%					.1225	.0575	.1975	.0700
									12%	6%	20%	7%

Precipitation 11"	Utilization Deduction Total 10%	Wildlife Species & Use:
Production 495	Slope(Livestock) Erosion Class Frail Lands 1- Low Production 2- Rocks.....10% 3-(0-15%) Rodents 4-(20-55%) 5-(60-100%)	Male Deer, Moderate

Unserviced Areas: Photo No. Acres:____ AUM's:____	Treatment Areas: Photo No. Acres:____ AUM's____	Usable Plant Production: Livestock: 446 ____ Wildlife: 446 ____

ESTIMATED FORAGE PRODUCTION

	Livestock Present	Livestock Potential	Wildlife Present	Wildlife Potential	Total Present	Total Potential	
lbs./Air dry	54	89	27	31			Average
	41	67	20	23			75% of Average
A./AUM	14.8	9.0	29.6	25.8			Average
	19.5	11.9	40.0	34.8			Stocking Rate
AUM's 1600.00	82	134	40	46			

- From this product, however, a utilization deduction of 10 percent is made to allow for rocks that prevent plant growth. Usable forage production for livestock would thus amount to 54 pounds/acre. Calculation of usable forage production for wildlife would be as follows: 6% x 495 = 29.7; 29.7 x .9 = 27 lbs./acre.

- These 54 and 27 pounds are then listed on the vegetative analysis form in the "present" box under estimated forage production.

- These figures are then reduced by the drought buffer of 25 percent, resulting in 41 pounds/acre for livestock and 20 pounds/acre for wildlife.

- The 41 and 20 pounds are converted to AUMs by dividing them into 800 pounds, the amount of forage required to feed one animal unit for 1 month. The resulting quotients comprise the present carrying capacity--19.5 acres/AUM for livestock and 40 acres/AUM for wildlife. The values 14.8 and 29.6 (appearing immediately above 19.5 and 40 on the vegetative analysis form) represent acres/AUM without a 25 percent drought buffer reduction.

- Finally, the 19.5 acres/AUM and 40 acres/AUM are divided into the 1,600 acres of subtype represented by this vegetative analysis form. The quotients represent usable forage AUMs in the subtype: 82 AUMs for livestock and 40 AUMs for wildlife.

DETERMINATION OF FORAGE ALLOCATION (FOR WILDLIFE AND LIVESTOCK)

Wildlife forage requirements were determined from habitat management plans in the resource area, MFP decisions, and recommendations from the Arizona Game and Fish Department. BLM and AG&FD cooperatively formulated a wildlife forage allocation to satisfy the needs of a "reasonable number" of big-game animals. This number was based on the habitat's present carrying capacity and on a comparison of high and low populations that occurred in the past. Big-game populations are presently lower than the "reasonable number" agreed upon. The acres of various habitats contained in each allotment were inventoried in conjunction with AMP development, and a determination made as to the number of wildlife AUMs needed. (See Vermillion MFP, District memo entitled Forage Allocation for Wildlife dated August 8, 1975 and District memo entitled Allocation of Forage for Antelope dated August 5, 1976.)

The AUMs needed for wildlife were determined simultaneously with the livestock AUMs by incorporating dual-use factors for wildlife and livestock within the proper use limits outlined in the previous section (Determination of Usable Forage Production). Dual-use means dividing the total allowable PUF between livestock and wildlife.

For cattle and mule deer a total PUF on cliffrose would amount to 50 percent. In the allocation of use on this species, 25 percent would go to mule deer and 25 percent to cattle. See attached vegetation analysis sheet.

Allocations were made on key species as well as intermediate species, depending on wildlife species and use. (See sample vegetation writeup sheet attached.)

The one exception was antelope for which an allocation was determined and subtracted directly from livestock carrying capacity.

PROJECTION OF FORAGE PRODUCTION INCREASES

Potential forage production was determined on the basis of production within 15 years under proposed management. Future usable production or the total estimated increase in AUMs over a 15-year period was projected by the following method.

Future usable production per acre of grassland, sagebrush, pinyon-juniper, saltbush, and desert shrub was determined from the existing field estimates of those subtypes under good, fair, and poor condition. These estimates were then averaged by the above types. The average percent increase in usable forage production was determined for each of the above subtypes between the three condition ratings. That percent then was applied on an allotment and subtype basis to those acres subject to a condition change over a 15-year period by the proposed action. This is shown in appendix 3-2.

The other subtypes not listed above but existing on the ES area occurred too infrequently to determine production under all three condition categories. Thus the data were insufficient to extrapolate. This is shown in appendix 3-2.

Allotments having a large amount of acreage of the subtypes for which future production data could not be extrapolated (Button, Chatterly, Fuller Road, Frank's Reservoir, Grama Point, Sage, Sunshine, and Wild Band) had their estimated increase by the following method. The data for these 8 allotments is shown only in table 1-2 as the methodology below differs from that used above and shown in appendix 3-2.

Projected forage production was determined using management and ecological potential based on a 15-year period. Management decisions affect the species of vegetation that the grazing systems are designed to favor.

The projected increased vegetation or forage production was then calculated using specific management objectives outlined for key areas identified on the individual allotments. The objectives were derived by using watershed and vegetation studies, and early photographs and by considering protected and relic areas, grazing systems and season of use, and similar sites properly used.

The amount and type of vegetation increase arrived at in the specific objectives of the particular vegetation type were plugged into the vegetation writeup sheet under the potential column, and calculations completed as they would be in determining present forage production for each vegetation type on the allotment.

All vegetation types within an allotment were totaled to obtain a total potential increased forage production figure for the allotment. (See attached vegetation analysis sheet.)

Thus, the above-named allotments will not be consistent between table 1-2 and appendix 3-2, which details the current and future usable production.

DETERMINATION OF RANGE CONDITION, TREND, AND UTILIZATION

Field investigators determined range condition by assessing the plant species composition of the vegetation subtypes. The standards for this assessment were subjective. When inventorying each vegetation subtype in each allotment, the investigator assessed each subtype's condition, looking for a good forage and browse species mix. A subtype with a good mix was rated good. A subtype lacking a good mix was rated as poor or fair. For a grassland to be rated in good condition, it had to have a mix of cool- and warm-season grasses. A monotype or a grassland of cheatgrass was rated as poor.

A monotype of sagebrush with little or no understory of herbaceous plants was rated poor. On the other hand, a sagebrush subtype with a mix of cool- and warm-season grasses and browse was rated good.

Investigators compared the above judgments to the species composition data obtained on the transect. Transect data used were categorized as follows:

Good Condition: 40 or more percent key species (See chapter 2 Vegetation)

Fair Condition: 15 to 39 percent key species

Poor Condition: less than 15 percent key species

In many cases, however, investigators did not use the transect data when the soil erosion merited that range condition be rated lower. Rather, they assigned a lower condition rating to the subject subtypes.

Investigators judged apparent range trend on all allotments except those managed under implemented AMPs, where actual range trend studies provided data. They rated trend by the following conditions:

Up Trend

1. Vegetation restoring around water.
2. Vegetation restoring in wash bottoms.
3. Vegetation density increasing.
4. Vegetation composition of desirable plants improving.

Static Trend

All four conditions appear to be remaining static.

Down Trend

1. Vegetation not restoring around water.
2. Vegetation not restoring in wash bottoms.
3. Vegetation density decreasing.
4. Vegetation composition becoming monotypic rather than a mix.

Trend

Trend studies are conducted according to BLM Manual 4412.22c. These studies will be conducted in each pasture before the implementation of grazing systems and during the rest treatment of each grazing cycle. A trend plot is read by measuring ground cover, plant composition, and plant species age class in the plot. A transect is read by making a step-pace transect of 50-100 points, which measures frequency and density of ground cover and plant composition. The transect is used to determine browse condition, watershed erosion condition, and trend. Trend studies indicate in what directions the allotment is moving in relation to its potential vegetation composition and density.

Utilization

Utilization of forage is measured immediately after each pasture is grazed. The method proposed for use is the key species method described in BLM Manual 4412.22b, by which the utilization of forage is determined by observing height of stubble, remaining seed heads of key species, and relative use made of less desirable species. Utilization studies aid in determining whether stocking rates are at proper levels.

APPENDIX 1-2

ALLOTMENT MANAGEMENT PLAN OBJECTIVES FOR RENEWABLE RESOURCES
(15-YEAR TIME FRAME)

Allotment Name and Number	Wildlife Habitat	Watershed Protection	Livestock Production on Public Lands	Vegetation (Key Species)
Antelope 3	Reserve 332 AUMs for mule deer and 48 AUMs for antelope. Increase production, density, and variety of forage and cover species desirable to wildlife.	Reduce SSF* by 10 points when current SSF is above 25 in 15 yrs.	Produce at least 180 calves/yr. Increase weaning weights from 400 to 425 lbs.	Increase composition of desirable forage as follows: warm-season grasses 20% to 70%, cool-season grasses- 0% to 15%, fourwing saltbush, Mormon tea, winterfat 0% to 25%.
\ntelope Spring 2	Reserve 41 AUMs for mule deer and 15 AUMs for antelope.	Reduce SSFs higher than 25 by 6 points.	Increase calf weights from 375 lbs. to an average of 425 lbs.	Increase desirable species as follows: Warm-season grasses (galleta, grama grass) 15% to 40%; cool season grasses (needlegrass, Indian ricegrass) 5% to 10%; browse, fourwing saltbush, cliffrose, Mormon tea 5% to 25%.
Atkin Well 11	Reserve 45 AUMs of annual forage production for mule deer and 24 AUMs for antelope.	Reduce SSF at following transects: 1. 42 to 39 2. 56 to 45 3. 57 to 45	Increase weaner weights from 450 lbs. to 500 lbs.	Increase desirable forage species as follows: Cool season grasses from trace to 5%; warm-season grasses from trace-45% to 5%-45%; browse from trace-15% to 5%-20%.
Badger Creek 63	Reserve 8 AUMs annually for mule deer.	Reduce SSF in key areas as follows: 1. 39 to 34 2. 42 to 34	N/A	Increase desirable forage species as follows: Cool-season grass from trace-5% to 5-15%, warm-season grass from trace-25% to 1-30%; browse from 2-5% to 4-7%.
Beanhole 59	Reserve 29 AUMs annually for antelope.	N/A	Obtain through management at least a 90% calf crop. Produce on an average 400 lbs. weaners.	Increase composition of galleta grass from 15% to 20%; sand dropseed from trace to 5-10%; Indian ricegrass from 5% to 15%; fourwing saltbush from trace to 10%.
Buffalo Tank (Implemented) 58	Reserve 48 AUMs annually for antelope.	N/A	Produce at least 250 calves/yr. Increase weaner weight from 350 to 400 lbs.	Increase cool-season grass from trace-5% to 5-10%; warm season grass from 5-50% to 10-55; browse 10-55% to 15-60%.
Button 47	Reserve 26 AUMs for deer and 10 AUMs for antelope.	Reduce SSF at transects as follows: 1. 41 to 31 2. 63 to 53 3. 56 to 46 4. 31 to 27	Increase base cattle herd to Class I Qualifications.	Increase warm season grasses from 20% to 30%, cool season grass from 0% to 10-30%, browse-fourwing saltbush from 5% to 10-15%. Reduce snakeweed and Russian thistle from 5-20% to 0-15%.
Cannan Gap 16	Reserve 96 AUMs annually for mule deer.	Reduce SSF at transects as follows: 1. 42 to 36 2. 35 to 28 3. 54 to 46 4. 39 to 33 5. 37 to 34	Increase base herd to Class I Qualifications.	Increase cool-season grasses trace-25% to 5-30%; warm season
Cane Beds 19	Reserve 114 AUMs for mule deer and 7 AUMs for antelope.	Reduce SSF at following transects: 1. 25 to 19 2. 26 to 19 3. 22 to 15 4. 20 to 15	Increase base hard to Class I Qualifications.	Increase cool-season grasses from 5-30% to 10-40%; warm-season grasses from 5-10% to 10-20%; browse from 5-20% to 10-25%.
Cedar Knoll (Implemented) 40	Reserve 230 AUMs for mule deer.	N/A	Produce 140 calves each year. Increase weaner weights from 425 to 475 lbs. each year.	Increase cool season grasses from 15-55% to 25-70%; warm-grasses from trace to 5%.
Chatterly 46	Reserve 75 AUMs to mule deer.	Reduce SSF at following transects: 1. 36 to 33 2. 31 to 25 3. 41 to 36 4. 31 to 29 5. 44 to 40 6. 40 to 33 7. 56 to 41 8. 08 to 26 9. 60 to 52	Increase base cattle herd to Class I qualifications.	Increase cool-season grasses 5-10% to 10-15; warm-season grasses from 10-30% to 15-35%; browse from trace to 5%.
Clayhole (Implemented) 6	Reserve 248 AUMs for antelope.	Reduce bare ground hits at plots 5, 9 and 14 from 25-50 to 15-25.	Produce 1,100-1,200 calves each year. Increase weaner weights to 450 lbs.	Increase cool-season grasses from trace to 5%; warm-season grasses from 5% to 10%; browse from 5-15% to 10-25%.
Cottonwood 12	Reserve 6 AUMs of annual forage production for mule deer.	Reduce all SSFs of over 25 by 10 points.	N/A	Increase cool-season grasses from trace to 5-10%; warm-season grasses from 25-35% to 30-45%; browse from 5-20% to 10-20%.

*SSF is Soil Surface Factor, a soil erosion factor.
N/A : Not Applicable
Most objectives are taken directly from AMPs, but objectives have been summarized in those cases where there is more than one objective for a specific plant species.
Cool-season grasses include: Indian ricegrass, needlegrasses, crested wheatgrasses, western wheatgrass and wildryes.
Warm-season grasses include: galleta grass, black grama, and blue grama.
Browse includes: Fourwing saltbush, Mormon tea, cliffrose, bitterbrush, winterfat, and sagebrush.

Allotment Name and Number	Wildlife Habitat	Watershed Protection	Livestock Production on Public Lands	Vegetation (Key Species)
Cowboy Butte 36 (Implemented)	Reserve 7 AUMs for antelope.	N/A	N/A	Increase cool-season grasses from 7% to 15%; maintain 47% crested wheat, 36% Russian wildrye, 45% sagebrush in Key Area 3; increase warm-season grasses from 20 to 25%, maintain 30% galleta, 10% winterfat, 18% shadscale at Area 2.
Coyote 54	Reserve 448 AUMs of annual forage production for mule deer.	Reduce SSF at following transects as follows: 1. 43 to 37 2. 50 to 39 3. 67 to 66 4. 42 to 33 5. 51 to 43 6. 51 to 45 7. 37 to 30	Improve range condition to allow Class I stocking base	Increase cool-season grasses from trace to 1%, warm-season grasses from 5-20% to 7-25%; browse from 5-10% to 10-13%.
Cram 60	Maintain a minimum of 32 AUMs for antelope.	Reduce soil erosion as follows: 1. 2450 acres slight erosion to stable 2. 14710 acres moderate erosion to slight 3. 7000 acres of critical erosion to moderate.	Attain a 90% calf crop. Attain, on the average, 400-lb. weaners	Increase cool-season grasses from 7% to 15%, warm-season grasses from 15% to 20%, browse, increase to 10-30%.
Crosby Tank 9	Reserve 108 AUMs of annual forage production for mule deer.	Reduce SSF at Key Areas as follows: 1. 28 to 23 2. 34 to 25	N/A	Increase cool-season grassea from 5% to 10%; warm-season grasses from 5% to 10%; maintain blue grama in Area 2 at 40%.
Fern Tank 7 (Implemented)	Reserve 425 AUMs annually for mule deer and 35 AUMs for antelope.	N/A	Produce 550 calves each year. Increase weaner weights from 400 to 450 lbs.	Increase cool-season species from trace-2% to 5-10%, warm-season grasses 45-80% to 60-85%.
Ferry Swale 65	Reserve 98 AUMs of annual forage production for mule deer.	Reduce SSF as follows at transects listed: 1. 28 to 25 2. 45 to 41 3. 26 to 20 4. 36 to 31 5. 21 to 19 6. 32 to 30 7. 35 to 30	N/A	Increase cool-season grasses from 5-15% to 15-25%; browse from trace to 10%.
Frank's Reservoir 53	Reserve 74 AUMs of annual forage production for mule deer.	Reduce SSF at the following transects: 1. 33 to 31 2. 44 to 38 3. 47 to 40	Increase calf crop to 95%. Increase weaner weight from 350 lbs. to 400 lbs.	Increase cool-season grasses from trace to 2%; warm-season grass from 5% to 6-8%; browse from trace-20% to 2-21%.
Fuller Road 52 (Implemented)	Reserve 339 AUMs forage for deer	N/A	Produce 155 calves each year. Increase weaner weights from 425 lbs.to 450 lbs.	Increase cool-season grasses from trace-5% to 5-10%; warm season grasses from 5-25% to 15-35%, browse from 5% to 10-20%.
Glazier Dam 13	Reserve 14 AUMs of forage production annually for antelope.	Reduce all SSFs of over 25 by 10 points.	Increase calf crop from 85% to 90%. Increase weaner weights from 400 to 456 lbs.	Increase cool-season grasses from trace-5% to 5-10%; warm-season grasses from 25-40% to 35-45%; browse from trace-10% to 5-20%.
Grama Point 30 (Implemented)	Reserve 20 AUMS for antelope.	Reduce SSF at following transects: 1. 24 to 19 2. 19 to 15 3. 22 to 17 4. 32 to 28	Increase calf crop from 85% to 90%. Increase weaning weights of calves from 350 to 400 lbs. Increase base herd from 315 to 430 cows.	Increase cool-season grasses from 0-15% to 10-30%; warm-season grasses from 10-15% to 15-25%; browse from 0-15% to 5-30%; forbs (globemallow) from trace to 10%.
Gunsight 41	Reserve 95 AUMs annually for mule deer.	Reduce SSF at following transects: 1. 34 to 34 2. 45 to 35	N/A	Increase blue grama 0% to 5-10%. Increase Indian ricegrass from 0% to 5%, increase browse from 4% to 7-10%; maintain wildrye at 20%, maintain galleta at 10%.
Hack Canyon 23	Reserve 55 AUMs annually for antelope.	Reduce the slight erosion (SSF of 28-38) to a stable condition (SSF of 19).	Increase calf crop to 95%. Increase wesner weights to 425 lbs. on the average. Annually produce 2960 AUMs.	Increase cool-season grasses from 0% to 15%; maintain vigor of warm-sesson grasses; increase fourwing saltbush from 5% to 15%.
Home Ranch 62	Reserve 568 AUMs for deer.	Reduce all SSFs of over 25 by 10 points.	Increase calf crop to 90%. Increase weaner weights from 400 to 425 lbs.	Increase cool-season grasses from trace to 10%; warm-season grasses from 5-15% to 10-20%; browse from trace-5% to 5-10%.
House Rock 57 (Implemented)	Reserve 23 AUMs for antelope and 21 AUMs for mule deer.	N/A	Produce 150-170 calves esch year. Increase weaning weight from 400 to 450 lbs.	Increase browse from a trace to 10%, increase cool-season grasaes from 15% to 20%; maintain 50% composition of warm-season grasses.

APPENDIX 1-2 (cont.)

Allotment Name end Number	Wildlife Habitat	Watershed Protection	Livestock Production on Public Lands	Vegetation (Key Species)
Jacob Canyon 38	Reserve 25 AUMs of annual forage production for mule deer and 10 AUMs for antelope.	Reduce SSFe at the following transects: 1. 32 to 27 2. 28 to 25	Increeee preeent calf crop from 65% to 85%. Increaee weaning weight from 350 lbs. to 400 lbe.	Increase cool-season grasses from 15-30% to 20-35;, browse from trace to 5%.
June Tank 27	Reeerve 893 AUMs of annual forage production for mule deer. Increase forb dsneities in Grasslend-Half-ehrub type.	Reduce current SSFe of 24-39 to 20-32.	Produce 85% to 95% calf crop. Increase weaning weight from 425 to 450 lbs. Increase carrying capscity by 20% by 1985.	Increase cool-season grasses from 1-10% to 5-20%; warmsaaeon graeses from 10-35% to 15-45%; browes from 4-15% to 14-25%.
Lamb Tank 22	Reserve 31 AUMs for mule deer and entelope. Diversify riparian and flood plein vegetation to 35% shrub, 40% grass, and 25% forbs.	Reduce SSF at the following transects: 1. 31 to 29 2. 34 to 30 3. 40 to 29 4. 45 to 30 5. 34 to 30 6. 22 to 19 7. 31 to 29 8. 34 to 30	N/A	Increaee warm season grasses from trece-20% to 5-25%; cool season grasses from 15% to 20%; browee from trace-10% to 5-15%.
Lee's Ferry 64	Provide 51 AUMs for 17 mule deer.	Reduce SSFe as ehown: 1. 40 to 35 2. 38 to 32 3. 39 to 34	N/A	Increase cool-season grasses from 10% to 15%; warm-season graeses from 10% to 20%; browse from 5% to 10%. Reduce undesirable shrubs from 45-20% to 40-5%. Reduce undesirable forbs from 10% to 5%. Fence riparian areas to allow recovery.
Moonehine 21	Reeerve 14 AUMs for deer annuelly and 11 AUMs annually for antelope.	Maintain the SSF of 29 over 80% of the allotment.	N/A	Increase cool-season grasses from trace-7% to 5-12%; warm-season gresees from 15-30% to 20-35%; browse from 5-25% to 10-30%.
Mt. Logan 8	Reeerve 1977 AUMs annually for mule deer.	Maintain correct SSF on allotmente.	N/A	Increase cool-season grasaea from trace-25% to 5-40%; warm-season grasses from trace-35% to 5-40%; browse from trace-10% to 5-15%.
Muggins Flat 51	Reserve 132 AUMs of the estimated yearly forage production for mule deer.	Maintain SSF from 20 to 39.	Produce at leaet 55 calves eech year. Produce average weaning weight of 425 lbs.	Increase cool-season grasses from trace to 5%; warm-season graeses from trace-40% to 5-55%; browse from trace to 5%.
Pigeon Tenk 26	Reserve 60 AUMs for deer of annual forage production. Reserve 13 AUMs for antelope.	Reduce SSF at following transects: 1. 42 to 32 2. 35 to 35 3. 43 to 39 4. 42 to 32	Increase calf crop from 87% to 92%. Increase weaner weighte from 375 lbe. to 400 lbe.	Increaee cool-season grasses 2-40% to 4-40%; warm-season grasses 9-29% to 10-31%; browse from 1-10% to 2-11%.
Pratt Tank 45	Reeerve 271 AUMs of the annual forage production for mule deer.	Reduce all erosion eo that entire allotment has slight erosions ss shown at traneects below: 1. 36 to 32 2. 36 to 33 3. 37 to 29 4. 49 to 35 5. 43 to 39 6. 44 to 40 7. 33 to 29 8. 28 to 25	Produce a minimum of 350 AUMs annually for livestock. Manage for a 90% calf crop end 450-lb. weaners.	Increase cool-season grasses from 2% to 20%. Maintain all seeded areae at current compositione. Increase warm-season graeses from 0% to 10%; browse from trace to 10-15%.
Rider 50	Reserve 61 AUMs of annual production for mule deer.	Reduce the SSF at following transects: 1. 63 to 59 2. 40 to 35 3. 38 to 33 4. 41 to 31 5. 44 to 40	Increese bese cattle herd to Clase I.	Increase cool season grasses from trace-5% to 5-10%; warm-season grasaes from 5-10% to 10-15%; browse from 5-10% to 10-15%.
Rock Canyon 1	Reserve 8 AUMs of annual forage production for mule deer.	Reduce SSF of 42 to 33.	N/A	Increaes cool-season grassea from trace-5% to 5-10;, warm-season gresses from 20-35% to 25-40%; browse from 15-20% to 20-25%.
Rock Canyon Tank 39	Provide 22 AUMs of annual production for 22 mule deer.	Reduce the SSF from 42 to 33.	Produce 887 AUMs of livestock forage annually on a eustained yield baeis. Improve calf crop from 75% to 85%. Increaee calf weights from 600 lbe. to 675 lbs.	Increase desirable grasses from 5-32% to 10-40%; increase dseirable browse from 5-11% to 10-15%, decrease undesirable species from 45-10% to 40-5%.
Rock Pockets 5	Reeerve 28 AUMs for entelope.	Reduce all SSF above 25 by 10 points.	Increase calf weaning weights. Increase calf crops.	Increaee cool-eeeson gresses from trece-10% to 5-15%, warm-eeaeon graesee from 30-55% to 35-60%, browse from 5-15% to 10-20%.
Sage 28	Provide 84 AUMs for mule deer and 9 AUMs for antelope.	Reduce the SSF at following transects: 1. 27 to 22 2. 22 to 19 3. 27 to 23 4. 34 to 32 5. 49 to 35 6. 40 to 33 7. 32 to 27	N/A	Increase cool-eeason greeses from 3% to 20%; warm-season grasees from 6% to 20%; browse from 4% to 20%.

APPENDIX 1-2 (cont.)

Allotment Name and Number	Wildlife Habitat	Watershed Protaction	Livestock Production on Public Lands	Vegetation (Key Species)
Shinarump 48	Provide a forage allocation of 39 AUMs for the populstion of 16 deer.	Reduce the SSF at following transects: 1. 63 to 53 2. 41 to 31	N/A	Increase cool-season grasses from trace to 7%; warm season grasses from 3-25% to 5-28%; browse from trace-15% to 3-20%.
Shuttleworth 44	Reserve 120 AUMs of annual forage production for mule deer.	Reduce the SSF as follows: 1. 63 to 53 2. 49 to 35 3. 20 to 17 4. 56 to 41 5. 45 to 33 6. 32 to 28 7. 33 to 29 8. 42 to 39 9. 49 to 40 10. 37 to 29	N/A	Increase cool-season grasses from 5-10% to 15-30%; warm season grasses from 10-45% to 15-50%; browse from trace-10% to 5-15%.
Soap Creek 61	Reserve 146 AUMs for deer and 24 AUMs for antelope.	Reduce erosion as follows: West shortgrass - SSF 46 to 34. East shortgrass - SSF 58 to 46. Desert shrub - SSF 82 to 60.	N/A	Increase cool-season grasses from trace to 5%; increase Browse from 5% to 30%.
Spooks Knoll 37	Reserve 30 AUMs of snnusl forage production for mule deer and 8 AUMs for antelope.	Reduce SSF from 1. 28 to 25 2. 37 to 30 3. 41 to 35 4. 32 to 27 5. 42 to 34 6. 40 to 33 7. 32 to 28	Incresse calf crop to 85%. Incresse weaner weight to 450 lbs.	Increase cool-season grasses from trace to 5%; warm season grasses from trace-15% to 5-20%; browse from trace to 5%.
Suicide 42	Reserve 107 AUMs of annual forage production for mule deer.	Reduce SSF from 43 to 35.	Increase bsse cattle herd to the operator's Clsss I qualifications.	Increase cool-season grasses from 5-10% to 10-15%; warm season grasses from 10-15% to 15-20%; browse from trace-5% to 5-10%.
Sunshine 29	Reserve 56 AUMs of annual forage production for deer and 7 AUMs for antelope.	Reduce all SSF at following transects: 1. 27 to 22 2. 27 to 23 3. 34 to 32 4. 31 to 24	N/A	Increase cool-season grasses from 5-10% to 10-15%, warm-season grasses from 7-15% to 14-20%; browse from 5-15% to 10-20%.
Temple Trail 4	Reserve 36 AUMs for mule deer and 60 AUMs for antelope.	Reduce the SSF by 10 points in all transect areas where the current SSF is above 25.	Produce at least 305 cslves/year. Increase weaning weights from 400 lbs. to 425 lbs.	Increase cool-season grasses from trace-5% to 5-10%, warm-season grasses from 15-45% to 20-55%; browse from 15-60% to 20-65%.
Tuweep 10	Reserve 737 AUMs of annual forage production for mule deer and 4 AUMs for antelope. Increase densities of cliffrose, bitterbrush and ceonothus from 5-10% to 15-20%.	N/A	Increase calf crops 81 to 90%. Increase weaner weights from 350 to 400 lbs.	Increse cool-season grasses from trace-60% to 5-60%; warm-season grssses from trace-30% to 5-30%.
Two Mile 55	Reserve 538 AUMs for deer and 2 AUMs for antelope annually.	Reduce SSF by improving ground cover.	Increase carrying capacity by 10% to approximately 400 CYL.	Increase cool-season grasses from trace to 5%; wsrm season grasses from 25-35% to 30-40%.
Valley Wash 25	Reserve 5 AUMs for sntelope annually.	Reduce SSF at following transects: 1. 30 to 26 2. 31 to 20 3. 38 to 22 4. 40 to 20 5. 34 to 30	Increase calf crop from 80% to 90%. Increase weaner weight from 400 lbs. to 425 lbs.	Increase cool-season grasses from trace-7% to 10-15%; warm-season grasses from 13-50% to 30-55%; browse from trace-15% to 10-25%.
Vermillion 56 (Implemented)	Reserve 1504 AUMs for mule deer annually.	N/A	Produce 650-700 calves each year. Increase weaning weights from 390 to 450 lbs. Increase stocking rate by at lesst 10%.	Increase cool-season grasses from trace-5% to 5-10%, warm-season grasses from 30-60% to 35-65%.
Wells 14 (Implemented)	Reserve 76 AUMs for mule deer annually.	Reduce SSF at following transects: 1. 54 to 46 2. 35 to 28 3. 39 to 34	N/A	Increase cool-season grasses from trace-5% to 5-10%, warm-season grasses from trace to 5%, browse from trace-10% to 5-15%.
White Sage 43 (Implemented)	Reserve 153 AUMs for mule deer snnually.	N/A	Increase calf crop to 90%. Increase weaner weights from 350 lbs. to 425 lbs.	Increase western wheatgrass from trsce to 3%; increase warm-season grasses from 5-20% to 10-30%; browse from 1-5% to 5-10%.
Wild Band 24 (Implemented)	Reserve 37 AUMs of forage for antelope annually. Reserve 297 AUMs for mule deer.	N/A	Produce 310 calves each year, at laast. Increase weanar weight to 425 lbs.	Increase cool-season grasses from trace-15% to 5-25%; warm season grasses from 10-30% to to 20-50%, browse from 5-15% to 10-25%.

APPENDIX 2-1
COMMON PLANT SPECIES

Common Name	Scientific Name	Abbreviated Binomials
Blue grama	Bouteloua gracilis	Bogr
Galleta grass	Hilaria jamesii	Hija
Squirreltail	Sitanion hystrix	Sihy
Indian ricegrass	Oryzopsis hymenoides	Orhy
Crested wheatgrass	Agropyron cristatum	Agcr
Russian wildrye	Elymus junceus	Elju
Big sagebrush	Artemisia tridentata	Artr
Sandsage	Artemisia filifolia	Arfi
Fringed sage	A. frigida	Arfr
Black sagebrush	A. nova	Arno
Bigelow sagebrush	A. bigelovii	Arbi
Junegrass	Koeleria cristata	Kocr
Western wheatgrass	Agropyron smithii	Agsm
Ephedra	Ephedra spp.	EPHE
Cliffrose	Cowania mexicana stansburiana	Come
Fourwing saltbush	Atriplex canescens	Atca
Pinyon	Pinus monophylla and edulis	Pimo and Pied
Juniper	Juniperus osteosperma	Juos
Ring muhly	Muhlenbergia spp.	MUHL
Sacaton	Sporobolus airoides	Spai
Shadscale	Atriplex confertifolia	Atco
Snakeweed	Gutierrezia sarothrae	Gusa
Blackbrush	Coleogyne ramosissima	Cora
Buckwheats	Eriogonum spp.	ERIO
Wolfberry	Lycium spp.	LYCI
Yucca	Yucca spp.	YUCC
Greasewood	Sarcobatus vermiculatus	Save
Saltgrass	Distichlis stricta	Dist
Rabbitgrass	Chrysothamnus spp.	CHRY
Great Basin wildrye	Elymus cinereus	Elci
Oak	Quercus gambelii and Q. turbinella	Quga and Qutu
Serviceberry	Amelanchier alnifolia	Amal
Mountain mahogany	Cercocarpus spp.	CERC
Bluegrasses	Poa spp.	POA
Willow	Salix spp.	SALI
Bullrushes	Juncus spp.	JUNC
Sedges	Carex spp.	CARE
Cottonwoods	Populus spp.	POPU
Creosotebush	Larrea tridentata	Latr
Bursage	Ambrosia spp.	AMBR
Range ratany	Krameria spp.	KRAM
Big galleta	Hilaria rigida	Hiri
Winterfat	Ceratoides lanata	Cela
Ponderosa pine	Pinus ponderosa	Pipo
Arizona fescue	Festuca Arizonica	Fear
Bitterbrush	Purshia tridentata	Putr
Cheatgrass	Bromus tectorum	Brte
Russian thistle	Salsola Kali	Saka

APPENDIX 2-2

VEGETATION TYPES ALLOCATED FOR LIVESTOCK FORAGE

All Acres

Allotment	Total Acres	Grass-land	Sage-brush	Salt-bush	Pinyon-Juniper	Half shrub	Grease-wood	Mountain Shrub	Meadow	Riparian	Creosote-bush	Winter-fat	Shad-scale	Annual	Coni-fers	Desert Shrub	Unsuitable/ Barren
Antelope	41080	23371	3330	10290	4089	-	-	-	-	-	-	-	-	-	-	-	-
Antelope Spring	16899	8049	4967	3883	-	-	-	-	-	-	-	-	-	-	-	-	-
Atkin Well	28647	10803	-	9882	537	4927	-	-	-	-	-	-	-	-	-	1253	1245
Badger Creek	6362	2052	-	1441	-	-	-	-	-	12	-	-	-	-	-	-	2869
Beanhole	20920	435	2105	18310	-	-	-	-	-	-	-	-	-	-	-	70	-
Buffalo Tank	34442	19255	-	12087	-	3100	-	-	-	-	-	-	-	-	-	-	-
Button	5660	-	3550	1720	-	-	-	-	-	Scattered	-	-	-	390	-	-	-
Cannan Gap	8390	2290	2680	-	3250	-	-	-	170	-	-	-	-	-	-	-	-
Cane Beds	22180	2850	8960	-	4120	-	-	-	-	-	-	-	-	-	-	1480	4770
Cedar Knoll	17951	4335	13616	-	-	-	-	-	-	Scattered	-	-	-	-	-	-	-
Chatterly	7500	-	5660	200	-	-	-	-	-	-	-	-	-	1640	-	-	-
Clayhole	178560	120929	-	56791	840	-	-	-	-	-	-	-	-	-	-	-	-
Cottonwood	4080	660	-	3340	-	-	-	-	-	Scattered	-	-	-	-	-	-	80
Cowboy Butte	4245	370	1200	540	-	-	600	1510	-	-	-	-	-	-	-	-	25
Coyote	41261	-	27808	-	13102	-	-	-	-	Scattered	-	-	-	-	-	-	351
Cram	25430	9360	2810	7800	-	-	-	-	-	-	-	-	-	-	-	4210	1250
Crosby Tank	5360	-	1460	-	3900	-	-	-	-	-	-	-	-	-	-	-	-
Fern Tank	51749	4420	31599	-	15730	-	-	-	-	-	-	-	-	-	-	-	-
Ferry Swale	30340	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29140	1200
Frank's Reservoir	8406	-	1581	-	6317	-	-	508	-	-	-	-	-	-	-	-	-
Fuller Road	35807	-	19906	-	14351	-	-	-	-	-	-	-	-	1550	-	-	-
Glazier Dam	9989	4742	-	4914	-	-	-	-	-	Scattered	-	-	-	-	-	-	333
Grama Point	23865	2100	11705	-	-	9860	-	-	-	-	-	-	-	-	-	-	200
Gunsight	7610	2030	5440	-	140	-	-	-	-	-	-	-	-	-	-	-	-
Hack Canyon	37307	20924	-	6875	3120	4450	-	-	-	Scattered	-	-	-	-	-	974	964
Home Ranch	43708	-	12580	-	31128	-	-	-	-	-	-	-	-	-	-	-	-
House Rock	18664	18605	-	-	-	-	-	-	-	-	-	-	-	-	-	-	59
Jacob Canyon	3840	-	2960	-	880	-	-	-	-	-	-	-	-	-	-	-	-
June Tank	92632	20858	43791	-	25506	-	-	-	-	-	-	-	-	-	-	-	2477
Lamb Tank	12600	6793	-	-	-	-	-	-	-	Scattered	-	-	-	576	-	1868	3363
Lee's Ferry	20060	-	-	-	-	-	-	-	-	1140	-	-	3500	-	-	6600	8820
Moonshine	10045	8995	-	-	1050	-	-	-	-	-	-	-	-	-	-	-	-
Mt. Logan	97290	12550	11440	-	49380	-	-	1620	-	10	1700	-	-	-	5080	7300	8220
Muggins Flat	11888	-	11888	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pigeon Tank	15368	6615	2287	-	6466	-	-	-	-	-	-	-	-	-	-	-	-
Pratt Tank	22663	400	16808	-	5455	-	-	-	-	-	-	-	-	-	-	-	-
Rock Canyon	2410	1820	590	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rock Canyon Tank	11255	1090	7495	-	1560	-	-	-	-	-	-	-	-	-	-	-	1110
Rock Pocket	22990	19395	1985	1610	-	-	-	-	-	-	-	-	-	-	-	-	-
Rider	4852	-	2742	675	1035	-	400	-	-	Scattered	-	-	-	-	-	-	-
Sage	11650	-	-	6120	2430	-	-	-	-	-	-	2830	-	-	-	-	270
Shinarump	4629	-	1589	-	3040	-	-	-	-	-	-	-	-	-	-	-	-
Shuttleworth	26787	3230	13920	690	4287	2300	-	-	-	-	-	-	-	-	-	2090	270
Soap Creek	49430	21100	770	-	-	-	-	-	-	2	-	-	6240	-	-	16175	5145
Spooks Knoll	18080	-	17880	155	-	-	-	-	-	Scattered	-	-	-	-	-	-	45
Suicide	4830	-	1120	-	3710	-	-	-	-	-	-	-	-	-	-	-	-
Sunshine	8930	2940	1800	110	-	-	-	-	-	-	-	3950	-	-	-	-	130
Temple Trail	41306	26353	10698	1858	2397	-	-	-	-	-	-	-	-	-	-	-	-
Two Mile	41830	-	18927	-	21703	-	-	-	-	-	-	-	-	-	-	-	1200
Tuweep	57494	11740	11855	-	27319	-	-	-	-	-	-	-	-	-	3800	-	2780
Valley Wash	16523	12048	-	4475	-	-	-	-	-	Scattered	-	-	-	-	-	-	-
Vermillion	116321	21806	12670	-	81845	-	-	-	-	-	-	-	-	-	-	-	-
Wells	5290	1870	1430	-	1580	-	-	-	-	Scattered	-	-	-	-	-	-	410
White Sage	14100	-	8220	-	5880	-	-	-	-	-	-	-	-	-	-	-	-
Wild Band	52340	5010	17804	1160	9130	19236	-	-	-	Scattered	-	-	-	-	-	-	-
Cove	110	-	-	-	110	-	-	-	-	-	-	-	-	-	-	-	-
Eight Mile Pass	440	-	440	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ferrin	3360	-	700	-	2570	-	-	-	-	-	-	-	-	-	-	-	90
Gramma Springs	4495	-	-	4495	-	-	-	-	-	-	-	-	-	-	-	-	-
Gulch	3400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3400	-
Harris Well	6800	6430	-	-	370	-	-	-	-	-	-	-	-	-	-	-	-
Kanab Creek	5260	-	-	5260	-	-	-	-	-	Scattered	-	-	-	-	-	-	-
Kanab Gulch	3700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3700	-
Lost Spring Gap	1875	250	1625	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stateline	1760	750	1010	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wahweep	15459	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11864	3595

APPENDIX 2-3

PUBLIC LAND ACRES* RANGE CONDITION AND APPARENT TREND

Allotment	Vegetation Type	Present Range Condition (Acres) Good	Fair	Poor	Range Trend Up	Static	Down	Public Land Acres
Antelope	Grassland	200	17,768			17,968		
	Sagebrush	930	1,920			2,850		
	Pinyon-Juniper		3,449			3,449		
	Saltbush	320	8,190	160		8,510	160	
		1,450	31,327	160		32,777	160	32,937
Antelope Spring	Grassland	5,498				5,498		
	Sagebrush	4,967				4,967		
	Desert Shrub		3,754			3,754		
		10,465	3,754			14,219		14,219
Atkin Well	Grassland	8,729				8,729		
	Unsuitable			1,225			1,225	
	Pinyon-Juniper		347			347		
	Saltbush		5,730	4,152		5,730	4,152	
	Desert Shrub			1,143		1,143		
	Half Shrub		4,927			4,927		
		8,729	11,004	6,520		20,876	5,377	26,253
Badger Creek	Grassland		1,962			1,962		
	Unsuitable			1,811			1,811	
	Barren			662			662	
	Saltbush			1,441		1,441		
			1,962	3,914		3,403	2,473	5,876
Beanhole	Grassland		190				190	
	Sagebrush		1,630				1,630	
	Saltbush		17,070				17,070	
	Desert Shrub		70				70	
			18,960				18,960	18,960
Buffalo Tank (Actual Trend)	Grassland	15,695					15,695	
	Saltbush	10,827					10,827	
	Half Shrub	2,820					2,820	
		29,342					29,342	29,342
Button	Sagebrush		1,650	1,370	1,650		1,370	
	Saltbush		1,090		1,090			
	Annuals			390			390	
			2,740	1,760	2,740		1,760	4,500
Cane Beds	Grassland		1,540			1,540		
	Sagebrush	5,040	3,000			3,000	5,040	
	Unsuitable			4,550			4,550	
	Pinyon-Juniper		2,800			2,800		
	Desert Shrub			150			150	
		5,040	7,340	4,700		7,340	9,740	17,080
Cannan Gap	Grassland		810			810		
	Meadow		50			50		
	Sagebrush			1,580		1,580		
	Pinyon-Juniper			2,830		2,830		
			860	4,410		5,270		5,270
Cedar Knoll (Actual Trend)	Grassland		4,335				4,335	
	Sagebrush		13,616				13,616	
			17,951				17,951	17,951
Chatterly	Sagebrush		1,710	3,160	1,710	3,160		
	Annuals			1,270		1,270		
			1,710	4,430	1,710	4,430		6,140

Allotment	Vegetation Type	Present Range Condition (Acres) Good	Fair	Poor	Range Trend Up	Static	Down	Public Land Acres
Glayhole (Actual Trend)	Grassland	44,414	59,321		103,735			
	Pinyon-Juniper			720		720		
	Saltbush		54,089		54,089			
		44,414	113,410	720	157,824	720		158,544
Gottonwood	Grassland		660			660		
	Unsuitable			80			80	
	Saltbush		3,020			3,020		
			3,680	80		3,680	80	3,760
Cowboy Butte (Actual Trend)	Grassland	370					370	
	Sagebrush	1,160					1,160	
	Mt. Shrub			1,350			1,350	
	Unsuitable			15			15	
	Saltbush		85			85		
	Greasewood		140			140		
		1,530	225	1,365		225	2,895	3,120
Goyote	Sagebrush	9,010	12,498	3,400		21,508	3,400	
	Pinyon-Juniper			9,970			9,970	
	Waste			351			351	
		9,010	12,498	13,721		21,508	13,721	35,229
Gram	Grassland		7,955				7,955	
	Sagebrush		2,775				2,775	
	Unsuitable			1,210			1,210	
	Saltbush	7,670				7,670		
	Desert Shrub	3,500	660			4,160		
		11,170	11,390	1,210		11,830	11,940	23,770
Grosby Tank	Sagebrush		820			820		
	Pinyon-Juniper			3,900		3,900		
			820	3,900		4,720		4,720
Fern Tank (Actual Trend)	Grassland	2,085	1,865		3,950			
	Sagebrush		28,959		28,959			
	Pinyon-Juniper		9,152	6,208		15,360		
		2,085	39,976	6,208	32,909	15,360		48,269
Ferry Swale	Desert Shrub		10,988	6,912		10,988	6,912	
	Unsuitable			300			300	
			10.988	7,212		10,988	7,212	18,200
Frank's Reservoir	Sagebrush	251		1,145		251	1,145	
	Mt. Shrub		411			411		
	Pinyon-Juniper	3,546		2,341		3,546	2,341	
		3,797	411	3,486		4,208	3,486	7,694
Fuller Road	Sagebrush		5,808	10,910		16,718		
	Pinyon-Juniper		8,313	4,948		13,261		
	Annuals			1,090			1,090	
			14,121	16,948		29,979	1,090	31,069
Glazier Dam	Grassland		2,952			2,952		
	Unsuitable			333			333	
	Saltbush		3,502			3,502		
			6,454	333		6,454	333	6,787
Grama Point	Grassland		2,100			2,100		
	Sagebrush		11,385			11,385		
	Unsuitable		200				200	
	Half Shrub		9,860			9,860		
			23,545			23,345	200	23,545

*Data on trend and condition are available on public land acres only.

APPENDIX 2-3 (cont.)

Allotment	Vegetation Type	Present Range Condition (Acres) Good	Fair	Poor	Range Trend Up	Static	Down	Public Land Acres
Gunsight	Grassland	1,850				1,850		
	Sagebrush		2,620	2,620		5,240		
	Pinyon-Juniper			140		140		
		1,850	2,620	2,760		7,230		7,230
Hack Canyon	Grassland		18,350			18,350		
	Unsuitable			964			964	
	Pinyon-Juniper			3,120			3,120	
	Saltbush			6,849			6,849	
	Desert Shrub		974			974		
	Half Shrub		4,450			4,450		
			23,774	10,933		23,774	10,933	34,707
Home Ranch	Sagebrush	10,742				10,742		
	Pinyon-Juniper	27,648				27,648		
		38,390				38,390		38,390
House Rock (Actual Trend)	Grassland	8,477	8,478				16,955	
	Unsuitable			59			59	
		8,477	8,478	59			17,014	17,014
Jacob Canyon	Sagebrush	460	1,860			2,320		
	Pinyon-Juniper		880			880		
		460	2,740			3,200		3,200
June Tank	Grassland	7,218	12,561			19,779		
	Sagebrush		41,611			41,611		
	Unsuitable			2,477			2,477	
	Pinyon-Juniper		24,341			24,341		
		7,218	78,513	2,477		85,731	2,477	88,208
Lamb Tank	Grassland		5,433			5,433		
	Desert Shrub		1,868			1,868		
	Annuals			576			576	
	Unsuitable			3,363			3,363	
			7,301	3,939		7,301	3,939	11,240
Lee's Ferry	Riparian			850			850	
	Shadscale		1,560			1,560		
	Desert Shrub		2,550	2,710		2,550	2,710	
	Unsuitable		7,860				7,860	
			11,970	3,560		4,110	11,420	15,530
Moonshine	Grassland		8,745			8,745		
	Pinyon-Juniper		980			980		
			9,725			9,725		9,725
Mt. Logan	Grassland	640	2,040	6,820		2,680	6,820	
	Sagebrush	960	4,520	3,710		9,190		
	Mt. Shrub			1,300		1,300		
	Conifer			4,880		4,880		
	Waste			5,460			5,460	
	Pinyon-Juniper		15,200	21,260		36,460		
	Desert Shrub		1,770			1,770		
		1,600	23,530	43,430		56,280	12,280	68,560
Muggins Flat	Sagebrush		11,888			11,888		11,888

Allotment	Vegetation Type	Present Range Condition (Acres) Good	Fair	Poor	Range Trend Up	Static	Down	Public Land Acres
Pigeon Tank	Grassland	5,530	1,085			5,530	1,085	
	Sagebrush	428	1,859			428	1,859	
	Pinyon-Juniper	2,434	981	3,051		3,415	3,051	
		8,392	3,925	3,051		9,373	5,995	15,368
Pratt Tank	Sagebrush	6,756	8,063		6,756	8,063		
	Pinyon-Juniper		5,084			5,084		
		6,756	13,147		6,756	13,147		19,903
Rock Canyon	Grassland		790		790			
	Desert Shrub		570		570			
			1,360		1,360			1,360
Rock Canyon Tank	Grassland			1,090			1,090	
	Sagebrush		7,495			7,495		
	Unsuitable			1,110			1,110	
	Pinyon-Juniper		1,560			1,560		
			9,055	2,200		9,055	2,200	11,255
Rock Pocket	Grassland	2,810	13,425		2,810	13,425		
	Sagebrush		1,985			1,985		
	Saltbush		1,610			1,610		
		2,810	17,020		2,810	17,020		19,830
Rider	Sagebrush			1,922			1,922	
	Pinyon-Juniper			1,005			1,005	
	Saltbush			626			626	
	Greasewood			80			80	
				3,633			3,633	3,633
Sage	Unsuitable		270				270	
	Pinyon-Juniper		2,430				2,430	
	Saltbush		5,600				5,600	
	Winterfat		2,190				2,190	
			10,490				10,490	10,490
Shinarump	Sagebrush	1,259		310	1,259		310	
	Pinyon-Juniper		1,585	855			2,440	
		1,259	1,585	1,165	1,259		2,750	4,009
Shuttleworth	Grassland	1,310			1,310			
	Sagebrush	5,090		8,270		13,360		
	Pinyon-Juniper		4,217			4,217		
	Saltbush	50			50			
	Desert Shrub			2,090		2,090		
	Half Shrub		1,240			1,240		
	Barren		270			270		
		6,450	5,727	10,360	1,360	21,177		22,537
Soap Creek	Grassland	18,630				18,630		
	Sagebrush		770				770	
	Unsuitable			3,840			3,840	
	Shadscale		5,310			5,310		
	Desert Shrub		14,755			14,755		
		18,630	20,835	3,840		38,695	4,610	43,305
Spooks Knoll	Sagebrush	1,810		14,550		1,810	14,550	16,360
Suicide	Sagebrush	1,120				1,120		
	Pinyon-Juniper		3,510	200			3,710	
		1,120	3,510	200		1,120	3,710	4,830

APPENDIX 2-3 (cont.)

Allotment	Vegetation Type	Present Range Condition (Acres) Good	Fair	Poor	Range Trend Up	Static	Down	Public Land Acres
Sunshine	Grassland	2,940					2,940	
	Sagebrush		1,313				1,313	
	Unsuitable		130				130	
	Saltbush		107				107	
	Winterfat		3,950				3,950	
		2,940	5,500				8,440	8,440
Temple Trail	Grassland	6,485	20,375			6,485	20,375	
	Pinyon-Juniper	5,961	2,435			8,396		
	Saltbush	1,215				1,215		
		13,661	22,810			16,096	20,375	36,471
Tuweep	Pinyon-Juniper			23,448		23,448		
(Actual Trend)	Sagebrush		8,717			8,717		
	Grassland		9,014			9,014		
	Conifer		3,686			3,686		
	Unsuitable		1,751			1,751		
			23,168	23,448		46,616		46,616
Two Mile	Sagebrush		18,337			18,337		
	Unsuitable			1,160		1,160		
	Pinyon-Juniper		19,533			19,533		
			37,870	1,160		39,030		39,030
Valley Wash	Grassland	11,418			11,418			
	Saltbush			3,563			3,563	
		11,418		3,563	11,418		3,563	14,981
Vermillion	Grassland		21,206				21,206	
(Actual Trend)	Sagebrush		11,390				11,390	
	Pinyon-Juniper		77,398				77,398	
			109,994				109,994	109,994
Wells	Grassland		1,245			1,245		
	Sagebrush		1,030	400			1,430	
	Unsuitable			405			405	
	Pinyon-Juniper			1,570		1,570		
			2,275	2,375		2,815	1,835	4,650
White Sage	Sagebrush	2,010		3,680		2,010	3,680	
(Actual Trend)	Pinyon-Juniper	1,540		3,780		5,320		
		3,550		7,460		7,330	3,680	11,010
Wild Sand	Grassland		3,190			3,190		
	Sagebrush		17,804			17,804		
	Pinyon-Juniper		9,130			9,130		
	Saltbush		600			600		
	Half Shrub		16,496			16,496		
			47,220			47,220		47,220
Intensive Management Totals		262,013	851,156	225,240	220,146	739,465	380,608	1,340,219
Custodial								
Cove	Pinyon-Juniper		110			110		110
Eight Mile Pass	Sagebrush			440			440	440
Ferrin	Pinyon-Juniper			2,280		2,280		
	Barren			70		70		
				2,350		2,350		2,350
Gramma Springs	Rabbitbrush/ Saltbush		4,495			4,495		4,495
Gulch	Oesert Shrub		3,400			3,400		3,400
Kanab Gulch	Oesert Shrub		3,700			3,700		3,700
Harris Well	Grassland	2,330				2,330		
	Pinyon-Juniper		310			310		
		2,330	310			2,640		2,640
Kanab Creek	Saltbush/ Rabbitbrush			4,544		4,544		4,544
Lost Spring	Sagebrush		465				465	
Gap	Grassland	250				250		
		250	465			250	465	715
Stateline	Grassland/ Fringed Sage		580			580		580
Wahweep	Unsuitable		3,595				3,595	
	Oesert Shrub		11,864			11,864		
			15,459			11,864	3,595	15,459
Custodial Management Totals		2,580	28,519	7,334	0	33,933	4,500	38,433
Grand Totals		264,593	879,675	232,574	220,146	773,398	385,108	1,378,652

APPENDIX 2-4
VEGETATION PRODUCTION PER ALLOTMENT*

Allotment	Vegetation Type	Average Rainfall (Inches)	Average Production Per Acre (Air Dry Pounds)	Acreage of Type (All Acres)	Total Production (Pound of Air Dry)	Usable Production (Forage) Per Acre (Air Dry Pounds)**	Usable AUMs***
Antelope	Grassland	9	405	23,901	9,679,905	115	3,426
	Sagebrush	9	405	3,330	1,348,650	68	283
	Pinyon-Juniper	11.5	440	4,089	1,799,160	23	118
	Saltbush	9	405	10,290	4,167,450	57	733
							4,560
Antelope Spring	Grassland	9	398	8,049	3,203,502	82	818
	Sagebrush	9	405	4,467	1,809,135	70	391
	Desert Shrub	9	304	3,683	1,119,632	54	248
							1,457
Atkin Well	Grassland	9	405	10,803	4,375,215	91	1,225
	Pinyon-Juniper	9	405	537	217,485	86	58
	Saltbush	9	405	9,882	4,002,210	79	972
	Desert Shrub	9	324	1,253	405,972	37	58
	Half Shrub	9	405	4,927	1,995,435	77	474
	Unsuitable	9	-	537	-	-	-
							2,787
Badger Creek	Grassland	5.7	256	2,052	525,312	23	61
	Saltbush	5.7	256	1,441	368,896	27	49
	Unsuitable	5.7	256	2,207	564,992	-	-
	Barren	5.7	-	-	-	-	-
							110
Beanhole	Grassland	7.5	337	435	146,595	75	41
	Sagebrush	7.5	337	2,105	709,385	59	156
	Saltbush	7.5	360	18,310	6,591,600	77	1,768
	Desert Shrub	7.5	337	70	23,590	34	3
							1,968
Buffalo Tank	Grassland	8	360	19,255	6,931,800	101	2,425
	Saltbush	7	315	12,087	3,807,405	69	1,047
	Half Shrub	7.5	337	3,100	1,044,700	46	179
							3,651
Button	Sagebrush	10	450	3,550	1,597,500	76	336
	Saltbush	10	450	1,720	774,000	10	22
	Annuals	10	450	390	175,500	62	30
							388
Cane Beds	Grassland	9	405	2,050	830,250	88	225
	Grassland	10	450	800	360,000	100	100
	Sagebrush	9	365	5,360	1,956,400	75	500
	Sagebrush	10	450	3,600	1,620,000	25	110
	Unsuitable	10	450	4,770	2,146,500	-	-
	Pinyon-Juniper	10	450	4,120	1,854,000	39	200
	Desert Shrub	10	450	1,480	666,000	23	40
							1,175
Cannan Gap	Grassland	10	450	2,290	1,030,500	71	202
	Meadow	10	1,500+	170	255,000	349	74
	Sagebrush	10	450	1,790	805,500	57	127
	Sagebrush	11.5	518	890	461,026	63	70
	Pinyon-Juniper	11.5	518	3,250	1,683,500	36	146
							619
Cedar Knoll	Grassland	9.5	430	4,335	1,864,050	125	677
	Sagebrush	9.5	430	13,616	5,854,880	19	327
							1,004
	Actual use and utilization studies indicate total carrying capacity is 774 AUMs. No type breakdown exists for new capacity.						
Chatterly	Sagebrush	10	450	5,660	2,547,000	61	433
	Saltbush	10	450	200	90,000	32	8
	Annuals	10	450	1,640	738,000	56	115
							556
Clayhole	Grassland	10	450	120,929	54,418,050	90-150	14,957
	Pinyon-Juniper	10	450	840	378,000	-	-
	Saltbush	10	450	56,791	25,555,950	60-80	4,723
							19,680
	Actual use and utilization studies indicate new total carrying capacity is 14,628 AUMs. No vegetal breakdown exists for new capacity.						
Cottonwood	Grassland	9	405	660	267,300	76	63
	Unsuitable	9	405	80	32,400	-	-
	Saltbush	9	405	3,340	1,352,700	66	277
							340

* Includes woody and herbaceous production.
** Usable production is determined by the forage inventory method described in appendix 1-1.
*** AUMs of usable forage are calculated by multiplying usable production by the acreage and then dividing that product by 800.
\+ Surfacing water table allowed increased production.

NOTE: Some of the AUM figures shown differ from the AUMs shown in table 1-2 because the estimated carrying capacities shown in table 1-2 do not include unallotted wildlife AUMs, unpalatable to livestock and presently unneeded by wildlife. Wildlife allocations are based on reasonable big game numbers, and available wildlife AUMs exceed the identified need.

APPENDIX 2-4 (cont.)

Allotment	Vegetation Type	Average Rainfall (Inches)	Average Production Per Acre (Air Dry Pounds)	Acreage of Type (All Acres)	Total Production (Pound of Air Dry)	Usable Production (Forage) Per Acre (Air Dry Pounds)**	Usable AUMs***
Cove	Pinyon-Juniper	10	450	110	49,500	73	10
Cowboy Butte	Grassland	9.5	428	370	158,360	155	72
	Sagebrush	9.5	342	1,055	360,810	64	84
	Sagebrush	9.5	428	145	62,060	88	16
	Mt. Shrub	9.5	214	1,510	323,140	30	57
	Unsuitable	-	-	25	-	-	-
	Saltbush	9.5	385	540	207,800	71	48
	Greasewood	9.5	428	600	256,800	100	75
							352
Coyote	Sagebrush	10	450	14,708	6,618,600	76	1,396
	Sagebrush	10	405	2,800	1,134,000	36	126
	Sagebrush	10	427	10,300	4,398,100	52	670
	Pinyon-Juniper	12	540	13,102	7,075,080	36	590
	Waste	10	-	351	-	-	-
							2,782
Cram	Grassland	6.5	292	9,360	2,733,120	68	797
	Sagebrush	6.5	292	2,810	820,520	61	216
	Unsuitable	6.5	292	1,250	365,000	-	-
	Saltbush	6.5	292	7,800	2,277,600	89	864
	Desert Shrub	6.5	292	4,200	1,229,320	78	409
							2,286
Crosby Tank	Sagebrush	10	450	1,460	657,000	49	90
	Pinyon-Juniper	12	540	3,900	2,106,000	65	320
							410
Eight Mile Pass	Sagebrush	10	450	440	198,000	31	17
Fern Tank	Grassland	10	405	4,420	1,790,100	102	564
	Sagebrush	10	428	6,111	2,615,508	89	678
	Sagebrush	10	450	6,113	2,750,850	76	582
	Sagebrush	10	405	19,335	7,830,675	89	2,163
	Pinyon	10	405	3,395	1,374,975	55	234
	Juniper	10	450	12,335	5,550,750	42	644
	Actual use and utilization studies indicate 5,900 AUMs. However, no vegetal type breakdown is available.						4,865
Ferrin	Sandsage	10.5	473	700	331,100	38	33
	Pinyon-Juniper	10.5	473	2,570	1,215,610	45	143
	Barren	10.5	-	90	-	-	-
							176
Ferry Swale	Desert Shrub	6	135	14,148	1,909,980	27	482
	Desert Shrub	6	270	11,244	3,035,880	53	749
	Desert Shrub	6	243	3,748	910,764	56	263
	Unsuitable	6	-	1,200	-	-	-
							1,494
Frank's Reservoir	Sagebrush	10	450	1,581	711,450	62	196
	Mt. Shrub	11	495	508	251,460	56	57
	Pinyon-Juniper	12.5	432	6,317	2,728,944	3	38
							291
Fuller Road	Sagebrush	10	450	10,910	4,909,500	46	637
	Sagebrush	9	405	8,996	3,643,380	6	68
	Pinyon-Juniper	12	540	8,313	4,489,020	75	782
	Pinyon-Juniper	10	450	6,039	2,717,100	30	231
	Annuals	9	405	1,550	627,750	109	212
							1,930
Glazier Dam	Grassland	9	405	4,742	1,920,510	78	460
	Unsuitable	9	405	333	134,865	-	-
	Saltbush	9	405	4,914	1,990,170	73	448
							908
Grama Point	Grassland	9.5	450	2,100	945,000	105	275
	Sagebrush	9.5	450	11,705	5,267,250	72	1,054
	Unsuitable	9.5	450	200	90,000	-	-
	Half Shrub	9.5	450	9,860	4,437,000	102	1,258
							2,587
Gramma Springs	Rabbit Brush/ Saltbush	8.5	384	4,495	1,726,080	24	137
Gulch	Desert Shrub	8	360	3,440	1,224,000	32	138
Gunsight	Grassland	9	405	2,030	822,150	68	173
	Sagebrush	9	405	5,440	2,203,200	53	363
	Pinyon-Juniper	9	405	140	56,700	51	9
							545
Hack Canyon	Grassland	9	405	20,924	847,220	79	2,075
	Unsuitable	9	405	964	390,420	-	-
	Pinyon-Juniper	10	450	3,120	1,404,000	60	234
	Saltbush	9.5	427	6,875	2,935,625	84	725
	Desert Shrub	7	315	974	306,810	14	17
	Half Shrub	9.5	427	4,450	1,900,150	75	416
							3,467

APPENDIX 2-4 (cont.)

Allotment	Vegetation Type	Average Rainfall (Inches)	Average Production Per Acre (Air Dry Pounds)	Acreage of Type (All Acres)	Total Production (Pound of Air Dry)	Usable Production (Forage) Per Acre (Air Dry Pounds)**	Usable AUMs***
Harris Well	Grass	9.5	428	6,430	2,752,040	123	985
	Pinyon-Juniper	9.5	428	370	158,360	65	30
							1,015
Home Ranch	Sagebrush	9	405	12,580	5,095,710	123	1,939
	Pinyon-Juniper	10	450	7,110	3,199,500	42	380
	Pinyon-Juniper	9	405	24,018	9,727,290	92	2,769
							5,088
House Rock	Grassland	8	360	18,605	6,697,800	81	1,878
	Unsuitable	8	360	59	21,240	-	-
Jacob Canyon	Sagebrush	10	450	2,960	1,332,000	50	186
	Pinyon-Juniper	10	450	880	396,000	37	41
							227
June Tank	Grassland	10	450	20,858	9,386,100	87	2,247
	Sagebrush	10	450	43,791	1,966,950	78	4,285
	Unsuitable	10	450	2,477	1,114,650	-	-
	Pinyon-Juniper	10	450	25,506	11,477,700	58	1,878
							8,410
Kanab Creek	Saltbush/Rabbitbrush	8.5	383	5,260	2,014,500	17	115
Kanab Gulch	Desert Shrub	8	360	3,700	1,332,000	24	113
Lamb Tank	Grassland	9	405	7,507	3,040,335	61	576
	Pinyon-Juniper	10	450	1,731	788,950	48	103
	Unsuitable	10	450	3,352	1,508,400	-	-
							679
Lee's Ferry	Riparian	6	270	1,140	307,800	36	51
	Shadscale	6	270	3,500	945,000	35	152
	Desert Shrub	6	270	6,600	1,452,000	43	356
	Unsuitable	6	270	8,420	2,273,400	-	-
	Barren	6	-	400	-	-	-
							559
Lost Spring Gap	Sagebrush	9	405	1,625	658,125	52	105
	Grassland	9	405	250	101,250	61	19
							124
Moonshine	Grassland	10	440	8,995	3,957,800	67	752
	Pinyon-Juniper	10	405	1,050	425,250	32	42
							794
Mt. Logan	Grassland	12	540	12,550	6,777,000	111	1,733
	Sagebrush	11	495	11,440	5,662,800	83	1,191
	Mt. Shrub	14	630	1,620	1,020,600	60	121
	Conifer	13	556	5,080	2,824,480	55	352
	Waste	10	-	8,220	-	-	-
	Pinyon-Juniper	12	472	49,380	23,307,360	52	3,227
	Creosote	9	405	1,700	688,500	35	75
	Desert Shrub	10	428	3,695	1,581,460	12	57
	Desert Shrub	10	450	1,532	689,400	114	219
	Desert Shrub	12	486	2,073	1,007,478	132	343
							7,318
Muggins Flat	Sagebrush	9	405	11,888	4,814,640	48	719
Pigeon Tank	Grassland	9.5	427	1,085	463,295	114	154
	Grassland	9	405	5,530	2,239,650	99	684
	Sagebrush	9.5	427	1,850	789,950	45	103
	Sagebrush	9	405	437	176,985	82	45
	Pinyon-Juniper	9.5	427	3,051	1,302,777	21	79
	Pinyon-Juniper	9	405	3,415	1,383,075	33	338
							1,403
Pratt Tank	Grassland	12	540	400	216,000	159	80
	Sagebrush	10	450	6,516	2,932,200	29	241
	Sagebrush	12	540	4,631	2,200,740	21	123
	Sagebrush	11	495	5,661	2,802,195	67	475
	Pinyon-Juniper	12	540	5,455	2,945,700	33	228
							1,147
Rock Canyon	Grassland	9	405	1,820	737,100	78	178
	Sagebrush	9	405	590	238,950	81	60
							238
Rock Canyon Tank	Grassland	9.5	428	1,090	466,520	57	77
	Sagebrush	10	450	7,495	3,372,750	65	605
	Pinyon-Juniper	10	450	1,560	702,000	87	169
	Unsuitable	10	450	1,110	499,500	-	-
							851
Rock Pockets	Grassland	9	405	18,305	7,413,525	76	1,738
	Grassland	9.5	428	1,090	466,520	267	364
	Sagebrush	9	405	1,985	803,925	171	425
	Saltbush	9	405	1,610	652,050	80	161
							2,688

APPENDIX 2-4 (cont.)

Allotment	Vegetation Type	Average Rainfall (Inches)	Average Production Per Acre (Air Dry Pounds)	Acreage of Type (All Acres)	Total Production (Pound of Air Dry)	Usable Production (Forage) Per Acre (Air Dry Pounds)**	Usable AUMs***
Rider	Sagebrush	12	540	2,742	1,480,680	44	157
	Pinyon-Juniper	12	540	1,035	558,900	25	34
	Saltbush	12	540	675	364,500	58	50
	Greasewood	12	540	400	216,000	58	29
							270
Sage	Unsuitable	10	450	270	121,500	-	-
	Pinyon-Juniper	10	450	2,430	1,093,500	71	217
	Saltbush	10	450	6,120	2,754,000	83	637
	Winterfat	9.3	405	2,830	1,146,150	98	348
							1,202
Shinarump	Sagebrush	12.65	514	1,589	816,746	66	131
	Pinyon-Juniper	12.65	514	3,040	1,562,560	46	177
							308
Shuttle-worth	Grassland	9.5	428	3,230	1,382,440	105	425
	Sagebrush	9.5	428	13,420	4,743,760	50	835
	Pinyon-Juniper	10	450	4,287	1,929,150	48	258
	Saltbush	9.5	428	690	295,320	87	75
	Desert Shrub	9.5	428	2,090	894,520	41	106
	Half Shrub	9.5	428	2,300	984,400	45	129
	Barren	9.5	428	270	115,560	-	-
							1,828
Soap Creek	Grassland	7	315	18,205	5,734,575	73	1,664
	Grassland	7	268	2,895	775,860	42	153
	Sagebrush	7	315	770	242,550	42	40
	Unsuitable	7	315	4,390	1,382,850	-	-
	Shadscale	7	268	6,240	1,672,320	17	214
	Desert Shrub	7	110	11,260	1,238,600	28	388
	Desert Shrub	7	236	2,605	614,780	33	106
	Desert Shrub	7	63	2,310	145,530	18	51
	Highway	-	-	755	-	-	-
							2,616
Spooks Knoll	Sagebrush	9.5	427	17,880	7,634,760	34	762
	Unsuitable	9.5	427	45	19,215	-	-
	Saltbush	9.5	427	155	66,185	21	4
							766
Stateline	Grassland/ Fringed Sage	10	450	1,760	792,000	64	140
Suicide	Sagebrush	10	450	1,120	504,000	82	115
	Pinyon-Juniper	10	450	3,710	1,669,500	59	275
							390
Sunshine	Grassland	10	450	2,940	1,323,000	97	355
	Sagebrush	9.3	405	1,800	729,000	48	109
	Unsuitable	10	450	130	58,500	-	-
	Saltbush	9.3	405	110	44,550	44	6
	Winterfat	10	450	3,950	1,777,500	105	518
							988
Temple Trail	Grassland	10	450	30,360	13,662,000	90	3,400
	Sage	9	405	5,360	2,170,800	70	468
	Pinyon-Juniper	10	450	9,471	426,950	74	879
	Saltbush	10	450	1,475	663,750	105	195
							4,942
Two Mile	Sagebrush	10	450	18,927	8,517,150	54	1,279
	Unsuitable	10	450	1,200	540,000	-	-
	Pinyon-Juniper	10	450	21,703	9,766,350	91	2,481
							3,760
Tuweep	Pinyon-Juniper	11.52	518	27,319	14,151,242	43	1,460
	Sagebrush	11.52	518	11,855	6,140,890	62	926
	Grassland	11.52	518	11,740	6,081,320	63	925
	Ponderosa	11.52	518	3,800	1,968,400	52	250
	Unsuitable	11.52	518	2,780	1,440,040	-	-
							3,561
Valley Wash	Grassland	9.5	427	8,561	3,655,547	97	1,035
	Grassland	9.5	405	3,487	1,412,235	74	321
	Saltbush	9.5	363	1,168	377,264	59	86
	Saltbush	9.5	385	3,307	1,273,195	40	167
							1,609
Vermillion	Grassland	9	405	21,806	8,831,430	71	1,925
	Sagebrush	9	405	12,670	5,131,350	84	1,335
	Pinyon-Juniper	9	405	81,845	33,147,225	76	7,780
							11,040
Wahweep	Unsuitable	6	270	3,595	970,650	-	-
	Desert Shrub	6	270	11,864	3,203,280	49	734
Wells	Grassland	10	450	1,870	841,500	97	226
	Sagebrush	11.5	518	1,430	740,740	65	116
	Unsuitable	10	450	460	184,500	-	-
	Pinyon-Juniper	11.5	518	1,580	818,440	36	71
							413

APPENDIX 2-4 (cont.)

Allotment	Vegetation Type	Average Rainfall (Inches)	Average Production Per Acre (Air Dry Pounds)	Acreage of Type (All Acres)	Total Production (Pound of Air Dry)	Usable Production (Forage) Per Acre (Air Dry Pounds)**	Usable AUMs***
White Sage	Sagebrush	9.5	430	8,220	3,534,600	80	821
	Pinyon-Juniper	10	450	4,160	1,872,000	42	221
	Pinyon-Juniper	9.5	430	1,720	739,600	48	103
							1,145
Wild Band	Grassland	8	360	5,010	1,803,600	84	527
	Sagebrush	8	360	2,920	1,051,200	90	332
	Sagebrush	9	405	7,383	2,990,115	64	597
	Sagebrush	9.5	450	7,501	3,375,450	63	595
	Pinyon-Juniper	9	405	850	344,250	63	57
	Pinyon-Juniper	8	360	8,280	2,980,800	37	385
	Saltbush	8	360	1,160	417,600	83	120
	Half Shrub	8	360	19,236	6,924,960	77	1,845
							4,458

APPENDIX 2-5
IMPLEMENTED AMP EVALUATION STUDIES

Attached are range studies which include utilization, actual use, and trend.

The utilization studies and actual use studies are averaged out per allotment per year. There are actual use and utilization studies per pasture from which the above are averaged.

The trend studies are detailed and should be well studied for a complete understanding of what is happening. The discussion in chapter 2 covers what may occur in a trend plot and what it means.

There are two segments on trend studies. The first part shows the overall quantifications, and the second part shows what is happening to the cool-season grasses, warm-season grasses, and browse in the allotments.

The first part of the trend studies shows an overall trend. One will observe, however, allotments showing upward trend in key species but an overall downward trend. This trend may be due to a large shrub dying out. Because the key species have, as yet, not replaced the shrub in area, the trend is downward. The overall trend is obtained by adding up the columns and putting the totals through the following formula:

$$\frac{\text{First Reading on Trend}}{100} = \frac{\text{Second Reading on Trend}}{x}$$

$$x = \text{Trend}$$

This formula will yield a trend figure, but each plot and its components must be examined to get the real picture of trend.

APPENDIX 2-5

AVERAGE UTILIZATION ON ALLOTMENTS UNDER IMPLEMENTED AMPs

AMP	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	AVERAGE
White Sage								33			33%
Cedar Knoll					74	57		56	48	61	59%
Buffalo Tank									62	52	57%
Vermillion Cliff							64		55	55	58%
Tuweep						66		47	51		55%
Fuller Road							50		53	40	48%
Cowboy Butte								61			61%
House Rock						43			40	72	51%
Wild Band									45		45%
Clayhole	61	52	74			62	53	28*	51		54%
Fern Tank	52								51	55	52%

* All pastures were read on one day, and reading is low due to regrowth. This figure will not be used because utilization needs to be read immediately after use for an accurate reading.

ACTUAL USE (AUMs) ON ALLOTMENTS UNDER IMPLEMENTED AMPs

AMP	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	Average Actual Use	Estimated Carrying Capacity
White Sage								91	407	345	281	837
Cedar Knoll						534	870	1,145	961	1,050	912	1,110
Buffalo Tank	-	-	-	-	No actual use		-	-	-	-	-	-
Vermillion Cliff						6,812	9,298	Inc.	6,947	7,556	7,653	9,870
Tuweep						1,441	1,712	2,022	1,991	1,740	1,781	2,458
Fuller Road	-	-	-	-	No actual use		-	-	-	-	-	-
Cowboy Butte								152	49	58	86	244
House Rock						1,238	2,042	1,416	2,088	1,124	1,581	2,192
Wild Band								2,481	3,170	3,148	2,933	4,381
Clayhole	14,876	13,243			16,800	13,280	17,706	15,857	15,621	15,324	15,764	15,896
Fern Tank								5,352	4,889	4,725	4,988	6,076

APPENDIX 2-5
TREND STUDIES

PLOT	COMPOSITION (Key Species)		COVER (Live Vegetation)	SEEDLINGS (Key Species)	LITTER	TOTAL TREND (Rounded)
			BUFFALO TANK			
1.	59	(1974)	37	2	1	99
	72	(1977)	7	0	0	79
2.	94	(1974)	97	1	1	193
	84	(1977	17.5	0	0	102
3.	76	(1974)	19	0	3.5	99
	76	(1977)	6	0	0	82
4.	Only one reading.					
			Overall Trend			
	391/100 = 263/X =			100 ⟶ 67	Down	
			CEOAR KNOLL			
1.	100	(1972)	44	0	9	153
	95	(1976)	51	0	0	146
2.	45	(1972)	25.2	0	0	70
	12	(1977)	15.05	0	0	27
3.	Only one reading.					
4.	100	(1972)	10.8	0	14	125
	99	(1977)	31.8	0	0	131
			Overall Trend			
	348/100 = 304/X =			100 ⟶ 87	Down	
			FERN TANK			
1.	76.9	(1968)	27.3	0	2.3	107
	93	(1977)	24.15	0	0	117
2.	12.9	(1968)	5.43	0	11.9	30
	26	(1977)	8.	0	0	34
3.	71.6	(1968)	18.5	0	5.2	95
	94	(1977)	26.9	1	0	122
4.	86.3	(1968)	30.8	0	5.6	123
	88	(1977)	18.4	0	0	106
			Overall Trend			
	355/100 = 380/X =			100 ⟶ 106	Up	
			CLAYHOLE			
Little Clayhole	87	(1970)	9.8	6	5.9	109
	98	(1974)	22.05	0	0	120
Clayhole	93	(1970)	7.17	5	3.6	109
	90	(1974)	14.0	0	0	104
Bert's Well	70	(1969)	12.4	0	0	82
	60	(1974)	24.5	5	7	97
Bert's Well	83	(1969)	4.2	0	0	87
	77	(1974)	9.1	0	1	87
Childer's Well	67	(1969)	6.4	0	4	77
	73	(1974)	17.2	0	0	90
Spend-love	12	(1969)	11.09	0	0	23
	35.6	(1974)	21.7	0	3.75	45
	100	(1977)	5.25	0	0	105
Yellow-atone	86	(1974)	8.4	0	7	101
	100	(1977)	9.1	0		109
Little Warren	100	(1970)	2.8	0	3	106
	27	(1974)	7.7	8	7	50
Black Knolls	100	(1970)	17	0	12.5	130
	80	(1974)	12.6	4	8	105
	100	(1977)	12.6	0	0	112
Big Warren	25	(1974)	8.4	1	7	41
	45	(1977)	10.15	0	14.5	70
			Overall Trend			
	865/100 = 945/X			100 ⟶ 109		

PLOT	COMPOSITION (Key Species)		COVER (Live Vegetation)	SEEDLINGS (Key Species)	LITTER	TOT TRE (ROUN
			FULLER ROAD			
1.	82	(1974)	93	3	3	181
	95	(1977)	37	0	0	132
2.	51	(1974)	32	0	3	86
	41	(1977)	24	0	0	65
3.	28	(1974)	41	0	19	88
	68	(1977)	13	0	12	93
4.	82	(1974)	20	0	0	102
	83	(1977)	16	0	0	99
5.	80	(1974)	42	10	0	132
	89	(1977)	26	0	0	115
			Overall Trend			
	589/100 = 504/X			100 ⟶ 86	Down	
			HOUSE ROCK			
1.	100	(1971)	3.2	3	.5	106
	57	(1973	8.1	1	0	66
	Dormant	(1977)	0	0	0	0
2.	16	(1973)	10.6	0	.7	27
	100	(1977)	2.8	0	0	103
3.	No data	(1971)	no data	no data	no data	no
	2.3	(1973)	25.9	0	3.8	32
	Dead Dormant	(1977)	0	0	0	0
			Overall Trend			
	165/100 = 103/X			100 ⟶ 62	Down	
			TUWEEP			
1.	48.7	(1973)	12.19	0	0	61
	79	(1976)	17	0	0	96
2.	87.2	(1973)	15.1	8	0	110
	91	(1976)	12.2	0	0	103
3.	100	(1973)	15.75	0	0	116
	100	(1976)	12.6	0	0	113
4.	Abandoned					
5.	100	(1973)	6.9	0	0	107
	44	(1976)	27	0	0	71
6.	100	(1973)	13.85	2	0	114
	100	(1976)	12.6	3	0	113
7.	0	(1973)	19.9	2	0	20
	8	(1976)	17.5	0	0	26
8.	96.3	(1973)	8.4	0	0	105
	100	(1976)	9.1	0	0	109
			Overall Trend			
	633/100 = 631/X			100 ⟶ 99.6	Static	
			VERMILLION CLIFF			
1.	11	(1974)	13.30	2	1	27
	5	(1977)	13.20	0	0	18
2.	92	(1969)	9.1	0	4	105
	54	(1977)	5.2	0	0	59
	Fringed sage was killed out.					
3.	57	(1974)	18.9	7	4	87
	100	(1977)	15.7	0	0	115
4,5,6	Only one reading.					
7.	77	(1974)	44	3	4	128
	100	(1977)	16.1	0	0	116
8.	64.7	(1974)	23.1	1	1	89
	57		19.6	0	0	77
			Overall Trend			
	437.1/100 = 386/X			100 ⟶ 88	Down	
			WHITE SAGE			
1.	52	(1974)	29.4	0	0	81
	43	(1977)	16.1	7	0	59
2.	16	(1974)	30.1	0	0	46
	46	(1977)	17	0	0	63
3.	52	(1974)	19	0	16	87
	43	(1977)	12	0	0	55
4.	75	(1976)	14	0	6	95
	92	(1977)	9.4	0	0	101
5.	58	(1976)	10	0	0	68
	44	(1977)	6	0	0	50
6.	58	(1976)	10	0	0	68
	0	(1978)	23.3	0	24.1	47.
			Overall Trend			
	483/100 = 375/X			100 ⟶ 78	Down	

APPENDIX 2-5
TRANSECT DATA TREND IN THE CLAYHOLE AMP

Plot No.	Changes in Species Composition 1972 - 1974 Grass	Forb	Shrub
5	Galleta: Up 15% Burrograss: Down 10%	Static	Static
6	Sand Dropseed: Down 5%	Static	Rabbitbrush: Up 5% Snakeweed: Up 5%
9	Static	Static	Static
13	Static	Static	Static
14	Static	Static	Static
17	Static	Static	Static
21	Galleta: Up 10% Sand Dropseed: Up 2%	Static	Static
23	Galleta: Up 5% Sand Dropseed: Up 5%	Static	Snakeweed: Up 5%
24	Galleta: Up 5%	Static	Static
26	Galleta: Down 10% Sand Dropseed: Up 5%	Static	Static
28	Galleta: Up 5% Sand Dropseed: Down 5%	Static	Static
29	Static	Static	Static
	Trend Up Slightly	Warm Seasons Only	

APPENDIX 2-5
EFFECTS OF GRAZING SYSTEMS ON SPECIES COMPOSITION
YEARLONG REST-ROTATION GRAZING SYSTEMS

Allotment	Total Plots	Cool Season Grasses Species*	Plots	Trend	Desirable Browse Species*	Plots	Trend	Warm Season Grasses Species*	Plots	Trend
House Rock	3	Orhy	3	Down	-	None	-	Spcr Hija	3	Down
Tuweep	7	Sihy	1	Up	-	None	-	Boer	4	Up
		Agri	1	Static				Bogr	1	Static
		Agcr	1	Down				Hija, Spcr	2	Down
Clayhole	10	Sihy	2	Down	Atca	2	Up	Bogr	4	Up
		Kocr			Atco	2	Down	Spcr	4	Down
					Eula	1	Static	Hija, Brte	2	Static
Buffalo Tank	3	Orhy	1	Static	Atca	2	Up	Bogr	1	Down
Fully		Stco			Eula	1	Down	Boer	1	Static
Implemented 1977		Buda						Hija, Spcr		
Fuller Road	5	Sihy	2	Up	Putr	4	Up	Spcr	2	Up
Not Fully		Kocr	2	Down	Atca	1	Down	Bogr	1	Down
Implemented		Agsm			Epne			Hija		
Vermillion Cliff	4	Orhy	1	Up	Arfi	2	Up	Bogr	2	Up
			1	Down	Eula, Atca	2	Down	Spcr	2	Down
SEASONAL REST-ROTATION GRAZING SYSTEMS (Fall through Spring)										
Fern Tank	4	-	None	-	Eula	1	Up	Spcr Bogr Hija	4	Up
Cedar Knoll	3	Agcr Elci	3	Down	Atca	2	Down	-	None	-
		Sihy, Orhy				1	Up			
White Sage	5	Sihy, Orhy Elju	6	Down	Atca	2	Up	Hija	2	Down
		Agin, Agcr				1	Down	Bogr		

*Species occurring in plots

APPENDIX 2-6
DETERMINATION OF PRESENT AND FUTURE SEDIMENT YIELD

Data to determine sediment yields were taken from the BLM Phase I Watershed Conservation and Development Inventory (WC&DI) conducted from 1971 to 1973.

Resource specialists delineated areas on base maps, using much the same criteria as the ocular reconnaissance range survey but considering additional factors such as critical soil erosion and slope changes. They then used a step-point or pace transect of 100 points, taking a reading at each point, which represented one percent. They collected the following data at each location: type of ground cover (litter, bare ground, large or small rock), vegetation composition by species, effective root depth, and percent slope (Form 7330-12). They then used these data to predict the present and future sediment yield by a method developed by the BLM Denver Service Center from the Pacific Southwest Inter-Agency Committee (PSIAC, 1968).

Phase I WC&DI data for surface geology, soil texture, climate, runoff, topography (slope), ground cover, upland erosion and channel erosion were used with nomographs produced by the Denver Service Center to approximate data needed for the PSIAC method.

As an example the following table shows how the WC&DI information was converted using the nomographs to PSIAC factor values to determine sediment yields on the Antelope Spring allotment.

FACTORS CONSIDERED	WC&DI VALUES (Average of 5 Transects on Antelope Spring Allotment) Present	Future	ADAPTED PSIAC FACTOR VALUE (From Nomographs) Present	Future
Geology	3	3	5	5
Soils	3	3	5	5
Climate	1.1	1.1	7	7
Runoff	4	4	7	7
Topography	4	4	3	3
Ground Cover	25	25	- 5	- 5
Land Use	32	26	- 2	- 4
Upland Erosion	27	20	8	6
Channel Erosion	7	7	12	12
Total			40	36

Resource specialists applied the totals to the PSIAC conversion table and obtained a value for sediment yield (acre feet/square mile) of 0.34 (present) and 0.29 (future). They then multiplied these figures by the square miles in the allotment to get total sediment yield.

APPENDIX 3-1

PUBLIC LAND ACRES - PRESENT AND FUTURE RANGE CONDITION

Allotment	Vegetation Type	Present Range Condition (Acres) Good	Fair	Poor	Future Range Condition (Acres)* Good	Fair	Poor	Public Land Acres
Antelope	Grassland	200	17,768		17,968			
	Sagebrush	930	1,920		2,850			
	Pinyon-Juniper		3,449			3,449		
	Saltbush	320	8,190	160	8,510	160		
								32,937
Antelope Spring	Grassland	5,498			5,498			
	Sagebrush	4,967			4,967			
	Desert Shrub		3,754			3,754		
								14,219
Atkin Well	Grassland	8,729			8,729			
	Unsuitable			1,225			1,225	
	Pinyon-Juniper		347			347		
	Saltbush		5,730	4,152	5,730	4,152		
	Desert Shrub			1,143			1,143	
	Half Shrub		4,927		4,927			
								26,253
Badger Creek	Grassland		1,962			1,962		
	Unsuitable			1,811			1,811	
	Barren			662			662	
	Saltbush			1,441			1,441	
								5,876
Beanhole	Grassland		190		190			
	Sagebrush		1,630		1,630			
	Saltbush		17,070		17,070			
	Desert Shrub		70			70		
								18,960
Buffalo Tank	Grassland	15,695			15,695			
	Saltbush	10,827			10,827			
	Half Shrub	2,820			2,820			
								29,342
Button	Sagebrush		1,650	1,370	1,650		1,370	
	Saltbusb		1,090		1,090			
	Annuals			390		390		
								4,500
Cane Beds	Grassland		1,540		1,540			
	Sagebrusb	5,040	3,000		8,040			
	Unsuitable			4,550			4,550	
	Pinyon-Juniper		2,800			2,800		
	Desert Sbrub			150			150	
								17,080
Cannan Gap	Grasaland		810		810			
	Meadow		50		50			
	Sagebrush			1,580			1,580	
	Pinyon-Juniper			2,830			2,830	
								5,270
Cedar Knoll	Grassland		4,335		4,335			
	Sagebrush		13,616		13,616			
								17,951
Chatterly	Sagebrush		1,710	3,160	1,710		3,160	
	Annuals			1,270		1,270		
								6,140

Allotment	Vegetation Type	Present Range Condition (Acres) Good	Fair	Poor	Future Range Condition (Acres)* Good	Fair	Poor	Public Land Acres
Clayhole	Grassland	44,414	59,321		95,104	8,631		
	Pinyon-Juniper			720			720	
	Saltbush		54,089		54,089			
								158,544
Cottonwood	Grassland		660		660			
	Unsuitable			80			80	
	Saltbush		3,020		3,020			
								3,760
Cowboy Butte	Grassland	370			370			
	Sagebrush	1,160			1,160			
	Mt. Shrub			1,350			1,350	
	Unsuitable			15			15	
	Saltbush		85		85			
	Greasewood		140		140			
								3,120
Coyote	Sagebrush	9,010	12,498	3,400	21,508		3,400	
	Pinyon-Juniper			9,970			9,970	
	Waste			351			351	
								35,229
Cram	Grassland		7,955		7,955			
	Sagebrush		2,775		2,775			
	Unsuitable			1,210			1,210	
	Saltbush	7,670			7,670			
	Desert Shrub	3,500	660		4,160			
								23,770
Crosby Tank	Sagebrush		820		820			
	Pinyon-Juniper			3,900			3,900	
								4,720
Fern Tank	Grassland	2,085	1,865		3,950			
	Sagebrush		28,959		28,959			
	Pinyon-Juniper		9,152	6,208		9,152	6,208	
								48,269
Ferry Swale	Desert Shrub		10,988	6,912	10,988		6,912	
	Unsuitable			300			300	
								18,200
Frank's Reservoir	Sagebrush	251		1,145	411		985	
	Mt. Shrub		411		411			
	Pinyon-Juniper	3,546		2,341	3,546		2,341	
								7,694
Puller Road	Sagebruah		5,808	10,910	8,808		7,910	
	Pinyon-Juniper		8,313	4,948	10,313		2,948	
	Annuals			1,090		1,090		
								31,069
Glazier Dam	Grassland		2,952		2,952			
	Unsuitable			333			333	
	Saltbuah		3,502		3,502			
								6,787
Grama Point	Graasland		2,100		2,100			
	Sagebrush		11,385		11,385			
	Unsuitable		200			200		
	Half Shrub		9,860		9,860			
								23,545

* 15 years after implementation of AMP

APPENDIX 3-1 (cont.)

Allotment	Vegetation Type	Present Range Condition (Acres) Good	Fair	Poor	Future Range Condition (Acres)* Good	Fair	Poor	Public Land Acres
Gunsight	Grassland	1,850			1,850			
	Sagebrush		2,620	2,620	2,620		2,620	
	Pinyon-Juniper			140			140	
								7,230
Hack Canyon	Grassland		18,350		18,350			
	Unsuitable			964			964	
	Pinyon-Juniper			3,120			3,120	
	Saltbush			6,849		6,849		
	Desert Shrub		974			974		
	Half Shrub		4,450			4,450		
								34,707
Home Ranch	Sagebrush	10,742			10,742			
	Pinyon-Juniper	27,648			27,648			
								38,390
House Rock	Grassland	8,477	8,478		16,955			
	Unsuitable			59			59	
								17,014
Jacob Canyon	Sagebrush	460	1,860		2,320			
	Pinyon-Juniper		880			880		
								3,200
June Tank	Grassland	7,218	12,721		19,939			
	Sagebrush		41,491		41,491			
	Unsuitable			2,477			2,477	
	Pinyon-Juniper		23,991			23,991		
								87,898
Lamb Tank	Grassland		5,433		5,433			
	Desert Shrub		1,868			1,868		
	Annuals			576		576		
	Unsuitable			3,363			3,363	
								11,240
Lee's Ferry	Riparian			850			850	
	Shadscale		1,560		1,560			
	Desert Shrub		2,550	2,710	2,550		2,710	
	Unsuitable		7,860			7,860		
								15,530
Moonshine	Grassland		8,745		8,745			
	Pinyon-Juniper		980			980		
								9,725
Mt. Logan	Grassland	640	2,040	6,820	2,680	6,820		
	Sagebrush	960	4,520	3,710	6,600		2,590	
	Mt. Shrub			1,300			1,300	
	Conifer			4,880			4,880	
	Waste			5,460			5,460	
	Pinyon-Juniper		15,200	21,260		15,200	21,260	
	Desert Shrub		1,770			1,770		
								68,560
Muggins Flat	Sagebrush		11,888		11,888			11,888
Pigeon Tank	Grassland	5,530	1,085		6,615			
	Sagebrush	428	1,859		2,287			
	Pinyon-Juniper	2,434	981	3,051	2,434	981	3,051	
								15,368
Pratt Tank	Sagebrush	6,756	8,063		14,819			
	Pinyon-Juniper		5,084			5,084		
								19,903
Rock Canyon	Grassland		790		790			
	Desert Shrub		570		570			
								1,360
Rock Canyon	Grassland			1,090	1,090			
Tank	Sagebrush		7,495		7,495			
	Unsuitable			1,110			1,110	
	Pinyon-Juniper		1,560			1,560		
								11,255
Rock Pocket	Grassland	2,810	13,425		16,235			
	Sagebrush		1,985		1,985			
	Saltbush		1,610		1,610			
								19,830
Rider	Sagebrush			1,922		1,922		
	Pinyon-Juniper			1,005			1,005	
	Saltbush			626		626		
	Greasewood			80			80	
								3,633
Sage	Unsuitable		270			270		
	Pinyon-Juniper		2,430			2,430		
	Saltbush		5,600		5,600			
	Winterfat		2,190		2,190			
								10,490
Shinarump	Sagebrush	1,259		310	1,259	310		
	Pinyon-Juniper		1,585	855		1,585	855	
								4,009
Shuttleworth	Grassland	1,310			1,310			
	Sagebrush	5,090		8,270	5,090	8,270		
	Pinyon-Juniper		4,217			4,217		
	Saltbush	50			50			
	Desert Shrub			2,090			2,090	
	Half Shrub		1,240		1,240			
	Barren		270			270		
								22,537
Soap Creek	Grassland	18,630			18,630			
	Sagebrush		770		770			
	Unsuitable			3,840			3,840	
	Shadscale		5,310		5,310			
	Desert Shrub		14,755		14,755			
								43,305
Spooks Knoll	Sagebrush	1,810		14,550	1,810	14,550		16,360
Suicide	Sagebrush	1,120			1,120			
	Pinyon-Juniper		3,510	200		3,510	200	
								4,830

APPENDIX 3-1 (cont.)

Allotment	Vegetation Type	Present Range Condition (Acres) Good	Fair	Poor	Future Range Condition (Acres)* Good	Fair	Poor	Public Land Acres
Sunshine	Grassland	2,940			2,940			
	Sagebrush		1,313		1,313			
	Unsuitable		130		130			
	Saltbush		107		107			
	Winterfat		3,950		3,950			
								8,440
Temple Trail	Grassland	6,485	20,375		26,860			
	Pinyon-Juniper	5,961	2,435		5,961	2,435		
	Saltbush	1,215			1,215			
								36,471
Tuweep	Pinyon-Juniper			23,448			23,448	
	Sagebrush		8,717		8,717			
	Grassland		9,014		9,014			
	Conifer		3,686			3,686		
	Unsuitable		1,751			1,751		
								46,616
Two Mile	Sagebrush		18,337		9,920		8,417	
	Unsuitable			1,160			1,160	
	Pinyon-Juniper		19,533			19,533		
								39,030
Valley Wash	Grassland	11,418			11,418			
	Saltbush			3,563		3,563		
								14,981
Vermillion	Grassland		21,206		21,206			
	Sagebrush		11,390		11,390			
	Pinyon-Juniper		77,398			77,398		
								109,994
Wells	Grassland		1,245		1,245			
	Sagebrush		1,030	400	1,030		400	
	Unsuitable			405			405	
	Pinyon-Juniper			1,570			1,570	
								4,650
White Sage	Sagebrush	2,010		3,680	2,010		3,680	
	Pinyon-Juniper	1,540		3,780	1,540		3,780	
								11,010
Wild Band	Grassland		3,190		3,190			
	Sagebrush		17,804		17,804			
	Pinyon-Juniper		9,130			9,130		
	Saltbush		600		600			
	Half Shrub		16,496		16,496			
								47,220
Cove	Pinyon-Juniper		110		110			110
Eight Mile Pass	Sagebrush			440			440	440
Ferrin	Pinyon-Juniper			2,280			2,280	
	Barren			70			70	
								2,350
Gramma Springs	Rabbitbrush/ Saltbush		4,495			4,495		4,495
Gulch	Desert Shrub		3,400			3,400		3,400
Kanab Gulch	Desert Shrub		3,700			3,700		3,700
Harris Well	Grassland	2,330			2,330			
	Pinyon-Juniper		310			310		
								2,640
Kanab Creek	Saltbush/ Rabbitbrush			4,544			4,544	4,544
Lost Spring Gap	Sagebrush		465		465			
	Grassland	250			250			
								715
Stateline	Grassland/ Fringed Sage		580		580			580
Wahweep	Unsuitable		3,595			3,595		
	Desert Shrub		11,864			11,864		
								15,459

APPENDIX 3-2
PRESENT AND FUTURE USABLE PRODUCTION

Allotment	Vegetation Type	Acres	Current Usable Production/Acre Air Dry Pounds	Current AUMs	Future Usable Production/Acre Air Dry Pounds	Future* AUMs
Antelope	Grassland	23,371	115	3,426	143	4,177
	Sagebrush	3,330	68	283	85	353
	Pinyon-Juniper	4,089	23	118	23	118
	Saltbush	10,290	57	733	72	982
Antelope Spring	Grassland	8,049	82	818	104	1,046
	Sagebrush	5,067	70	391	84	532
	Desert Shrub	3,883	54	248	54	262
Atkin Well	Grassland	10,803	91	1,225	109	1,482
	Pinyon-Juniper	537	86	58	86	58
	Saltbush	9,882	79	972	102	1,265
	Desert Shrub	1,253	37	58	37	58
	Half Shrub	4,927	77	474	Insufficient data to extrapolate	
	Unsuitable	1,245	-	-	-	-
Badger Creek	Grassland	2,052	23	61	23	61
	Saltbush	1,441	27	49	27	49
	Unsuitable	2,207	-	-	-	-
	Barren	662	-	-	-	-
Beanhole	Grassland	435	75	41	95	51
	Sagebrush	2,105	59	156	72	189
	Saltbush	18,310	77	1,768	97	2,220
	Desert Shrub	70	34	3	34	3
Buffalo Tank	Grassland	19,255	101	2,425	128	3,080
	Saltbush	12,087	69	1,047	88	1,329
	Half Shrub	3,100	46	179	Insufficient data to extrspolate **	
Button	Sagebrush	3,550	76	336	84	372
	Saltbush	1,720	10	22	13	28
	Annuals	390	62	30	Insufficient data to extrapolate	
Cane Beds	Crassland	2,050	88	225	112	287
	Grassland	800	100	100	127	127
	Sagebrush	5,360	75	500	91	609
	Sagebrush	3,600	25	110	31	139
	Unsuitable	4,770	-	-	-	-
	Pinyon-Juniper	4,120	39	200	39	200
	Desert Shrub	1,480	23	40	23	40
Cannan Gap	Grasaland	2,290	71	202	91	260
	Meadows	170	349	74	No data to extrapolate	
	Sagebrush	1,790	57	127	57	127
	Sagebrush	890	63	70	63	70
	Pinyon-Juniper	3,250	36	146	36	146
Cedar Knoll	Grassland	4,335	125	677	159	861
	Sagebrush	13,616	19	327	25	425
Chatterly	Sagebrush	5,660	61	433	63	443
	Saltbush	200	32	8	41	11
	Annuals	1,640	56	115	Insufficient data to extrapolate **	
Clayhole	Grasaland	120,929	99	14,957	120	18,139
	Pinyon-Juniper	840	-	-	-	-
	Saltbush	56,791	67	4,723	85	6,034
Cottonwood	Grasaland	660	76	63	96	79
	Unsuitable	80	-	-	-	-
	Saltbush	3,340	66	277	84	350
Cove	Pinyon-Juniper	110	73	12	100	13
Cowboy Butte	Grassland	370	155	72	196	90
	Sagebrush	1,055	64	84	77	101
	Sagebrush	145	88	16	106	19
	Mt. Shrub	1,510	30	57	30	57
	Unsuitable	25	-	-	-	-
	Saltbush	540	71	48	90	60
	Greasewood	600	100	75	No data to extrapolate	
Coyote	Sagebrush	14,708	76	1,396	92	1,691
	Sagebrush	2,800	36	126	36	126
	Sagebrush	10,300	52	670	62	808
	Pinyon-Juniper	13,102	36	590	36	590
	Waste	351	-	-	-	-
Cram	Crasaland	9,360	68	797	86	1,006
	Sagebrush	2,810	61	216	74	259
	Unsuitable	1,260	-	-	-	-
	Saltbush	7,800	89	864	113	1,101
	Desert Shrub	4,200	78	409	130	682
Crosby Tank	Sagebrush	1,460	49	90	59	108
	Pinyon-Juniper	3,900	65	320	65	320
Eight Mile Gap	Sagebrush	440	42	23	42	23
Fern Tank	Grasaland	4,420	102	564	129	712
	Sagebrush	6,111	89	678	107	817
	Sagebrush	6,113	76	582	92	702
	Sagebrush	19,335	89	2,163	107	2,586
	Pinyon	3,395	55	234	55	234
	Juniper	12,375	42	644	42	644
Ferrin	Sandsage	700	38	33	38	33
	Pinyon-Juniper	2,570	56	181	56	181
	Barren	90	-	-	-	-
Ferry Swale	Desert Shrub	14,148	27	482	27	482
	Desert Shrub	11,244	53	749	88	1,236
	Desert Shrub	3,748	56	263	71	332
	Unsuitable	1,200	-	-	-	-
Frank's Reservoir	Sagebrush	1,581	99	196	104	206
	Mt. Shrub	508	56	57	Insufficient data to extrapolate **	
	Pinyon-Juniper	6,317	3	38	3	38
Fuller Road	Sagebrush	10,910	46	637	57	777
	Sagebrush	8,996	6	68	6	68
	Pinyon-Juniper	8,313	75	782	102	1,059
	Pinyon-Juniper	6,039	30	231	33	253
	Annuals	1,550	109	212	Insufficient data to extrapolate **	

NOTE: Like the appendix in chapter 2, this table includes unalloted AUMs, thus in some cases will not match table 1-2. The future AUMs on this table were determined solely by the appendix 3 methodology.

* 15 years after AMP implementation

** Future AUMS shown here differ from those shown on table 1-2 because of the application of the projected forage production methodology (appendix 1-1) to vegetation subtypes with insufficient data to extrapolate. (Also see appendix 3-4 for explanation.)

APPENDIX 3-2 (cont.)

Allotment	Vegetation Type	Acres	Current Uaable Production/Acre Air Dry Pounds	Current AUMs	Future Usable Production/Acre Air Dry Pounds	Future* AUMs
Glazier Dam	Grassland	4,742	78	460	99	586
	Unsuitable	333	-	-	-	-
	Saltbush	4,913	73	448	92	564
Grama Point	Grassland	2,100	105	275	133	349
	Sagebruah	11,705	72	1,054	87	1,330
	Unsuitable	200	-	-	-	-
	Half Shrub	9,860	102	1,258	Inaufficient data to extrapolate **	
Gramma Springs	Rabbitbrush/ Saltbush	4,495	24	137	24	137
Gulch	Desert Shrub	3,440	32	138	32	138
Gunsight	Grasaland	2,030	68	173	86	218
	Sagebruah	5,440	53	363	58	394
	Pinyon-Juniper	140	51	9	51	9
Hack Ganyon	Grassland	20,924	79	2,075	100	2,615
	Unsuitable	964	-	-	-	-
	Pinyon-Juniper	3,120	60	234	60	234
	Saltbush	6,875	84	725	113	971
	Desert Shrub	974	14	17	14	17
	Half Shrub	4,450	75	416	Insufficient data to extrapolate	
Harria Well	Grassland	6,430	123	985	123	985
	Pinyon-Juniper	370	65	30	65	30
Home Ranch	Sagebruah	12,580	123	1,939	123	1,939
	Pinyon-Juniper	7,110	42	380	57	506
	Pinyon-Juniper	24,018	92	2,769	92	2,769
House Rock	Grassland	18,605	81	1,878	103	2,395
	Unsuitable	59	-	-	-	-
Jacob Ganyon	Sagebrush	2,960	50	186	60	222
	Pinyon-Juniper	880	37	41	37	41
June Tank	Grassland	20,858	87	2,247	110	2,867
	Sagebrush	43,791	78	4,285	94	5,145
	Unsuitable	2,477	-	-	-	-
	Pinyon-Juniper	25,506	58	1,878	58	1,878
Kanab Greek	Saltbush/Rabbitbrush	5,260	17	115	17	115
Kanab Gulch	Desert Shrub	3,700	24	113	24	113
Lamb Tank	Grassland	6,793	77	656	97	823
	Desert Shrub	1,868	48	112	48	112
	Unsuitable	3,363	-	-	-	-
	Annuala	576	31	23	Insufficient data to extrapolate	
Lee's Ferry	Riparian	1,140	36	51	Insufficient data to extrapolate	
	Shadscale	3,500	35	152	Inaufficient data to extrapolate	
	Desert Shrub	6,600	43	356	71	585
	Unsuitable	8,420	-	-	-	-
	Barren	400	-	-	-	-
Lost Spring Gap	Sagebrush	1,625	52	105	52	105
	Grassland	250	93	29	93	29
	Annuals	335	45	19	45	19
Moonshine	Grassland	8,995	67	752	85	955
	Pinyon-Juniper	1,050	32	42	32	42
Mt. Logan	Grassland	12,550	111	1,733	147	2,315
	Sagebrush	11,440	83	1,191	91	1,301
	Mt. Shrub	1,620	60	121	60	121
	Conifer	5,080	55	352	55	352
	Waste	8,220	-	-	-	-
	Pinyon-Juniper	49,380	52	3,227	52	3,227
	Greosote	1,700	35	75	35	75
	Desert Shrub	3,695	12	57	14	64
	Desert Shrub	1,532	114	219	133	255
	Desert Shrub	2,073	132	343	22	57
Muggins Flat	Sagebrush	11,888	48	719	58	861
Pigeon Tank	Grassland	1,085	114	154	144	195
	Grassland	5,530	99	684	125	864
	Sagebrush	1,850	45	103	54	124
	Sagebrush	437	82	45	99	54
	Pinyon-Juniper	3,051	21	79	21	79
	Pinyon-Juniper	3,415	33	228	44	187
Pratt Tank	Grassland	400	154	80	195	97
	Sagebruah	6,516	29	241	35	285
	Sagebrush	4,631	21	123	25	144
	Sagebrush	5,661	67	475	81	573
	Pinyon-Juniper	5,455	33	228	33	288
Rock Ganyon	Grasaland	1,820	78	178	99	225
	Desert Shrub	590	81	60	98	72
Rock Canyon Tank	Grassland	1,090	57	77	72	98
	Sagebrush	7,495	65	605	78	730
	Unsuitable	1,110	-	-	-	-
	Pinyon-Juniper	1,560	87	169	87	169
Rock Pocket	Graasland	18,305	76	1,758	96	2,197
	Grassland	1,090	267	164	339	461
	Sagebrush	1,985	171	425	206	511
	Saltbush	1,610	80	161	101	203
Rider	Sagebrush	2,742	44	157	63	215
	Pinyon-Juniper	1,035	25	34	25	34
	Saltbush	675	58	50	78	66
	Greaaewood	400	58	29	Insufficient data to extrapolate	
Sage	Unsuitable	270	-	-	-	-
	Pinyon-Juniper	2,430	71	217	71	217
	Saltbush	6,120	83	637	105	803
	Winterfat	2,830	98	348	Insufficient data to extrapolate **	
Shinarump	Sagebrush	1,589	66	131	82	163
	Pinyon-Juniper	3,040	46	177	46	177

APPENDIX 3-2 (cont.)

Allotment	Vegetation Type	Acres	Current Usable Production/Acre Air Dry Pounds	Current AUMs	Future Usable Production/Acre Air Dry Pounds	Future* AUMs
Shuttleworth	Grassland	3,230	105	425	133	536
	Sagebrush	13,420	50	835	66	1,120
	Pinyon-Juniper	4,287	48	258	48	258
	Saltbush	690	87	75	110	94
	Desert Shrub	2,090	41	106	41	106
	Half Shrub	2,300	45	129	Insufficient data to extrapolate	
	Barren	270	-	-	-	-
Soap Creek	Grassland	18,205	73	1,664	93	2,116
	Grassland	2,895	42	153	53	191
	Sagebrush	770	42	40	50	48
	Unsuitable	4,390	-	-	-	-
	Shadscale	6,240	17	214	Insufficient data to extrapolate	
	Desert Shrub	11,260	28	388	46	647
	Desert Shrub	2,605	33	106	55	179
	Desert Shrub	2,310	18	51	36	86
	Highway	755	-	-	-	-
Spooks Knoll	Sagebrush	17,880	34	762	43	961
	Unsuitable	45	-	-	-	-
	Saltbush	155	21	4	27	5
Stateline	Grassland/Fringed Sage	1,760	64	140	64	140
Suicide	Sagebrush	1,120	82	115	99	138
	Pinyon-Juniper	3,710	59	275	59	275
Sunshine	Grassland	2,940	97	355	123	452
	Sagebrush	1,800	48	109	58	130
	Unsuitable	130	-	-	-	-
	Saltbush	110	44	6	55	8
	Winterfat	3,950	105	518	Insufficient data to extrapolate **	
Temple Trail	Grassland	30,360	90	3400	114	4,326
	Sagebrush	5,360	70	468	84	562
	Pinyon-Juniper	9,471	74	879	74	879
	Saltbush	1,475	105	179	133	245
Tuweep	Pinyon-Juniper	27,319	43	1,460	43	1,460
	Sagebrush	11,855	62	926	75	1,111
	Grassland	11,740	63	925	80	1,174
	Conifer	3,800	52	250	52	250
	Unsuitable	2,780	-	-	-	-
Two Mile	Sagebrush	18,927	54	1,279	49	1,165
	Unsuitable	1,200	-	-	-	-
	Pinyon-Juniper	21,703	91	2,481	91	2,481
Valley Wash	Grassland	8,561	97	1,035	123	1,316
	Grassland	3,487	74	321	94	409
	Saltbush	1,168	59	86	79	115
	Saltbush	3,307	40	167	54	223
Vermillion	Grassland	21,806	71	1,925	90	2,453
	Sagebrush	12,670	84	1,335	101	1,610
	Pinyon-Juniper	81,845	76	7,780	76	7,780
Wahweep	Unsuitable	3,595	-	-	-	-
	Desert Shrub	11,864	49	734	49	734
Wells	Grassland	1,870	97	226	123	287
	Sagebrush	1,430	65	116	74	134
	Unsuitable	410	-	-	-	-
	Pinyon-Juniper	1,580	36	71	36	71
White Sage	Sagebrush	8,220	80	821	90	934
	Pinyon-Juniper	4,160	42	221	42	221
	Pinyon-Juniper	1,720	48	103	65	141
Wild Band	Grassland	5,010	84	527	106	663
	Sagebrush	2,920	90	332	108	394
	Sagebrush	7,383	64	597	77	710
	Sagebrush	7,501	63	595	76	712
	Pinyon-Juniper	850	63	57	63	57
	Pinyon-Juniper	8,280	37	385	37	385
	Saltbush	1,160	83	120	105	152
	Half Shrub	19,236	77	1,845	Insufficient data to extrapolate**	

APPENDIX 3-3
PRESENT AND FUTURE KEY SPECIES COMPOSITION

Allotment	Subtype	Present (Percent) Key Species Composition Grass**	Shrub***	Future* (Percent) Key Species Composition Grass**	Shrub***
Antelope	Grassland	37	8	65	16
	Sagebrush	45	-	65	T
	Pinyon-Juniper	10	5	15	10
	Saltbush	21	2	33	10
Antelope Spring	Grassland	35	17	50	22
	Sagebrush	33	12	50	17
	Desert Shrub	20	15	40	25
Atkin Well	Grassland	47	7	50	17
	Pinyon-Juniper	20	15	30	20
	Saltbush	17	T	27	5
	Desert Shrub	5	5	10	5
	Half Shrub	30	10	50	10
	Unsuitable	-	-	-	-
Badger Greek	Grassland	30	-	48	-
	Saltbush	1	-	4	-
	Unsuitable	12	-	15	-
Beanhole	Grassland	37	20	42	25
	Sagebrush	20	-	25	5
	Saltbush	30	28	35	33
	Desert Shrub	15	-	15	-
Buffalo Tank	Grassland	42	22	47	27
	Saltbush	25	45	30	45
	Half Shrub	No data			
Button	Sagebrush	27	5	40	10
	Saltbush	20	10	30	15
	Annuals	20	10	30	15
Cane Beds	Grassland	37	30	45	32
	Sagebrush	13	13	20	18
	Pinyon-Juniper	12	5	17	7
	Desert Shrub	5	5	15	10
Gannan Gap	Grassland	22	8	33	12
	Meadow	60	-	65	-
	Sagebrush	24	4	34	6
	Pinyon-Juniper	10	5	15	10
Gedar Knoll	Grassland	60	10	70	10
	Sagebrush	3	2	20	10
Ghatterly	Sagebrush	20	T	28	2
	Saltbush	5	T	10	5
	Annuals	10	10	15	15
Clayhole	Grassland	44	10	54	10
	Pinyon-Juniper	No data			
	Saltbush	50	5	50	15
Gottonwood	Grassland	30	10	45	20
	Saltbush	27	5	30	10
Gove	Pinyon-Juniper	35	5	40	10
Gowboy Butte	Grassland	95	-	95	-
	Sagebrush	27	7	37	12
	Mt. Shrub	-	10	-	10
	Saltbush	27	17	50	27
	Greasewood	15	-	25	-
Coyote	Sagebrush	9	5	18	5
	Pinyon-Juniper	12	7	15	10
Cram	Grassland	25	30	40	40
	Sagebrush	22	12	35	12
	Saltbush	27	31	40	40
	Desert Shrub	17	22	27	36
Grosby Tank	Sagebrush	45	-	50	-
	Pinyon-Juniper	5	10	10	10
Eight Mile Pass	Sagebrush	T	T	5	5
Fern Tank	Grassland	58	7	68	14
	Sagebrush	41	T	51	5
	Pinyon-Juniper	23	-	23	-
Ferrin	Sandsage	5	T	10	5
	Pinyon-Juniper	15	5	20	10
Ferry Swale	Desert Shrub	17	15	27	15
Frank's Reservoir	Sagebrush	17	5	20	6
	Mt. Shrub	10	20	17	20
	Pinyon-Juniper	2	T	2	T
Fuller Road	Sagebrush	17	2	30	5
	Pinyon-Juniper	10	5	15	10
	Annuals	25	20	35	25
Glazier Dam	Grassland	37	12	50	20
	Saltbush	25	7	47	12
Grama Point	Grassland	10	10	30	20
	Sagebrush	25	T	40	5
	Half Shrub	30	15	55	30
Gramma Springs	Rabbitbrush/ Saltbush	20	5	25	10
Gulch	Desert Shrub	20	-	25	T
Gunsight	Grassland	30	20	35	20
	Sagebrush	5	15	10	15
	Pinyon-Juniper	-	5	-	5
Hack Ganyon	Grassland	34	-	39	-
	Pinyon-Juniper	25	5	25	15
	Saltbush	21	39	26	44
	Desert Shrub	30	10	35	15
	Half Shrub	30	10	35	15
Harris Well	Grassland	58	8	58	8
	Pinyon-Juniper	32	5	32	5
Home Ranch	Sagebrush	55	T	70	T
	Pinyon-Juniper	25	2	25	5
House Rock	Grassland	75	5	72	15
Jacob Canyon	Sagebrush	20	3	27	5
	Pinyon-Juniper	5	10	5	10
June Tank	Grassland	42	7	50	13
	Sagebrush	12	3	20	9
	Pinyon-Juniper	22	4	22	4
Kanab Greek	Saltbush	15	5	20	10
Kanab Gulch	Desert Shrub	20	T	25	5
Lamb Tank	Grassland	30	12	35	17
	Desert Shrub	30	10	35	15
	Annuals	31	4	36	9
Lee's Ferry	Riparian	23	8	32	10
	Shadscale	20	15	30	15
	Desert Shrub	23	10	32	10
Lost Spring Gap	Sagebrush	5	25	10	30
	Grassland	20	10	30	10
Moonshine	Grassland	34	14	39	19
	Pinyon-Juniper	19	5	24	10
Mt. Logan	Grassland	51	6	61	11
	Sagebrush	35	4	45	9
	Mt. Shrub	5	T	5	T
	Conifer	11	T	11	T
	Pinyon-Juniper	11	5	11	5
	Creosote	10	10	15	10
	Desert Shrub	34	5	39	10
Muggins Flat	Sagebrush	14	T	24	4
Pigeon Tank	Grassland	53	10	54	10
	Sagebrush	17	4	18	5
	Pinyon-Juniper	20	6	23	6
Pratt Tank	Grassland	70	5	70	5
	Sagebrush	17	T	22	5
	Pinyon-Juniper	3	5	3	5
Rock Canyon	Grassland	30	17	43	23
	Desert Shrub	25	15	35	20

* 15 years after AMP implementation

** Key Species Grass: Indian ricegrass, squirreltail, galleta, blue grama, black grama, western wheatgrass, sand dropseed, crested wheatgrass, Russian wildrye, needlegrass, tall wheatgrass

*** Key Species Shrub: Fourwing saltbush, winterfat, cliffrose, Mormon tea, serviceberry

T = Trace

NOTE: The species composition shown above is an average, which includes composition on sites in good, fair, and poor condition depending on their occurrence as per allotment and subtypes in that allotment.

APPENDIX 3-3 (cont.)

Allotment	Subtype	Present (Percent) Key Species Composition Grass**	Shrub***	Future* (Percent) Key Species Composition Grass**	Shrub***
Rock Canyon Tank	Grassland	25	4	33	9
	Sagebrush	15	5	23	10
	Pinyon-Juniper	23	11	23	11
Rock Pockets	Grassland	52	21	78	22
	Sagebrush	40	10	50	10
	Saltbush	35	5	50	10
Rider	Sagebrush	12	T	17	10
	Pinyon-Juniper	T	5	T	5
	Saltbush	30	15	37	20
	Greasewood	25	10	35	15
Sage	Pinyon-Juniper	40	10	50	15
	Saltbush	20	20	30	25
	Winterfat	50	10	55	15
Shinarump	Sagebrush	20	T	25	5
	Pinyon-Juniper	3	38	3	38
Shuttleworth	Grassland	40	25	45	25
	Sagebrush	32	3	40	3
	Pinyon-Juniper	25	5	40	10
	Saltbush	40	10	50	15
	Desert Shrub	17	20	25	20
	Half Shrub	30	5	40	5
Soap Creek	Grassland	18	18	25	22
	Sagebrush	20	T	35	5
	Shadscale	20	20	30	30
	Desert Shrub	16	16	26	21
Spooks Knoll	Sagebrush	11	4	16	9
	Saltbush	T	T	5	5
Stateline	Grassland	40	T	45	5
	Sandsage	20	T	25	5
Suicide	Sagebrush	35	T	45	5
	Pinyon-Juniper	12	5	12	5
Sunshine	Grassland	45	5	57	T
	Sagebrush	50	4	55	4
	Saltbush	50	10	55	10
	Winterfat	20	20	30	25
Temple Trail	Grassland	55	13	58	23
	Sagebrush	35	20	45	25
	Pinyon-Juniper	32	T	47	T
	Saltbush	15	60	25	65
Two Mile	Sagebrush	25	T	45	T
	Pinyon-Juniper	32	T	40	T
Tuweep	Pinyon-Juniper	12	T	12	T
	Sagebrush	23	T	32	T
	Grassland	63	T	72	T
	Conifer	8	T	17	T
Valley Wash	Grassland	45	8	61	15
	Saltbush	15	5	40	15
Vermillion	Grassland	No data			
	Sagebrush	No data			
	Pinyon-Juniper	39	T	39	T
Wahweep	Desert Shrub	25	15	30	15
Wells	Grassland	45	15	55	20
	Sagebrush	10	5	20	10
	Pinyon-Juniper	10	5	10	10
White Sage	Sagebrush	35	T	45	T
	Pinyon-Juniper	12	5	12	5
Wild Band	Grassland	30	15	40	20
	Sagebrush	27	T	37	5
	Pinyon-Juniper	20	5	30	5
	Saltbush	T	45	5	50
	Half Shrub	30	15	65	30

APPENDIX 3-4
METHODOLOGY FOR PREDICTED RANGE CONDITION,
SPECIES COMPOSITION, AND USABLE PRODUCTION

RANGE CONDITION AND SPECIES COMPOSITION

The basis for range condition and species composition prediction is the existing range studies on implemented AMPs (summarized in appendix 2-5) in the Vermillion Resource Area and cited studies such as Gibbens and Fisser, 1975; Heady, 1975; Paulsen, 1975; Humphrey, 1955; and Hughes, 1978. These studies allowed the following assumptions to be applied to the Vermillion ES area.

1. The rest-rotation and deferred rotation grazing systems would improve all subtypes by one condition class. In 15 years a poor condition subtype would move to fair condition or a fair condition subtype would move to good condition. Exceptions to this condition change are the sagebrush, pinyon-juniper, desert shrub, mountain shrub, and conifer subtypes, which would remain in poor condition until some impact agent (land treatment) breaks the dominance of the existing shrub canopy.

   A small percent of the subtypes in poor condition would move to fair condition. Such areas actually have a low fair species composition but have other site conditions that justify the acreage's being rated in poor condition. Under management the poor condition of such areas would improve to fair condition.

   In most cases, those acres of pinyon-juniper and conifers in fair condition would not move to good condition, since pinyon-juniper and conifers are the climax vegetation of subtype and would move to dominance in an area.

2. All acres given land treatment would move into a good range condition, since the species composition and trend would improve after the removal of shrub canopy.

3. Condition changes within condition classes would also occur. Low fair condition types could move to high fair, but not into good condition.

4. Allotments or pastures under less intensive management are expected to remain in the same condition, with a static or slightly upward trend. With a reduction in livestock numbers, trend could be expected to improve, except in the livestock's favorite grazing and gathering areas, which would continue to deteriorate.

5. The criterion for change in condition classes is: Current key species plus the objective's change in key species equals the new key species level after 15 years under an allotment management plan. If this new level falls into the category of good, fair, or poor as stated in appendix 1-1 it would be so rated.

USABLE FORAGE PRODUCTION

1. The rest-rotation and deferred rotation grazing systems would increase production of the usable component with the change to a better range condition class.

Future usable production per acre of grassland, sagebrush, pinyon-juniper, saltbush, and desert shrub was determined from the existing field estimates of those subtypes under good, fair, and poor condition. These estimates were then averaged by the above types. Then the average percent increase in usable forage production was determined for each of the above subtypes, between the three condition ratings. That percent was applied by allotment and subtype to those acres subject to a condition change from the proposed action over a 15-year period.

The ES area's other subtypes occurred too infrequently to determine production under all three condition categories. Thus the data were insufficient to extrapolate.

The allotments having a large amount of acreage in the subtypes for which future production data could not be extrapolated, had their estimated increase determined as discussed in appendix 1-1. The allotments involved are Button, Chatterly, Frank's Reservoir, Grama Point, Sage, Sunshine, and Wild Band. These allotments show different future usable production figures on table 1-2 as opposed to those in appendix 3-2.

Production changes would occur within condition classes as the vegetation subtype improves within the limits of a condition class. The production of forage would also increase. The percent change would be the same as that figure in appendix 3-4 between condition classes. A good condition grassland would improve and thus show a 26 percent increase in production as shown between a fair condition grassland to a good condition grassland. However, eventually a good condition grassland would reach a maximum production level and not show increase.

2. On allotments under less intensive management usable forage production would remain static or slightly increase but be approximately the same 15 years hence.

GLOSSARY

G

GLOSSARY

ABBREVIATIONS

The following abbreviations are used frequently in this statement. Those representing terms will be defined under respective entries in the glossary.

AG&FD	Arizona Game & Fish Department
AMP	allotment management plan
AU	animal unit
AUM	animal unit month
BLM	Bureau of Land Management
CCD	census county division
CFR	Code of Federal Regulations
EAR	environmental assessment report
ES	environmental statement
FLPMA	Federal Land Policy and Management Act of 1976
FTEE	full-time employment equivalent
HMP	habitat management plan
MFP	management framework plan
ORV	off-road vehicle
SCS	Soil Conservation Service
SEDS	BLM Socioeconomic Data System
SEP	social-economic profile
SEPA	social-economic profile area
SSF	soil surface factor
URA	unit resource analysis
VRM	visual resource management
WC&DI	Watershed Conservation and Development Inventory

TERMS

Acre-foot: a volume that will cover an area of 1 acre to a depth of 1 foot (43,560 cubic feet).

Allotment: an area of land where one or more operators graze their livestock. It generally consists of public lands but may include parcels of private or State-owned lands. The number of livestock and season of use are stipulated for each allotment. An allotment may consist of one or several pastures.

Allotment Management Plan (AMP): a livestock grazing management plan dealing with a specific unit of rangeland, based on multiple-use resource management objectives. The AMP considers livestock grazing in relation to other uses of the range and in relation to renewable resources--watershed, vegetation, and wildlife. An AMP establishes the seasons of use, the number of livestock to be permitted on the range, and the range improvements needed.

Animal Unit (AU): considered to be one mature (1,000-pound) cow or the equivalent based upon average daily forage consumption of 26 pounds dry matter per day (Range Term Glossary Committee, 1974).

Animal Unit Month (AUM): the amount of forage necessary for the sustenance of 1 cow or its equivalent for a period of 1 month.

Annual Plant: a plant that completes its life cycle and dies in 1 year or less (Range Term Glossary Committee, 1974).

Aquifer: a water-bearing bed or stratus of permeable rock, sand, or gravel capable of yielding considerable amounts of water.

Basal Area: the area of ground surface covered by the stem or stems of a range plant, usually measured 1 inch above the soil.

Base Herd: constant herd size that is continually licensed; it may or may not be the same as the carrying capacity.

Browse: the tender shoots, twigs, and leaves of trees and shrubs often used as food by cattle, deer, elk and other animals; or to feed or eat on browse.

Calf Crop: the number of calves weaned from a given number of cows bred, usually expressed as a percentage (Range Term Glossary Committee, 1974).

Canopy: the vertical projection downward of the aerial portion of shrubs and trees, usually expressed as percent of ground so occupied.

Carrying Capacity (Grazing Capacity): the maximum stocking rate possible without damage to vegetation or related resources. It may vary from year to year in the same area because of fluctuating forage production (Range Terms Glossary Committee, 1974).

Census County Division (CCD): county division used by the U.S. Bureau of the Census for enumerating some census data.

Channel Erosion: erosion occurring in the bottom of gullies that are more than 1 foot deep.

Cist: a burial chamber typically lined with stone.

Climax: the highest ecological development of a plant community capable of perpetuation under the prevailing climate and soil conditions.

Cool-Season Plant: a plant whose major growth period occurs during the winter and early spring. See warm-season plant.

Cow-Calf Livestock Operation: a livestock operation in which a base breeding herd of mother cows and bulls is maintained. The cows produce a calf crop each year, and the operation keeps some heifer calves from each calf crop for breeding herd replacements. The operation sells the rest of the calf crop between the ages of 6 and 12 months along with old or nonproductive cows and bulls.

Crucial (Critical) Wildlife Habitat: that part of the habitat of a wildlife species that is essential to the survival and perpetuation of the species, either as individuals or as a population.

Cull Cow Weight: weight of a cow when removed from a livestock operation.

Cultural Resource Data Base: the totality of information sources that can be used to understand past human activities. This base includes not only cultural remains such as artifacts, structures, features and activity areas, but any parts of the natural and cultural environments that were either used or modified by people in the past or which can aid in understanding the basic relationship between people and the environment in the past.

Deferred-Rotation Grazing: moving grazing animals to various parts of a range in succeeding years or seasons to provide for seed production, plant vigor, and seedling growth.

Discharge: the volume of water flowing past a point per unit time, commonly expressed as cubic feet per second, million gallons per minute, or cubic meters per second (Soil Conservation Society of America, 1970).

Dominant Species: a plant species that dominates the general view of an area or appears to be the dominant species in an area and thus determines the vegetation subtype into which an area is classed.

Double Chaining: a method by which an anchor chain is dragged across the same area twice (the second dragging normally in the opposite direction from the first), resulting in a more effective kill of target plants than a single chaining.

Drainage, Natural: a soil condition referring to the frequency and duration of periods when the soil is free of saturation or partial saturation. Two drainage classes are recognized in this ES:

Well-Drained--water is removed from the soil readily but not rapidly. These soils are normally medium textured, but finer or coarser-textured soils may also fall in this class.

Moderately Well-Drained--water is removed from the soil slowly so that the profile is wet for a small but significant part of the time. These soils commonly have a slowly permeable layer within or immediately underneath the solum.

Ecosystem: a complex self-sustaining natural system that includes living and nonliving components of the environment and the interactions that bind them together. Its functioning involves the circulation of matter and energy between organisms and their environment.

Ecotone: a transition line or strip of vegetation between two communities, having characteristics of both kinds of neighboring vegetation as well as characteristics of its own (Soil Conservation Society of America, 1970).

Effective Root Depth: the depth to which the major portion of roots of the most common forage species penetrate the soil.

Endangered Species: any species in danger of extinction throughout all or a significant portion of its range. This definition excludes species of insects that the Secretary of Interior determines to be pests and whose protection under the Endangered Species Act of 1973 would present an overwhelming and overriding risk to man.

Environment: the surrounding conditions, influences, or forces that affect or modify an organism or an ecological community and ultimately determine its form and survival.

Environmental Analysis Record (EAR): the procedure and format for recording environmental analysis (the systematic process of considering environmental factors in land management actions).

Evapotranspiration: the loss of water by transpiration from plants and evaporation from the soil.

Erosion: the wearing away of the land surface by wind, water, and other geological agents.

Exclosure: a smaller area set aside and protected from grazing either to preserve representative areas in excellent range condition or to allow observation of succession on depleted rangeland without grazing (Rangeland Reference Area Committee, 1975).

Family Livestock Operation: an operation owned by adult members of a family (often maintaining separate households) who share expenses and responsibilities but have not legally incorporated. Family operations that incorporate are considered corporation owned rather than family owned.

Federal Lands: in this statement, public lands administered by the Bureau of Land Management and lands in Lake Mead and Glen Canyon National Recreation Areas that are administered by the National Park Service but on which BLM administers grazing.

Food Web: the total complex pattern of feeding relations of an independent, self-maintaining, major, biotic community.

Forb: a herbaceous plant that is not a grass, sedge, or rush (Soil Conservation Society of America, 1970).

Full-Time Employment Equivalent (FTEE): an estimate of the work that could be accomplished by one full-time employee for a 1-year period, regardless of the number of part-time employees who might actually do the work.

Grazing Capacity: see carrying capacity.

Habitat: a specific set of physical conditions that surround the single 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.

Habitat Management Plan (HMP): a written and officially approved plan for a specific geographical area of public land that identifies wildlife habitat and related objectives, establishes the sequence of actions for achieving objectives, and outlines procedures for evaluating accomplishments.

Half-Shrub: a perennial plant with a woody base whose annually produced stems die each year (Range Term Glossary Committee, 1974).

Herbaceous: pertaining to plants having little or no woody tissue.

Herbage: herbaceous vegetation (as grass), especially when used for grazing.

Infiltration: the movement of water into soil through pores or other openings.

Intensive Livestock Grazing Management: a livestock management program that is based on the multiple-use resource management concept and that implements a specified grazing system formulated in an allotment management plan.

Intrusion: a feature (land, vegetation, or structure) that is generally considered out of context with the characteristic landscape.

Key Areas: areas of pastures representing various vegetation communities and used as sites for evaluation studies to monitor range condition and trend.

Key Species: a plant that is relatively or potentially abundant, that is able to endure moderately close grazing, and that serves as an indicator of changes occurring in a vegetational complex. The key species is an important vegetation component, which, if overused, will significantly affect watershed conditions, grazing capacity, or other resources. More than one key species may be selected on an allotment. One species may be important for watershed protection and a different species important for livestock or wildlife forage or other values.

Less Intensive Management: a limited form of range management employed when the percentage of public land is small; when public land is scheduled to be transferred from public ownership; or when other conditions are not conducive to intensive management. Under less intensive management, an allottee is not required to follow a specified grazing system, but BLM specifies livestock numbers, class of animal, and grazing season.

Lithic: a stone or rock that may be either abraded into the proper form for use as a tool or shaped by knocking pieces off.

Litter: a surface layer of loose organic debris, consisting of freshly fallen or slightly decomposed organic materials (Soil Conservation Society of America, 1970).

Livestock Operator: in this ES, an individual, family, corporation, or other entity that runs a livestock operation. An operator may have a single allotment, more than one allotment, or a portion of an allotment.

Livestock Performance: the efficiency of livestock within an operation, as measured by such indicators as percent calf crop, weaned calf weights, animal death rates, and cull cow weights.

Livestock Production: the weight and number of animals that a particular range, pasture, or management system produces (Range Term Glossary Committee, 1974).

Management Framework Plan (MFP): a land use plan for public lands that provides a set of goals, objectives, and constraints for a specific planning area to guide the development of detailed plans for the management of each resource.

Moenkopie Badlands: highly eroded shales, siltstones, and sandstones of the Moenkopie geologic formation, which support little vegetation and have little potential for vegetation improvement.

Multiplier (Income): a number that, when multiplied by $1.00, indicates the total change in personal income resulting from a one dollar change in income to a particular sector. With a multiplier of 1.226, one dollar in livestock income would create $1.226 as the first dollar is exchanged secondarily.

National Register of Historic Places: a register of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, and culture, maintained by the Secretary of the Interior.

Natural Area: lands managed for retention of their typical or unusual plant or animal types, associations, or other biotic phenomena; or their outstanding scenic, geologic, pedologic, or aquatic features or processes.

Off-Road Vehicle (ORV): any motorized vehicle designed for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland or other natural terrain, excluding (a) any registered motorboat, (b) any fire, military, emergency, or law enforcement vehicle when used for emergencies and any combat or combat support vehicle when used for national defense, and (c) any vehicle whose use is expressly authorized by the respective agency head under a permit, lease, license, or contract.

Operator: see livestock operator.

Pasture: a grazing area enclosed and separated from other areas by fences or natural barriers.

Perched Water Table: see water table.

Perennial Plant: a plant that has a life cycle of 3 or more years (Range Term Glossary Committee, 1974).

Phase I Watershed Studies: see Watershed Conservation and Development System.

Phenology (Phenologies): the study of periodic biological phenomena, such as flowering or seeding, especially as related to climate (Range Term Glossary Committee, 1974).

Pioneer Plant: a plant able to establish itself in bare or barren areas and to begin a new ecological cycle.

Plant Vigor: the relative well being and health of a plant as reflected by its ability to manufacture sufficient food for growth and maintenance.

Preference Lands: the privately owned or controlled land upon which the issuance of a grazing lease is based.

Prescribed Burning: the intentional burning of the wildland fuels of a predetermined area under proper weather, fuel moisture, and soil moisture conditions to achieve planned benefits with minimum damage at acceptable costs.

Primitive Areas: areas established to preserve, protect, and enhance lands of scenic splendor, natural wonder, scientific interest, primitive environment, and other natural values for the enjoyment and use of present and future generations. BLM primitive areas are managed to maintain the same quality of lands included in the National Wilderness Preservation System. Upon completion of the wilderness review effort, BLM will no longer use the term "primitive area."

Privileges, Active Grazing: the present maximum allowable grazing use, usually expressed in AUMs.

Proper Use Factor (PUF): a degree and time of use of current year's growth, which, if continued, will either maintain or improve the range condition consistent with conservation of natural resources.

Public Land: Federal lands administered by the Bureau of Land Management.

Ranch Value: the total value of a livestock operation, based on the value of privately owned land, livestock, buildings, and machinery and the right to use AUMs on Federal, Forest Service and State lands.

Range Condition: the present state of a vegetation subtype, determined by a subjective assessment of the mix of forage and browse species. Range condition for a subtype may be rated good, fair, or poor. (See appendix 1-1.)

Range Improvement: a structure, development, or treatment used in concert with management to rehabilitate, protect, and improve public land and its resources; to arrest range deterioration; and to improve forage condition, fish and wildlife habitat, watershed protection, and livestock production, all consistent with land use plans.

Range Site: a distinctive kind of rangeland that differs from other kinds in its ability to produce a characteristic natural plant community.

Range Suitability: the adaptability of a range to grazing by livestock, game, or both (Range Term Glossary Committee, 1974).

Range Trend: a change in vegetation and soil characteristics resulting directly from environmental factors, primarily climate and grazing.

Recreation Information System (RIS): the system for gathering and recording data needed to carry out BLM's recreation program.

Rest-Rotation Grazing: a system in which one part of the range is ungrazed for an entire grazing year or longer, while other parts are grazed for a portion or all of a growing season.

Research Natural Area (RNA): a physical or biological unit in which current natural conditions are maintained insofar as possible. Activities such as grazing and vegetation manipulation are prohibited unless they replace natural processes and contribute to the protection and preservation of an area. In RNAs, recreation, such as camping and gathering plants, is discouraged.

Residual Impact: the adverse impact of an action occurring after application of all mitigating measures.

Riparian: situated on or pertaining to the bank of a river, stream or other body of water. Normally used to refer to the plants of all types that grow along streams or around springs.

Runoff (Hydraulics): that portion of the precipitation on a drainage area that is discharged from the area in stream channels. These include surface runoff, groundwater runoff, or seepage (Soil Conservation Society of America, 1970).

Sacrifice Area: a portion of the range, regardless of site, that is allowed to be overgrazed to obtain efficient overall use of the management area. Such areas commonly occur around waters.

Salvage (Archaeological): emergency recovery of cultural or paleontological data to prevent their loss from human or natural disturbance. Recovery techniques usually include partial or complete excavation.

Scarification: mechanical disturbance of the upper soil layer in preparing a site for seeding and planting.

Sediment Loss: solid material (sediment) transported out of a watershed by wind or water.

Sediment Yield: the volume of soil moved from its point of origin to another point on the Earth's surface.

Shrub: a relatively low-growing, much-branched, many-stemmed woody perennial.

Social-Economic Profile (SEP): an information document for use in BLM planning decisionmaking. The SEP describes the social and economic characteristics of the human population and analyzes and records the economic, social, historical and public coordination data for the social-economic profile area (SEPA).

Social-Economic Profile Area (SEPA): a region or area of similar social, economic or institutional characteristics for which a social-economic profile (SEP) is prepared. A SEPA represents an area whose external or spillover effects with other areas are not significant.

Soil Surface Factor (SSF): a numerical expression of surface erosion caused by wind and water as reflected by soil movement, surface litter, erosion, pavement, pedestalling, rills, flow patterns and gullies. Values vary from zero for no erosion condition to 100 for a severe condition.

Specific Conductance (Electrical): a measure of the ability of water to conduct an electrical current, expressed in micromhos per centimeter at 25 degrees C. It is related to the number and specific chemical types of ions in the water solution.

Stocking Rate (Level): number of grazing animals on a given area of land at any time. The stocking rate may be above, below, or equal to the proper carrying capacity and may be expressed as AUMs per acre, AU years per section, or acres per AUM or AU years.

Subclimax: a state of succession in which further development is inhibited by the influence of factors other than climate.

Subirrigated Land: land whose water table is high enough to support lush plant life.

Succession: an orderly process of biotic community development that involves changes in species, structure, and community processes with time. It is reasonably directional and therefore predictable.

Sustained Yield: achieving and maintaining a permanent high level, annual or regular period production of the various renewable land resources without impairing the productivity of the land and its environmental values.

Target Species: plant species to be reduced or eliminated by land treatment.

Texture (Visual): the visual result of the tactile surface characteristics of an object.

Threatened Species: any species likely to become endangered within the foreseeable future throughout all or a significant part of its range.

Total Dissolved Solids (TDS): salt--an aggregate of carbonates, bicarbonates, chlorides, sulfates, phosphates, and nitrates of calcium, magnesium, manganese, sodium, potassium, and other cations that form salts. High TDS solutions can change the chemical nature of water. High TDS concentrations exert varying degrees of osmotic pressures and often become lethal to life in an aquatic environment.

Trailing: controlled directional movement of livestock. Natural trailing is the habit of livestock or wildlife repeatedly treading in the same line or path (Range Term Glossary Committee, 1974).

Travel Influence Zone: a buffer zone along each side of a travel route where visual intrusions affecting the quality of scenery along the route are prohibited.

Unit Resource Analysis (URA): the system of data gathering and analysis that precedes land use planning for public lands.

Use (Grazing): the consumption and destruction of forage by grazing animals or the amount of forage so consumed and destroyed. Use is usually expressed in animal unit months (AUMs).

Utilization (Forage): the proportion of current year's forage consumed or destroyed by grazing animals. Utilization is usually expressed as a percentage.

Utilization Cage: a wire mesh box that is placed on plant species to prevent use by livestock or wildlife. At the end of the growing season, the cage is removed and comparisons are made between grazed and ungrazed areas.

Vegetation Subtype: subdivision of a vegetation type, which generally indicates an aspect to the viewer of dominant species or a single dominant species. For example, vegetation type = conifer; vegetation subtype = pinyon-juniper.

Vegetation Trend: see range trend.

Visitor Day: 12 visitor hours, which may be aggregated continuously, intermittently, or simultaneously by one or more people.

Visual Resource Management (VRM) Classes: classification of landscapes according to the kinds of structures and changes that are acceptable to meet established visual goals.

Warm-Season Plant: a plant whose growth period or major portion thereof occurs in spring, summer, and fall and that is usually dormant in the winter. See cool-season plant.

Water Table: the upper limit of the part of the soil or underlying rock material that is wholly saturated with water. In some places an upper or perched water table may be separated from a lower one by a dry zone.

Watershed Conservation and Development System: BLM's system of inventory for present and potential watershed conditions. Phase I develops soil surface factors (SSFs) and other pertinent data.

Weaner: a young animal recently weaned from its mother.

Wilderness: an uncultivated, uninhabited, and usually roadless area set aside for preservation of natural conditions.

REFERENCES

REFERENCES

Arizona Inter-Agency Range Committee 1972. 1973. Proper use and management of grazing land. Washington, D. C.: U.S. Government Printing Office.

Arizona Wildlife Federation. 1975. Arizona wildlife trophies. 2nd ed. Phoenix.

Arrington, L. J. 1958. Great Basin kingdom. Lincoln, Nebraska: University of Nebraska Press.

Autenrieth, Robert (ed.). 1978. Guidelines for the management of pronghorn antelope. Preliminary draft (unpublished). Western Association of Game and Fish Commissioners, Pronghorn Antelope Workshop.

Bell, H. M. 1973. Rangeland management for livestock production. Norman, Oklahoma: University of Oklahoma Press.

Britt, Thomas. 1977 and 1978. Region II, Arizona Game and Fish Department. Personal communication.

Brown, D. E., Lowe, C. H., and Hausler, J. F. 1977. Discussion of southwestern riparian communities and their biotic importance and management in Arizona. Unpublished mimeograph copy. St. George, Utah: BLM District files.

Buechner, H. K. 1950. The bighorn sheep in the United States, its past, present, and future. Monograph No. 4. Washington, D. C.; The Wildlife Society.

Bureau of Indian Affairs Navajo Land Selection EIS Task Force. 1978. Navajo land selection draft environmental impact statement. Flagstaff, Arizona: Bureau of Indian Affairs.

Bureau of Land Management. 1977. North Rim social-economic profile. St. George, Utah: BLM District office.

Bureau of Land Management. 1978. The proposed Rio Puerco livestock grazing management program. Final environmental statement. Albuquerque, New Mexico: BLM District office.

Burget, M. L. 1957. The wild turkey in Colorado. Colorado Department of Game and Fish, P-R Report, Project 39-R-1. Denver.

Busack, S. D., and Bury, R. B. 1974. Some effects of off-road vehicles and sheep grazing on lizard populations in the Mojave Desert. Biological Conservation 6(3):179-183.

Christensen, G. C. 1954. The chukar partridge in Nevada. Biological Bulletin No. 1. Reno: Nevada Fish and Game Commission.

Dickerman, A. R., and Martin, W. M. 1967. Organization, costs, and returns for Arizona cattle ranches. File Report 67-6, Department of Agricultural Economics, University of Arizona. Tucson.

Fleming, W. B. 1959. Migratory waterfowl in Arizona. Wildlife Bulletin No. 5. Phoenix: Arizona Game and Fish Department.

Gallizioli, Steve. 1965. Quail research in Arizona. Phoenix: Arizona Game and Fish Department.

Gibbens, R. P., and Fisser, H. G. 1975. Influence of grazing management systems on vegetation in the Red Desert region of Wyoming. Science Monograph 29. Laramie, Wyoming: University of Wyoming, Agriculture Experiment Station.

Gifford, G. F. 1973. Runoff and sediment yields from runoff plots on chained pinyon-juniper sites in Utah. Journal of Range Management 26(6):440-443.

Gifford, G. F., Williams, G., and Coltharp, G. B. 1970. Infiltration and erosion studies in pinyon-juniper conversion sites in southern Utah. Journal of Range Management 23(6):402-406.

Green, C. R., and Sellers, W. D., eds. 1964. Arizona Climate. Tucson: University of Arizona Press.

Harshbarger, J. W., Lewis, D. D., Skibitzke, H. E., Heckler, W. L., and Kister, L. R. 1966. Arizona water. U.S. Geological Survey Water Supply Paper 1648. Washington, D. C.: U.S. Government Printing Office.

Heady, H. F. 1975. Rangeland Management. New York: McGraw-Hill.

Hendricks, B. A. 1942. Effect of grass litter on infiltration of rainfall on granitic soils in a semidesert shrub grass area. U.S. Forest Service Southwest Forest and Range Experiment Station Research Note 96. Tucson, Arizona.

Hewitt, O. W. 1967. The wild turkey and its management. Washington, D. C.: The Wildlife Society.

Hughes, L. E. 1978. Rest-rotation grazing vs. season-long grazing on naval oil shale reserve allotments in Colorado. Abstract of Papers, 31st Annual Meeting, Society for Range Management, San Antonio, Texas. Denver, Colorado: Society for Range Management.

Humphrey, R. R. 1955. Forage production on Arizona range IV Navajo, Apache, Coconino Counties, a study in range condition. Tucson, Arizona: U.S. Department of Agriculture Agricultural Experiment Station.

Hungerford, C. R. 1960. Water requirement of Gambel's quail. Transactions 25th North American Wildlife Conference: 213-219. Washington, D. C.: Wildlife Management Institute.

Hutchings, S. S., and Stewart, George. 1953. Increasing forage yields and sheep production in intermountain winter ranges. U.S. Department of Agriculture Circular No. 925. Washington, D. C.

Iorns, W. V., Hembree, C. H., Phoenix, D. A., and Oakland, G. L. 1964. Water resources of the Upper Colorado River Basin--Basic data. U.S. Geological Survey Professional Paper 442. Washington, D. C.: U.S. Government Printing Office.

Jahn, L. R., and Trefethen, J. B. 1972. Placing channel modifications in perspective. In Watersheds in transition, proceedings of a symposium sponsored by the American Water Resources Association and Colorado State University, p. 15-21. Fort Collins, Colorado.

Jameson, D. A., Williams, J. A., and Wilton, E. W. 1962. Vegetation and soils of Fishtail Mesa, Arizona. Ecology 43(3):403-410.

Jantzen, R. A. 1976. Arizona Game and Fish Department. Personal communication.

Jensen, T. L. 1977. Forage production inventory method. Unpublished report. St. George, Utah: BLM District files.

Killough, J. R., and Lesueur, H. 1953. The red harvester ant. Our Public Lands 3(4):14.

Lavigne, R. J., Kumer, R., Leetham, J., and Keith, V. 1972. Population densities and biomass of above ground arthropods under various grazing and environmental stress treatments on the Pawnee site, 1971. U. S. International Biome Program Grassland Biome Technical Report 204. Fort Collins, Colorado.

Leithead, H. L. 1959. Runoff in relation to range condition in the Big Bend-Davis Mountain section of Texas. Journal of Range Management 12(2):83-87.

Little, R. L. 1976. Rural industrialization: the case of Four Corners. In Social implications of energy scarcity, ed. L. Carter and L. Gray. Pullman, Washington: Washington State University, Social Research Center.

Lowe, C. H. 1964. Arizona's natural environment: landscape and habitats. Tucson: University of Arizona Press.

Lutz, F. E. 1948. Field book of insects. 3rd ed. New York: G. P. Putnam's Sons.

Mackie, R. J. 1976. Interspecific competition between mule deer and other game animals and livestock. In Mule deer decline in the West, a symposium, p. 51. Logan, Utah: Utah State University.

McAda, C., Phillips, C., Berry, C. R., and Wydoski, R. S. 1977. A survey of threatened and endangered fish in southwestern Utah streams. Logan, Utah: Cooperative Fish Research Unit.

McCulloch, C. V. 1973. Control of pinyon-juniper as a deer management measure in Arizona. Final report. Phoenix: Arizona Game and Fish Department.

Merkle, J. 1952. An analysis of a pinyon-juniper community at Grand Canyon, Arizona. Ecology 33:375-384.

Michaels, C. C., Schmutz, E. M., and Judd, B. I. 1967. Boysag Point: a relict area on the North Rim of Grand Canyon in Arizona. Journal of Range Management 20(6):363-368.

Miller, R. O. 1977. BLM and the external environment: the problem of clientele. Unpublished paper. St. George, Utah: BLM District files.

Mortensen, V. L., and Wilhelm, M. J. 1978. Vegetation impact area around waterhole in Clayhole and Fern Tank allotments. Unpublished study. St. George, Utah: BLM District files.

Nichol, A. A. 1938. Experimental feeding of deer. Technical Bulletin 75. Tucson: University of Arizona.

Pacific Southwest Inter-Agency Committee. 1968. Report of the water management subcommittee on factors affecting sediment yield in the Pacific Southwest area and selection and evaluation of measures for reduction of erosion and sediment yield. Sacramento, California: Pacific Southwest Region Planning Office, U. S. Department of the Interior.

Patton, D. R., and Green, W. 1964. Aberts prefer mature ponderosa pine. Note RM-169. Fort Collins, Colorado: U.S. Forest Service Rocky Mountain Forest and Range Experimental Station.

Paulsen, H. A., Jr. 1975. Range management in the central and southern Rocky Mountains. U.S. Forest Service Research Paper RM-154. Fort Collins, Colorado: Rocky Mountain Forest and Range Experimental Station.

Phillips, F. 1975. Arizona Game and Fish Department. Personal communication.

Pimlott, D. H. 1969. The value of diversity. In Readings in wildlife conservation, p. 31-43. Washington, D. C.: The Wildlife Society.

Pratt, H. 1978. Arizona Game and Fish Department. Personal communication.

Rangeland Reference Area Committee. 1975. Rangeland reference areas. Denver, Colorado: Society for Range Management.

Range Term Glossary Committee. 1974. A glossary of terms used in range management. Denver, Colorado: Society for Range Management.

Rasmussen, D. I. 1941. Biotic communities of Kaibab Plateau, Arizona. Ecological Monographs 11:229-275.

Reardon, P. O. and Merrill, L. B. 1976. Vegetative response under grazing systems in the Edwards Plateau of Texas. Journal of Range Management 29(3):195-198.

Reeves, R. H., and Swank, W. G. 1955. Food habits of Merriam Turkey. Phoenix: Arizona Game and Fish Department.

Riffey, M. M. 1977. Breeding bird densities in five selected habitats on the Arizona Strip. Unpublished progress report (No. 2) of a study contracted by BLM. St. George, Utah: BLM District files.

Robbins, C. S., Bruun, B., Zim, H. S., and Singer, A. 1966. A guide to field identification birds of North America. 1st. ed. Racine, Wisconsin: Western Publishing Co.

Ross, A. 1967. Ecological aspects of the food habits of insectivorous bats. In Proceedings of the Western Foundation of Vertebrate Zoology, Vol. 1, p. 205-263.

Ross, H. H. 1965. A textbook of entomology. 3rd ed. New York: John Wiley and Sons.

Ruos, J. L., and MacDonald. 1970. Mourning dove status report, 1968. Special Scientific Report, Wildlife No. 129. Washington, D. C.: Bureau of Sport Fisheries and Wildlife.

Russo, J. P. 1964. The Kaibab north deer herd. Wildlife Bulletin No. 7. Phoenix: Arizona Game and Fish Department.

Sharp, L. A. 1970. Suggested management programs for grazing crested wheatgrass. University of Idaho Bulletin No. 4. Moscow, Idaho.

Smith, A. H., and Martin, W. E. 1972. Socioeconomic behavior of cattle ranchers, with implications for rural community development in the West. American Journal of Agricultural Economics 54(2):217-225.

Soil Conservation Society of America. 1970. Resource conservation glossary. Ankeny, Iowa.

Spicer, R. L. 1959. The wild turkey in New Mexico, an evaluation of habitat development. New Mexico Game and Fish Department, Bulletin No. 10. Santa Fe.

Spillett, J. J., Low, J. B., and Sill, D. 1967. Livestock fences--how they influence pronghorn antelope movements. Agricultural Experimental Station Bulletin 470. Logan, Utah: Utah State University.

Stebbins, R. C. 1966. A field guide to western reptiles and amphibians. Boston: Houghton Mifflin Co.

Stewart, R. H. 1967. Mule deer. In New Mexico wildlife management, p. 42-50. Santa Fe: New Mexico Department of Game and Fish.

Stoddart, L. A., Smith, A. D., and Box, T. W. 1975. Range Management. 3rd ed. New York: McGraw-Hill.

Texas Tech University. 1976. Range plant and range ecosystem studies applicable to the Rio Puerco area. A report by the Range management personnel at Texas Tech University. Albuquerque, New Mexico: BLM District office.

Thatcher, A. P. and Hart, V. 1974. Spy Mesa yields better understanding of pinyon-juniper in range ecosystem. Journal of Range Management 27(5):354-357.

U.S. Department of Agriculture, Soil Conservation Service. 1972. General Soil Map of Coconino County, Arizona. Portland, Oregon.

U.S. Department of Agriculture, Soil Conservation Service. 1974a. General Soil Map of Mojave County, Arizona. Portland, Oregon.

U.S. Department of Agriculture, Soil Conservation Service. 1974b. Special Soil Survey Report of Mt. Trumbull Area. Portland, Oregon.

U.S. Department of Agriculture, Soil Conservation Service. 1975. General Soil Map of Arizona. Portland, Oregon.

Vallentine, J. F. 1971. Range Development and Improvement. Provo, Utah: Brigham Young University Press.

Webb, Paul. 1978. Arizona Game and Fish Department. Personal communication.

Welles, R. E., and Welles, F. B. 1961. The bighorn of Death Valley. Fauna of the National Parks of the United States, Series No. 6. Washington, D. C.: U.S. Department of the Interior, National Park Service.

Westwide Study Team. 1974. Western U.S. water plan. Boulder City, Nevada: Bureau of Reclamation.

Wilson, L. O. 1968. Distribution and ecology of the desert bighorn sheep in southeastern Utah. Utah Department of Natural Resources, Division of Fish and Game Publication 68-5. Salt Lake City.

Yoakum, J. D. 1975. Antelope and livestock on rangelands. Journal of Animal Science 40(5):985-991.

1 DESCRIPTION OF PROPOSED ACTION

2 DESCRIPTION OF THE ENVIRONMENT

3 THE ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

4 MITIGATING MEASURES

5 UNAVOIDABLE ADVERSE IMPACTS

6 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

7 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

8 ALTERNATIVES TO THE PROPOSED ACTION

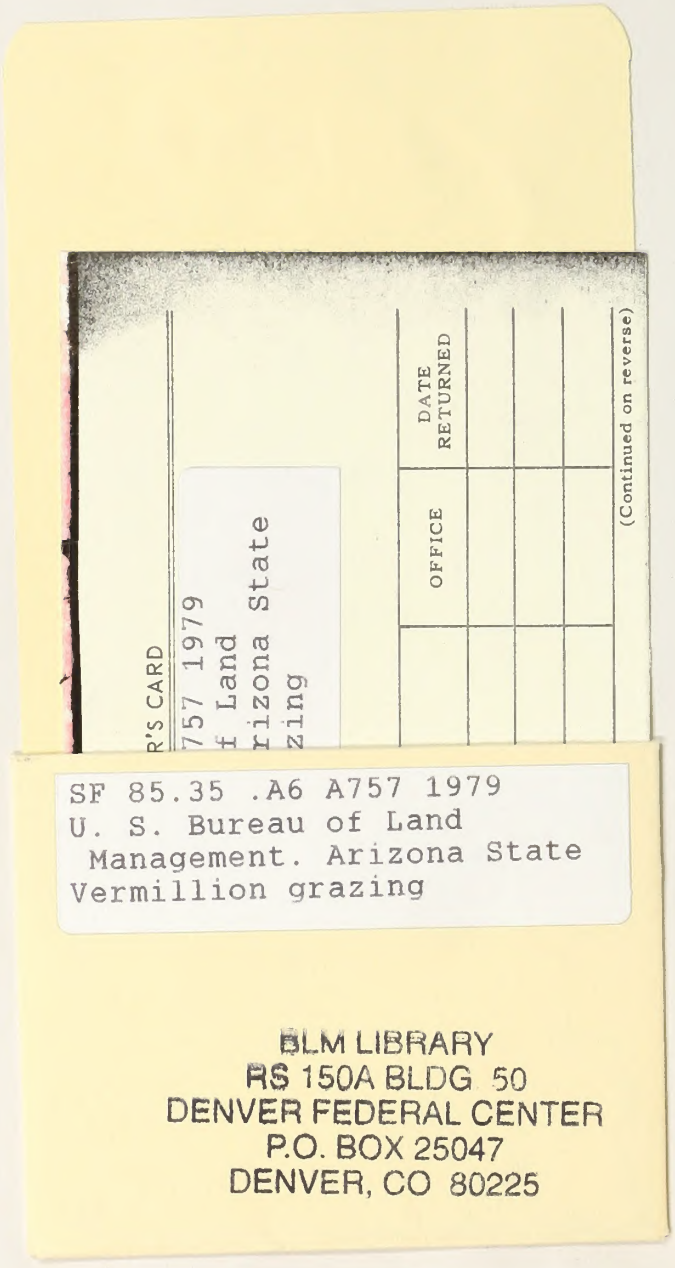
9 CONSULTATION AND COORDINATION

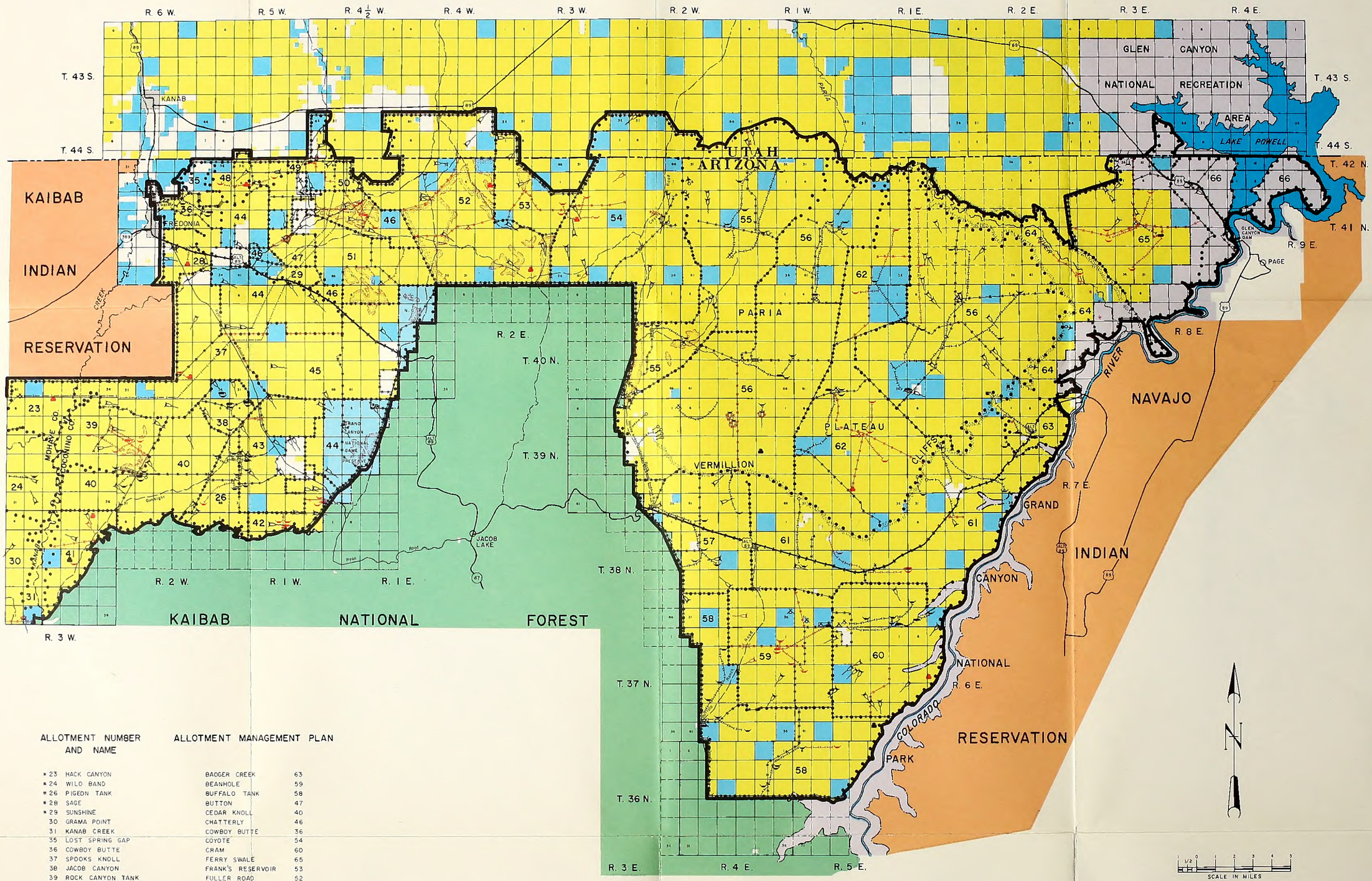
A APPENDIXES

G GLOSSARY

R REFERENCES

☆ U.S. GPO:1979-684-280/2118





ALLOTMENT NUMBER AND NAME

* 23	HACK CANYON	
* 24	WILO BAND	
* 26	PIGEON TANK	
* 28	SAGE	
* 29	SUNSHINE	
30	GRAMA POINT	
31	KANAB CREEK	
35	LOST SPRING GAP	
36	COWBOY BUTTE	
37	SPOOKS KNOLL	
38	JACOB CANYON	
39	ROCK CANYON TANK	
40	CEDAR KNOLL	
41	GUNSIGHT	
42	SUICIDE	
43	WHITE SAGE	
* 44	SHUTTLEWORTH	
45	PRATT TANK	
* 46	CHATTERLY	
47	BUTTON	
48	SHINARUMP	
49	EIGHT MILE PASS	
50	RIDER	
51	MUGGINS FLAT	
52	FULLER ROAD	
53	FRANK'S RESERVOIR	
54	COYOTE	
55	TWO MILE	
* 56	VERMILLION	
57	HOUSE ROCK	
58	BUFFALO TANK	
59	BEANHOLE	
60	CRAM	
61	SOAP CREEK	
62	HOME RANCH	
63	BADGER CREEK	
64	LEE'S FERRY	
65	FERRY SWALE	
* 66	WAHWEEP	

* indicates more than one area under this number.

ALLOTMENT MANAGEMENT PLAN

BADGER CREEK	63
BEANHOLE	59
BUFFALO TANK	58
BUTTON	47
CEDAR KNOLL	40
CHATTERLY	46
COWBOY BUTTE	36
COYOTE	54
CRAM	60
FERRY SWALE	65
FRANK'S RESERVOIR	53
FULLER ROAD	52
GRAMA POINT	30
GUNSIGHT	41
HACK CANYON	23
HOME RANCH	62
HOUSE ROCK	57
JACOB CANYON	38
LEE'S FERRY	64
MUGGINS FLAT	51
PIGEON TANK	26
PRATT TANK	45
RIDER	50
ROCK CANYON TANK	39
SAGE	28
SHINARUMP	48
SHUTTLEWORTH	44
SOAP CREEK	61
SPOOKS KNOLL	37
SUICIDE	42
SUNSHINE	29
TWO MILE	55
VERMILLION	56
WHITE SAGE	43
WILO BAND	24

CUSTODIAL MANAGEMENT

EIGHT MILE PASS	49
KANAB CREEK	31
LOST SPRING GAP	35
WAHWEEP	66

RANGE IMPROVEMENTS

	EXISTING	PROPOSED
ALLOTMENT BOUNDARY	• • •	
CORRAL		
FENCE		
CATTLEGUARD		
PIPELINE		
WELL		
WINDMILL		
WATER TROUGH		
WATER STORAGE TANK		
WATER CATCHMENT		
SPRING		
SPRING (IMPROVED)		
RESERVOIR		
LAND TREATMENT		
ADMINISTRATIVE STOCK DRIVEWAY		

LEGEND

MAP SYMBOLS

- ES BOUNDARY
- STATE BOUNDARY
- COUNTY BOUNDARY
- MISCELLANEOUS (PARKS, RES., ETC.)
- U.S. ROUTE MARKER
- STATE ROUTE MARKER
- PAVED HIGHWAY
- ALL WEATHER ROAD
- SEASONAL USE OR JEEP ROAD
- CITY OR TOWN
- PEAK OR MOUNTAIN
- PROMINENT RIDGE
- SECTION IDENTIFICATION

LAND STATUS

- PUBLIC LANDS
- NATIONAL FOREST
- NATIONAL PARK, MONUMENT, AND RECREATION AREAS
- INDIAN RESERVATIONS
- WILDLIFE REFUGE
- PATENTED LANDS
- STATE LANDS

N

SCALE IN MILES

1/2 0 1 2 3 4 5

PLATE I-E

VERMILLION ES AREA
EAST HALF

ARIZONA
1979

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

BASE MAP COMPILED FROM ONE OR MORE OF THESE SOURCES: RECENT MAPS PUBLISHED BY THE U.S.G.S., U.S.F.S., STATE HIGHWAY DEPARTMENT, B.L.M. RECORDS, LOCAL MAPPING SOURCES AND AERIAL PHOTOGRAPHY.

PLATE 2

VEGETATION AND SOIL ASSOCIATIONS

LEGEND

VEGETATION SUBTYPES

- ANNUALS
- BARREN
- CREOSOTEBUSH
- DESERT SHRUB
- GRASSLAND
- GREASEWOOD
- HALF SHRUB
- MOUNTAIN SHRUB
- PINYON—JUNIPER
- PONDEROSA PINE
- RIPARIAN
- SAGEBRUSH
- SALTBUSH
- WASTE 7R & 7I

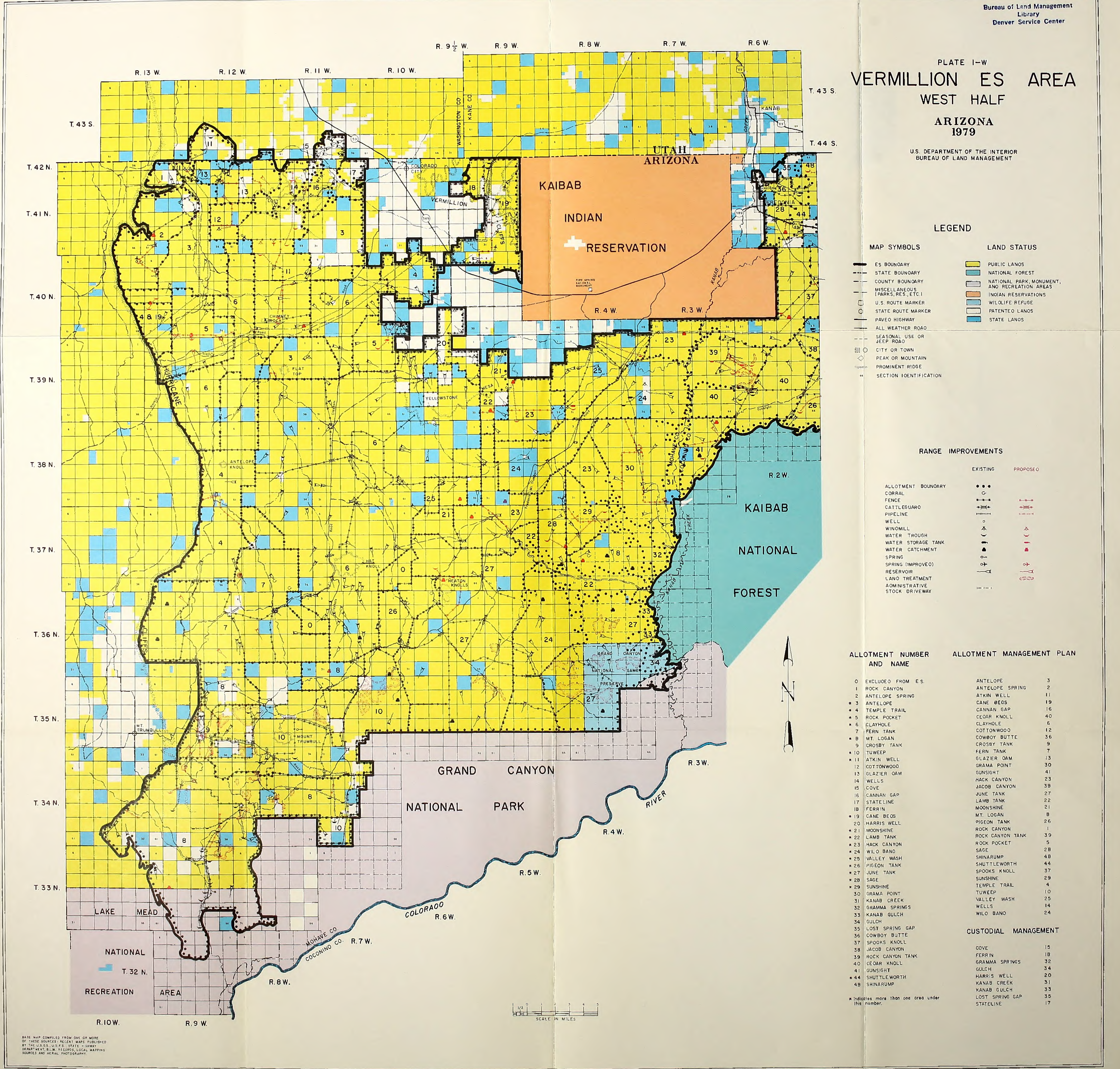
SOIL ASSOCIATIONS

1. TORRIORTHENTS — CAMBORTHIDS — ROCK OUTCROP ASSOC.
2. MOENKOPIE — SHALET — TOURS ASSOC.
3. FRUITLAND — SHEPPARD — ROCK OUTCROP ASSOC.
4. TOURS — NAVAJO ASSOC.
5. WINONA — BOYSAG — ROCK OUTCROP ASSOC.
6. PALMA — CLOVIS — TRAIL ASSOC.
7. RUDD — WUKOKI — CABEZON ASSOC.
8. COLLBRAN — CABEZON — WUKOKI ASSOC.

SCALE IN MILES 0 1 2 3 4 5 6 7 8 9 10

ARIZONA

VERMILLION ES AREA
UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT



ERRATA SHEET

Plates 1-E and 1-W

Although the Grand Canyon National Game Preserve is shown in light blue, it is a designated game preserve on public land administered by the Bureau of Land Management

Plate 2

The Vegetation Subtypes map and legend have been confused for the pinyon-juniper, creosotebush, greasewood, and ponderosa pine subtypes:

- The light green shown on the legend for creosotebush actually represents pinyon-juniper.

- The darker green shown on the map in the lower left corner represents the only creosotebush subtype in the ES area.

- The dark purple around the town of Fredonia (top center) represents the greasewood vegetation subtype.