

ENVIRONMENTAL ASSESSMENT

ALLOTMENT MANAGEMENT PLANS

for

**CHEVELON CANYON,
CLEAR CREEK,
LIMESTONE
and
WALLACE
ALLOTMENTS**

**USDA Forest Service
Apache-Sitgreaves National Forests
Chevelon/Heber Ranger District
Coconino County
Arizona**

Responsible Official:

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ENVIRONMENTAL ASSESSMENT

I. PROJECT SCOPE

The purpose of this environmental assessment [EA] is to provide a basis for making a decision regarding future activities on lands managed by the Apache-Sitgreaves National Forests [Forest]. The activities of present interest pertain to the grazing of cattle on Chevelon Canyon, Clear Creek, Limestone, and Wallace allotments and to the possible effects of such use on the soils, vegetation, wildlife, and other components of the natural and human environment.

As part of the assessment process, studies of existing environmental conditions have been conducted. Based on these reviews, together with meetings with the grazing permittees and with interested agencies and individuals, several alternative actions have been proposed for each allotment. This EA summarizes existing conditions and analyzes the potential effects of each of the alternatives on those conditions.

A. LOCATION & SETTING

The entire project area is within Coconino County, Arizona, on the Chevelon/Heber Ranger Districts, Apache-Sitgreaves National Forests (Appendix H). Encompassing some 335 square miles, the area is bounded by Chevelon Canyon on the east, Clear Creek/Leonard Canyon on the west, and the Mogollon Rim on the south. Some 70% of this is generally classed as forested, 27% as woodland, and 1% as grassland. Large portions have gentle to moderate slopes, but these are separated by deeply incised canyons. For the present analysis, the area is divided among four grazing allotments (Chevelon Canyon, Clear Creek, Limestone and Wallace) and a parcel without current livestock obligation. More detailed descriptions are provided below for each allotment.

This is a very rural area -- there are few yearlong residents; the nearest full-service centers, Winslow and Payson, are at least an hour's drive, although basic services are available in Heber/Overgaard and Forest Lakes. Ranching has been a traditional occupation since the 1870s. Commercial lumbering did not become a major industry until the 1940s. Given its isolated nature, this is a very popular recreation destination. Camping (both developed and dispersed), hiking, nature watching/photography, and fishing and hunting are all widely enjoyed. The Recreation Opportunity Spectrum classification system shows very different profiles, in terms of percentage of area, for each of the subdivisions.

	Chevelon Canyon	Limestone	Wallace	Clear Creek	Unobligated Area
Roaded	0	0	1	0	2
Roaded Modified	1	0	1	0	13
Roaded Natural	67	54	72	14	54
Semiprimitive Motorized	15	23	20	57	23
Semiprimitive Nonmotorized	17	23	7	28	7

Economic data for nongame recreation uses are not presently available.

B. PURPOSE & NEED FOR ACTION

The majority of the Chevelon Canyon, Clear Creek, Limestone and Wallace allotments are in poor range condition as defined by the Forest Service Range Handbook (FSH 2209.21). Current capacity

estimates and monitoring indicate an overstocking and overutilization of vegetation by livestock and wild ungulates. Therefore, there is a need to modify grazing by both livestock and wild ungulates to improve range and wildlife conditions by increasing the composition, vigor and density of desirable vegetation. Even so, given present physiological conditions, the majority of the area will likely never achieve better than Fair range condition.

The desired distribution for Vegetative Structural Stage types for the pinyon-juniper woodland is 20% in each major VSS class. Currently, the bulk of the woodlands are either in the VSS 1 class (small) or the 5B or 5C classes (very mature and dense). There is a need to reduce the density of some of the mature stands to increase the composition, vigor and density of desirable vegetation.

A Proper Functioning Condition Survey was completed in the summer and fall of 1998 on 41 stream reaches totalling approximately 110 miles. Of these, 19 were rated Functional at Risk and eleven Non-functional. Overutilization of vegetation by both livestock and wild ungulates has led to head cutting and a low density of woody riparian species. There is a need to increase ground cover and woody riparian species in the watershed.

There are streams within the analysis area containing native fish species, including the threatened Little Colorado River spinedace. Overutilization of these areas by both livestock and wild ungulates could potentially affect the riparian and native fish habitat (see "Biological Opinion for Ongoing Livestock Grazing Activities on Allotments"). There is a need to reduce headcuts and streambank trampling.

Dependable water sources on the allotments are not distributed in such a manner as to facilitate the movement of livestock or wildlife. There is a need to improve the distribution and dependability of water sources in the Vigil-Durfee Pasture of the Chevelon Canyon Allotment; the South, North and East pastures of the Clear Creek Allotment; the Wilkins Pasture of the Limestone Allotment; and the Butte and Tillman pastures of the Wallace Allotment.

And finally, there is a need to bring the Term Grazing Permits into compliance with Forest Plan standards and guidelines and with applicable environmental laws. The Recission Act of 1995 directs the Forest Service to establish and adhere to a schedule for analysis and decisions on all allotments where National Environmental Policy Act compliance is required. A schedule for completing NEPA was established by the Forest Service Washington Office on March 7, 1996. This analysis is in compliance with that revised schedule.

C. DESIRED FUTURE CONDITIONS

Desired future conditions are defined as the long-term management goals for a particular area. These goals include consideration of commodity production as well as components of the human and natural environment. Some portions of the project area may already be in the desired condition while others may require years of management to reach the stated objectives; due to resource conditions, budget constraints or other factors, some objectives may never be met. Desired future conditions were developed by an Interdisciplinary Analysis Team based on Forest Plan goals and objectives, and are described below by environmental component; it should be noted that any condition statement under one heading may apply to other components as well.

Social & Economic Factors - Community and individual economic sustainability are maintained. The social environment is diverse and stable. Costs and benefits of range developments are generally in balance.

Wildlife - Wildlife populations are consistent with the land's capability. A diverse mosaic of habitats for healthy and balanced wildlife populations are present. Threatened, endangered, and sensitive wildlife species have an abundant, widely spread prey base. Prey species have habitats with good hiding cover and forage availability.

Watershed - Water quality meets or exceeds Arizona Department of Environmental Quality requirements. Upland and riparian areas do not contribute to degraded water quality. Floodplain and channel characteristics are adequate to dissipate energy during high stream-flow events. Streambanks and channels are stable, with few headcuts. Watershed conditions on the fifth-code watershed are in satisfactory condition by 2020.

Soils - Satisfactory soil conditions are maintained. Impaired soil condition is in an upward trend within one decade on all areas where the potential exists to restore soil productivity and hydrologic functions. Soils have the ability to accept, hold, and release water and nutrients. Soils have the ability to resist erosion and degradation because of adequate effective ground cover.

Riparian Areas - Riparian areas are in a Proper Functioning Condition and meet Forest Plan guidelines. Multi-Storyed woody species composition is diverse with at least two deciduous, broadleaf species present in the plant community. Grasses and sedges have at least a four-inch stubble height in riparian areas, and exhibit high vigor and diverse composition. Streambank vegetation is comprised of plants able to withstand high stream-flow events. Ponds, springs, seeps, and wet meadows exhibit healthy, vigorous plant communities.

Range - Grazing is consistent with the land's capability to support such use. Wild ungulate (essentially elk and deer) and permitted livestock use is in balance with the estimated grazing capacity. Fences and other range developments complement management needs, help meet desired conditions, and have no negative effects on wildlife. Structural improvements are well maintained and in good condition. The distribution of dependable water sources meets Forest Plan standards.

Vegetation - On Full Capacity range, the ponderosa pine and mixed conifer habitats are in fair or better range condition, riparian habitat is in good or better range condition, and the pinyon/juniper woodland is in fair or better range condition. Ponderosa pine, mixed conifer, and pinyon/juniper Vegetative Structural Stages have an even distribution across the landscape. Cool season grass and forb plants on full capacity range make up at least 50% of the herbaceous ground cover (given appropriate soil and climatic conditions). Cool season grass species are diverse within each habitat type. Management actions, such as the seeding of disturbed sites, favor native grasses over introduced species. Browse stands are well distributed and are healthy. Browse stands contain the more desirable shrub species, such as cliffrose, ceanothus, fourwing saltbush, winterfat, and mountain mahogany. Browse growth forms are not "clubbed" in appearance, and trees do not exhibit a shrub form. Browse utilization is not more than 40% of the terminal ends. Fire is encouraged to play its natural role throughout the ecosystem.

Heritage Resources - Heritage resources are inventoried and evaluated to Forest standards. Prehistoric and historic sites are protected and preserved through management activities.

Air Quality - Air quality meets or exceeds Arizona Department of Environmental Quality standards.

D. PROPOSED ACTIONS

The Chevelon/Heber Ranger Districts are proposing actions for the management of the Chevelon Canyon, Clear Creek, Limestone and Wallace allotments. Specifically, it is proposed to implement Alternative 3 for the Chevelon Canyon Allotment (see pp. 7-26); Alternative 3 for the Clear Creek Allotment (pp. 27-44); Alternative 3 for the Limestone Allotment (pp. 45-65); and Alternative 3 for the Wallace Allotment (pp. 66-83).

E. DECISION TO BE MADE

The Chevelon/Heber Districts Ranger is the official responsible for selecting an alternative for management of the allotments. For these allotments the scope of the decision is limited to the development of the Allotment Management Plans. If an Action alternative is selected, the Districts Ranger will decide on the permitted number and class of livestock, allowable forage utilization standards, season of use and the schedule of livestock movement, developments needed, monitoring and mitigation requirements, and clauses needed to bring livestock grazing into compliance with the Forest Plan.

F. IMPLEMENTATION OF DECISION

A decision not to permit grazing would be implemented over a three year period. In accordance with Forest Service policy, if a new term grazing permit is issued with changed livestock numbers and/or season of use the change would not occur for at least one year following notification of the permittee. A reduction in numbers would be accomplished with no more than one-third of the change being made in the first year following notification. Other new permit clauses would be effective immediately.

G. ISSUES & MEASURES

A scoping document that identified proposed actions was mailed November 23, 1998, to 134 individuals, groups, tribes and agencies (the mailing list is in the Project Record). Comments were received from five individuals and an agency representative. No new issues or alternatives were identified through this public process.

The Interdisciplinary Team identified three key issues. Where appropriate, the measurement of issues is quantified; when measures are not quantified, a narrative addressing specific effects is presented. The concern regarding livestock grazing of recently acquired private lands was considered and then dismissed (see Appendix A).

The issues and measures for this analysis are:

Issue 1: Economics - There is concern that the cost of proposed range developments (e.g., fencing and waters) on each allotment exceeds the anticipated benefits derived from livestock grazing; this will be measured (a) by the permittee's cost per Animal Use Month, amortized over the ten-year permit period, and (b) through Quick-Silver investment analysis (see Glossary). There is also a concern that the total cost of the developments is excessive; this will also be measured by the Quick-Silver analysis.

Issue 2: Wildlife - There is a concern that herbaceous forage utilization by livestock and wild ungulates will continue to adversely affect the habitat needs of threatened, endangered and sensitive

species. This issue will be measured by a written narrative of the effects on threatened, endangered and sensitive species' habitat based on proposed forage utilization.

Issue 3: Watershed and Riparian Health - There is a concern herbaceous forage utilization by livestock and wild ungulates will continue to negatively affect the recovery time of riparian areas functioning at risk or not functioning properly. This issue will be measured by a narrative estimating the recovery time, in decades, for riparian areas once the selected alternative is fully implemented.

H. ALTERNATIVES

Alternatives proposed for the allotments were developed by the Interdisciplinary Analysis Team. Public scoping was also used to solicit input from concerned individuals, tribes, groups and agencies. Additional alternatives were not identified as a result of the public scoping. Meetings were held with grazing permittees. These meetings resulted in one additional alternative each for the Chevelon Canyon and Wallace allotments. A general summary of each alternative is presented below.

Alternative 1 - No Action: When the current permit expires the Districts will take no action to extend or renew.

Alternative 2 - Current Situation: This proposes to continue the present level of grazing, type of grazing system, and season of use.

Alternative 3 - Proposed Action: Given the results of the analyses, the Interdisciplinary Team proposes a level of grazing, type of grazing system, season of use, and range developments which address the identified Need for Action and Desired Future Conditions. This alternative would balance capacity with the available herbaceous forage by providing 60% of the available forage to livestock.

Alternative 4: Given the projected cost of developments proposed in Alternative 3, this alternative addresses a reduced number of developments; otherwise it is identical with the previous alternative.

Alternative 5: (Pertains to Chevelon Canyon and Wallace allotments only.) These were developed to include input from the individual permittees.

Alternative 5: (Pertains to Clear Creek Allotment only.) Given particular concerns with rangeland health, this proposes to rest each pasture every third year; otherwise, it is identical to Alternative 4 for this allotment.

The alternatives for each allotment are described in detail, and their effects analyzed, below. Each allotment is considered in a separate section.

A *standard monitoring plan* has been developed (see Appendix D) and will be implemented as appropriate. Common to Alternative 2 for each allotment is monitoring that would occur once per year. Common to Alternative 3 for each allotment is monitoring that would occur three times per year. Common to Alternative 4 for each allotment and Alternative 5 for the Chevelon Canyon, Clear Creek, and the Wallace allotments is monitoring that would occur at least once per pasture. Additional monitoring would be performed as needed. Any decision based on the monitoring results would be made by the Districts Ranger.

Common to most Action alternatives is one or more proposed developments. The implementation of any of these proposals may affect, directly or indirectly, other resources. Therefore, a set of *standard mitigation measures* has been developed (see Appendix E). These measures are designed to reduce or resolve any negative effects incidental to the proposed activity. All, or virtually all, have been used extensively in the past on identical or similar projects, and all have been found to be effective for avoiding or ameliorating impacts. These measures will be followed for all implemented projects. The costs for implemented projects would be shared among the Forest Service, the permittee, and (where appropriate) a third party on the proposed woodland treatments and the maintenance of openings. For the development of the fences and pipelines, the Forest Service would supply the materials and the permittee would supply the labor.

Common to all of the Action alternatives is the presence of one or more *holding traps*. These traps are used for holding livestock in the spring or fall, or for holding a sick animal until it can be moved. Since traps are used only on an as-needed basis, they are not in the regular rotation grazing schedule. Traps would not be used to graze livestock for extended time periods if the early removal of livestock became necessary. Therefore, the herbaceous forage production in the traps is not counted toward the estimated livestock grazing capacity, but would be included as being available for wild ungulates. Alternative 5 for Chevelon Canyon Allotment is an exception, where two traps are scheduled for use by bulls.

Common to Alternatives 3, 4 and, where applicable, 5 is a *standard distribution of available herbaceous forage* on each allotment of 60% for livestock and 40% for wild ungulates. Game Management Unit 4A [GMU 4A], as defined by the Arizona Game and Fish Department [AGFD], encompasses the entire project area. During collaborative analysis of the grazing allotments, the Forest Service and AGFD agreed to conduct a joint analysis of forage production and grazing ungulate demands within GMU 4A. The analysis was conducted in an effort to address the forage needs of both wild and domestic ungulates (hoofed animals), the results of which were used to forge an agreement on distribution of available forage. The mutually accepted forage distribution ratio will be used in the new allotment management plans.

The GMU 4A analysis was conducted from April through September of 1998. Comments regarding the analysis and a recommended rate of forage distribution between wild and domestic ungulates were solicited from the public; efforts included public meetings, presentations to the Arizona Game and Fish Commission, and informational mailings to interested parties. Upon review of the public input, the Forest Service and AGFD agreed on a 1:1 distribution ratio of available herbaceous forage between wild ungulates and permitted livestock. Making allowances for areas with no livestock use, the distribution of available forage on each allotment is 60% available for livestock and 40% available for wild ungulates. Domestic stocking rates are therefore based on 60% of available forage.

II. CHEVELON CANYON ALLOTMENT

The Chevelon Canyon Allotment is divided into four pastures and three holding traps, encompassing some 43,303 acres within portions of T12, 13, and 14N, R14 and 15E, G&SRM (Appendix H). It is used for summer grazing. Elevations in the area range from 6,200 to 7,700 feet. The topography is generally characterized by flat to moderate ridges that run north to south. Steep slopes do occur, associated with Alder and Chevelon canyons. The area is generally covered with trees, the dominant overstory species being ponderosa pine, pinyon and juniper. Management emphasis areas include Forested Land, Woodland, Riparian, and Developed Recreation.

A. DESCRIPTION OF ALTERNATIVES

This section presents the alternatives developed by the Interdisciplinary Team. Alternatives considered but not analyzed/adopted are discussed in Appendix B. In summary, the alternatives propose the following:

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Permitted number *	0	700	109	109	300
Animal unit months*	0	3500	436	436	1500
Permitted number **	0	700	171	109	300
Animal unit months**	0	3500	684	436	1500
Season of use	-	5/15 - 10/15	6/15 - 10/15	6/15 - 10/15	5/15 - 10/15
Range Developments					
P-J treatment	-	-	2516 acres	2516 acres	2516 acres
P-J maintenance	-	-	496 acres	496 acres	496 acres
Fence	-	-	-	-	20.5 miles
Cattleguard	-	-	-	-	3
Pipeline	-	-	16.8 miles	-	16.8 miles
Water trough	-	-	16	-	16
Storage tank	-	-	1	-	1

* Short Term ** Long Term

Alternative 1 - No Action: When the current term grazing permit expires, the Districts would take no action to renew or extend the permit. There would be no domestic livestock grazing on the allotment. Improvements would be maintained by the Districts and AGFD. All available herbaceous forage would be available to meet the forage requirements for the estimated wild ungulate populations. Monitoring forage utilization by wild ungulates would be done by AGFD to ensure allowable forage utilization levels are not exceeded.

Alternative 2 - Current Situation: There are currently permitted 700 cow/calf pairs grazing from May 15 to October 15; AUMs total 3500. Management is a three pasture, deferred grazing system with Vigil-Durfee Pasture being infrequently grazed due to lack of a permanent water source. If this alternative were selected, no direct consideration would be made for wild ungulate's herbaceous forage needs, nor would any range developments be undertaken. The record shows that the number of livestock actually grazed on the allotment has varied greatly over the past decade. The reported actual use in the period 1988 - '98 averaged 62%, including three years of nonuse and two others of less than 50%.

Alternative 3 - Proposed Action: This alternative would balance capacity with the available herbaceous forage.

[Short Term] The grazing permit would authorize 109 cow/calf pairs grazing from June 15 to October 15; AUMs would total 436. Sand Point (167 AUMs), Circle Bar (161 AUMs), and Breed

(108 AUMs) pastures would be grazed with a three pasture, deferred grazing system. Vigil-Durfee Pasture would not be grazed due to a lack of water.

[Long Term] The total capacity would increase when water is furnished to Vigil-Durfee Pasture. The grazing permit would then authorize 171 cow/calf pairs for the same season of use; AUMs would total 684. Sand Point (167 AUMs), Circle Bar (161 AUMs), Breed (108 AUMs), and Vigil-Durfee (246 AUMs) pastures would be grazed with a four pasture, deferred grazing system.

Range developments are associated with this proposal. The proposed action would authorize:

1. Treatments consisting of thinning and individual tree-pushes in pinyon-juniper stands on approximately 2,516 acres.
2. Maintenance of existing pinyon-juniper pushes to Forest Plan standards on approximately 496 acres.
3. Extension of the existing Dye pipeline approximately 16.8 miles into the Vigil-Durfee Pasture. This would also require a storage source for about 40,000 gallons of water plus 16 water troughs.

Alternative 4: The alternative would be the same as Alternative 3 except there would be no construction of a pipeline and associated water troughs in the Vigil-Durfee Pasture, precluding livestock there. Management would be with a three pasture, deferred grazing system. The permit would authorize 109 cow/calf pairs grazing from June 15 to October 15; AUMs would total 436.

Some vegetation treatment projects are associated with the proposal for the benefit of soils, watershed, and wild ungulates. The location of these treatments would be the same as with Alternative 3. The proposed action would authorize:

1. Treatments consisting of thinning and individual tree-pushes in pinyon-juniper stands on approximately 2,516 acres.
2. Maintenance of existing pinyon-juniper openings to Forest Plan standards on approximately 496 acres.

Alternative 5: With this alternative, the permit would authorize 300 cow/calf pairs grazing from May 15 to October 15; AUMs would total 1500. The permittee believes the proposed number of head can be grazed without exceeding the desired allowable forage utilization. This would be accomplished through more intensive management, including actively herding the cattle, increasing the number of pastures, and placing salt blocks to better distribute livestock across the pastures. Livestock would not graze Vigil-Durfee Pasture until water is provided, either through the construction of a new pipeline or by the permittee hauling water. Bulls, following breeding, would be grazed in two holding traps (Babbitt [34 AUMs] and Marquette [102 AUMs]) with a deferred grazing system; this would require the permittee to haul water to maintain livestock distribution.

The alternative would provide for the vegetation treatments and new pipelines described for Alternative 3. In addition, each of the four main pastures would be fenced north-south to implement a more intensive eight pasture, deferred grazing system. A long-term consideration would be to evaluate the cross fencing of each pasture east-west at the next planning period. The proposed action would authorize:

1. Treatments consisting of thinning and individual tree-pushes in pinyon-juniper stands on approximately 2,516 acres.
2. Maintenance of existing pinyon-juniper pushes to Forest Plan standards on approximately 496 acres.
3. Extension of the existing Dye pipeline for approximately 16.8 miles into the Vigil-Durfee Pasture. This would require a 40,000 gallon storage tank plus 16 water troughs.
4. Construction of approximately 13.5 miles of fence to split Breed, Circle Bar, and Sand Point pastures.

5. Following construction of the pipeline into Vigil-Durfee Pasture, there would be an additional 7.0 miles of new fence built to split the pasture.
6. Emplacement of 3 new cattleguards in Circle Bar Pasture.

B. AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

The section describes the prevailing conditions (affected environment) within the project area and the changes that can be expected from implementing the Action alternatives or taking no action at this time. The following table summarizes the costs and effects for the identified Key Issues.

ISSUE	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
1- Economics					
\$/AUM/year cost to permittee.	\$0	\$3.34	\$21.96	\$16.71	\$12.08
Cost of developments to all parties.	\$0	\$0	\$245,627	\$178,456	\$330,327
2- Wildlife					
Consistency of forage use is within allowable forage utilization standards.	Yes	No	Yes	Yes	No
3- Watershed/Riparian Health					
Estimated recovery time, in decades, for riparian areas.	1	Not expected	1-2	1-2	2-3

1. ECONOMIC & SOCIAL FACTORS - Issue 1

Affected Environment - Economic Considerations

In the earlier part of this century, the economic base for most communities close to the Forest was timber harvesting and forest products processing. Ranching and recreation uses supplemented the area's economy. This pattern is changing. In recent years, there has been a decrease in timber harvesting and ranching coupled with an increase in recreation uses. The Chevelon Canyon Allotment is located in the southeastern corner of Coconino County, the largest county in the state. The majority of the county's population, however, centers around Flagstaff and is very removed from the project area. Economic benefits would also flow to Navajo County, which contains the nearest full-service communities, and/or to Maricopa and Gila counties, where operations are headquartered.

It is important to recognize that, although the following projections appear very precise numerically, they should be viewed merely as indicators. First, there are a variety of assumptions underlying the derivation of these indices. Second, these indices apply to a "typical" regional situation, rather than the specific local case. The use of such indicators enables a direct comparison with other, recent and near-future EAs since they will all rely on the same assumptions. The projections then, while realistic, serve better as indicators of *relative* change rather than as measures of *actual* change.

Analysis of the Alternatives

The primary economic effects issue in this analysis pertains to the estimated costs for new range developments. The first measure is the annual cost to the permittee per AUM, as shown above. The second is the total cost to all contributing parties of the proposed developments, as summarized above and detailed in the following table.

The following efficiency analysis anticipates the rate of return for the projected expenditures by the permittee, third parties, and Forest Service. Measures used to conduct an investment analysis include:

the present value of benefits, the present value of costs, the present net value, and the benefit / cost ratio (see Glossary under "Quick-Silver" for definitions).

	Permittee				
	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Present Value of Benefits	\$0	\$221,132	\$36,203	\$27,546	\$94,771
Present Value of Costs	\$0	\$117,040	\$150,185	\$72,869	\$181,241
Present Net Value	\$0	\$104,092	-\$113,982	-\$45,322	-\$86,471
Benefit / Cost Ratio	0.00	1.89	0.24	0.38	0.52
Forest Service					
Present Value of Benefits	\$0	\$39,857	-\$73,696	-\$4,965	-\$164,607
Present Value of Costs	\$68,326	\$3,037	\$145,597	\$102,177	\$185,003
Present Net Value	-\$68,326	\$36,820	-\$71,901	-\$97,212	-\$20,396
Benefit / Cost Ratio	0.00	13.13	0.51	0.05	0.89
Third Party					
Present Value of Benefits	\$0	\$0	\$0.00	\$0.00	\$0.00
Present Value of Costs	\$8,857	\$0	\$49,208	\$80,012	\$49,208
Present Net Value	-\$8,857	\$0	-\$49,208	-\$80,012	-\$49,208
Benefit / Cost Ratio	0.00	0.00	0.00	0.00	0.00
All Parties					
Present Value of Benefits	\$0	\$260,989	\$109,900	\$32,512	\$259,378
Present Value of Costs	\$77,183	\$120,077	\$344,991	\$255,059	\$415,452
Present Net Value	-\$77,183	\$140,912	-\$235,091	-\$222,547	-\$156,074
Benefit / Cost Ratio	0.00	2.17	0.32	0.13	0.62

The investment analysis displays a variety of costs and benefits associated with the alternatives. All estimated costs associated with range improvement and maintenance activities are displayed. Quantified values were not established for all benefits, however. An example of this would be the pinyon-juniper treatments for Alternatives 3-5: there is a qualitative "value" for resource areas such as watershed improvement, range condition, and wildlife. Similarly, Alternative 1 would also have associated resource benefits. No attempt was made to quantify these benefit values in dollar terms as there are no local studies to provide comparable, baseline information. There are, nevertheless, obvious intuitive values associated with these actions.

Alternative 1 does not have any development costs; maintenance costs would be shared by the Forest and AGFD. Alternative 2 would retain the current infrastructure and would require maintenance of existing improvements, but would not have any development costs. Alternative 3 would have a cost to provide water to Vigil-Durfee Pasture; this improvement would allow an additional 246 AUMs annually at a cost to the permittee of \$21.96/AUM. Alternative 5 has costs for new fencing and cattleguards in addition to those associated with proposed Alternative 3 developments; the cost to the permittee would be \$12.08/AUM.

Alternatives 3, 4 and 5 would require investment to maintain existing openings and to complete 2,516 acres of woodland treatment. None of these expenses would be the responsibility of the permittee with Alternative 4 since, without water in Vigil-Durfee Pasture, other improvements would not benefit the operation.

As a secondary issue, a brief analysis of employment and Forest Service payments to the county is displayed. While providing a measure of other economic effects, this will also allow for cumulative effects analyses to be done for current and future AMP analyses on the Forest.

The level of employment directly and indirectly supported by a livestock operation is assumed to be 1.14 jobs per 100 animal-years, or 0.00095 job/AUM. This index was developed for the 1995 permit issuance project by the Forest Service's Regional Office.

Payments to counties are 25% of Forest Service receipts, which include grazing fees paid by the permittee. The grazing fees in 1998 were \$1.35 per AUM, 25% of which equals \$0.3375/AUM. Estimates of measures are:

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
No. of Jobs	0	3.32	0.65	0.41	1.43
Payments to Coconino County	\$0	\$1,181	\$231	\$147	\$506

Affected Environment - Social Considerations

Livestock producers stress the importance of the quality of life that ranching provides them and their families. Owning livestock is important as a way of reaffirming a feeling of self-sufficiency, along with ties to ancestral lands and heritage. Preserving this working relationship with the land so it can be passed on to children is a cornerstone of ranchers' values. Generally speaking, the more rural and remote the community, the more important the ranching option becomes (Eastman and Gray 1987).

Cultural patterns are also an important facet of the human environment. "Cultural" generally refers to ways of thought and life, to the social identities people develop in their communities. Most people will work hard to preserve their culture and pass it on to their children. The ranching culture is closely identified with the American West in general and Arizona in particular. Personal traits associated with ranching include self-sufficiency, independence, and a predilection for hard work.

A 1997 survey of Forest grazing permittees found that if they were no longer able to ranch, two of 36 respondents would move elsewhere to non-ranch employment and seven of 36 would move elsewhere to ranch -- in other words, about 25% of respondents would leave the area but the great majority would not leave ranching (Cosgrove 1998a). Most permittees would try to adjust their operations to absorb the loss of income rather than sell their ranches, since maintaining the ranching life-style is very important to them. Fowler (1993) found that 59% of smaller ranchers in eastern Arizona would continue at a smaller scale if they lost access to federal lands.

The Chevelon Canyon Allotment is located in Coconino County which, in 1992, had some 200 cow/calf operations. The majority of these ranches were small to medium in size with only 33 operations having greater than 200 head. Large operations, such as the one utilizing this allotment, tend to be more stable and generally can fully support an operation. Smaller operations have a greater need to supplement their income from outside sources.

Analysis of the Alternatives

Alternative 1: This proposal would have the most severe effects on the permittee, the discontinuation of grazing resulting in the complete loss of income from use of Forest lands. Based on estimates for the past decade there would be a loss of \$51,000 of average annual gross income from use of Forest lands (this figure includes three years of nonuse and two of less-than-permitted use; it should be noted that the operation has recently changed ownership). The effect of this loss on the permittee and family would depend on the financial condition of the entire operation and its dependency on this particular allotment. The loss of use of this summer range could also impact the use of winter allotments located below the Mogollon Rim because the permittee might not be able to graze cattle year around in that area.

Alternative 2: This proposal would allow for operations to continue at the present level. If all other factors were held constant, there would be no change in the social or economic environment. Range and drought conditions would be limiting factors affecting the actual number of livestock permitted in a given year, so, if future actual use mirrors the past decade, the permittee could gross an estimated \$51,000/year from use of Forest lands. If operated at fully permitted numbers, estimated gross annual income would be about \$83,000.

Alternative 3: Compared to Alternative 2, this proposal would reduce permitted AUMs 88% in the short term and 81% after Vigil-Durfee Pasture becomes available. There would be an estimated gross annual income, from use of Forest lands, of almost \$10,300 short-term and about \$16,100 long-term. Additionally, there would be a cost to implement the improvements. If supplemental summer pasturage cannot be found, there may be an effect on the permittee's overall operations; even if other pastures were available additional effort and expense would be required to use them. Without considering the operation's other sources of income, a reduction of this magnitude could place the operation at risk.

Alternative 4: This proposal would result in reductions in AUMs and income similar to Alternative 3's short term. Additional investments to improve water availability in Vigil-Durfee Pasture would not be required, but without this improvement permitted numbers would not increase in the future. Without the additional cost, and even considering the AUM reduction, the operation would be at somewhat less of a risk than with Alternative 3.

Alternative 5: Compared to Alternative 2, this proposal would reduce permitted AUMs 57%, but would require a more intensive management strategy involving additional time to be spent herding cattle as well as capital to build new fences, water sources and cattleguards. There would be an estimated gross annual income of almost \$35,000 from use of Forest lands. The alternative would permit the permittee to graze the desired number of cattle and reduce the need to seek supplemental summer pasture. The actual period of grazing would still be determined by utilization standards, so in some years the permittee may have to make adjustments. This alternative should allow the operation to continue at a self-sufficient level.

2. WILDLIFE - Issue 2

Affected Environment

Threatened, Endangered and Sensitive Species: Several threatened, endangered, and sensitive [TES] species have been documented as occurring within the analysis area. Others that have not been documented require habitat conditions similar to those within the area. Seven species -- the bald eagle, Mexican spotted owl, American peregrine falcon, Little Colorado River spinedace, black-footed ferret, jaguar, and southwestern willow flycatcher -- are listed by the U.S. Fish and Wildlife Service as threatened or endangered. An eighth species, Blumer's dock, has been proposed for listing as threatened. Threatened and endangered [T&E] species have been given protection by the Secretary of Interior under the Endangered Species Act of 1973. Sensitive species status results from a finding by the Forest Service's Regional Forester. An account will be included in the Biological Assessment and Evaluation for all TES species.

All or portions of seven Mexican spotted owl [MSO] protected activity centers and three northern goshawk territories fall within the allotment boundary. Grazing guidelines and recommendations have been developed for each of these species and are included in revisions to the Forest Plan.

The primary concern with grazing is that overutilization of forage by large ungulates reduces the abundance of prey species for the MSO and goshawk. These prey require insects and seedheads for all or portions of their diets. In areas where grazing is too heavy, insect abundance drops and seedheads are not allowed to develop. Hiding cover for prey species is also of concern. Much of the herbaceous vegetation in the allotment does not provide adequate cover for smaller species, and this may be limiting the abundance of some prey species, either by limiting forage or cover. Heavy browsing on oak and conifers by cattle and elk is also reducing the amount of cover to some prey species. The Chevelon Creek drainage (Management Emphasis Area 4-16) is adjacent to the allotment on the east. Although no livestock grazing is allowed in the canyon, the effects of grazing nearby may affect water quality. Species that may occupy habitat that is found exclusively here include the belted kingfisher, Little Colorado River spinedace, roundtail chub, speckled dace, and bluehead sucker. Surveys for all of these have been conducted within the past four years, and all but the spinedace were detected; there is a Little Colorado River spinedace population in Chevelon Creek near its confluence with the Little Colorado River.

Southwestern willow flycatchers potentially could occur in Chevelon Canyon. Surveys conducted along approximately nine miles of the stream in 1993, 1994, and 1995 resulted in no detections, but did identify some areas as having potentially suitable habitat. This species nests in thickets of trees and shrubs 13 feet or more in height with dense canopy cover. Most of the vegetation along survey routes was less than 13 feet tall and lacked dense canopy; for this reason, it is doubtful that flycatchers will colonize the canyon or be affected by grazing adjacent to the canyon in the foreseeable future.

Blumer's dock is believed to exist on non-federal lands within the allotment. Grazing ungulates seem to favor this plant and can limit its ability to propagate.

Management Indicator Species: There are three Forest Plan Management Areas within the allotment, and each has species which have been designated as indicators of management area health. Indicator species for the ponderosa pine, mixed conifer, and aspen forest (Management Area 4-01) include the red-naped sapsucker, mule deer, turkey, goshawk, pygmy nuthatch, elk, Abert's squirrel, red squirrel, hairy woodpecker, and Mexican spotted owl. Of these, mule deer, turkey, goshawk, elk, Abert's and red squirrels, and MSO are known to be present within the allotment. Red-naped sapsuckers, pygmy nuthatches, and hairy woodpeckers are believed to exist in the area but surveys have not been conducted; all three are cavity nesters, using either coniferous or deciduous trees. Grazing would not affect the current availability of snags.

Health of the pinyon-juniper woodland (Management Area 4-02) is gauged by plain titmouse, mule deer, elk, and antelope populations. All are present within the allotment where woodlands occur. Elk are substantially more abundant in this area than in the early 1970s. Mule deer populations have declined over the same period. Antelope use of the allotment is limited and occurs only in the northern extents; limited water, lack of herbaceous cover for fawns, and predation on fawns restrict populations.

Lincoln sparrows, yellow-breasted chats, Lucy's warblers, and aquatic macroinvertebrates are indicators of riparian health (Management Area 4-03). No formal bird or macroinvertebrate surveys have been conducted here, so the status of these populations is unknown.

It is important to note that several indicator species are also game species whose populations are managed by AGFD. The populations of elk, mule deer, antelope, turkey, and to a lesser extent, Abert's and red squirrels, are affected by hunting pressure in addition to habitat conditions.

Analysis of the Alternatives

Alternative 1: Removing livestock from the allotment would improve conditions the fastest for TES species. Wild ungulates would be allowed to graze 10% of the forage produced, providing 90% of the total herbaceous production to other wildlife and resource needs. The primary benefit of this alternative would be that recovery of range and watershed conditions would be quicker than in any of the other alternatives. Improved range and watershed conditions equate to better habitat for wildlife. Increases in hiding cover and available forage are expected to result in higher densities and a wider distribution of insects, small mammals, and other wildlife species that depend on grasses and annuals for food and cover. Increases in these prey groups would be likely to benefit several TES species that use the allotment. Mexican spotted owls, northern goshawks, flammulated owls, and occult little brown bats are examples of TES species that would benefit from increases in these prey groups. Browse species, which in some cases provide important nesting habitat for wildlife, would achieve the highest vigor under this alternative.

More abundant food enhances the physiological condition of animals, which often results in higher birth or clutch rates and better survival of young. The survival rate of northern goshawk young, for example has been shown to be significantly higher when prey is abundant and the time parent birds must be away from the nest to search for food is minimal (Dewey and Kennedy 1997). Voles, important in the diet of Mexican spotted owls, are known to be more abundant in meadows where grasses provide quality forage and cover (Ward and Block 1995). Recruitment of individuals into TES species populations would likely be higher with this alternative than any of the others because it would provide the best prey conditions. This could allow delisting objectives for some T&E species to be met sooner and prevent listing of some sensitive species that are under consideration.

Several wildlife species on the allotment may currently occur in reduced numbers because low level cover in meadows, openings, and along riparian corridors is less than adequate. Alternative 1 would increase the amount of cover more than any of the other alternatives. Amphibians, reptiles, insects, small mammals, and birds that rely on herbaceous ground cover would become more abundant as cover improves. This, in turn, could increase the populations of wildlife species that prey on these smaller species as well.

Implementing this alternative would preclude the development of some waters and the reduction in pinyon-juniper densities that are planned for in other alternatives. The lack of water in the Vigil-Durfee Pasture and some areas of other pastures has limited the distribution of some wildlife species; distributions of these species would continue to be limited under this alternative. If pinyon-juniper densities are not reduced, habitat for some sensitive species would continue to be limited on the allotment. Swainson's hawks, ferruginous hawks, and prairie falcons are examples of species that require open savannah and grassland conditions and would continue to have only a small amount of suitable habitat available to them if this alternative is implemented.

It is anticipated that forage use by wild ungulates would not exceed the 10% forage utilization standard allowed them. If use by wild ungulates exceeds 10%, benefits to other wildlife species would decrease accordingly. As long as forage use by wild ungulates does not approach that prescribed by the other alternatives, this alternative would provide the greatest benefit to wildlife as a whole.

Alternative 2: This alternative would retain the existing grazing system which has contributed to the poor conditions that are present today. High utilization of grasses, forbs, and browse by livestock and wild ungulates would continue to restrict some wildlife populations. The 5/15 livestock entry date for this alternative would result in lower grass height and seedhead development in whichever pasture is grazed first. Insect, small mammal, and bird populations that forage on grasses and forbs, and the

seedheads they produce, would remain suppressed. Wildlife that preys on herbivorous and granivorous species, including Mexican spotted owls, northern goshawks, flammulated owls, and several species of bats, would not experience the benefits of increased prey that other alternatives would provide. High use on browse would also continue under this alternative. The lack of recruitment of aspen and oak would continue to limit opportunities for cavity nesters and wildlife species that forage on oak mast.

Cover would not improve for those species that live in the herbaceous strata. TES amphibians, reptiles, small mammals, and birds that require tall, dense grasses for cover would continue to be limited in abundance. Vulnerability for these populations would remain high because of inadequate cover. Mexican spotted owls, flammulated owls, bats, and other wildlife that forage on populations that prosper in high quality cover would remain limited in part because of less than optimal prey availability. Retention of existing range and watershed conditions could slow the recovery of some T&E species and may increase the likelihood that some sensitive species would be listed as threatened or endangered.

Ungulate trampling of wildlife habitat would be highest under Alternative 2 because this alternative would allow the highest number of ungulates on the allotment. Paine *et al.* (1996) found that livestock damaged an average of 75% of grassland bird nests, with eggs and young being either crushed by an animal's muzzle, trampled by a hoof, or kicked out of the nest. Trampling can be especially detrimental to streamside and riparian habitats. Trampling results in a loss of undercut banks, reduction of streamside vegetation, widening of the stream channel, and modification of aquatic habitat through increased sedimentation, water temperatures, and channel width (Bohn 1986). Streambank changes resulting from livestock trampling are most pronounced in the spring and early summer when soil moisture content is highest. A reduction or elimination of certain wildlife and plant species may result from single or cumulative effects of streambank trampling by livestock (Platts and Nelson 1989).

This alternative would provide for no new water developments or pinyon-juniper treatments. The lack of water in the Vigil-Durfee Pasture and some areas of other pastures has limited the distribution of some wildlife species; distributions of these species would continue to be limited under this alternative. If pinyon-juniper densities are not reduced, habitat for some sensitive species would continue to be limited on the allotment. Swainson's hawks, ferruginous hawks, and prairie falcons are examples of species that require open savannah and grassland conditions and that would continue to have only a small amount of suitable habitat available to them if this alternative is implemented.

Compared to the other alternatives, this alternative would provide the least amount of benefit to wildlife.

Alternative 3: Alternative 3 is the District's proposed action. It would reduce livestock numbers by approximately 81% from current numbers. Combined livestock/wild ungulate forage utilization would be expected to average 25% in key areas across the allotment. Seventy-five percent of the total herbaceous production would not be grazed and would be available for nongame wildlife and other resource needs.

Alternative 3 would improve wildlife forage and cover conditions faster than Alternatives 2 and 5 but not as fast as Alternative 1. Forage utilization levels would be higher by 15% than in Alternative 1, which would result in less of the total herbaceous production available to provide forage and cover for nongrazing wildlife species. Alternative 3 would provide more forage and cover to nongrazing wildlife species than Alternative 2 simply because allowable use levels would be lower under Alternative 3. A livestock entry date of 6/15 compared to 5/15 in Alternatives 2 and 5 would allow

cool season grasses to achieve greater height and more seedhead development. This would enhance the beneficial effects of fewer ungulate numbers and reduced forage utilization in providing nongrazing wildlife more forage and cover than in Alternative 2. Forage and cover in key areas would be about equal among Alternatives 3, 4, and 5 as long as monitoring does not allow forage use to exceed an average of 25% in key areas in grazed pastures; this has a higher likelihood of happening in Alternative 5. If forage utilization levels do not exceed 25% in key areas, Alternative 3 can be expected to improve habitat conditions for insects, small mammals, and other wildlife species that depend on quality herbaceous forage and cover. Threatened, endangered, and sensitive wildlife species preying on species that use the herbaceous layer would also be expected to benefit from this alternative.

Trampling would be more of a concern under this alternative than Alternative 1 due to the presence of livestock. Trampling would be significantly less under this alternative when compared to current conditions (Alternative 2) because of the substantial reduction in ungulate numbers. The later livestock entry date for Alternative 3 would also allow riparian areas and streambank soils more time to dry out before being subject to livestock trampling. Marlow and Pogacnik (1985) found that riparian degradation can be tempered by deferring livestock use until after streambank soil moisture content has dried to <10%. This soil moisture level is more likely to be achieved with a 6/15 entry date than with a 5/15 entry date. The effects of livestock trampling to wildlife in grazed pastures under this alternative would likely be comparable to Alternative 4 but less than Alternative 5. Over the entire allotment, Alternative 3 would have a higher trampling effect than Alternative 4 because in the long term, the Vigil-Durfee Pasture would be grazed.

Range developments proposed in this alternative would improve water availability and distribution to wildlife species in the Vigil-Durfee Pasture. This could be a benefit to some species and adversely affect others. Elk, deer, and antelope would benefit from the water developments, as would some non-game species that have territories near the drinkers. Other non-game species may not benefit because of higher amounts of trampling in an area where this effect is now caused only by wild ungulates. Pinyon-juniper density reduction treatments proposed in this alternative would begin steps toward providing a better balance of VSS classes, which would improve conditions for most wildlife species that use the pinyon-juniper woodlands.

Alternative 3 and Alternative 4 would be about equal in their effects to wildlife and would benefit wildlife the most when compared to the other action alternatives.

Alternative 4: Alternative 4 would have many of the same effects as Alternative 3. The main difference between these two alternatives would be that no grazing would occur in the Vigil-Durfee Pasture in Alternative 4 because no water would be developed. The lack of water would continue current conditions in this pasture, which would restrict distribution for elk, deer, and antelope but also limit trampling damage to ground nesting birds and small mammals. Continued rest in the Vigil-Durfee Pasture would provide more forage and cover for insects, birds, and small mammals using the herbaceous stratum than if the pasture was grazed. It is anticipated that forage use by wild ungulates would not exceed the 10% forage utilization standard allowed them. If use by wild ungulates exceeds 10%, benefits to other wildlife species would decrease accordingly.

Alternative 4 and Alternative 3 would be about equal in their effects to wildlife and would benefit wildlife the most when compared to the other action alternatives.

Alternative 5: Alternative 5 was proposed by the permittee and would allow 300 head of livestock to graze the allotment from 5/15 to 10/15. Stocking would exceed capacity by approximately 129 head of cattle. Livestock distribution would be improved over other alternatives by active herding, increasing the number of pastures from four to eight, and placing salt blocks to improve distribution.

However, stocking the allotment beyond its capacity would likely result in livestock forage utilization levels of 50 to 60%. Combined use by livestock and wild ungulates would be likely to approach 60 to 70%.

This alternative would use more of the total herbaceous growth than Alternatives 1, 3, and 4, but less than Alternative 2. Utilization rates would be somewhat lower on the allotment than under Alternative 2 but would still be high enough to restrict the growth of some wildlife populations. The 5/15 livestock entry date specified in this alternative would result in lower grass height and seedhead development at the time of entry. Forage for insects, small mammals, and ground-nesting birds would probably not improve over current conditions. Thus, the prey base for Mexican spotted owls, northern goshawks, flammulated owls, and other TES wildlife species would probably remain suppressed, which could limit the populations of these species also. High use on browse would be likely to continue under this alternative.

Cover for those species that live in the herbaceous strata would improve over Alternative 2 but not as much as under Alternatives 1, 3, and 4. Combined grazing utilization levels of 60-70% would not leave the residual grass height required to provide adequate cover for several wildlife species. TES amphibians, reptiles, small mammals, and birds that require tall, dense grasses for cover would continue to be limited in abundance. Mexican spotted owls, flammulated owls, bats, and other wildlife that forage on populations that prosper in high quality cover would remain limited in part because of less than optimal prey availability. Range and watershed conditions would probably remain poor, which could slow the recovery of some T&E species and may increase the likelihood that some sensitive species would be listed as threatened or endangered.

Trampling of vegetation and wildlife nests would be more prevalent under this alternative than Alternatives 1, 3, and 4, but less than Alternative 2. Trampling in wet meadows and along streambanks would probably continue to limit the quality of habitat in these areas. This could affect the abundance of prey for several TES wildlife species and could cause failures in the reproductive attempts of some wildlife species.

Improvement projects proposed in Alternative 5 include piping water to the Vigil-Durfee Pasture, reducing pinyon-juniper densities in the Vigil-Durfee Pasture, and constructing approximately 20.7 miles of new pasture division fence. The pipeline would improve water availability and distribution to wildlife species in the Vigil-Durfee Pasture. This could be a benefit to some species and adversely affect others. Elk, deer, and antelope would benefit from the water developments, as would some non-game species that have territories near the drinkers. Other non-game species may not benefit because of higher amounts of trampling in an area where this effect is now caused only by wild ungulates. Pinyon-juniper density reduction treatments proposed in this alternative would begin steps toward providing a better balance of VSS classes, which would improve conditions for most wildlife species that use the pinyon-juniper woodlands. The new pasture division fencing would create more obstacles for wildlife species and could result in mortality of wildlife, especially big game species.

Alternative 5 would benefit wildlife more than Alternative 2, but less than Alternatives 1, 3, and 4.

3. WATERSHED, SOILS & RIPARIAN CONDITION - Issue 3

Affected Environment - Watershed and Soils

Watershed condition was determined for the Forest Plan in 1987. At that time the Chevelon Creek watershed was estimated to be in satisfactory condition, but Clear Creek watershed was deemed

unsatisfactory. Woodland areas with moderate to heavy canopy cover within these watersheds are generally found to have unsatisfactory or impaired soil conditions due to poor distribution and relatively low amounts of organic material in the soil, and to altered surface structure from the effects of raindrop impact. Additionally, lack of vegetative basal area and litter have resulted in reduced resistance to overland flow. These conditions result in accelerated soil movement, and are exacerbated when coupled with the effects of increasing woodland overstory canopy-cover and the overutilization of remaining forage by wild and domestic ungulates. Watershed condition by class by fifth-code watershed is shown below (areas are in acres).

Watershed	Total Area	Satisfactory	Satisfactory Untreatable	Unsatisfactory
Chevelon Creek	56,149	40,368	2,391 + steep canyons	13,389
Clear Creek	1,701	0	0	1,701

Cryptogamic crusts are evident within the allotment. These crusts serve many roles, from increasing surface roughness and resistance to raindrop impact, to providing a source of nutrients for some plants. The crusts are most prevalent in areas where there are large interspaces between litter and plant basal area. Crusts on this allotment occur under moderate to heavy pinyon-juniper canopy cover. These areas see little animal use, as forage is not generally available to ungulates. The crusts are considered to be a pioneer plant in these degraded conditions.

The Arizona Department of Environmental Quality documents water quality in Chevelon Canyon Creek and East Clear Creek as fully supporting the designated uses of cold water fisheries (A&Wc), fish consumption (FC), full body contact (FBC), agricultural irrigation (AgI) and livestock watering (AgL) within the Chevelon Ranger District (ADEQ 1998). However, the project areas are hydrologically connected to Chevelon Creek near Winslow (site 150200008-003), approximately 30 miles north of the Forest boundary, where the designated uses are not fully met due to measured high levels of copper, lead and turbidity.

Best Management Practices for grazing (see Appendix C), when fully implemented, are effective in protecting water quality. Monitoring of BMP implementation and effectiveness will be accomplished. In addition to monitoring range condition, monitoring of effective ground cover will be used to determine whether watershed condition is improving in key areas within the allotment.

Analysis of the Alternatives

Alternative 1: Watershed condition would improve in open grassland due to reduced effects from grazing livestock, so long as wild ungulate populations do not increase. Areas under dense pinyon-juniper canopy would not improve since this requires removal of competing overstory. Areas under ponderosa pine overstory should remain in satisfactory condition, since litter and duff are responsible for maintaining soil stability and slowing overland flow.

Alternative 2: Watershed condition on the Chevelon Canyon Allotment would not improve as livestock use will exceed capacity. Areas under dense pinyon-juniper canopy would not improve due to the effects of competing overstory and overuse of remaining forage. Areas under ponderosa pine canopy should remain in satisfactory condition as these areas have adequate ground cover from litter and duff.

Alternatives 3 and 4: Watershed condition would improve on the Chevelon Canyon Allotment due to the effects of balancing livestock numbers with capacity. Plant density and vigor in the open grasslands should increase, resulting in improved ground cover conditions, infiltration rates and

resistance to overland flow. In areas where range treatments to reduce pinyon/juniper overstory are proposed, there would be reduced competition for light and nutrients, allowing grass and litter cover to increase. Areas under ponderosa pine overstory should generally remain in satisfactory condition.

Alternative 5: Watershed conditions on the Chevelon Canyon Allotment with Alternative 5 may be similar to that described for Alternative 2 as this alternative does not balance livestock use with capacity. Improvement, if it occurred would be at a slower rate than with Alternatives 3 or 4 unless forage utilization monitoring occurred, which would trigger early moves from pastures and the allotment if necessary.

Affected Environment - Riparian

Riparian condition is determined using the Proper Functioning Condition (PFC) methodology (USDI 1998). Three basic categories are used to describe condition: proper functioning (PFC), functional-at-risk (FAR), and non-functional (NF). Reaches with ratings of FAR and NF are considered to be in unsatisfactory condition by the Forest Service. The riparian areas inventoried and their corresponding condition class are indicated on the attached map (Appendix I). West Chevelon and Chevelon Creeks are adjacent to the Chevelon Canyon Allotment but are not used for cattle grazing; wildlife access is not restricted. A summary of the major riparian areas within the allotment is found below; a detailed account is in the Project Record.

Alder Canyon		
Condition	Miles Surveyed/Evaluated	% of Reaches
<i>Riparian Reaches</i>		
Functional At Risk - Upward Trend	12.0	75
Functional At Risk - Downward Trend	0.5	3
Nonfunctional	3.5	22
<i>Non-riparian Reaches</i>		
Functional At Risk - Downward Trend	1.5	100
East Fork Alder Canyon		
<i>Non-riparian Reaches</i>		
Functional At Risk - Downward Trend	3.0	100
Chevelon Canyon		
<i>Riparian Reaches</i>		
Proper Functioning Condition	10.25	100
Circle Bar Draw		
<i>Riparian Reaches</i>		
Proper Functioning Condition	1.0	14
Functional At Risk - Upward Trend	2.5	36
Functional At Risk - Trend Not Apparent	0.5	7
Nonfunctional	3.0	43
West Chevelon Canyon		
<i>Riparian Reaches</i>		
Proper Functioning Condition	0.7	100

The following is a brief description of riparian areas inventoried and found to be in unsatisfactory condition. Numbers in parentheses refer to stream reach number found on the Riparian Condition Map in Appendix H.

Alder Canyon, FAR - Upward Trend reaches (reach 4) show a significant increase in the amount of riparian species present and reproducing along the stream channel. These reaches may reach Proper Functioning Condition in 20+ years. Channel problems are caused by increased flows spawned by

unsatisfactory upland watershed conditions and upstream riparian and stream conditions, both historic and current. These reaches should be a priority for monitoring efforts as these are areas which are improving, but remain at risk. The Cliff Springs reach (2) contains a wet meadow that appears to be drying out. Problems appear to be derived from overgrazing by all ungulates, causing stream channel degradation. Vegetation is grazed during all seasons and insufficient carryover stubble height remains to slow down flow velocities. This area should take highest management priority because a decline in resource values is at risk. However, this area retains much of the resiliency associated with a functioning area and there is an opportunity to reverse this trend through changes in management. Management strategies include balancing livestock use with capacity, monitoring rate of recovery, which may result in further or excluding the area from all ungulates. Alder Canyon below the Cliff Springs meadow (NF) (reach 3) is a deeply incised channel, devoid of riparian vegetation. Historically, it was probably a riparian reach as is evidenced by the reaches above and below this stretch. Existence of young ponderosa pines indicate encroachment of upland species associated with the lowering of the water table. One of two things must take place to improve riparian condition. Either flow velocities must be reduced with greater hydraulic roughness (more vegetation, coarse woody debris), or the channel needs to widen to accommodate greater flows and rebuild a functioning floodplain. While this area could still be in decline, most of the riparian values have already been lost. This area should be a lowest management priority as the dollar investment to restore this reach to a functional riparian area would be very costly and perhaps unsuccessful.

East Fork of Alder Canyon from Forest Road 169 to its confluence with Alder Canyon (reach 1) and the non-riparian reaches of Alder Canyon (reach 1) was rated *FAR - Downward Trend*. This area primarily receives flows during spring runoff. The channel bottom is currently downcutting as a function of *Poa pratensis* not having the root depth to withstand saturated conditions and high flows. Downcutting is more severe at the confluence of Alder Canyon, where East Fork has adjusted to meet the new Alder Canyon channel bottom elevation. Heavy grazing is evident and residual stubble height carrying over into the spring is insufficient. This area should take a high management priority because a decline in resource values is at risk. The area, however, retains much of the resiliency associated with a functioning area. Changes in management strategy could involve control of ungulate grazing which would benefit the vegetative species, curtailing much of the downcutting.

Within Circle Bar Draw, the *FAR - Upward Trend* (3) occurs for approximately 2.5 miles. This area most likely lost its form during the 1993 flood and is still in the process of recovery. The channel is wide and shallow, but continues to narrow as it reestablishes a new floodplain. Problems stem from upper watershed conditions which are unable to slow down runoff processes and delay and suppress high flow events. This section should take 20-30 years to experience full recovery, provided the upper watershed is not degraded further in either overstory and/or ground cover.

AGFD's property of Duran Ranch was rated *FAR - Trend Not Apparent* (1). As a meadow reach, this area experiences heavy ungulate grazing. This falls under that agency's management. With revised management of ungulate grazing, i.e. fencing, this area has a quick recovery potential of less than 10 years. Check dams placed prior to AGFD's ownership show that the incised channel is collecting sediment and rebuilding to its previous channel.

The AGFD Tillman property (2) was rated *Nonfunctional* based on the poor condition of this meadow reach. Virtually devoid of vegetation, the channel has incised the meadow, draining the water table several feet. This meadow is suffering from severe overgrazing and will probably never recover to its original wet meadow state. If fenced off, this reach may reestablish at a new elevation in 50+ years. Because of its poor rating, this reach may not be a high management priority for the AGFD but would still greatly benefit from reductions in ungulate grazing.

Below both the Duran and Tillman properties, Circle Bar Draw was rated as *Nonfunctional* (2). Restoring these channels will probably take over a century and a substantial investment. The time and cost may make these a low management priority for the Forest. Recommendations are to reestablish overstory and ground cover in the uplands and limit utilization near the channel to allow vegetation to recover.

Analysis of the Alternatives

Alternative 1: Riparian areas with woody riparian species would improve, due to less impacts on the woody species from elimination of livestock. Riparian meadows, such as in upper Alder Creek composed chiefly of graminoids would improve with graminoids likely increasing in cover and density due to reduced grazing pressure. It is estimated that recovery time to proper functioning condition or trending toward PFC for riparian areas functioning at risk or not properly functioning would be one decade after the alternative has been fully implemented.

Alternative 2: Concentrated grazing within the riparian meadow areas by cattle would compact wet soils, reduce effective ground cover, and destabilize stream banks. Riparian areas with woody riparian species would likely not improve, due to direct impact by wild ungulates and some impact from livestock use. The wet meadows composed mainly of graminoids may decline, based on effects of stocking the allotment above estimated capacity. Riparian recovery would not be expected to occur except in those areas of upward trend due to continued ungulate pressure. Any improvement in condition would be at the slowest rate of all alternatives.

Alternatives 3 and 4: Woody riparian species would improve due to balancing livestock numbers with capacity. Overuse of herbaceous production is likely to occur until wild ungulates are balanced with their estimated capacity. It is estimated that recovery time to PFC or trending towards PFC for riparian areas functioning at risk or not properly functioning would be one to two decades after the alternative has been fully implemented.

Alternatives 5: Alternative 5 would result in overuse of the available herbaceous forage which would be detrimental to the riparian habitat, although less than Alternative 2. It is estimated that recovery time for riparian areas functioning at risk or not properly functioning would be two to three decades after the alternative has been fully implemented.

4. RANGE & VEGETATION

Affected Environment - Range

Major herbaceous plants at higher elevations include Arizona fescue, mountain muhly, screwleaf muhly, junegrass, squirreltail, *bromus* spp., Kentucky bluegrass, redtop bentgrass and pine dropseed. Other species include ponderosa pine, Gambel oak, aspen, mountain mahogany and elderberry; the Gambel oak is heavily hedged.

The lower elevation herbaceous plants include blue grama, threeawn, sand dropseed, squirreltail and western wheatgrass. Other species include cliffrose, mountain mahogany, skunkbush, algerita, winterfat, fourwing saltbush, sage spp., pinyon pine, juniper spp. and snakeweed; the cliffrose is heavily hedged.

Forage production averages approximately 100 lbs per acre across the allotment. Production is typically higher in the open areas. Densities of pinyon and juniper in Vigil-Durfee Pasture are limiting production there.

Range condition is a measure of vigor, composition and density of vegetation. Range conditions vary from Very Poor to Poor on the allotment, with the majority of the acres in Poor condition. Condition classifications were verified by ocular estimate during field reviews to confirm herbaceous forage production. Range condition is displayed by acreage, pasture, and grazing capability class.

Range Condition	Full Capacity Range	Potential Capacity Range	No Capacity Range	Unavailable Range
Very Poor	6,780	898	354	0
Poor	34,994	0	0	0
Fair	0	0	0	277
Good	0	0	0	0
Total	41,774	898	354	277*

* This acreage includes private land, mineral pits, and water.

Analysis of Alternatives

Alternative 1: With no livestock on the allotment, wildlife would have 100% of the available forage, with allowable utilization 10% by ungulates; AGFD would monitor forage use across the entire herd unit. Cool-season grasses would still be grazed before the range is ready. If utilization is kept to the 10% level during the spring and the fall, range condition should improve in terms of forage production and of plant vigor, composition and density.

This proposal would improve range condition and increase forage production in the Sand Point, Breed, and Circle Bar pastures at a faster rate than other alternatives. Range condition would not improve and forage production would not increase, and could decline, in Vigil-Durfee Pasture due to the lack of opening maintenance and pinyon-juniper treatments.

Alternative 2: This proposal would continue the currently permitted grazing situation. The current forage distribution provides 78% to livestock and 22% to wildlife, based on current forage needs. This would not balance permitted livestock use with allotment capacity, and could result in high utilization levels (80% to 90%) by both wildlife and livestock. The entry date for cattle would be May 15; in most years this is too early for range readiness, especially in the higher-elevation Circle Bar and the Breed pastures.

Key areas, as currently monitored, would be heavily utilized (50% to 90%) by wildlife, especially in the early spring and especially in the riparian areas and wetter meadows on Circle Bar and Breed pastures. The uplands within all pastures would receive heavy use on selected species; wild ungulates would tend to use the lower elevation pastures during the winter. These pastures would receive heavy browsing during the late fall winter and early spring.

With the expected level of grazing intensity, the vigor, density and composition of desirable plants would decline. There would also be an increase in undesirable plants, thereby adversely affecting range conditions, forage production, and capacity.

Alternative 3: This proposal would balance permitted livestock use with allotment capacity. Forage distribution would be 60% for livestock and 40% for wildlife, meeting the desired conditions. Pasture rotations and capacity will be developed so that livestock would be moved when utilization reaches 25%.

The entry date for livestock would be June 15, by which date plants typically have enough growth and soils are sufficiently dry that range readiness conditions would be met. Compared to Alternatives 2

and 5, this would allow more growth for plants before livestock grazing. With the proposed utilization level and grazing schedule most plants would become more vigorous.

The addition of the pipeline into the Vigil-Durfee Pasture would allow for more forage being available for use and would lead to better distribution of livestock and wildlife. This pasture would receive 2,516 acres of pinyon-juniper treatments, moving VSS distribution toward desired conditions. This alternative calls for approximately 496 acres of maintenance of existing treatment areas which would enhance or maintain forage production and range conditions. These treatments should improve range condition and forage production within a short time by reducing undesirable plant cover. The vigor of the existing forage plants should also increase due to decreased competition. The slash remaining from these treatments would provide protection to soils and plants, allowing desirable grass species to become established. Forage production and range conditions in these treatment areas should reach Fair range condition over time.

The allowable use by grazing wildlife would be 10% on the allotment; AGFD will monitor key areas across the entire herd unit. There are no key areas on this particular allotment, so it could be difficult to assess actual utilization. There would be wildlife grazing before the expected readiness date is met, but if wildlife utilization is held to 10%, the benefits listed above should still occur.

With this proposal, forage production and range conditions would be expected to improve. The vigor, density and composition of desirable plants should also improve.

Alternative 4: This alternative would balance permitted livestock use with allotment capacity. Total utilization is expected to average 25%, and pasture rotations and capacities will be developed so that livestock would be moved when the utilization reaches this level.

Livestock entry date would be June 15, by which date plants typically have enough growth and soils are sufficiently dry that range readiness conditions would be met. Compared to Alternatives 2 and 5, this would allow more growth for plants before livestock grazing. With the proposed utilization level and grazing schedule most plants would become more vigorous. The time livestock spent in the three grazed pastures would be slightly longer in this alternative than with Alternative 3, but with the proposed schedule and utilization level, conditions would improve.

The Vigil-Durfee Pasture would not be grazed by livestock. This pasture would receive 2,516 acres of pinyon-juniper treatments, moving VSS distribution toward desired conditions. This alternative calls for approximately 496 acres of maintenance of existing treatment areas which would enhance or maintain forage production and range conditions. These treatments should improve range condition and forage production within a short time by reducing undesirable canopy cover. The vigor of the existing forage plants should also increase due to decreased competition. The slash remaining from these treatments would provide protection to soils and plants, allowing desirable grass species to become established. Forage production should increase and range condition in these treatment areas should reach Fair over time. The treatments should improve at a faster rate than with Alternatives 3 and 5 because there would be no livestock grazing.

The allowable use by wildlife would be 10% on the allotment; AGFD will monitor key areas across the entire herd unit. There are no key areas on this particular allotment, so it could be difficult to assess actual utilization. There would be wildlife grazing before the expected readiness date is met, but if wildlife utilization is held to 10%, the benefits listed above should still occur.

With this alternative, the forage production and range conditions would be expected to improve. The vigor, density and composition of desirable plants should also improve.

Alternative 5: This alternative is not expected to balance permitted livestock use with capacity. Forage distribution would be 60% for livestock and 40% for wildlife. The expected utilization levels would be 50% to 60%. Pasture rotations would be developed according to the capacities for each pasture.

The entry date for cattle would be May 15, which in most years is too early for range readiness, especially in the higher-elevation Circle Bar and the Breed pastures. Until the pipeline is established in the Vigil-Durfee Pasture, utilization levels in the Breed, Circle Bar and Sand Point pastures could range from 65% to 75%.

There are 20.5 miles of proposed north-south fences which would divide the existing pastures approximately in half. Once the fences were constructed the rotation schedule would be adjusted. The fences and pipeline would help the distribution of animals, but would not offset the expected high utilization levels.

Vigil-Durfee Pasture would receive 2,516 acres of pinyon-juniper treatments, moving VSS distribution toward desired conditions. These treatments should improve range condition and forage production within a short time by reducing undesirable cover. The vigor of the existing forage plants should also increase due to decreased competition. The slash remaining from these treatments would provide protection to soils and plants, allowing desirable grass species to become established. Range conditions would probably not improve beyond the initial gain, and could actually decline over the long run due to the expected high utilization levels.

This alternative calls for maintenance of approximately 496 acres of existing treated areas. This maintenance would initially enhance or maintain forage production and range conditions, but with the expected high utilization rates the range condition of the openings would ultimately decline.

The allowable use by wildlife would be 10% on the allotment; AGFD will monitor key areas across the entire herd unit. There are no key areas on this allotment, so it could be difficult to assess actual utilization. There would be wildlife grazing before the expected readiness date is met, but if utilization is held to 10%, the benefits listed above should still occur.

With the combined wildlife and livestock utilization levels, forage production and range conditions would not improve and would probably decline over the long term.

Affected Environment - Vegetation

The desired conditions for Vegetative Structural Stage [VSS] distribution for the pinyon-juniper woodland is 20% in each major VSS class; the Forest Plan directs that 20% is to be managed for old growth. It should be noted the distribution is a Forestwide objective, and there is no intent to meet this on any given parcel, such as an individual allotment or even a single District. VSS distributions in forested stands are not addressed here since no forestland treatments are proposed (such analysis will be done in the future). Watershed condition and forage production are not expected to improve in untreated areas where canopy covers exceed 40%.

Analysis of Alternatives

No change would occur with Alternatives 1 and 2. Identical treatments are proposed in Alternatives 3, 4 and 5, but changes would occur in less than 20% of the stands. Most treatments are in stands classified as VSS 5, converting them to other VSS classes. About 60% of the stands would be retained as VSS 5. The table below displays the current and future distributions given the proposed treatments.

VSS Class	CURRENT		PROPOSED	
	Acres	%	Acres	%
1	2032	12	2032	12
2A	84	0	438	3
2B	0	0	0	0
2C	0	0	0	0
3A	190	1	380	2
3B	190	1	190	1
3C	0	0	0	0
4A	69	0	1996	11
4B	402	2	402	2
4C	1534	9	1534	9
5A	274	2	274	2
5B	3488	20	3028	17
5C	9197	53	7168	41

6. HERITAGE RESOURCES

The effects of grazing on heritage resources are of concern. By letter of March 16, 1995, the Regional Forester and the Arizona State Historic Preservation Officer clarified the process for addressing this concern. Implementation of that process will satisfy compliance with the National Historic Preservation Act and NEPA. For any of the proposed alternatives, a Forest Archeologist must be consulted if ground-disturbing range developments or treatments are proposed to ensure that the requirements of the National Historic Preservation Act are met.

Within the context of grazing projects, heritage resources may be directly affected by trampling and by construction of improvements or implementation of woodland conversion/maintenance activities. Cultural sites may be indirectly affected by natural processes, primarily sheet- or gully-erosion subsequent to loss of vegetative cover. It is noted that trampling by ungulates has been an on-going process for centuries prior to the introduction of cattle. Similarly, long term geologic cycles of aggradation and degradation have been operating within the span of human history. Maintenance, replacement or reconstruction of existing facilities are not considered undertakings and do not require additional survey. Of main concern, therefore, are the proposed construction and vegetation treatment projects. Potential impacts to sites, however, are easily avoided through project redesign once proper inventories are completed.

Affected Environment

More than 24% of the allotment has been surveyed, 21% using sampling tactics and over 3% with complete inventory. There are 74 prehistoric sites identified; none has been formally evaluated. Known, but uninventoried, historic sites relate to early homesteading.

Location of heritage sites is influenced by soil type, slope, aspect, elevation, access to water and arable land. The majority of identified sites are located on gentle slopes near water and arable land. Throughout this portion of the Districts, prehistoric sites are concentrated within the forest-woodland ecotone while historic sites appear to be more directly tied to perennial waters.

None of the known prehistoric sites are standing ruins or cliff dwellings, site types recognized as more susceptible to grazing impacts. None of the sites are identified as having traditional cultural values.

Analysis of the Alternatives

Alternative 1: Since no livestock grazing would be permitted under this alternative, the potential for heritage resources to be directly affected by livestock trampling is eliminated. Ground cover should increase, minimizing the effects of erosion.

Alternatives 2 and 5: With livestock grazing exceeding estimated capacity, ground cover would be expected to decrease which would continue to cause indirect effects by accelerated site deterioration from erosional processes.

Alternatives 3 and 4: Under these alternatives, livestock numbers are balanced with the estimated grazing capacity. Ground cover should increase, minimizing the effects of erosion. The continuation of grazing at or below historic levels is not expected to result in negative effects to heritage resources.

7. AIR QUALITY

The Arizona Department of Environmental Quality has determined that the airsheds within the Districts are "in attainment" (satisfactory condition). None of the alternatives propose actions that would detrimentally affect air quality.

III. CLEAR CREEK ALLOTMENT

The allotment is divided into three pastures and one holding trap, encompassing some 17,334 acres within portions of T12, 13 and 14N, R12 and 13E, G&SRM (Appendix H). It is used for summer grazing. Elevations in the area range from 6,100 to 6,700 feet. The topography is generally characterized by gentle to moderate slopes. Steep slopes do occur, associated with the canyons along Clear and Willow creeks. The area is generally covered with trees, the dominant overstory species being pinyon and juniper. Management emphasis areas include Forested Land and Woodland.

A. DESCRIPTION OF ALTERNATIVES

The section presents the alternatives developed by the Interdisciplinary Team. Alternatives considered but not analyzed/adopted are discussed in Appendix B. The alternatives propose the following:

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Permitted Number *	0	150	157	157	125
Animal unit months*	0	540	392	392	312
Permitted Number **	0	150	178	157	125
Animal unit months**	0	540	444	392	312
Season of use	-	7/16- 10/31	8/16 - 10/31	8/16 - 10/31	8/16- 10/31
Range Developments					
Fence	-	-	0.25 mile	0.25 mile	0.25 mile
P-J treatment	-	-	2726 acres	2726 acres	2726 acres
P-J maintenance	-	-	738 acres	738 acres	738 acres
Pipeline replacement	-	-	1.0 mile	1.0 mile	1.0 mile
Pipeline extension	-	-	4.5 mile	-	-
Pipeline new	-	-	2.5 mile	-	-
Trough	-	-	9	-	-

* Short Term ** Long Term

Alternative 1 - No Action: When the current term grazing permit expires, the Districts would take no action to renew or extend the permit. There would be no domestic livestock grazing on the allotment. Improvements within these pastures would be maintained by the Districts. All available herbaceous forage would be available to meet the forage requirements for the estimated wild ungulate populations. Monitoring forage utilization by wild ungulates would be done by AGFD to ensure allowable forage utilization levels are not exceeded.

Alternative 2 - Current Situation: This would continue the current grazing situation, which permits 150 cow/calf pairs grazing from July 16 to October 31; AUMs total 540. Management would be a three pasture rest grazing system. No consideration would be made directly for wild ungulate herbaceous forage needs. No new range developments would be built. The record shows that the number of livestock actually grazed has varied between 1988 and 1997. There has been one year of nonuse and another of less than 50%; all other years have been very close to the number authorized, the overall average being 83%.

Alternative 3 - Proposed Action: *[Near Term]* The allotment would be rested from livestock grazing to restore plant vigor. The length of time that the allotment would be rested is contingent upon monitoring results. Livestock would be allowed to return to the allotment when blue grama leaf-length reaches four to five inches and those of western wheatgrass are five to six inches.

[Short Term] Following the rest period, this alternative would permit 157 cow/calf pairs grazing from August 16 to October 31; AUMs would total 392. Grazing would be with a three-pasture deferred grazing system. Based on estimated grazing capacity, AUMs are distributed: North Pasture,

125; South Pasture 124; and East Pasture 143. Initially, the southwestern portion of South Pasture would not be included in the capacity due to a lack of water.

[Long Term] After water is furnished to the southwestern portion of South Pasture, the permit would authorize 178 cow/calf pairs grazing from August 16 to October 31; AUMs would total 444. Based on estimated grazing capacity, AUMs are distributed: North Pasture, 125; South Pasture 176; and East Pasture 143. The grazing system would remain a deferred rotation.

Range developments are associated with the proposed action. The proposed action would authorize:

1. Treatments consisting of thinning and individual tree-pushes in pinyon-juniper stands on approximately 2,726 acres.
2. Maintenance of existing pinyon-juniper pushes to Forest Plan standards on some 738 acres.
3. Replacement of approximately 1.0 mile of pipeline from Tillman Draw to Government Storage Tank.
4. Installation of approximately 2.5 miles of new pipeline (from Government Storage Tank northwest into North Pasture) and three water troughs.
5. Construction of approximately 0.25 mile of new fence (with a smooth bottom wire) to exclude livestock access to Clear Creek at Hamilton Crossing. The fence would be constructed before livestock are permitted to graze in the South Pasture.
6. Extension of approximately 3.6 miles of pipeline and the addition of 4 troughs into South Pasture from Tillman Well (as described in the proposed actions for Wallace Allotment).
7. Extension of about 0.9 mile of pipeline and the addition of 2 troughs into East Pasture from Tillman Well (as described in the proposed actions for Wallace Allotment).

Alternative 4: This was developed in response to concerns about costs of proposed range developments. The alternative would be the same as Alternative 3 except there would be no construction of a pipeline into South, North or East Pastures.

[Near Term] The allotment would be rested from livestock grazing to restore plant vigor. The length of time that the allotment would be rested is contingent upon monitoring results. Livestock would be allowed to return to the allotment when blue grama leaf-length reaches four to five inches and those of western wheatgrass are five to six inches.

[Long Term] This alternative, following the rest period, would permit 157 cow/calf pairs grazing from August 16 to October 31; AUMs would total 392. Grazing would be with a three-pasture deferred grazing system. Based on estimated grazing capacity, AUMs are distributed: North Pasture, 125; South Pasture 124; and East Pasture 143.

Developments are associated with the proposal to benefit soils, watershed, and wild ungulates. The location of these treatments would be the same as with Alternative 3. The proposed action would authorize:

1. Treatments consisting of thinning and individual tree-pushes in pinyon-juniper stands on approximately 2,726 acres.
2. Maintenance of existing pinyon-juniper pushes to Forest Plan standards on some 738 acres.
3. Replacement of approximately 1.0 mile of pipeline from Tillman Draw to Government Storage Tank.
4. Construction of approximately 0.25 mile of new fence (with a smooth bottom wire) to exclude livestock access to Clear Creek at Hamilton Crossing. The fence would be constructed before livestock are permitted to graze in the South Pasture.

Alternative 5: This alternative would be the same as Alternative 4 except management would be with a three pasture, deferred, rest-rotation grazing system. The actual livestock numbers grazed would be 20% lower because one pasture would be rested each year. Because rest is provided to each pasture every third year, the allowable use level is increased 5% except on very poor range. This alternative would permit 125 cow/calf pairs grazing from August 16 to October 31; AUMs would total

312. Based on estimated grazing capacity, AUMs are distributed: North Pasture, 150; South Pasture, 148; and East Pasture, 170; these numbers may be adjusted slightly, on an annual basis, depending on which pasture is being rested.

Developments are associated with the proposal to benefit soils, watershed, and wild ungulates. The location of these treatments would be the same as with Alternative 3. The proposed action would authorize:

1. Treatments consisting of thinning and individual tree-pushes in pinyon-juniper stands on approximately 2,726 acres.
2. Maintenance of existing pinyon-juniper pushes to Forest Plan standards on some 738 acres.
3. Replacement of approximately 1 mile of pipeline from Tillman Draw to Government Storage Tank.
4. Construction of approximately 0.25 mile of new fence (with a smooth bottom wire) to exclude livestock access to Clear Creek at Hamilton Crossing. The fence would be constructed before livestock are permitted to graze in the South Pasture.

B. AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

This section describes the prevailing conditions (affected environment) within the project area and the changes that can be expected from implementing the Action alternatives or taking no action at this time. The No Action alternative sets the environmental baseline for comparing effects of each Action alternative. The following table summarizes the outputs and effects for the identified Key Issues.

ISSUE	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
1- Economics					
\$/AUM/year cost to permittee.	\$0	\$6.06	\$21.89	\$23.50	\$29.37
Cost of developments to all parties.	\$0	\$0	\$221,838	\$201,500	\$201,500
2- Wildlife					
Consistency of forage use is within allowable forage utilization standards.	Yes	No	Yes	Yes	Yes
3- Watershed/Riparian Health					
Estimated recovery time, in decades, for riparian areas.	1	Not expected	1-2	1-2	1-2

I. ECONOMIC & SOCIAL FACTORS - Issue 1

Affected Environment - Economic Considerations

In the earlier part of this century, the economic base for most communities close to the Forest was timber harvesting and forest products processing. Ranching and recreation uses supplemented the area's economy. This pattern is changing. In recent years, there has been a decrease in timber harvesting and ranching coupled with an increase in recreation uses. The Clear Creek Allotment is located in the southeastern corner of Coconino County, the largest county in the state. The majority of the county's population, however, centers around Flagstaff and is very removed from the project area. Economic benefits would also flow to Navajo County, which contains the nearest full-service communities and where operations are headquartered.

It is important to recognize that, although the following projections appear very precise numerically, they should be viewed merely as indicators. First, there are a variety of assumptions underlying the derivation of these indices. Second, these indices apply to a "typical" regional situation, rather than the specific local case. The use of such indicators enables a direct comparison with other, recent and

near-future EAs since they will all rely on the same assumptions. The projections then, while realistic, serve better as indicators of *relative* change rather than as measures of *actual* change.

Analysis of the Alternatives

The primary economic effects issue in this analysis pertains to the estimated costs for new range developments. The first measure is the annual cost to the permittee per AUM, as shown above. The second is the total cost to all contributing parties of the proposed developments, as summarized above and detailed in the following table.

The following efficiency analysis anticipates the rate of return for the projected expenditures by the permittee, third parties, and Forest Service. Measures used to conduct an investment analysis include: the present value of benefits, the present value of costs, the present net value, and the benefit / cost ratio (see Glossary under "Quick-Silver" for definitions).

	Permittee				
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Present Value of Benefits	\$0	\$34,118	\$15,498	\$13,683	\$10,890
Present Value of Costs	\$0	\$32,721	\$97,175	\$92,136	\$91,633
Present Net Value	\$0	\$1,397	-\$81,677	-\$78,453	-\$80,742
Benefit / Cost Ratio	0.00	1.04	0.16	0.15	0.12
	Forest Service				
Present Value of Benefits	\$0	\$6,149	\$24,581	\$5,600	\$5,097
Present Value of Costs	\$23,619	\$3,037	\$111,387	\$77,756	\$74,709
Present Net Value	-\$23,619	\$3,113	-\$86,806	-\$72,146	-\$69,612
Benefit / Cost Ratio	0.00	2.03	0.22	0.07	0.07
	Third Party				
Present Value of Benefits	\$0	\$0	\$0.00	\$0.00	\$0.00
Present Value of Costs	\$2,952	\$0	\$53,315	\$53,315	\$53,315
Present Net Value	-\$2,952	\$0	-\$53,315	-\$53,315	-\$53,315
Benefit / Cost Ratio	0.00	0.00	0.00	0.00	0.00
	All Parties				
Present Value of Benefits	\$0	\$40,267	\$40,079	\$19,283	\$15,987
Present Value of Costs	\$26,571	\$35,757	\$261,877	\$223,197	\$219,657
Present Net Value	-\$26,571	\$4,510	-\$221,798	-\$203,914	-\$203,669
Benefit / Cost Ratio	0.00	1.13	0.15	0.09	0.07

The investment analysis displays a variety of costs and benefits associated with the alternatives. All estimated costs associated with range improvement and maintenance activities are displayed. Quantified values were not established for all benefits, however. An example of this would be the pinyon-juniper treatments for Alternatives 3-5: there is a qualitative "value" added for resource areas such as watershed improvement, range condition, and wildlife. Similarly, Alternative 1 would also have associated resource benefits. No attempt was made to quantify these benefit values in dollar terms as there are no local studies to provide comparable, baseline information. There are, nevertheless, obvious intuitive values associated with these actions. Additionally, values may change over time: for the no grazing alternative there will be a short-term improvement in range condition but long term there will be a decline as pinyon-juniper becomes thicker and grasses are lost.

As a secondary issue, a brief analysis of employment and Forest Service receipts to the county will be displayed. This would allow for additional cumulative effects analysis to be done for current and future AMP analyses on the Forest.

The level of employment directly and indirectly supported by a livestock operation is assumed to be 1.14 jobs per 100 animal-years or 0.00095 job/AUM. This index was developed for the 1995 permit issuance project by the Forest Service's Regional Office.

Payments to counties are 25% of Forest Service receipts, which include grazing fees paid by the permittee. The grazing fees in 1998 were \$1.35 per AUM, 25% of which equals \$0.3375/AUM. Estimates of effects are:

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
No. of Jobs	0	0.51	0.42	0.37	0.30
Payments to Coconino County	\$0	\$182	\$150	\$132	\$105

Alternative 1, no grazing, does not have any associated development costs; maintenance costs are shared by the Forest and AGFD. Alternative 2 would retain the current infrastructure and would require maintenance of existing improvements. Alternative 3 has an additional cost of \$4,900 to the permittee above Alternatives 4 and 5 to place water in the southwestern portion of South Pasture; this would allow an additional 52 AUMs at an amortized cost of \$9.42/AUM. Alternatives 3 and 4 propose a deferred grazing system. Alternative 5 has a rest grazing system with the same range development costs as Alternative 4 but with fewer AUMs because one pasture would be rested each year.

Affected Environment - Social Considerations

Livestock producers stress the importance of the quality of life ranching provides them and their families. Owning livestock is important as a way of reaffirming ties to their ancestral lands and heritage. Preserving this working relationship with the land so it can be passed on to their children along with a feeling of self-sufficiency is a cornerstone of their values. Generally speaking, the more rural and remote the community, the more important the ranching option becomes (Eastman and Gray 1987). Cultural patterns are also an important facet of the human environment. "Cultural" generally refers to ways of thought and life, to the social identities people develop in their communities. Most people will work hard to preserve their culture and pass it along to their children. The ranching culture is closely identified with the American West in general and Arizona in particular. Personal traits associated with ranching include self-sufficiency, independence, and a predilection for hard work.

A 1997 survey of Forest grazing permittees found that if they were no longer able to ranch, 2 of 36 respondents would move elsewhere to non-ranch employment and 7 of 36 would move elsewhere to ranch -- in other words, about 25% of respondents would leave the area but the great majority would not leave ranching (Cosgrove 1998a). Most permittees would try to adjust their operations to absorb the loss of income rather than sell their ranches since maintaining the ranching life-style is very important to them.

The Clear Creek Allotment is located in Coconino County which, in 1992, had approximately 200 cow/calf operations. The majority of these ranches were small to medium in size with 44 operations having greater than 100 head. Medium operations can be self-sufficient provided there is a fairly stable market and investment schedule. Weather changes can easily effect the profit capability on these ranches. The current permittee is at least a medium operation and appears to be larger as it is only partially dependent upon Forest lands. Smaller operations have a greater need to supplement their income from outside sources in order to support their operation.

Analysis of the Alternatives

Alternative 1: This alternative would have the most severe effects on the permittee. The discontinuation of grazing would result in a loss of income from use of Forest lands. Based on averages from throughout eastern Arizona over the past five years this would equate to a projected loss of \$12,000 of income per year. The effect of this loss on the permittee and family would depend on the financial condition of the operation, and the dependency of their operation on this particular allotment. This alternative would increase pressure on either private land or other leases to compensate for some of the loss.

Alternative 2: This alternative would allow for operations to continue at the present level. If all other factors were held constant, there would be no change to the social or economic impacts. Currently the permittee generates an estimated \$12,000/year from operations on Forest lands when full use is taken. Actual use has averaged 83% in the period 1988 - '97, with one season of nonuse and another of less than 50%. Range and drought conditions have tended to be the limiting factors affecting the actual number of livestock permitted on a year by year basis.

Alternative 3: Compared with Alternative 2, this proposal would have an 18% reduction in AUMs. With this reduction there would result a similar decrease in revenues. Even if other summer pastures could be found, it would require additional effort and expense to graze the herds on other lands. The ability of the permittee to withstand this change is dependent on his personal situation. In the long term, provided water improvements are completed and plant vigor is restored, the permittee may be able to increase the number of livestock. The season of use would still be shorter, thus total AUMs would be less than the current situation. Projected gross income for the long term is \$10,000/year from the use of Forest lands.

There is a period of nonuse proposed to restore plant vigor. This action would cause a short term loss to these permittee until plant health is restored.

The current operations on Forest lands would classify as a medium operation. This alternative should provide the means for the permittee to continue ranching as the operation is only partially dependent on Forest lands, thus personal characteristics such as self-sufficiency, independence, hard work and other traits associated with a ranching life-style would most likely be protected. It is not likely that the permittee would sell his base property as he has additional ranches and land, but the implementation of this alternative could mean he would have to curtail some operations.

Alternative 4: Effects associated with Alternative 4 are similar to Alternative 3 except there would not be an investment in improving water. Thus there would not be an increase in number of livestock in the long term. Projected income would remain at \$9,000/year. There would also be a short term impact of no income until the allotment has been rested.

Alternative 5: The number of AUMs would decline 42% from the current permit. This is more than with Alternative 3 or 4 because a rest grazing system would be implemented. Projected income would be \$7,400/year. There would be an additional need to find alternate pastures for not only the shortened season of the permit but also the rest season. If supplemental summer pastures cannot be found it may impact the overall operations, further reducing income generated from ranching. Even if supplemental summer pastures could be found, it would require additional effort and expense to graze the herds on other lands. The ability of the permittee to withstand this change is dependent on his personal situation.

The current operations on Forest lands would classify as a medium operation. This alternative should provide the means for the permittee to continue ranching as he is only partially dependent on Forest lands, thus personal characteristics such as self-sufficiency, independence, hard work and other traits associated with a ranching life-style would most likely be protected. It is not likely that the permittee

would sell his base property as he has additional ranches and land, but the implementation of this alternative could mean he would have to curtail operations.

2. WILDLIFE - Issue 2

Affected Environment

Threatened, Endangered and Sensitive Species: Several threatened, endangered, and sensitive [TES] species have been documented as occurring within the analysis area. Others that have not been documented require habitat conditions similar to those within the area. Seven species -- the bald eagle, Mexican spotted owl, American peregrine falcon, Little Colorado River spinedace, black-footed ferret, jaguar, and southwestern willow flycatcher -- are listed by the U.S. Fish and Wildlife Service as threatened or endangered. Threatened and endangered [T&E] species have been given protection by the Secretary of Interior under the Endangered Species Act of 1973. Sensitive species status results from a finding by the Forest Service's Regional Forester. An account will be included in the Biological Assessment and Evaluation for all TES species.

There is one Mexican spotted owl [MSO] protected activity center located adjacent to the allotment, and the allotment could be used as foraging and dispersal habitat. No northern goshawk territories fall within the allotment boundary even though suitable habitat exists in portions of the South and East pastures.

The primary concern with grazing is that overutilization of forage by large ungulates reduces the abundance of prey species for the MSO and goshawk. Prey species for these birds include small mammals and small to medium-sized songbirds. In areas where grazing is too heavy, insect abundance drops and seedheads are not allowed to develop. Hiding cover for prey species is also of concern. Much of the herbaceous vegetation in the allotment does not provide adequate cover for smaller species, and this may be limiting the abundance of some prey species, either by limiting forage or cover. Heavy browsing on oak and conifers by cattle and elk is also reducing the amount of cover to some prey species. Browsing on oak is retarding the recruitment of additional MSO nesting and roosting habitat.

The Clear Creek drainage (Management Emphasis Area 4-03) parallels the allotment to the west. Although no livestock grazing is allowed in Clear Creek, the effects of grazing near the canyon are likely to influence water quality and possibly the type and abundance of riparian vegetation growing there. AGFD surveyed Clear Creek for the Little Colorado River spinedace (LCS) in 1983, 1990 and 1991. LCS had been detected in past surveys at Hamilton Crossing but were not captured at the site during the most recent survey. A survey for LCS and other native fish species in Willow Creek was last conducted in 1997; no LCS were captured.

Species that may occupy habitat that is found exclusively within these canyons include the belted kingfisher, Little Colorado River spinedace, roundtail chub, speckled dace, and bluehead sucker. Surveys for all of these species have been conducted within the past two years but only the belted kingfisher, speckled dace and bluehead sucker have been detected.

Management Indicator Species: There are two Forest Plan Management Areas within the allotment, and each has wildlife species that have been designated as indicators of management area health. A third Management Area borders the allotment on the south and west in Willow and Leonard Canyons.

Indicator species for the ponderosa pine, mixed conifer, and aspen forest (Management Area 4-01) include the red-naped sapsucker, mule deer, turkey, goshawk, pygmy nuthatch, elk, Abert's squirrel, red squirrel, hairy woodpecker, and Mexican spotted owl. Of the ten indicator species listed, mule deer, elk, and Abert's squirrels are known to be present within the allotment. Pygmy nuthatches and hairy woodpeckers are believed to exist in the area, but surveys for these species have not been conducted. Both of these birds are cavity nesters, using either conifer or deciduous tree cavities. Grazing would not impact current availability of snags within the allotment.

Health of the pinyon-juniper woodland (Management Area 4-02) is gauged by plain titmouse, mule deer, elk, and antelope populations. All of these species are present within the allotment where pinyon-juniper woodlands occur. Elk are substantially more abundant in this and other management areas of the allotment than they were in the early 1970s. Mule deer populations have declined over the same period of time. Antelope use of the allotment is limited and occurs only in the northern extents; limited water, lack of herbaceous cover for fawns, high tree densities, and predation on fawns restrict population growth.

Lincoln sparrows, yellow-breasted chats, Lucy's warblers, and aquatic macroinvertebrates are indicators of riparian health (Management Area 4-03). There are no riparian areas within the allotment although Leonard Canyon, Clear Creek and Willow Canyon are adjacent. No formal songbird surveys have been conducted in these canyons, with the exception of Southwestern willow flycatcher [SWWF] surveys. None of the management indicator bird species were detected during the SWWF surveys. Macroinvertebrates have been surveyed by AGFD but results have not been released.

It is important to note that several indicator species are also game species whose populations are managed by AGFD. The populations of elk, mule deer, antelope, turkey, and to a lesser extent, Abert's and red squirrels, are affected by hunting pressure in addition to habitat conditions.

Analysis of the Alternatives

Alternative 1: Removing livestock from the allotment would improve conditions the fastest for TES species. Wild ungulates would be allowed to graze 10% of the forage produced which would provide 90% of the total herbaceous production to other wildlife species and resource needs. The primary benefit of this alternative would be that recovery of range and watershed conditions would be quicker than in any of the other alternatives. Improved range and watershed conditions equate to better habitat for wildlife. Increases in hiding cover and available forage are expected to result in higher densities and a wider distribution of insects, small mammals, and other wildlife species that depend on grasses and annuals for food and cover. Increases in these prey groups would be likely to benefit several TES species that use the allotment. Mexican spotted owls, northern goshawks, flammulated owls, and occult little brown bats are examples of TES species that would benefit from increases in these prey groups. Browse species, which in some cases provide important nesting habitat for wildlife, would achieve the highest vigor under this alternative.

More abundant food enhances the physiological condition of animals, which often results in higher birth or clutch rates and better survival of young. The survival rate of northern goshawk young, for example has been shown to be significantly higher when prey is abundant and the time parent birds must be away from the nest to search for food is minimal (Dewey and Kennedy 1997). Voles, important in the diet of Mexican spotted owls, are known to be more abundant in meadows where grasses provide quality forage and cover (Ward and Block 1995). Recruitment of individuals into TES species populations would likely be higher with this alternative than any of the others because it would provide the best prey conditions. This could allow delisting objectives for some T&E species to be met sooner and prevent listing of some sensitive species that are under consideration.

Several wildlife species on the allotment may currently occur in reduced numbers because low level cover in meadows and created openings is less than adequate. Alternative 1 would increase the amount of cover more than any of the other alternatives. Reptiles, insects, small mammals, and birds that rely on herbaceous ground cover would become more abundant as cover improves. This, in turn, could increase the populations of wildlife species that prey on these smaller species as well.

Implementing this alternative would preclude the development of some waters and the reduction in pinyon-juniper densities that are planned for in Alternative 3. The lack of water in southern portions of both the South and East Pastures has limited the distribution of some wildlife species; distributions of these species would continue to be limited under this alternative. If pinyon-juniper densities are not reduced, habitat for some sensitive species would continue to be limited on the allotment. Swainson's hawks, ferruginous hawks, and prairie falcons are examples of species that require open savannah and grassland conditions and would continue to have only a small amount of suitable habitat available to them if this alternative is implemented.

It is anticipated that forage use by wild ungulates would not exceed the 10% forage utilization standard allowed them. If use by wild ungulates exceeds 10%, benefits to other wildlife species would decrease accordingly. As long as forage use by wild ungulates does not approach that prescribed by the other alternatives, this alternative would provide the greatest benefit to wildlife as a whole.

Alternative 2: This alternative would retain the existing grazing system which has contributed to the poor conditions present today. Alternative 2 has the highest number of livestock AUMs of any of the alternatives. High utilization of grasses, forbs, and browse by livestock and wild ungulates would continue to restrict some wildlife populations. The 7/15 livestock entry date for this alternative would result in lower grass height and seedhead development in whichever pasture is grazed first in years of normal or late summer monsoon rains. Insect, small mammal, and bird populations that forage on grasses and forbs, and the seedheads they produce, would remain suppressed. Wildlife that preys on herbivorous and granivorous species, including Mexican spotted owls, northern goshawks, flammulated owls, and several species of bats, would not experience the benefits of increased prey that other alternatives would provide. High use on browse would also continue under this alternative.

Cover would not improve for those species that live in the herbaceous strata. TES reptiles, small mammals, and birds that require tall, dense grasses for cover would continue to be limited in abundance. Vulnerability for these populations would remain high because of inadequate cover. Mexican spotted owls, flammulated owls, bats, and other wildlife that forage on populations that prosper in high quality cover would remain limited in part because of less than optimal prey availability. Retention of existing range and watershed conditions could slow the recovery of some T&E species and may increase the likelihood that some sensitive species would be listed as threatened or endangered.

Ungulate trampling of wildlife habitat would be higher in Alternative 2 than any of the other alternatives because of the earlier livestock entry date and longer length of time on the allotment. Paine *et al.* (1996) found that livestock damaged an average of 75% of grassland bird nests, with eggs and young being either crushed by an animal's muzzle, trampled by a hoof, or kicked out of the nest. Most nesting that could be affected by grazing would be completed by the time livestock enter the allotment but some nest destruction could still occur. Since there are no streams or riparian areas in the allotment, trampling of streambank habitat would not be a concern.

This alternative would provide for no new water developments or pinyon-juniper treatments. The lack of water in southern areas of the allotment has limited the distribution of some wildlife species;

distributions of these species would continue to be limited under this alternative. If pinyon-juniper densities are not reduced, habitat for some sensitive species would continue to be limited on the allotment. Swainson's hawks, ferruginous hawks, and prairie falcons are examples of species that require open savannah and grassland conditions and that would continue to have only a small amount of suitable habitat available to them if this alternative is implemented.

Compared to the other alternatives, this alternative would provide the least amount of benefit to wildlife.

Alternative 3: Alternative 3 is the District's proposed action. It would rest the allotment from livestock grazing until certain vegetation vigor standards are met. After livestock grazing resumed, Alternative 3 would reduce the season of use by one month from the current situation and the number of AUMs by approximately 18%. Combined livestock/wild ungulate forage utilization would be expected to average 25% in key areas across the allotment. Seventy five percent of the total herbaceous production would not be grazed and would be available for non-game wildlife and other resource needs.

Alternative 3 would improve wildlife forage and cover conditions faster than Alternative 2 but not as fast as Alternatives 1 and 5. Forage utilization levels would be higher by 15% than in Alternative 1, which would result in less of the total herbaceous production available to provide forage and cover for non-grazing wildlife species. Alternative 3 would provide more forage and cover to non-grazing wildlife species than Alternative 2 simply because use levels would be lower under Alternative 3. A livestock entry date of 8/15 compared to 7/15 in Alternative 2 would allow warm season grasses to achieve greater height and more seedhead development. This would enhance the beneficial effects of fewer AUMs and reduced forage utilization in providing non-grazing wildlife more forage and cover than in Alternative 2. Forage and cover in key areas would be about equal among Alternatives 3 and 4 as long as forage use does not exceed an average of 25% in key areas in grazed pastures. At a forage utilization level of 25% in key areas, Alternative 3 can be expected to improve habitat conditions for insects, small mammals, and other wildlife species that depend on quality herbaceous forage and cover. Threatened, endangered, and sensitive wildlife species preying on species that use the herbaceous layer would also be expected to benefit from this alternative. Alternative 3 is not expected to improve forage and cover conditions as fast as Alternative 5 because each pasture would be grazed every year in Alternative 3, while Alternative 5 would provide rest to one pasture each year.

Trampling would be more of a concern under this alternative than Alternative 1 due to the presence of livestock. Trampling would be less under this alternative when compared to current conditions (Alternative 2) because of the reduction in livestock AUMs. A comparison of livestock AUMs indicates that the effects of livestock trampling to wildlife in grazed pastures under this alternative would be slightly higher than Alternative 4 and significantly higher than Alternative 5.

Range developments proposed in this alternative would improve water availability and distribution to wildlife species in the southern portion of the allotment. This could be a benefit to some species and adversely affect others. Elk, deer, and antelope would benefit from the water developments, as would some non-game species that have territories near the drinkers. Other non-game species may not benefit because of higher amounts of trampling in an area where this effect is now caused only by wild ungulates. Pinyon-juniper density reduction treatments proposed in this alternative would begin steps toward providing a better balance of VSS classes, which would improve conditions for most wildlife species that use the allotment. Fencing above Hamilton crossing would prevent livestock from accessing important native fish habitat.

Alternative 3 would be more beneficial to wildlife than Alternative 2, about equal to Alternative 4, and less beneficial than Alternatives 1 and 5.

Alternative 4: Alternative 4 would have many of the same effects as Alternative 3. The main difference between these two alternatives would be that no water would be developed in portions of the East, North and South Pastures. The lack of water would continue current conditions in these pastures, which would restrict distribution for livestock, elk, deer, and antelope but also limit trampling damage to ground nesting birds and small mammals. Restrictions in the distribution of ungulates would provide more forage and cover for insects, birds, and small mammals using the herbaceous stratum than if the areas without water were grazed. It is anticipated that forage use by wild ungulates in areas lacking water would not exceed the 10% forage utilization standard allowed them. If use by wild ungulates exceeds 10%, benefits to other wildlife species would decrease accordingly.

Alternative 4 would be approximately equal to Alternative 3 in its effects to wildlife. Alternative 4 would be more beneficial to wildlife than Alternative 2 but less beneficial than Alternatives 1 and 5.

Alternative 5: Alternative 5 would also rest the allotment from livestock grazing until certain vegetation vigor standards are met. Alternative 5 is similar to Alternative 4 in that it would not provide new water to portions of the South, North and East Pastures. It differs from Alternative 4 by implementing a deferred rest grazing system which would provide rest to one pasture each year after livestock grazing resumes on the allotment.

This alternative would retain more of the total herbaceous growth on the allotment than any of the other alternatives except Alternative 1 because forage would not be removed by livestock from one pasture each year. Forage use in the pastures that are grazed each year would be slightly higher to Alternatives 3 and 4, averaging 30%. The rest to one pasture each year that this alternative stipulates would provide more long term benefit to non-grazing wildlife by allowing grasses and forbs to achieve their maximum height and seedhead production in the rested pasture. Ultimately, this would increase the density and number of grasses across the allotment. Forage and cover conditions for small mammals, ground-nesting birds, and other small wildlife species would improve faster over the entire allotment with this alternative than with Alternatives 2, 3, and 4. Increases in hiding cover and available forage are expected to result in higher densities and a wider distribution of insects, small mammals, and other wildlife species that depend on grasses and annuals for food and cover. Increases in these prey groups would be likely to benefit several TES species that use the allotment. Mexican spotted owls, northern goshawks, flammulated owls, and occult little brown bats are examples of TES species that would benefit from increases in these prey groups. Browse species, which in some cases provide important nesting habitat for wildlife, would improve more in vigor under this alternative than Alternatives 2, 3, and 4.

Trampling of vegetation and wildlife nests would be less prevalent under this alternative than Alternatives 2, 3, and 4 due to the lower number of livestock AUMs. Trampling would be more of a concern under this alternative than Alternative 1 due to the presence of livestock. Ground-nesting wildlife in the rested pasture would only be subjected to wild ungulate trampling.

The lack of water would continue current conditions in the South and East Pastures, which would restrict distribution for livestock, elk, deer, and antelope but also limit trampling damage to ground nesting birds and small mammals. Restrictions in the distribution of ungulates would provide more forage and cover for insects, birds, and small mammals using the herbaceous stratum than if the areas without water were grazed. It is anticipated that forage use by wild ungulates in areas lacking water would not exceed the 10% forage utilization standard allowed them. If use by wild ungulates exceeds 10%, benefits to other wildlife species would decrease accordingly. Pinyon-juniper density reduction treatments proposed in this alternative would begin steps toward providing a better balance of VSS classes, which would improve conditions for most wildlife species that use the allotment.

Alternative 5 would benefit wildlife more than Alternatives 2, 3, and 4 but less than Alternative 1.

3. WATERSHED, SOILS and RIPARIAN CONDITION - Issue 3

Affected Environment

Watershed condition was determined for the Forest Plan in 1987. At that time the Chevelon Creek watershed was estimated to be in satisfactory condition, but Clear Creek watershed was deemed unsatisfactory. Woodland areas with moderate to heavy canopy covers within these watersheds are generally found to have unsatisfactory or impaired soil conditions due to poor distribution and relatively low amounts of organic material in the soil and to altered surface structure from the effects of raindrop impact. Additionally, lack of vegetative basal area and litter have resulted in reduced resistance to overland flow. These conditions result in accelerated soil movement, and are exacerbated when coupled with the effects of increasing woodland overstory canopy-cover and the overutilization of remaining forage by wild and domestic ungulates. Watershed condition by class by 5th code watershed is shown below (areas are in acres). Cryptogamic crusts are prevalent on the allotment in areas of moderate to heavy canopy cover and where soil conditions have been degraded and soil surfaces are relatively undisturbed by animals or equipment.

Watershed	Total Area	Satisfactory	Satisfactory Untreatable	Unsatisfactory
Clear Creek	17,389	434	857	16,098

Best Management Practices for grazing (see Appendix C), when fully implemented, are effective in protecting water quality. Monitoring of implementation and effectiveness of BMPs will be accomplished. In addition to monitoring range condition, monitoring of effective ground cover will be used to determine whether watershed condition is improving in key areas within the allotment.

Analysis of the Alternatives

Alternative 1: Watershed condition would improve in open grassland due to reduced effects from grazing ungulates, so long as wild ungulate populations do not increase. Areas under dense pinyon/juniper canopy would not improve since this requires removal of competing overstory.

Alternative 2: Watershed condition on each allotment would not improve as livestock numbers would not be balanced with capacity. Areas under dense pinyon/juniper canopy would not improve due to the effects of competing overstory and overuse of remaining forage by wild ungulates and livestock.

Alternatives 3 and 4: Watershed condition would improve on Clear Creek Allotment due to the effects of resting the allotment until plant vigor is restored and balancing livestock numbers with capacity. Plant density and vigor in the open grasslands would increase, resulting in improved ground cover conditions, infiltration rates and resistance to overland flow. Proposed range treatments to reduce pinyon/juniper overstory would reduce competition for light and nutrients, allowing grass and litter cover to increase.

Alternative 5: Watershed condition would improve in similar fashion to that described for Alternative 3 and 4, except that no overstory treatments are scheduled. No improvement of watershed condition would occur in areas of heavy pinyon-juniper overstory.

Riparian

Proper Functioning Condition Inventory for the Chevelon Ranger District was completed in 1998. In addition, numerous washes were visited during production verification; no existing or potential riparian areas were found within the area used for livestock grazing. These washes provide much of the forage produced on the allotment, but are potentially susceptible to gully erosion if effective ground cover is removed. Some of these areas will be designated as key areas and will be monitored for forage utilization.

Clear Creek and Lower Willow Creek, both properly functioning riparian areas, are found along the south and west boundaries of the allotment. There is no cattle access to either creek from the grazing operations of the Clear Creek Allotment, although there is no restriction to wild ungulate use.

4. RANGE and VEGETATION

Affected Environment - Range

The herbaceous plants include blue grama, threeawn, sand dropseed, squirreltail and western wheatgrass. Other species include cliffrose, algerita, pinyon pine, juniper spp and snakeweed; the cliffrose is heavily hedged.

The forage production on the allotment averages approximately 150 lbs per acre. Forage production is typically higher in the open areas as compared to areas having dense trees and a high canopy. Range condition is a measure of vigor, composition and density of vegetation. Range conditions range from very poor to poor on the allotment, with the majority of the acres in poor condition. Densities of pinyon-juniper trees on the allotment are limiting the production of forage species and range conditions.

Range condition classifications were verified by ocular estimate during field reviews to confirm herbaceous forage production estimates. Range condition within each allotment is displayed by acreage, pasture, and grazing capability class for each analysis area.

Range Condition	Full Capacity Range	Potential Capacity Range	No Capacity Range	Unavailable Range
Very Poor	0	4,223	971	0
Poor	12,140	0	0	0
Fair	0	0	0	0
Good	0	0	0	0
Total:	12,140	4,223	971	0

Analysis of Alternatives

Alternative 1: This alternative would have no livestock on the allotment. Wild ungulates would have 100% of the available forage for their use. The desired allowable utilization on the allotment

would be 10% use in key areas on key species, by wildlife. The AGFD would monitor wildlife in the key areas on the herd unit as a whole. The cool-season grasses would still be used before the range is ready by wildlife. This alternative would not balance permitted livestock use with allotment capacity, because there would be no livestock.

If the utilization is kept at the 10% use level, during the spring and the fall, on key species, the range condition, plant vigor, composition, density of desirable plants and forage production should initially improve. In most areas, the long term range conditions and forage production would not continue to improve and could decline, due to the lack of opening maintenance and pinyon-juniper treatments .

Alternative 2: This alternative would continue with the current permitted livestock grazing situation (150 head for 540 AUMs) and also the same wildlife numbers. The current forage distribution provides 47% amount to livestock and 53% to wildlife, based on current forage needs. This alternative would not balance permitted livestock use with allotment capacity. This alternative would result in an expected utilization levels from livestock, ranging from 40 to 45% utilization. The entry date for cattle would be July 16 and the grazing system would be a 3 pasture rest rotation. Cattle would enter the allotment in some years before the summer rains have come or just after warm season growth has initiated.

Key Areas on the district, as currently monitored by the AGFD, would be heavily utilized (50 to 90%). These wildlife utilization levels would be expected in the early spring, before the range is ready, and also in the fall. Currently there are no key areas located on this allotment. Utilization levels on this allotment would not be expected to be as high as 50 to 90%, due to the different vegetation types and wildlife densities. It would be expected that the allotment would receive heavy browsing of desirable browse plants during the late fall, winter and early spring, due to the heavy amounts of snowfall in the high elevation areas of the district, which would force the wild ungulates to move to this allotment.

With the expected levels of grazing intensities, the forage production, range conditions, vigor, density and composition of desirable plants would not improve and could possibly decline.

Alternative 3: This alternative would permit 157 head for 392 AUMs initially, until water is furnished to portions of all three pastures, then the permitted livestock would be 178 head for 444 AUMs. The forage distribution for this allotment would be 60% of the available forage for livestock and 40% for wildlife, which would meet the desired conditions. The total utilization is expected to be between 20 and 30% averaging 25%. Pasture rotations and capacity were developed so that livestock would be moved when the utilization in the key areas was 25%. This alternative would balance permitted livestock use with allotment capacity.

The allotment would be rested until the average leaf lengths of blue grama are 4 to 5 inches and those of western wheatgrass are 5 to 6 inches. The estimated time frame would be 4 years, but this time period could vary up to 10 years. This growth would help allow these plants to restore their vigor and regain their production potential. Once the leaf length requirement has been met, the entry date for livestock would be August 16. Typically by this time period, the plant have enough growth and the soils are not saturated, that the range readiness for the allotment has been met. A three pasture deferred grazing system would be used for a 2 1/2 month time period (August 16 to October 31). Initially the days of grazing for each pasture would be 24 for both the North and the South pastures and 27 days for the East Pasture. After the water developments were installed, the days of grazing for each pasture would be 21 for the North, 30 days for the South and 24 days for the East. With these time periods and utilization levels most plants would complete their growing cycle, become more vigorous and conditions would improve. The addition of the pipeline into the 3 pastures would allow for more of the allotment being available for use and should improve both domestic and wild ungulate distribution. There would be approximately 0.25 miles of fence constructed, which would provide a

barrier to keep cattle out of Leonard Canyon. There would be little to no effects of this installation on the vegetation, since cattle rarely use this area, and would not be likely to go into Clear Creek.

The allotment would receive approximately 2726 acres of pinyon-juniper treatments, moving VSS distribution toward desired condition. These treatments should increase the range conditions by allowing more favorable plant species to grow. The vigor of the existing forage plants should also increase, due to lower competition. The slash remaining from these treatments would provide a microclimate for plants, provide protection to the plants from grazing ungulates, and protect soils. This would allow desirable grass species to become established. The forage production and range conditions over time in these treatment areas should improve, based on an expected increase in vigor, composition and density of plants.

There would be 738 acres of opening maintenance, improving or maintaining forage production and range conditions.

The allowable use by wildlife would be 10%, on the allotment. This would be measured through AGFD monitoring of key areas on the herd unit as a whole. There would not be any key areas on this allotment, so it could be difficult to assess actual utilization here. There would be wildlife grazing before the expected readiness date is met, but if wildlife utilization is held to 10%, the improvements listed above should still occur.

Alternative 4: This alternative would permit 157 head for 392 AUMs. The forage distribution would be 60% of the available forage for livestock and 40% of the available forage for wildlife. The total utilization is expected to be between 20 and 30%, averaging 25%. Pasture rotations and capacities were developed so that livestock would be moved when the utilization in key areas is 25%. It would be expected that this alternative would balance permitted livestock use with allotment capacity.

The allotment would be rested until the average leaf lengths of blue grama are 4 to 5 inches and those of western wheatgrass are 5 to 6 inches. The estimated time frame would be 4 years, but this time period could vary up to 10 years. This growth would help allow these plants to restore their vigor and regain their production potential. Once the leaf length requirement has been met, the entry date for livestock would be August 16. Typically by this time period, plants should have enough growth and the soils are not saturated, that the range readiness for the allotment would be met. A three pasture deferred grazing system would be used for a 2 1/2 month time period. The days of grazing for each pasture would be approximately 24 for both the North and the South Pastures and 27 days for the East Pasture. There would be approximately 0.25 miles of fence constructed, which would provide a barrier to keep cattle out of Leonard Canyon. There would be little to no effects of this installation on the vegetation, since cattle rarely use this area, and would not be likely to go into Clear Creek. With these time periods and utilization levels the range conditions, forage production, composition, vigor and density would improve.

The allotment would have approximately 2,726 acres of pinyon-juniper treatments. These treatments would move VSS conditions toward desired condition. These treatments should increase the range conditions by allowing more favorable plant species to grow. The vigor of the existing forage plants should also increase, due to lower competition. The slash remaining from these treatments would provide a microclimate for plants, provide protection to the plants from grazing ungulates and provide soil protection. This would allow desirable species grass species to become established. The forage production and range conditions over time in these treatment areas should improve, based on an expected increase in vigor, composition and density of plants.

There would be 738 acres of opening maintenance. This maintenance would increase or maintain forage production and range conditions, by not allowing Pinyon and Juniper trees to invade, which would reduce the vigor and density of forage plants.

The allowable use by wildlife would be 10%, on the allotment. This should be measured through the AGFD monitoring of key areas on the herd unit as a whole. There would not be any key areas on this allotment, so it could be difficult to assess actual utilization on this allotment. There would be wildlife grazing on the allotment, before the expected readiness date is met, but if wildlife utilization is held to 10% on the allotment, the improvements listed above should still occur.

Alternative 5: This alternative would permit 125 head for 312 AUMs. This alternative would allow for the 60% livestock distribution of allowable forage and 40% for wildlife. The expected utilization levels would be 25 to 35%, averaging 30%. Pasture rotations and capacities were developed so that livestock would be moved when the utilization in key areas is 30%. It would be expected that this alternative would balance permitted livestock use with allotment capacity.

The allotment would be rested until the average leaf lengths of blue grama are 4 to 5 inches and those of western wheatgrass are 5 to 6 inches. The estimated time frame would be 4 years, but this time period could vary from 0 to 10 years. This growth would help allow these plants to restore their vigor and regain their production potential. Once the leaf length requirement has been met, the entry date for livestock would be August 16. Typically by this time period, plants should have enough growth and the soils are not saturated, that the range readiness for the allotment have been met. The grazing system would be a 3 pasture rest rotation, with one pasture being rested each year. The time in each pasture would be approximately 36 days for the North and South Pasture and 41 days for the East Pasture. There would be approximately 0.25 miles of fence constructed, which would provide a barrier to keep cattle out of Leonard Canyon. There would be little to no effects of this installation on the vegetation, since cattle rarely use this area, and would not be likely to go into Clear Creek.

The allotment would have approximately 2726 acres of pinyon-juniper treatments. These treatments would move VSS conditions toward desired condition. These treatments should increase the range conditions by allowing more favorable plant species to grow. The vigor of the existing forage plants should also increase, due to lower competition. The slash remaining from these treatments would provide a microclimate for plants, provide protection to the plants from grazing ungulates and provide soil protection. This would allow desirable species grass species to become established. The forage production and range conditions over time in these treatment areas should improve, based on an expected increase in vigor, composition and density of plants.

There would be 738 acres of opening maintenance. This maintenance would increase or maintain forage production and range conditions, by not allowing Pinyon and Juniper trees to invade, which would reduce the vigor and density of forage plants.

The allowable use by wildlife would be 10%, on the allotment. This should be measured through AGFD monitoring of key areas on the herd unit as a whole. There would not be any key areas on this allotment, so it could be difficult to assess actual utilization on this allotment. There would be wildlife grazing on the allotment, before the expected readiness date is met, but if wildlife utilization is held to 10% on the allotment, the improvements in range conditions and forage production, listed above should still occur.

Restoring vigor before grazing, using a rest rotation grazing system, the allowable use standards, the pinyon-juniper treatments and the opening maintenance proposed with this alternative should improve the range conditions and forage production, on more total acres than the other alternatives.

Affected Environment - Vegetation

The desired conditions for Vegetative Structural Stages distribution for the pinyon-juniper woodland is 20% in each VSS class; the Forest Plan directs that 20% is to be managed for old growth. It should be noted that this distribution is a Forestwide objective, and there is no intent to meet this on any given parcel, such as an individual allotment or even a single District. There is no attempt to address VSS distributions in ponderosa pine stands since no treatments are proposed (this analysis would be done in future ecosystem studies). Watershed and forage production is not expected to improve in the untreated areas where canopy covers exceed 40%.

Analysis of Alternatives

Identical treatments for Clear Creek Allotment are proposed in both Alternative 3, 4 and 5 where treatments would occur in less than 20% of the existing stands. Most treatments are in stands classified as VSS 5, moving them into other VSS classifications. About 52% of the stands would be retained as a VSS 5. The following table displays the current distribution and the proposed treatments by VSS classification following treatment in the allotment area.

VSS Class	CURRENT		PROPOSED	
	Acres	%	Acres	%
1	1251	7	1644	9
2A	0	0	438	2
2B	8	0	8	0
2C	0	0	0	0
3A	0	0	368	2
3B	47	<1	47	<1
3C	0	0	0	0
4A	371	2	1898	10
4B	2077	11	2077	11
4C	3022	16	2388	13
5A	2207	12	2207	12
5B	5949	32	2948	16
5C	3504	19	4413	24

6. HERITAGE RESOURCES

The effects of grazing on heritage resources, and any proposed change to a more intensive grazing management system, are of concern. By letter of March 16, 1995, the Regional Forester and the Arizona State Historic Preservation Officer clarified the process for addressing this concern. Implementation of that process will satisfy compliance with the National Historic Preservation Act and NEPA. For any of the proposed alternatives, a Forest Archeologist must be consulted if ground-disturbing range developments or treatments are proposed to ensure that the requirements of the National Historic Preservation Act are met.

Within the context of grazing projects, heritage resources may be directly affected by trampling and by construction of improvements or implementation of woodland conversion/maintenance activities. Cultural sites may be indirectly affected by natural processes, primarily sheet- or gully-erosion subsequent to loss of vegetative cover. It is noted that trampling by ungulates has been an on-going process for centuries prior to the introduction of cattle. Similarly, long term geologic cycles of aggradation and degradation have operated longer than human history. Maintenance, replacement or reconstruction of existing facilities are not considered undertakings and do not require additional

survey. Of main concern, therefore, are the proposed construction and vegetation treatment projects. Potential impacts to sites, however, are easily avoided through project redesign once proper inventories are completed.

Affected Environment

More than 26% of the Project Area has been surveyed, all with complete inventory tactics. There are 93 prehistoric sites identified; none has been formally evaluated. Known, but uninventoried, historic sites relate to early homesteading and logging.

Location of heritage sites is influenced by soil type, slope, aspect, elevation, access to water and arable land. The majority of identified sites are located on gentle slopes near water and arable land. Throughout this portion of the Districts, prehistoric sites are concentrated within the forest-woodland ecotone while historic sites appear to be more directly tied to perennial waters.

None of the known prehistoric sites are standing ruins or cliff dwellings, site types recognized as susceptible to grazing impacts. None of the sites are identified as having traditional cultural values.

Analysis of the Alternatives

Alternative 1: No livestock grazing is permitted under this alternative. Therefore, the potential for heritage resources to be directly affected by livestock trampling is eliminated. Ground cover should increase, minimizing the effects of erosion.

Alternative 2: This alternative would continue current management with forage use exceeding estimated availability. With the continuation of grazing, ground cover would be expected to decrease which would continue to cause indirect impacts to heritage resources by accelerated site deterioration from erosional processes.

Alternatives 3, 4, and 5: Under these alternatives, livestock numbers are balanced with the estimated grazing capacity. Ground cover should increase, minimizing the effects of erosion. The continuation of grazing at or below historic levels is not expected to result in negative effects to heritage resources.

7. AIR QUALITY

The Arizona Department of Environmental Quality has determined that the airsheds within the Districts are "in attainment" (satisfactory condition). None of the alternatives propose actions that would detrimentally affect air quality.

IV. LIMESTONE ALLOTMENT

The allotment is divided into five pastures and three holding traps, encompassing some 49,781 acres within portions of T12, 13, and 14N, R14 and 15E, G&SRM (Appendix H). It is used for summer grazing. Elevations in the area range from 6,500 to 7,800 feet. The topography is generally characterized by flat to moderate ridges that run north to south. Steep slopes do occur, associated with Leonard and Willow canyons. The area is generally covered with trees, the dominant overstory species being ponderosa pine, with pockets of mixed conifer, aspen, riparian, and pinyon-juniper woodland. Management emphasis areas include Forested Land, Woodland, Grassland, Riparian, and Developed Recreation Areas.

A. DESCRIPTION OF ALTERNATIVES

This section presents the alternatives developed by the Interdisciplinary Team. Alternatives considered but not analyzed/adopted are discussed in Appendix B. The alternatives propose the following:

	Ait. 1	Ait. 2	Ait. 3	Ait. 4
Permitted Number *	0	640	133	133
Animal unit months*	0	3264	398	398
Permitted Number **	0	640	156	133
Animal unit months**	0	3264	625	398
Season of use	-	5/16- 10/15	6/15 - 9/15***	6/15- 9/15
Range Developments				
Fence removal	-	-	3.0 miles	-
Fence new	-	-	19.25 miles	10.25 miles
Cattleguard	-	-	3	2
Roadside Tank	-	-	2	2

* Short Term ** Long Term *** Long Term season: 6/15-10/15

Alternative 1 - No Action: When the current term grazing permit expires, the Districts would take no action to renew or extend the permit. There would be no domestic livestock grazing on the allotment. Improvements would be maintained by the Districts and AGFD. All available herbaceous forage would be available to meet the forage requirements for the estimated wild ungulate populations. Monitoring forage utilization by wild ungulates would be done by AGFD to ensure allowable forage utilization levels are not exceeded.

Alternative 2 - Current Situation: This would continue the current grazing situation, which permits 640 cow/calf pairs grazing from May 16 to October 15; AUMs total 3264. Management would be a five pasture, deferred, rest-rotation grazing system. No direct consideration would be made for wild ungulate herbaceous forage needs. No new range developments would be built. This would likely result in a jeopardy opinion from the U.S. Fish and Wildlife Service due to expected effects to the Little Colorado River spinedace.

The record shows that yearlings rather than cow/calf pairs have grazed the allotment between 1988 and 1998. Numbers have varied from 400 to 915 head. The reported actual use has averaged 71%, including one year of nonuse and two additional of less than half of authorized.

Alternative 3 - Proposed Action: This alternative would balance capacity with the available herbaceous forage.

[Short Term] The action would authorize 133 cow/calf pairs (or yearling equivalent) grazing from June 15 to September 15; AUMs would total 398. The grazing system would be a three pasture,

deferred grazing system. The pastures to be grazed would include O'Haco (142 AUMs), Tentground (78 AUMs) and Wilkins (178 AUMs). Double Cabin and Five Mile Pastures would be rested to restore plant vigor in drainages. The length of time that these pastures would be rested is contingent upon Forest Service monitoring results. Livestock would be allowed to return when Kentucky bluegrass reaches five to six inches in length within riparian areas.

[Long Term] After plant vigor is restored, the grazing permit would authorize 156 cow/calf pairs (or yearling equivalent) grazing from June 15 to October 15; AUMs would total 625. Management would consist of a five pasture, deferred grazing system. The pastures grazed would be O'Haco (142 AUMs), Tentground (78 AUMs), Wilkins (178 AUMs), Five Mile (146 AUMs), and Double Cabin (81 AUMs).

The proposed action would result in the construction of new fences at the top of Leonard Canyon to prohibit livestock from entering. Removal of 12.0 miles of old fence, along the Forest boundary at the bottom of Leonard Canyon, would then need to be evaluated (the existing fencing would no longer be needed by the Forest). However, removal of this fenceline would be contingent upon the future needs of the neighboring Coconino National Forest, and must await the analysis of the area west of Leonard Canyon. The grazing of livestock would not be allowed in the Tentground, O'Haco, Double Cabin or the Five Mile Pastures until the fences are constructed for the respective pasture.

Range developments are associated with the proposed action. The proposed action would authorize:

1. Remove 3 miles of fence from Five Mile Pasture to improve livestock distribution.
2. Construct approximately 4 miles of fence from the Double Cabin Pasture boundary along the west side of Gentry Canyon in O'Haco Pasture to the boundary of Tentground Pasture; this would move the fencing to ridge tops rather than across drainages, resulting in improved livestock distribution.
3. Construct approximately 2.5 miles of fence from the Double Cabin Pasture boundary along the east side of Forest Road 115 to the Tentground Pasture boundary.
4. Construct about 1.25 miles of fence east and south from FR 115, to exclude livestock from Fairchild Draw.
5. Construct approximately 1.5 miles of fence from the southern Tentground Pasture boundary northwest to tie into the existing fence south of FR 115A.
6. Construct two roadside tanks in Wilkins Pasture.
7. Install 3 cattleguards, one each on FR 62, FR 300, and FR 225.
8. Construct approximately 3 miles of fence along the east side of Bear Canyon, in Five Mile Pasture.
9. Create a new holding pasture from the area located between Bear Canyon and Beaver Park Wash, and name it *Bear Trap Pasture*.
10. Construct approximately 6 miles of fence along FR 115 within Double Cabin Pasture, to exclude livestock from Leonard Canyon.
11. Construct approximately 1 mile of fence on the west side of Wiggins Crossing to exclude livestock from Willow Canyon.

Alternative 4: This alternative would be the same as Alternative 3 except there would be no construction of the fencing in Double Cabin and Five Mile pastures. Double Cabin and Five Mile Pastures would be rested for the duration of the permit. The permit would authorize 133 cow/calf pairs grazing from June 15 to September 15; AUMs would total 398. Management would be with a three pasture, deferred grazing system. Pastures to be used are O'Haco (142 AUMs), Tentground (78 AUMs), and Wilkins (178 AUMs).

Range developments are associated with the proposal. The location of these treatments would be the same as with Alternative 3. The proposed action would authorize:

1. In O'Haco Pasture, construct approximately 4.0 miles of fence from the Double Cabin Pasture

boundary along the west side of Gentry Canyon to the boundary of Tentground Pasture.

2. In O'Haco Pasture, construct approximately 2.5 miles of fence from the Double Cabin Pasture boundary along the east side of FR 115 to the Tentground Pasture boundary.

3. In O'Haco Pasture, construct about 1.25 miles of fence east and south from FR 115, to exclude livestock from Fairchild Draw.

4. In Tentground Pasture, construct approximately 1.5 miles of fence from the southern Tentground Pasture boundary northwest to tie into the existing fence south of FR 115A.

5. In Wilkins Pasture, construct two roadside tanks.

6. Construct approximately 1 mile of fence on the west side of Wiggins Crossing to exclude livestock from Willow Canyon.

7. Install 2 cattleguards, one on FR 62 and one on FR 225.

B. AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

This section describes the prevailing conditions (affected environment) within the project area and the changes that can be expected from implementing the Action alternatives or taking no action at this time. The No Action alternative sets the environmental baseline for comparing effects of each Action alternative. The following table summarizes the outputs and effects for the identified Key Issues.

ISSUE	Alt. 1	Alt. 2	Alt. 3	Alt. 4
1 - Economics				
\$/AUM/year cost to permittee.	\$0	\$2.50	\$9.53	\$10.39
Total cost of proposed developments.	\$0	\$0	\$84,950	\$47,800
2 - Wildlife				
Consistency of forage use is within allowable forage utilization standards.	Yes	No	Yes	Yes
3 - Watershed/Riparian Health				
Estimated recovery time, in decades, for riparian areas.	1	Not expected	1-2	1-2

A. ECONOMIC & SOCIAL FACTORS - Issue 1

Affected Environment - Economic Considerations

In the earlier part of this century, the economic base for most communities close to the Forest was timber harvesting and forest products processing. Ranching and recreation uses supplemented the area's economy. This pattern is changing. In recent years, there has been a decrease in timber harvesting and ranching coupled with an increase in recreation uses. The Limestone Allotment is located in the southeastern corner of Coconino County, the largest county in the state. The majority of the county's population, however, centers around Flagstaff and is very removed from the project area. Economic benefits would also flow to Navajo County, which contains the nearest full-service communities, and/or to Maricopa and Gila counties, where operations are headquartered.

It is important to recognize that, although the following projections appear very precise numerically, they should be viewed merely as indicators. First, there are a variety of assumptions underlying the derivation of these indices. Second, these indices apply to a "typical" regional situation, rather than the specific local case. The use of such indicators enables a direct comparison with other, recent and near-future EAs since they will all rely on the same assumptions. The projections then, while realistic, serve better as indicators of *relative* change rather than as measures of *actual* change.

Analysis of the Alternatives

The primary economic effects issue in this analysis pertains to the estimated costs for new range developments. The first measure is the annual cost to the permittee per AUM, as shown above. The second is the total cost to all contributing parties of the proposed developments, as summarized above and detailed in the following table.

The following efficiency analysis anticipates the rate of return for the projected expenditures by the permittee, third parties, and Forest Service. Measures used to conduct an investment analysis include: the present value of benefits, the present value of costs, the present net value, and the benefit / cost ratio (see Glossary under "Quick-Silver" for definitions).

	Permittee			
	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Present Value of Benefits	\$0	\$206,222	\$31,616	\$25,146
Present Value of Costs	\$0	\$81,455	\$59,533	\$41,354
Present Net Value	\$0	\$124,767	-\$27,917	-\$16,208
Benefit / Cost Ratio	0.00	2.53	0.53	0.61
	Forest Service			
Present Value of Benefits	\$0	\$37,169	\$89,148	\$52,382
Present Value of Costs	\$43,864	\$3,037	\$114,284	\$58,773
Present Net Value	-\$43,864	\$34,133	-\$25,136	-\$6,390
Benefit / Cost Ratio	0.00	12.24	0.78	0.89
	Third Party			
Present Value of Benefits	\$0	\$0	\$0	\$0
Present Value of Costs	\$422	\$0	\$0	\$0
Present Net Value	-\$422	\$0	\$0	\$0
Benefit / Cost Ratio	0.00	0.00	0.00	0.00
	All Parties			
Present Value of Benefits	\$0	\$243,391	\$120,764	\$77,528
Present Value of Costs	\$44,285	\$84,492	\$173,817	\$100,126
Present Net Value	-\$44,285	\$158,899	-\$53,053	-\$22,598
Benefit / Cost Ratio	0.00	2.88	0.69	0.77

The investment analysis displays a variety of costs and benefits associated with the alternatives. All estimated costs associated with range improvement and maintenance activities are displayed. Quantified values were not established for all benefits, however. An example of this would be the new fences proposed for Alternatives 3-5: there is a qualitative "value" for resource areas such as watershed improvement, range condition, and wildlife, but no direct monetary benefit. Similarly, Alternative 1 would also have associated resource benefits. No attempt was made to quantify these benefit values in dollar terms as there are no local studies to provide comparable, baseline information. There are, nevertheless, obvious intuitive values associated with these actions.

As a secondary issue, a brief analysis of employment and Forest Service receipts to the county will be displayed. This would allow for additional cumulative effects analysis to be done for current and future AMP analyses on the Forest.

The level of employment directly and indirectly supported by a livestock operation is assumed to be 1.14 jobs per 100 animal-years or 0.00095 job/AUM. This index was developed for the 1995 permit issuance project by the Forest Service's Regional Office.

Payments to counties are 25% of Forest Service receipts, which include grazing fees paid by the permittee. The grazing fees in 1998 were \$1.35 per AUM, 25% of which equals \$0.3375/AUM. Estimates of outputs, with dollars being rounded off, are:

	Ait. 1	Ait. 2	Ait. 3	Ait. 4
No. of Jobs	0	3.10	0.59	0.38
Payments to Coconino County	\$0	\$1,102	\$211	\$134

Alternative 1, no grazing, does not have any associated development costs. Alternative 2 would retain the current infrastructure and would require maintenance of existing improvements. Alternative 3 has an additional cost of \$9,000 to the permittee above Alternative 4. This improvement would allow an additional 227 AUMs from Alternative 4 to be grazed once plant vigor in Five Mile pasture and Double Cabin has been restored. These additional AUMs would cost \$3.96 per AUM over a ten year period.

Affected Environment - Social Considerations

Livestock producers stress the importance of the quality of life ranching provides them and their families. Owning livestock is important as a way of reaffirming ties to their ancestral lands and heritage. Preserving this working relationship with the land so it can be passed on to their children along with a feeling of self-sufficiency is a cornerstone of their values. Generally speaking, the more rural and remote the community, the more important the ranching option becomes (Eastman and Gray 1987). Cultural patterns are also an important facet of the human environment. "Cultural" generally refers to ways of thought and life, to the social identities people develop in their communities. Most people will work hard to preserve their culture and pass it along to their children. The ranching culture is closely identified with the American West in general and Arizona in particular. Personal traits associated with ranching include self-sufficiency, independence, and a predilection for hard work.

A 1997 survey of Forest grazing permittees found that if they were no longer able to ranch, two of 36 respondents would move elsewhere to non-ranch employment and seven of 36 would move elsewhere to ranch -- in other words, about 25% of respondents would leave the area but the great majority would not leave ranching (Cosgrove 1998a). Most permittees would try to adjust their operations to absorb the loss of income rather than sell their ranches since maintaining the ranching life-style is very important to them.

The Limestone Allotment is located in Coconino County which, in 1992, had approximately 200 cow/calf operations. The majority of these ranches were small to medium in size with only 33 operations having greater than 200 head. Large operations, such as the one utilizing this allotment, tend to be more stable and generally can fully support an operation. Smaller operations have a greater need to supplement their income from outside sources in order to support their operation.

Analysis of the Alternatives

Alternative 1: This proposal would have the most severe effects on the permittee. The discontinuation of grazing would result in a loss of income from use of Forest lands. Based on averages from throughout eastern Arizona over the past five years this would equate to a projected loss of \$54,000 of income per year. The effect of this loss on the permittee would depend on the financial condition of the operation, and the dependency of the operation on this particular allotment. This operation appears to be fairly typical of large operation under Forest Service permits where 10-20 percent of the operation is dependent upon the Forest Service lands. This alternative would increase pressure on either private land or other leases to compensate for some of the loss.

Alternative 2: This proposal would allow for operations to continue at the present level. If all other factors were held constant, there would be no change to the social or economic impacts. Currently the permittee generates an estimated \$34,000 to \$75,000/year from operations of the permit.

The permittee has operated at about 71% of permitted use over the past eleven years, including one season of nonuse and two other of less than 50%. Range and drought conditions have tended to be the limiting factors affecting the actual number of livestock permitted on a year by year basis. The alternative would provide up to five months of grazing, which would supplement the grazing occurring on private lands. The permittee would be able to generate an income that would support his current life-style even if actual use is 20% to 40% less than permitted.

Alternative 3: This proposal would initially have an 88% reduction compared to Alternative 2 and an 83% reduction compared to actual use. With these reductions in the number of permitted AUMs there would result a similar decrease in revenues, projected at up to \$65,000/year. Even if other summer pastures could be found, it would require additional effort and expense to graze the herds on other lands. The ability of the permittee to withstand this change is dependent on his personal situation. These changes are theoretical in nature and the allotment has experienced some degree of reduced use during the past ten years. In the long term, provided plant vigor is restored, the permittee may be able to increase the number of livestock on the allotment. Projected income for the long term is \$15,000/year from use of Forest lands.

The current operations on Forest lands would classify as a large operation. This alternative should provide the means for the operation to continue as it is only partially dependent on Forest lands, thus personal characteristics such as self-sufficiency, independence, hard work and other traits associated with a ranching life-style would most likely be protected. It is not likely that the permittee would sell his base property as he has additional permits and leases, but the implementation of this alternative could mean he would have to curtail operations.

Alternative 4: Effects associated with Alternative 4 are similar to Alternative 3 except there would not be an investment in improving forage production in two pastures. Thus there would not be an increase in number of livestock in the long term. Projected gross income would remain at \$9,500/year from Forest lands, an 82% reduction from the current amount. There would be an additional need to find alternate pastures for not only the shortened season but also the rest proposed for two pastures on the allotment.

If supplemental summer pastures cannot be found it may impact the permittee's overall operations, thus further reducing income generated from ranching. Even if supplemental summer pastures could be found, it would require additional effort and expense to graze the herds on other lands. The ability of the permittee to withstand this change is dependent on his personal situation. Although the current permittee has additional private lands and leases, a reduction of this magnitude is likely to change certain life-style related traits.

2. WILDLIFE - Issue 2

Affected Environment

Threatened, Endangered and Sensitive Species: Several threatened, endangered, and sensitive [TES] species have been documented as occurring within the analysis area. Others that have not been documented require habitat conditions similar to those within the area. Seven species -- the bald eagle, Mexican spotted owl, American peregrine falcon, Little Colorado River spinedace, black-footed ferret, jaguar, and southwestern willow flycatcher -- are listed by the U.S. Fish and Wildlife Service as threatened or endangered. An eighth species, Blumer's dock, has been proposed for listing as threatened. Threatened and endangered [T&E] species have been given protection by the Secretary of Interior under the Endangered Species Act of 1973. Sensitive species status results from a finding by

the Forest Service's Regional Forester. An account will be included in the Biological Assessment and Evaluation for all TES species.

All or portions of thirteen Mexican spotted owl [MSO] protected activity centers and three northern goshawk territories fall within the allotment boundary. Grazing guidelines and recommendations have been developed for both of these species and have been included in revisions to the Forest Plan.

The primary concern with grazing is that overutilization of forage by large ungulates reduces the abundance of prey species for the MSO and goshawk. These prey require insects and seedheads for all or portions of their diets. In areas where grazing is too heavy, insect abundance drops and seedheads are not allowed to develop. Hiding cover for prey species is also of concern. Much of the herbaceous vegetation in the allotment does not provide adequate cover for smaller species, and this may be limiting the abundance of some prey species, either by limiting forage or cover. Heavy browsing on oak and conifers by cattle and elk is also reducing the amount of cover to some prey species. Browsing on oak is retarding the recruitment of additional MSO nesting and roosting habitat.

Leonard Canyon (Management Emphasis Area 4-03) parallels the allotment to the west. Although no livestock grazing is allowed in the canyon, the effects of grazing nearby may influence water quality. AGFD surveyed Leonard Canyon for the Little Colorado River spinedace [LCS] in 1983, 1990, 1991 and 1997. LCS were detected between Knoll Lake and Dines Tank, and in Dines Tank. LCS have been detected in past surveys at Hamilton Crossing further downstream but were not captured at the site during the most recent survey.

Willow Canyon (Management Emphasis Area 4-01) is found in the southeast portion of the allotment. Although the best potential and existing stream habitat is excluded from livestock grazing, livestock use continues in riparian areas in the headwaters and tributaries of Willow Creek. AGFD last conducted fish surveys in Willow Creek in 1997. No LCS were detected even though their presence had been documented at Wiggins Crossing, Mule Crossing, and Bear Canyon during the mid-1960s.

Nearby East Clear Creek drainage is identified as refugia in the Little Colorado River Spinedace Recovery Plan. Leonard and Willow canyons are not identified as refugia and are not classified as critical habitat for the species. However, these canyons and their tributaries are considered important habitat, especially since LCS has historically occurred in Willow Creek and its tributaries. Streams within the allotment are currently being evaluated for possible LCS reintroduction efforts.

Species that may occupy habitat that is found exclusively in canyons within this allotment include the belted kingfisher, Little Colorado River spinedace, roundtail chub, speckled dace, and bluehead sucker. Surveys for all of these species have been conducted within the past two years but only the belted kingfisher, speckled dace, and bluehead sucker have been detected during these surveys.

Management Indicator Species: There are four Forest Plan Management Areas within the Limestone Allotment, and each has wildlife species designated as indicators of management area health. Indicator species for the ponderosa pine, mixed conifer, and aspen forest (Management Area 4-01) include the red-naped sapsucker, mule deer, turkey, goshawk, pygmy nuthatch, elk, Abert's squirrel, red squirrel, hairy woodpecker, and Mexican spotted owl. All of these indicator species have been detected in the Limestone allotment. Red-naped sapsuckers, pygmy nuthatches, and hairy woodpeckers are all cavity nesters, using either conifer or deciduous tree cavities. Grazing will not effect current availability of snags within the allotment.

Health of the pinyon-juniper woodland (Management Area 4-02) is gauged by plain titmouse, mule deer, elk, and antelope populations. Three of these species are present within the allotment where pinyon-juniper woodlands occur. Elk are substantially more abundant in this and other management

areas of the allotment than they were in the early 1970s. Mule deer populations have declined over the same period of time. Antelope are not found in this allotment due to the lack of suitable habitat. Lincoln sparrows, yellow-breasted chats, Lucy's warblers, and aquatic macroinvertebrates are indicators of riparian health (Management Area 4-03). Songbird surveys were conducted in the allotment's southern pastures in 1996. None of the three riparian bird indicator species were detected. Macroinvertebrates have been surveyed in Willow Canyon by the AGFD but results of the survey have not yet been released.

Indicators for the grasslands (Management Area 4-04) are antelope and elk. Only elk are found on the allotment.

It is important to note that several indicator species are also game species whose populations are managed by AGFD. The populations of elk, mule deer, antelope, turkey, and to a lesser extent, Abert's and red squirrels, are affected by hunting pressure in addition to habitat conditions.

Analysis of the Alternatives

Alternative 1: Removing livestock from the allotment would improve conditions the fastest for TES species. Wild ungulates would be allowed to graze 10% of the forage produced which would provide 90% of the total herbaceous production to other wildlife species and resource needs. The primary benefit of this alternative would be that recovery of range and watershed conditions would be quicker than in any of the other alternatives. Improved range and watershed conditions equate to better habitat for wildlife. Increases in hiding cover and available forage are expected to result in higher densities and a wider distribution of insects, small mammals, and other wildlife species that depend on grasses and annuals for food and cover. Increases in these prey groups would be likely to benefit several TES species that use the allotment. Mexican spotted owls, northern goshawks, flammulated owls, and occult little brown bats are examples of TES species that would benefit from increases in these prey groups. Browse species, which in some cases provide important nesting habitat for wildlife, would achieve the highest vigor under this alternative.

More abundant food enhances the physiological condition of animals, which often results in higher birth or clutch rates and better survival of young. The survival rate of northern goshawk young, for example has been shown to be significantly higher when prey is abundant and the time parent birds must be away from the nest to search for food is minimal (Dewey and Kennedy 1997). Voles, important in the diet of Mexican spotted owls, are known to be more abundant in meadows where grasses provide quality forage and cover (Ward and Block 1995). Recruitment of individuals into TES species populations would likely be higher with this alternative than any of the others because it would provide the best prey conditions. This could allow delisting objectives for some T&E species to be met sooner and prevent listing of some sensitive species that are under consideration.

Several wildlife species on the allotment may currently occur in reduced numbers because low level cover in meadows, openings, and along riparian corridors is less than adequate. Reduced vegetative cover often results in increased vulnerability for species that act as prey for others. Whether or not this is beneficial for predators depends on the prey species and type of habitat. Some predators capture more prey in heavier cover simply because of the increase in prey availability. Alternative 1 would increase the amount of cover more than any of the other alternatives. Amphibians, reptiles, insects, small mammals, and birds that rely on herbaceous ground cover would become more abundant as cover improves. This, in turn, could increase the populations of wildlife species that prey on these small species as well.

Native fish habitat would improve faster under this alternative than under any of the action alternatives. Streambank vegetation would receive use only by wild ungulates and would be expected to increase in density, composition, and vigor. Trampling would also be less under this alternative than any of the others because no livestock would have access to streambanks. These reductions in the impacts to streambanks would eventually lead to more stable streambanks, better water quality, less sedimentation, and ultimately better native fish habitat. Elk would still cause some trampling to occur which would limit recovery of fish habitat to some degree.

Implementing this alternative would preclude the development of some waters. The lack of water in the Wilkins Pasture has limited the distribution of some wildlife species; distributions of these species would continue to be limited under this alternative. Several miles of fencing also would not be built under this alternative which would reduce the chances of injury or mortality of wildlife.

It is anticipated that forage use by wild ungulates would not exceed the 10% forage utilization standard allowed them. If use by wild ungulates exceeds 10%, benefits to other wildlife species would decrease accordingly. As long as forage use by wild ungulates does not approach that prescribed by the other alternatives, this alternative would provide the greatest benefit to wildlife as a whole.

Alternative 2: This alternative would retain the existing grazing system which has contributed to the poor conditions present today. High utilization of grasses, forbs, and browse by livestock and wild ungulates would continue to restrict some wildlife populations. The 5/16 livestock entry date for this alternative would result in lower grass height and seedhead development in whichever pasture is grazed first. Insect, small mammal, and bird populations that forage on grasses and forbs, and the seedheads they produce, would remain suppressed. Wildlife that preys on herbivorous and granivorous species, including Mexican spotted owls, northern goshawks, flammulated owls, and several species of bats, would not experience the benefits of increased prey that other alternatives would provide. High use on browse would also continue under this alternative. The lack of recruitment of aspen and oak would continue to limit opportunities for cavity nesters and wildlife species that forage on oak mast.

Cover would not improve for those species that live in the herbaceous strata. TES amphibians, reptiles, small mammals, and birds that require tall, dense grasses for cover would continue to be limited in abundance. Vulnerability for these populations would remain high because of inadequate cover. Mexican spotted owls, flammulated owls, bats, and other wildlife that forage on populations that prosper in high quality cover would remain limited in part because of less than optimal prey availability. Retention of existing range and watershed conditions could slow the recovery of some T&E species and may increase the likelihood that some sensitive species would be listed as threatened or endangered.

Ungulate trampling of wildlife habitat would be highest under Alternative 2 because this alternative would allow the highest number of ungulates on the allotment. Paine *et al.* (1996) found that livestock damaged an average of 75% of grassland bird nests, with eggs and young being either crushed by an animal's muzzle, trampled by a hoof, or kicked out of the nest. Trampling can be especially detrimental to streamside and riparian habitats. Trampling results in a loss of undercut banks, reduction of streamside vegetation, widening of the stream channel, and modification of aquatic habitat through increased sedimentation, water temperatures, and channel width (Bohn 1986). Streambank changes resulting from livestock trampling are most pronounced in the spring and early summer when soil moisture content is highest. A reduction or elimination of certain wildlife and plant species may result from single or cumulative effects of streambank trampling by livestock (Platts and Nelson 1989).

Native fish habitat would not improve under Alternative 2. Recovery of LCS populations would be hindered by poor habitat conditions in headwater drainages, which have led to the listing of this species as threatened. Native fish would likely continue to experience further degradation of their habitats.

This alternative would provide for no new water developments in the Wilkins Pasture. The lack of water in this pasture has limited the distribution of some wildlife species; distributions of these species would continue to be limited under this alternative. No additional fencing would be constructed under this alternative, which would keep this danger to wildlife at its current level.

Compared to the other alternatives, this alternative would provide the least amount of benefit to wildlife.

Alternative 3: Alternative 3 is the District's proposed action. It would reduce livestock numbers by approximately 79% from current numbers in the short term and 73% over the long term. Combined livestock/wild ungulate forage utilization would be expected to average 25% in key areas across the allotment. Seventy five percent of the total herbaceous production would not be grazed and would be available for non-game wildlife and other resource needs.

Alternative 3 would improve wildlife forage and cover conditions faster than Alternative 2 but not as fast as Alternatives 1 and 4. Forage utilization levels would be higher by 15% than in Alternative 1, which would result in less of the total herbaceous production available to provide forage and cover for non-grazing wildlife species. Alternative 3 would provide more forage and cover to non-grazing wildlife species than Alternative 2 simply because use levels would be lower under Alternative 3. A livestock entry date of 6/15 compared to 5/16 in Alternative 2 would allow cool season grasses to achieve greater height and more seedhead development. This would enhance the beneficial effects of fewer ungulate numbers and reduced forage utilization in providing non-grazing wildlife more forage and cover than Alternative 2. Forage and cover in key areas in grazed pastures would be about equal between Alternatives 3 and 4 as long as forage use does not exceed an average of 25% in key areas in grazed pastures. However, Alternative 3 would not improve forage and cover habitat in the Double Cabin and Five Mile Pastures as much as Alternative 4 because, under Alternative 3, livestock would be allowed to graze these two pastures after they reached a certain point of recovery. There would be no grazing in the Double Cabin and Five Mile Pastures in Alternative 4. At a forage utilization level of 25% in key areas, Alternative 3 can be expected to improve habitat conditions for insects, small mammals, and other wildlife species that depend on quality herbaceous forage and cover. Threatened, endangered, and sensitive wildlife species preying on species that use the herbaceous layer would also be expected to benefit from this alternative.

Trampling would be more of a concern under this alternative than Alternative 1 due to the presence of livestock. Trampling would be significantly less under this alternative when compared to current conditions (Alternative 2) because of the substantial reduction in ungulate numbers. The later livestock entry date for Alternative 3 would also allow riparian areas and streambank soils that livestock could access more time to dry out before being subject to livestock trampling. Marlow and Pogacnik (1985) found that riparian degradation can be tempered by deferring livestock use until after streambank soil moisture content has dried to <10%. This soil moisture level is more likely to be achieved with a 6/15 entry date than with a 5/16 entry date. The effects of livestock trampling to wildlife in grazed pastures under this alternative would likely be comparable to Alternative 4 in the short term and slightly less in the long term because livestock would be in each pasture for a shorter amount of time. However, in the long term Alternative 3 would subject more area of the allotment to trampling by livestock than Alternative 4 by allowing livestock to graze the Double Cabin and Five Mile Pastures.

Native fish habitat would improve more in this alternative than in Alternative 2, but less than in Alternatives 1 and 4. By eliminating livestock grazing for several years in the Double Cabin and Five

Mile pastures, native fish habitat would experience improvement in streambank condition, water quality, and turbidity. Elk would still cause some trampling to occur during this time which would limit recovery of fish habitat to some degree. Once livestock were allowed to graze the Double Cabin and Five Mile Pastures again, recovery to native fish habitat would slow. It is anticipated that forage use by wild ungulates would not exceed the 10% forage utilization standard allowed them. If use by wild ungulates exceeds 10%, benefits to native fish and other wildlife species would decrease accordingly.

Range developments proposed in this alternative would improve water availability and distribution to wildlife species in the Wilkins Pasture. This could be a benefit to some species and adversely affect others. Elk and deer would benefit from the water developments, as would some non-game species that have territories near the drinkers. Other non-game species may not benefit because of higher amounts of trampling in an area where this effect is now caused only by wild ungulates. This alternative would also add 19.25 new miles of fence to the allotment to keep livestock out of riparian areas and native fish habitat. Three miles of existing fence would be removed. The new fencing would create more obstacles for wildlife species and could result in mortality of wildlife, especially big game species. However, its over riding effect would be to exclude livestock from existing and potential native fish habitat, which would eliminate the chances of livestock-caused native fish mortality and allow potential or degraded habitat to improve faster than if livestock were allowed to graze these areas. By allowing only wild ungulates to forage in these areas, the fencing would also reduce allowable forage use from an average of 25% to 10%, which would increase cover and forage for insects, small mammals, and ground-nesting birds. The additional fencing would be an overall benefit to wildlife.

Alternative 3 would benefit wildlife more than Alternative 2 but less than Alternatives 1 and 4.

Alternative 4: Alternative 4 would have many of the same effects as Alternative 3 in grazed pastures but less overall effect to wildlife habitat across the allotment. The main difference between these two alternatives would be that no grazing would occur in the Double Cabin and Five Mile Pastures in Alternative 4 because no fences would be built to keep livestock out of TES native fish habitat in these two pastures. Fencing to exclude livestock from native fish habitat would still be built in the O'Haco and Tentground Pastures, and a holding pasture. The exclusion of livestock from the Double Cabin and Five Mile Pastures for the life of this AMP would allow native fish habitat in headwater drainages to achieve a higher level of recovery than Alternative 3. Continued rest in these pastures would also provide more forage and cover for insects, birds, and small mammals using the herbaceous stratum than if they were grazed. It is anticipated that forage use by wild ungulates would not exceed the 10% forage utilization standard allowed them. If use by wild ungulates exceeds 10%, benefits to native fish and other wildlife species would decrease accordingly.

Alternative 4 would benefit wildlife more than Alternatives 2 and 3 but less than Alternative 1.

3. WATERSHED, SOILS & RIPARIAN CONDITION - Issue 3

Affected Environment - Watershed & Soils

Watershed condition was determined for the Forest Plan in 1987. At that time, Upper Tonto Creek was estimated to be in satisfactory condition. Clear Creek watershed was estimated to be in unsatisfactory condition. Limited areas within the Clear Creek watershed consisting of a pinyon-juniper vegetation type are generally found to have unsatisfactory or impaired soil conditions due to the following circumstances: impaired water infiltration (resulting in excessive run-off) caused by poor distribution, and relatively low amounts of organic material in the soil. These conditions result in accelerated soil movement when coupled with the effects of increasing canopy-cover and the over-utilization of remaining forage by wild and domestic ungulates. Meadows within the Limestone

Allotment as indicated in the PFC surveys (see below), range in condition from satisfactory to unsatisfactory. Past ungulate use, along with other management activities within the upper reaches of stream systems have caused degraded conditions.

The Arizona Department of Environmental Quality documents water quality in Chevelon Canyon Creek and East Clear Creek as fully supporting the designated uses of cold water fisheries (A&Wc), fish consumption (FC), full body contact (FBC), agricultural irrigation (AgI) and livestock watering (AgL) within the Chevelon Ranger District (ADEQ, 1998). However, the project area is hydrologically connected to Chevelon Creek near Winslow (site 150200008-003), approximately 30 miles north of the Forest boundary, where the designated uses are not fully met due to measured high levels of copper, lead and turbidity.

Watershed conditions shown below were taken from the Environmental Impact Statement, completed in 1987, for the forests plan. The information is displayed in acres by watershed and allotment.

Watershed	Total Area	Satisfactory	Satisfactory Untreatable	Unsatisfactory
Clear Creek	55,687	50,260	619	4,807
Upper Tonto Creek	468	468	0	0

Best Management Practices for grazing (see Appendix C), when fully implemented, are effective in protecting water quality. Monitoring of implementation and effectiveness of BMPs will be accomplished. In addition to monitoring range condition, monitoring of effective ground cover will be used to determine whether watershed condition is improving in key areas within the allotment.

Analysis of the Alternatives

Alternative 1: Watershed condition would improve in degraded meadows due to reduced effects from grazing ungulates, so long as wild ungulate populations do not increase. The relatively small amount of area under dense pinyon-juniper canopy would not improve since this requires removal of competing overstory. Areas under ponderosa pine and mixed conifer overstory should remain in satisfactory condition since litter and duff are responsible for maintaining soil stability and reducing overland flow.

Alternative 2: Watershed condition would continue to be satisfactory in general. Meadows, such as those in Gentry Canyon, Double Cabin, Fairchild Draw, Open Draw and others would still be overutilized by livestock and wild ungulates, therefore, a continued decline in condition would occur unless actual use is monitored and livestock are moved to unused pastures at or before maximum allowable use is reached. Areas under dense pinyon-juniper canopy would not improve due to the effects of competing overstory and overuse of remaining forage. Areas under ponderosa pine and mixed conifer canopy would remain in satisfactory condition.

Alternatives 3 and 4: Watershed condition would improve on the Limestone Allotment due to the effects of balancing livestock numbers with capacity. Plant density and vigor in meadows should increase, resulting in improved ground cover conditions, infiltration rates and resistance to overland flow. Watershed condition under ponderosa pine and mixed conifer overstory should generally remain in satisfactory condition.

Affected Environment - Riparian

Riparian condition is determined using the Proper Functioning Condition (PFC) methodology (USDI, 1993). Three basic categories are used to describe condition: proper functioning (PFC), functional-at-risk (FAR), and non-functional (NF). Ratings of FAR and NF are considered to be in unsatisfactory condition by the Forest Service. The riparian areas inventoried and their corresponding condition class are indicated on the attached map (Appendix H). Leonard Canyon, and the lower reaches of Willow Creek are inaccessible to cattle from the Limestone Allotment, although wild ungulates may utilize these areas.

Condition	Bear Canyon Miles Surveyed/ Evaluated	% of Reaches
Proper Functioning Condition	0.25	7
Functional At Risk - Upward Trend	0.5	13
Functional At Risk - Trend Not Apparent	3	80
Beaver Park Canyon		
Functional At Risk - Upward Trend	0.5	10
Functional At Risk - Downward Trend	0.75	15
Nonfunctional	3.75	75
Double Cabin		
Functional At Risk - Trend Not Apparent	0.7	70
Nonfunctional	0.3	30
Fairchild Draw		
Functional At Risk - Downward Trend	2.0	28
Nonfunctional	5.2	72
Gentry Canyon		
Functional At Risk - Upward Trend	1.25	16
Functional At Risk - Downward Trend	1.25	16
Functional At Risk - Trend Not Apparent	0.25	3
Nonfunctional	5.0	65
Leonard Canyon		
Proper Functioning Condition	28.5	100
Open Draw		
Functional At Risk - Trend Not Apparent	3.0	100
Spaulding Draw		
Nonfunctional	1.5	100%
Turkey Creek		
Functional At Risk - Upward Trend	4.5	60
Nonfunctional	3.0	40
Wilkins Canyon		
Nonfunctional	6.5	100
Willow Creek		
Proper Functioning Condition	7.5	25
Functional At Risk - Upward Trend	8.75	30
Functional At Risk - Trend Not Apparent	12.75	43
Nonfunctional	0.5	2

Riparian Reaches in Unsatisfactory Condition:

The following is a brief description of riparian areas inventoried and found to be in unsatisfactory condition. Detailed descriptions and maps of riparian areas inventoried can be found in the Project Record.

Bear Canyon: The reach immediately below the Bear Canyon Lake Dam was rated *Functional At Risk - Upward Trend* (1). This stretch of the channel is influenced by the regulation of flow caused by the dam. Remnants of *Salix* were found but no regeneration was evident. The channel appears to be adapting to the new hydrograph generated by regulated flows. Limited water has determined what vegetation can be sustained and the shape of the channel. This reach should be a priority for monitoring efforts as it is improving, but remains at risk. The majority of Bear Canyon (2) is *FAR - Trend not Apparent*. This reach is also greatly influenced by regulated flows caused by the dam. The system appears to be lacking sufficient nutrients to sustain its primary riparian constituents. Regulated flows have impeded natural channel maintenance flows, and instead allow only high peak flows going over the dam's spillway. Focus should be on preserving what exists presently and manage for improving this type of system.

Beaver Park: Two riparian exclosures exist in Beaver Park Canyon that were not evaluated. The upper wildlife/livestock exclosure was established 6 years ago and shows remarkable recovery in terms of bank stability and regeneration of riparian vegetation. The lower wildlife/livestock exclosure was established 4 years ago and is now beginning to show signs of recovery. Eroded banks are rapidly receding and the carex community is establishing in the channel and along a newly forming floodplain. Absence of ungulate grazing has been the key factor in restoring both riparian exclosures. The reaches of Beaver Park immediately below both exclosures were evaluated as *FAR - Upward Trend* (1). These stretches of the channel are recipients of the improving conditions of the upper exclosures. To maintain their position for current and for continual improvement, control of ungulate grazing is suggested. The reach of Beaver Park between the two exclosures was rated *FAR - Downward Trend* (2). This reach fell victim to the 1983 floods, which removed much of the alder population. This area should recover rapidly (1 decade) if riparian vegetation is allowed to recover. This area should take highest management priority because a decline in resource values is at risk. However, this area retains much of the resiliency associated with a functioning area and there is an opportunity to reverse this trend through changes in management. The lower portion of Beaver Park was rated *Nonfunctional* (3). This reach has been impacted by large flow volumes and stream channel alteration resulting from upper watershed conditions from large fires, overuse by ungulates, and other activities. This section of stream is a low management priority as its time to recover is probable nearing 100 years. Upper watershed and stream conditions must be improved before runoff is regulated to a volume that the channel can accommodate.

Double Cabin: The majority of the Double Cabin reach (1) was rated *FAR - Trend Not Apparent*. This is a heavily grazed herbaceous meadow system, thus causing low density and vigor of riparian plants. Dominated by *Poa pratensis*, the system has the potential to become vertically unstable. Several problems are evident in the reach including excessive grazing by ungulates, historic timber harvests, and a road running parallel to the meadow and along the channel. This area is a high management priority as it has the potential to achieve the desired conditions with proper ungulate use. This is evidenced by the recent improvements in riparian condition inside of the exclosure. A small section of the Double Cabin drainage was rated *Nonfunctional* as it enters Gentry Canyon. Trying to match the lowered channel elevation of Gentry, this section has headcut from the confluence upstream several hundred yards. To bring Double Cabin back to its original elevation is probably impossible with the current state of Gentry Canyon. Objectives should be to allow the headcut to stabilize and adapt to its new elevation and encourage the reintroduction of carex and willows to protect the banks from further erosion.

Fairchild Draw: The upper degrading reach (1) of Fairchild Draw was rated as *FAR - Downward Trend*. This is a meadow reach that is rapidly unraveling during large runoff events, particularly spring runoff as there is not enough residual stubble height left over from summer and fall grazing to provide soil protection. This system has the potential to rapidly dry out and become an entrenched gully, modifying the wet meadow to a dry meadow, thus, this area is one of the highest management

priority. Enough of the riparian area is still intact at this point to rapidly recover if immediate actions are taken. Downstream of the extensive upper meadow reach (2 & 3), Fairchild Draw was rated as *Nonfunctional*. Here the drainage has incised and lost all sinuosity. Poor hydrologic conditions have led to this degradation, including activities such as past timber harvests, improper location of logging roads, excessive ungulate grazing and channelization of upper meadows. These conditions have caused increased peak flow volume and at much higher velocities. Raw banks, approximately 10 feet high are evident and many upland herbaceous species are present in the channel. Once the downcut channels are established, recovery is very slow. This system will take a minimum of 30 to 50 years to recover, provided the upland watershed and upstream riparian conditions improve. Problems in upper meadow reaches also need to be addressed to begin slowing down the amount and timing of spring runoff. Due to the current channel condition, the higher priority for management emphasis should be placed on the headwater reaches of Fairchild Draw (1), then progress downstream.

Gentry Canyon: The majority of Gentry Canyon (2 & 5) was rated as *Nonfunctional*. Most of this channel is an incised deep gully, with little or no sinuosity. This area experienced timber harvesting, major wildfires, and heavy ungulate used over several decades, within much of the watershed. "Watershed response has been irreparably degraded by the widespread channel incision attributable to historic overgrazing." (Hanes 1993) Ungulate grazing has continued to impede any recovery by disallowing desired vegetation (*Carex* spp.) to regenerate. Most of the steep banks have no vegetative cover and need to reach a suitable angle of repose before vegetation can establish. Without any assistance and control of ungulate grazing, the system may take 5 to 10 decades before it will recover. Recommendations include bank stabilization and encouragement of desired bank angles. The headwater portion of Gentry Canyon (1) was rated as *FAR - Downward Trend*. The bluegrass shows evidence of very heavy grazing, resulting in minimal residual stubble height for handling spring runoff. Recommendations in these areas are to evaluate alternate grazing opportunities and/or establish a riparian exclosures. This area should be a high management priority as it can quickly be turned around before huge gullies develop, similar to the downstream portion of Gentry. Reach 4 was rated as *FAR - Upward Trend*. The channel has adapted to this new elevation by reestablishing its sinuosity and a suitable width/depth ratio. While not at its premium state, this reach is steadily improving to desired future conditions. It is the most functional reach of Gentry Canyon and should take 20+ years before it will reach desired future conditions. This is a high priority area as improvement in this reach can extend upstream and downstream into the more poorly rated reaches. Focus should be on grazing management to insure that *Alnus* spp. and *Carex* spp. have time to reproduce and protect the banks from high flows. A very small portion of Gentry was rated as *FAR - Trend Not Apparent*. This was a small canyon reach where large flows are not causing as much degradation due to the extent of the canyon walls. Emphasis should be placed on the adjacent reaches where the most improvement can result from the investment.

Leonard Canyon: Two short reaches were sampled at Leonard Canyon to rate this 27+ mile stretch as *Proper Functioning Condition*. Leonard Canyon is geologically confined along most of its reach, thus limiting degradation to a minimum. Vegetation was very diverse, although limited accessibility prevented a more concise sample. All visible aspects of riparian condition were at potential, with the canyon being in pristine condition. Due to the nature of such a deep canyon, management impacts and upstream watershed conditions have little influence on channel behavior. However, care should be taken to preserve the abundance of riparian vegetation in the channel and ensure the longevity of perennial pools. Upper watershed activities such as logging on the canyon sideslopes and ungulate grazing should be monitored to ensure maintenance of watershed conditions.

Open Draw: The entire stretch of Open Draw, from its headwaters to Gentry Canyon, was rated *FAR - Trend Not Apparent*. As a meadow reach, this stretch should have a deep, narrow channel, not the wider, shallow channel currently present. The meadow has become incised, draining the water table from its base level, and putting the meadow at risk of drying out. Overall, the channel appears stable

but there are a few knickpoints located randomly along the banks. This reach has a high potential to degrade rapidly, given the vegetative composition and the visible signs of heavy ungulate grazing. Currently, there is a lack of adequate residual stubble height of native herbaceous species to protect the banks during spring runoff. Recommendations are to monitor and limit ungulate grazing. This area is of highest management priority as it will take only 3-5 years to improve to desired future conditions. A livestock/wildlife exclosure in this reach demonstrates how rapidly the system will recover and revert back to a sedge dominated channel.

Spaulding Draw: Spaulding Draw was rated *Nonfunctional* from Spaulding Tank to its confluence with Fairchild Draw (1). Severe degradation is occurring along this reach, eliminating any recovery. Several factors contribute to this, including a poorly located road along the stream channel which crosses it in several locations, influencing its natural sinuosity. Spaulding Tank has altered the channel's natural flows which have modified the natural channel morphology. The tank's dam and spillway are in disrepair, causing erosion along the spillway and overtopping of the dam when the tank is filled. The upper watershed has historically been heavily burned, grazed and harvested-with significant canopy and ground cover removed. This results in much larger runoff volumes, and quicker peak flows during seasonal events. Road closure, tank spillway repair, re-establishment of woody vegetation and improved graminoid density and height will result in vast improvements in this section of riparian vegetation.

Turkey Creek: The upper headwater reaches of Turkey Creek (1 & 2) were rated as *FAR - Upward Trend*. This section of Turkey Creek was mostly canyon confined, recovering from past degradation caused by extreme runoff events, the last of which was a rain on snow even in the winter of 1993. A new floodplain is rebuilding approximately 6-8 feet below the original channel, which is still in the process of widening. The stream channel is attempting to return to its natural sinuosity, which is strongly influenced by the canyon walls. Previous impacts were a result of sheep grazing, wildfire and timber harvesting activities. These impacts do not currently seem to be affecting this section of Turkey Creek, perhaps aided by the canyon walls' buffer. The 3 mile section of Turkey Creek from the confluence of Gentry Canyon upstream (3 & 4) was rated as *Nonfunctional*. This section of the creek has experienced very large volumes of runoff which have eradicated the previous floodplain and natural channel flow. Currently, this reach has virtually no sinuosity, with all fine soil flowing through and not settling due to high velocities. A few remnants of riparian vegetation remain but the channel is primarily cobble driven, leaving too large of a particle size for sedges, willows, or alders to establish. This system has lost its natural channel and has created a larger channel to compensate for greater volumes. Current problems stem from upper watershed conditions including grazing, large wildfires, past timber harvests, current and discontinued logging roads, and large storm events accelerating runoff over the disturbed watershed. Recommendations include evaluating the road system and obliterating those roads no longer needed, and reestablishing upland vegetative cover including overstory. This system is so severely degraded that it will likely take centuries to recover. Emphasis should be placed on improving upland watershed conditions.

Wilkins Canyon: Wilkins Canyon (1) from its confluence with Fairchild Draw downstream 6.5 miles was rated as *Nonfunctional*. This stretch of the canyon has lost its vegetative component after large flood events washed out most of the channel. Wilkins currently has no floodplain, no sinuosity, and no riparian species. The channel is too wide, as it should be narrow and winding. High debris marks are evident, indicating large volumes of water are flushing the system on a regular basis. The channel is mainly comprised of large cobbles with little to no fine sediments dropping out. Problems stem from historic logging and overgrazing by ungulates. It is not a high probability that this type of riparian system will be supported again. Recommendations are to work on upper watershed conditions to regulate flows to pretreatment conditions. Objectives are to allow the floodplain and channel to stabilize, as to store more water in the system. However, this reach may take centuries to reach desired conditions even with improved upland and upstream conditions occur.

Willow Creek: The majority of Willow Creek (2, 4, 5, 6) was rated as *FAR - Trend Not Apparent*. This rating was selected for many reaches that possessed the following characteristics: defined by canyon, few riparian plants, large volumes of water passing through channel, little deposition of fines, bluegrass benches, low vigor or little reproduction in riparian plants, man-made impairments such as dams and road crossings, little coarse woody debris in system, width/depth ratio out of balance, upland watershed problems, and excessive browsing/grazing on riparian plants. The majority of these problems stem from upper watershed and stream channel problems. This large watershed has been historically subject to timber activities, forest fires, road building, and widespread overgrazing by elk, sheep, and cattle, all contributing to reduction of overstory and ground cover, gully development, and acceleration of runoff. Large floods of the past 3 decades have degraded the channel periodically, limiting riparian shrub to an age class of 5-7 years. Desired future conditions in these reaches are to have the channel lined with herbaceous riparian species and shrubs capable of withstanding these large events. Coarse woody debris is also desirable in the narrower portions of the canyon with developed floodplains to allow dropping of fine bedload. Current ungulate grazing has little direct impact on the recovery of riparian areas within these reaches due to their position on the landscape. There is, however, the potential of further declining riparian conditions within the upper reaches and meadows within the watershed.

A small portion of Willow Creek (3, 7) was rated as *Nonfunctional*. This section of the channel is located below a breached dam, downstream of a large powerline and Forest Road 75. An impoundment located across the creek failed at some point in the past and completely obliterated the riparian section of stream below it. In addition, road access to the impoundment created accelerated erosion off of the adjacent hillside. If left alone, the reach will take over a century to return to desired conditions. Recommendations are to allow nature and time to repair this damage. 7.5 miles of Willow Creek were rated as *Proper Functioning Condition* (9), from its confluence with Leonard Canyon upstream. This section of the channel is in a narrow stretch of the canyon, with tight geologic controls. Sinuosity, width/depth ratios and floodplains are dominated by canyon walls. Management influences often have little effect in a protected reach such as this. However, care should be taken to ensure that the riparian species continue to thrive in this reach. Almost 4 miles of Willow Creek (1, 8) were rated as *FAR - Upward Trend*. This reach is recovering from high flood flows of the past but the system is still intact. Riparian shrubs are prevalent in the reach, however, they show signs of overuse by browsing ungulates and a lack of reproductive growth. The system has minimal herbaceous cover, possibly due to the lack of fine bed material. Although the channel is not at its optimum, it is recovering from prior degradation. Desired future conditions are to increase deposition of fines to increase herbaceous cover on the floodplains and channel banks, and to decrease willow browsing. This section should recover in approximately 20 years. Upper watershed problems should additionally be addressed to restore overstory and reduce rapidly peaking runoff hydrographs.

Analysis of the Alternatives

Alternative 1: Riparian areas with woody riparian species would improve, due to less impacts on the woody species from elimination of cattle. Riparian meadows, such as Gentry, Double, Open, composed chiefly of graminoids would improve with graminoids likely increasing in cover and density due to reduced grazing pressure. It is estimated that recovery time for riparian areas functioning at risk or not properly functioning in those riparian areas with potential would be one decade after the alternative has been fully implemented.

Alternative 2: Concentrated grazing within the riparian meadow areas by cattle will compact wet soils, reduce effect ground cover, and destabilize stream banks. Riparian areas with woody riparian species would not improve, due to direct impact by wild ungulates and some impact from cattle use. The wet meadows composed mainly of graminoids may decline, based on effects of stocking the

allotment above estimated capacity. Riparian recovery would not be expected to occur as ungulate pressure would continue.

Alternatives 3 and 4: Woody riparian species would improve due to balancing livestock grazing with capacity. Overuse of herbaceous production is likely to occur until wild ungulates are balanced with their estimated capacity. It is estimated that recovery time for riparian areas in upper watersheds functioning at risk or not properly functioning would be one to two decades after the alternative has been fully implemented. Riparian areas in lower watersheds affected by degraded conditions upstream will take longer.

4. RANGE & VEGETATION

Affected Environment

The major herbaceous plants on the allotment include Arizona fescue, mountain muhly, screwleaf muhly, junegrass, squirreltail, *bromus* spp., Kentucky bluegrass, redtop bentgrass and pine dropseed. Other species located on the allotment are ponderosa pine, Gambel oak, aspen, white fir, Douglas fir, mountain mahogany and elderberry. The Gambel oak, aspen, white fir and Douglas fir are heavily hedged.

The forage production on the allotment averages approximately 100 lbs per acre. Forage production is typically higher in the open areas as compared to areas having dense trees and a high canopy. Range condition is a measure of vigor, composition and density of vegetation. Range conditions range from very poor to fair on the allotment, with the majority of the acres in poor condition.

Range condition classifications were verified by ocular estimate during field reviews to confirm herbaceous forage production. Range condition within each allotment is displayed by acreage, pasture, and grazing capability class for each analysis area.

Range Condition	Full Capacity Range	Potential Capacity Range	No Capacity Range	Unavailable Range
Very Poor	0	15,313	2,141	0
Poor	32,223	0	0	0
Fair	104	0	0	0
Good	0	0	0	0
Total:	32,327	15,313	2,141	0

Analysis of Alternatives

Alternative 1: This alternative would have no livestock on the allotment. Wild ungulates would have 100% of the available forage for their use. The desired allowable utilization on the allotment would be 10% use in key areas on key species. AGFD would monitor wildlife in the key areas on the herd unit as a whole. The cool-season grasses would still be used before the range is ready.

If the utilization is kept at the 10% use level during the spring and the fall on key species, range condition, forage production, and plant vigor, composition and density should improve at a faster rate than with the other alternatives.

Alternative 2: This alternative would continue with the current permitted livestock grazing situation. The current forage distribution provides 75% amount to livestock and 25% to wildlife, based

on current forage needs. This alternative would not balance permitted livestock use with allotment capacity. There would result an expected high utilization level (80% or more). With this type of grazing intensity, the range condition, and composition, vigor, and density of plants of desirable plants would decline. The entry date for cattle would be May 16, which in most years is estimated to be too early for range readiness, especially in the higher-elevation portions of Five-Mile, Double Cabin, O'Haco and Tentground pastures. The soils in some areas may still be moist at this time period, which could lead to compaction.

Key Areas would be heavily utilized (50 to 90%). These wildlife utilization levels would be expected in the early spring, before the range is ready, and also in the fall. These use levels would be expected in the riparian areas and wetter meadows, especially in the Double Cabin, Five-Mile, O'Haco and Tentground pastures, leading to continuation of poor vigor and composition of desirable plants, head cutting and gulying, downward trends in range condition, and reduced forage production. The uplands within all pastures would receive heavy use on selective species by wild ungulates. Wild ungulates would tend to use the lower elevation pastures during the winter. It is expected that these pastures would receive heavy browsing of desirable browse plants during the late fall, winter and early spring.

Alternative 3: This alternative would permit 133 head for 398 AUMs initially, until fences are constructed in the Double Cabin, Tentground, O'Haco and Five-Mile pastures and plant vigor is restored in Double Cabin and the Five-Mile pastures. Once the fences are constructed and vigor is restored, this alternative would permit 156 head for 625 AUMs. The forage distribution for this allotment would be 60% of the available forage for livestock and 40% for wildlife, which would meet the desired conditions. The total utilization is expected to be between 20% and 30%, averaging 25%. Pasture rotations and capacity would be developed so that livestock would be moved when the utilization in the key area was 25%. This alternative would balance permitted livestock use with allotment capacity. The entry date for livestock would be June 15. Typically by this time, plants have enough growth and the soils are not saturated that range readiness conditions are met.

For the short term the grazing system would be a three pasture, deferred system with 3 months of use (6/15 to 9/15) and after fences are constructed and vigor is restored to the Double Cabin and Five-Mile pastures, the grazing system would become a five pasture, deferred rotation with 4 months of use (6/15 to 10/15). With this utilization level and grazing period most plants would become more vigorous.

The Double Cabin and Five-Mile pastures would be rested until leaf length of Kentucky bluegrass reached 5 to 6 inches. This would help restore plant vigor and forage production to these pastures before livestock enter. After livestock grazing resumes, the vigor and production of forage plants would be maintained or improved; composition of desirable species should also improve.

There would be 19.25 miles of fence constructed, primarily to keep livestock out of the canyons (Leonard, Willow and Gentry). There would be 1.25 miles of fence which would exclude livestock from Fairchild Draw; this will help restore the vigor of the plants. Construction of four miles of fence along Gentry Canyon and the removal of 3 miles of fence from the Five-Mile Pasture would improve livestock distribution in these areas.

The allowable use by wildlife would be 10% on the allotment. This should be measured through AGFD monitoring of key areas on the herd unit as a whole. There would be key areas on this allotment, so it would be easy to assess actual utilization. There would be wildlife grazing before the expected readiness date, but if wildlife utilization is held to 10%, the improvements listed above should still occur.

Alternative 4: This alternative would permit 133 head for 398 AUMs. The forage distribution would be 60% of the available forage for livestock and 40% for wildlife. The total utilization is expected to be between 20% and 30%, averaging 25%. Pasture rotations and capacities would be developed so that livestock would be moved when utilization in key areas reaches 25%. It would be expected that this alternative would balance permitted livestock use with allotment capacity. The entry date would be June 15. Typically by this time period, plants should have enough growth and the soils are not saturated that range readiness conditions are met. A three pasture, deferred grazing system would be used for a three month time period (6/15 to 9/15). The pastures used in the rotation would be O'Haco, Tentground and the Wilkins.

There would be 10.25 miles of fence constructed. Most of the proposed fences would keep livestock out of canyons (Leonard, Willow and Gentry). There would be 1.25 miles which would exclude livestock from Fairchild Draw; this will help restore the vigor of plants.

The Double Cabin and the Five-Mile pastures would be rested from livestock grazing, but these pastures would remain part of the allotment. The added rest should improve forage production, and vigor and composition of desirable plants.

The allowable use by wildlife would be 10%. This would be measured through AGFD monitoring of key areas on the herd unit as a whole. There would be key areas on this allotment, so it would be easy to assess actual utilization on this allotment. There would be wildlife grazing before the expected readiness date is met, but if wildlife utilization is held to 10%, the improvements listed above should still occur.

6. HERITAGE RESOURCES

The effects of grazing on heritage resources, and any proposed change to a more intensive grazing management system, are of concern. By letter of March 16, 1995, the Regional Forester and the Arizona State Historic Preservation Officer clarified the process for addressing this concern. Implementation of that process will satisfy compliance with the National Historic Preservation Act and NEPA. For any of the proposed alternatives, a Forest Archeologist must be consulted if ground-disturbing range developments or treatments are proposed to ensure that the requirements of the National Historic Preservation Act are met.

Within the context of grazing projects, heritage resources may be directly affected by trampling and by construction of improvements or implementation of woodland conversion/maintenance activities. Cultural sites may be indirectly affected by natural processes, primarily sheet- or gully-erosion subsequent to loss of vegetative cover. It is noted that trampling by ungulates has been an on-going process for centuries prior to the introduction of cattle. Similarly, long term geologic cycles of aggradation and degradation have operated longer than human history. Maintenance, replacement or reconstruction of existing facilities are not considered undertakings and do not require additional survey. Of main concern, therefore, are the proposed construction and vegetation treatment projects. Potential impacts to sites, however, are easily avoided through project redesign once proper inventories are completed.

Affected Environment

More than 83% of the Project Area has been surveyed, 76% using sampling tactics and over 7% with complete inventory. There are 13 prehistoric sites identified; none has been formally evaluated. Known, but uninventoried, historic sites relate to early homesteading and logging.

Location of heritage sites is influenced by soil type, slope, aspect, elevation, access to water and arable land. The majority of identified sites are located on gentle slopes near water and arable land. Throughout this portion of the Districts, prehistoric sites are concentrated within the forest-woodland ecotone while historic sites appear to be more directly tied to perennial waters.

None of the known prehistoric sites are standing ruins or cliff dwellings, site types recognized as susceptible to grazing impacts. None of the sites are identified as having traditional cultural values.

Analysis of the Alternatives

Alternative 1: No livestock grazing is permitted under this alternative. Therefore, the potential for heritage resources to be directly affected by livestock trampling is eliminated. Ground cover should increase, minimizing the effects of erosion.

Alternative 2: This alternative would continue current management with forage use exceeding estimated availability. With the continuation of grazing, ground cover would be expected to decrease which would continue to cause indirect impacts to heritage resources by accelerated site deterioration from erosional processes.

Alternatives 3 and 4: Under these alternatives, livestock numbers are balanced with the estimated grazing capacity. Ground cover should increase, minimizing the effects of erosion to heritage resources. The continuation of grazing at or below historic levels is not expected to result in negative effects to heritage resources.

7. AIR QUALITY

The Arizona Department of Environmental Quality has determined that the airsheds within the Districts are "in attainment" (satisfactory condition). None of the alternatives propose actions that would detrimentally affect air quality.

V. WALLACE ALLOTMENT

The allotment is divided into five pastures and one holding trap, encompassing some 42,614 acres within portions of T11 and 12N, R12, 13 and 14E, G&SRM (Appendix H). It is used for summer grazing. Elevations in the area range from 6,200 to 7,500 feet. The topography is generally characterized by flat to moderate ridges that run north to south. Steep slopes do occur, associated with Grama Draw. The area is generally covered with trees, the dominant overstory species being ponderosa pine, pinyon and juniper, with pockets of mixed conifer, aspen, and riparian. Management emphasis areas include Forested Land, Woodland, and Riparian.

A. DESCRIPTION OF ALTERNATIVES

This section presents the alternatives developed by the Interdisciplinary Team. Alternatives considered but not analyzed/adopted are discussed in Appendix B. The alternatives propose the following:

	Alt. 1	Alt. 2*	Alt. 3	Alt. 4	Alt. 5*
Permitted Number *	0	440	295	295	425***
Animal unit months*	0	2244	1032	1032	1032***
Permitted Number **	0	440	295	295	425***
Animal unit months**	0	2244	1032	1032	1032***
Class of Animals	-	c/c	c/c	c/c	yr/ig
Season of use	-	5/16- 10/15	7/1-10/15	7/1-10/15	6/1-10/15
Range Developments					
Repair Trick Tank	-	-	1	1	1
Evaluate well	-	-	1	-	-
Cattleguard	-	-	1	1	1
Generator	-	-	1	-	-
Pipeline Butte	-	-	7.8 miles	-	-
Pipeline Tillman	-	-	20.3 miles	-	-
Trough	-	-	30	-	-
P-J treatment	-	-	2810 acres	2810 acres	2810 acres
P-J maintenance	-	-	2593 acres	2593 acres	2593 acres

* Short Term ** Long Term ***yearlings 350-450 lbs ave weight at entry. AUMs converted from yearlings to adult cattle using a 0.54 conversion ratio.

Alternative 1 - No Action: When the current term grazing permit expires, the Districts would take no action to renew or extend the permit. There would be no domestic livestock grazing on the allotment. Improvements within these pastures would be maintained by the Districts. All available herbaceous forage would be available to meet the forage requirements for the estimated wild ungulate populations. Monitoring forage utilization by wild ungulates would be done by AGFD to ensure allowable forage utilization levels are not exceeded.

Alternative 2 - Current Situation: This would continue with the current permitted grazing situation, which authorizes 440 cow/calf pairs grazing from May 16 to October 15; AUMs total 2244. Management is a four pasture, deferred grazing system, with Tillman Pasture being infrequently grazed. No direct consideration would be made for wild ungulate herbaceous forage needs. No new range developments would be built.

The record shows that in most years yearlings rather than adult cattle have grazed the allotment between 1988 and 1998, their numbers varying from 300 to 629 head. The number of livestock actually grazed has varied from permitted numbers between 1988 and 1997; reported actual use includes one year of nonuse and another of less than half of authorized.

Alternative 3 - Proposed Action: This alternative would balance capacity with the available herbaceous forage.

[Short Term] Initially, 295 cow/calf pairs grazing from July 1 to October 15, totalling 1032 AUMs, would be authorized. The grazing system would consist of a four pasture, deferred rotation. The pastures to be grazed would include Grama, Barney, Butte and Waters. Tillman Pasture would not be included in the total capacity due to lack of water.

[Long Term] Once water is furnished to Tillman Pasture, it would be added to the grazing system. Grazing would then feature a five-pasture, deferred, rest rotation system. This would result in about 20% of the allotment not being grazed by livestock. Even though there would be one additional pasture, the permitted numbers and season or use would remain the same. Livestock capacity would be based on 60% of the available herbaceous forage. The estimated grazing capacity would be Grama, 221 AUMs; Barney, 254 AUMs; Butte, 405 AUMs; Waters, 152 AUMs; and Tillman, 245 AUMs; these numbers may be adjusted slightly, on an annual basis, depending on which pasture is being rested.

There is a meadow area above Water Draw Spring (in Section 2, T12N, R13E) that would be fenced for the purpose of monitoring elk forage utilization.

Some range developments are associated with the proposal. The location of proposed developments are shown on the attached map. The action would authorize:

1. Repair of the leaks in Erramuzpe Trick Tank.
2. Develop a pipeline into Butte Pasture from Tillman Well; this would require approximately 7.8 miles of pipeline, 9 water troughs, and a portable generator for pumping water.
3. Construction of some 20.3 miles of pipeline and 21 water troughs in Tillman Pasture. (This line would furnish water to the Clear Creek Allotment.)
4. Treatments consisting of thinning and individual tree pushes in pinyon-juniper stands on approximately 2,810 acres.
5. Maintenance of existing pinyon-juniper pushes to Forest Plan standards on 2,593 acres.
6. Installation of a cattleguard on FR 70A at the Wallace Administrative Site.

Alternative 4: This alternative would be the same as Alternative 3 except there would be no construction of pipelines proposed to furnish water to various pastures from Tillman Well. The permit would authorize 295 cow/calf pairs grazing from July 1 to October 15; AUMs would total 1032. Management would be with a four pasture, deferred grazing system. Livestock capacity would be based on 60% of the available herbaceous forage. The estimated grazing capacity would be Grama, 221 AUMs; Barney, 254 AUMs; Butte, 405 AUMs; and Waters, 152 AUMs.

There is a meadow area above Water Draw Spring (in Section 2, T12N, R13E) that would be fenced for the purpose of monitoring elk forage utilization.

Some vegetation treatment for the benefit of watershed, soils, and wild ungulates would be associated with the proposal. The location of these treatments would be the same as with Alternative 3. The proposed action would authorize:

1. Repair of the leaks in Erramuzpe Trick Tank.
2. Treatments consisting of thinning and individual tree pushes in pinyon-juniper stands on approximately 2,810 acres.
3. Maintenances of existing pinyon-juniper pushes to Forest Plan standards on approximately 2,593 acres.
4. Installation of 1 cattleguard on FR 70A at the Wallace Administrative Site.

Alternative 5: This would balance livestock numbers with the estimated capacity. This alternative would be grazed with yearlings rather than adult cattle. The yearlings would weigh an

average of 350 to 450 pounds at entry. The alternative would respond to economic concerns about costs of range developments. Tillman Pasture would not be counted towards the carrying capacity. It would be utilized on an opportunity basis only if water is present for adequate livestock distribution. It is expected that the Tillman Pasture will be grazed briefly for no more than 2 out of 10 years. One objective of this alternative would be to have a yearling weight gain of 150 pounds during the grazing season. Improvements shown for Alternative 4 would be the same for this alternative. The permit would authorize 425 yearlings grazing from June 1 to October 15; AUMs would total 1032. Management would be with a four pasture, deferred grazing system, using Grama (221 AUMs), Barney (254 AUMs), Butte (405 AUMs), and Waters (152 AUMs) pastures. Livestock capacity would be based on 60% of the available herbaceous forage.

There is a meadow area above Water Draw Spring (Section 2, T12N, R13E) that would be fenced for the purpose of monitoring elk forage utilization.

Some vegetation treatment for the benefit of watershed, soils, and wild ungulates would be associated with the proposal. The location of these treatments would be the same as with Alternative 3. The proposed action would authorize:

1. Repair of the leaks in Erramuzpe Trick Tank.
2. Treatments consisting of thinning and individual tree pushes in pinyon-juniper stands on approximately 2,810 acres.
3. Maintenances of existing pinyon-juniper pushes to Forest Plan standards on approximately 2,593 acres.
4. Installation of 1 cattleguard on FR 70A at the Wallace Administrative Site.

B. AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

The section describes the prevailing conditions (affected environment) within the project area and the changes that can be expected from implementing the Action alternatives or taking no action at this time. The following table summarizes the costs and effects for the identified Key Issues.

ISSUE	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
1 - Economics					
\$/AUM/year cost to permittee.	\$0	\$2.44	\$14.57	\$7.10	\$7.10
Total cost of developments.	\$0	\$0	\$345,966	\$255,285	\$255,285
2 - Wildlife					
Consistency of forage use is within allowable forage utilization standards.	Yes	No	Yes	Yes	Yes
3 - Watershed/Riparian Health					
Estimated recovery time, in decades, for riparian areas.	1	Not expected	1-2	1-2	1-2

1. ECONOMIC & SOCIAL FACTORS - Issue 1

Affected Environment - Economic Considerations

In the earlier part of this century, the economic base for most communities close to the Forest was timber harvesting and forest products processing. Ranching and recreation uses supplemented the area's economy. This pattern is changing. In recent years, there has been a decrease in timber harvesting and ranching coupled with an increase in recreation uses. The Wallace Allotment is located in the southeastern corner of Coconino County, the largest county in the state. The majority of the county's population, however, centers around Flagstaff and is very removed from the project area.

Economic benefits would also flow to Navajo County, which contains the nearest full-service communities, and where operations are headquartered.

It is important to recognize that, although the following projections appear very precise numerically, they should be viewed merely as indicators. First, there are a variety of assumptions underlying the derivation of these indices. Second, these indices apply to a "typical" regional situation, rather than the specific local case. The use of such indicators enables a direct comparison with other, recent and near-future EAs since they will all rely on the same assumptions. The projections then, while realistic, serve better as indicators of *relative* change rather than as measures of *actual* change.

Analysis of the Alternatives

The primary economic effects issue in this analysis pertains to the estimated costs for new range developments. The first measure is the annual cost to the permittee per AUM, as shown above. The second is the total cost to all contributing parties of the proposed developments, as summarized above and detailed in the following table.

The following efficiency analysis anticipates the rate of return for the projected expenditures by the permittee, third parties, and Forest Service. Measures used to conduct an investment analysis include: the present value of benefits, the present value of costs, the present net value, and the benefit / cost ratio (see Glossary under "Quick-Silver" for definitions).

	Permittee				
	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Present Value of Benefits	\$0	\$141,777	\$67,702	\$65,202	\$65,202
Present Value of Costs	\$0	\$54,656	\$150,394	\$73,266	\$73,266
Present Net Value	\$0	\$87,121	-\$82,692	-\$8,064	-\$8,064
Benefit / Cost Ratio	0.00	2.59	0.45	0.89	0.89
	Forest Service				
Present Value of Benefits	\$0	\$25,554	\$104,933	\$16,752	\$16,752
Present Value of Costs	\$28,258	\$3,037	\$204,184	\$138,858	\$138,858
Present Net Value	-\$28,258	\$22,517	-\$99,251	-\$122,106	-\$122,106
Benefit / Cost Ratio	0.00	8.42	0.51	0.12	0.12
	Third Party				
Present Value of Benefits	\$0	\$0	\$0.00	\$0.00	\$0.00
Present Value of Costs	\$844	\$0	\$54,958	\$82,437	\$82,437
Present Net Value	-\$844	\$0	-\$54,958	-\$82,437	-\$82,437
Benefit / Cost Ratio	0.00	0.00	0.00	0.00	0.00
	All Parties				
Present Value of Benefits	\$0	\$167,331	\$172,635	\$81,955	\$81,955
Present Value of Costs	\$29,102	\$57,693	\$409,536	\$294,561	\$294,561
Present Net Value	-\$29,102	\$109,639	-\$236,901	-\$212,607	-\$212,607
Benefit / Cost Ratio	0.00	2.90	0.42	0.28	0.28

The investment analysis displays a variety of costs and benefits associated with the alternatives. All estimated costs associated with range improvement and maintenance activities are displayed. Quantified values were not established for all benefits, however. An example of this would be the pinyon-juniper treatments for Alternatives 3-5: there is a qualitative "value" for resource areas such as watershed improvement, range condition, and wildlife. Similarly, Alternative 1 would also have associated resource benefits. No attempt was made to quantify these benefit values in dollar terms as there are no local studies to provide comparable, baseline information. There are, nevertheless, obvious intuitive values associated with these actions.

As a secondary issue, a brief analysis of employment and Forest Service receipts to the county will be displayed. This allows for additional cumulative effects analysis to be done for current and future AMP analyses on the Forest.

The level of employment directly and indirectly supported by a livestock operation is assumed to be 1.14 jobs per 100 animal-years or 0.00095 job/AUM. This index was developed for the 1995 permit issuance project by the Forest Service's Regional Office.

Payments to counties are 25% of Forest Service receipts, which include grazing fees paid by the permittee. The grazing fees in 1998 were \$1.35 per AUM, 25% of which equals \$0.3375/AUM. Estimates of outputs, with dollars being rounded off, are:

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
No. of Jobs	0	2.13	0.98	0.98	0.98
Payments to Coconino County	\$0	\$757	\$348	\$348	\$646*

* Payment based on yearling AUMs.

Analysis of the Alternatives

Alternative 1, no grazing, does not have any associated development costs. Alternative 2 would retain the current infrastructure and would require maintenance of existing improvements, but would not have any development costs associated with improvements. Alternative 3 would have an additional cost above Alternatives 4 and 5 to place water in Tillman Pasture. This improvement would not allow any additional AUMs annually but would allow a different grazing strategy to be utilized. Alternatives 3, 4 and 5 would require investments to maintain existing openings and to complete 2,810 acres of woodland treatment.

Affected Environment - Social Considerations

Livestock producers stress the importance of the quality of life that ranching provides them and their families. Owning livestock is important as a way of reaffirming ties to their ancestral lands and heritage. Preserving this working relationship with the land so it can be passed on to their children along with a feeling of self-sufficiency is a cornerstone of their values. Generally speaking, the more rural and remote the community, the more important the ranching option becomes (Eastman and Gray 1987). Cultural patterns are also an important facet of the human environment. "Cultural" generally refers to ways of thought and life, to the social identities people develop in their communities. Most people will work hard to preserve their culture and pass it along to their children. The ranching culture is closely identified with the American West in general and Arizona in particular. Personal traits associated with ranching include self-sufficiency, independence, and a predilection for hard work.

A 1997 survey of Forest grazing permittees found that if they were no longer able to ranch, two of 36 respondents would move elsewhere to non-ranch employment and seven of 36 would move elsewhere to ranch -- in other words, about 25% of respondents would leave the area but the great majority would not leave ranching (Cosgrove 1998a). Most permittees would try to adjust their operations to absorb the loss of income rather than sell their ranches since maintaining the ranching life-style is very important to them.

The Wallace Allotment is located in Coconino County which, in 1992, had approximately 200 cow/calf operations. The majority of these ranches were small to medium in size with only 33 operations having greater than 200 head. Large operations, such as the one utilizing this allotment, tend to be more stable and generally can fully support an operation. Smaller operations have a greater need to supplement their income from outside sources in order to support their operation.

Analysis of the Alternatives

Alternative 1: This alternative would have the most severe effects on the permittee. The discontinuation of grazing would result in a loss of income from use of Forest lands. Based on estimated income over the past eleven years this would equate to an estimated loss of \$30,000 of income per year. The effect of this loss on the permittee and family would depend on the financial condition of the operation, and the dependency of their operation on this particular allotment. The loss of use of this summer range could also impact the permittee's ability to use winter allotments.

Alternative 2: This alternative would allow for operations to continue at the present level on the allotment. If all other factors were held constant, there would be no change to the social or economic impacts. Over the past eleven years, the former permittee generated an estimated \$30,000/year from operations of the permit. If operated at the full permitted number the permittee could generate an estimated \$52,000/year of gross income.

This alternative would provide up to five months of grazing, which would supplement the grazing occurring at lower elevations. This alternative would provide the opportunity to graze more cattle than have been traditionally grazed on the allotment. Although range and drought conditions have tended to be the limiting factors affecting the actual number of livestock permitted on a year by year basis.

Alternative 3: This proposal would have an 33% reduction in permitted AUMs on the allotment. These reduction would result in an estimated gross annual income of about \$24,300 from use of Forest lands. Additionally there would be a cost to complete the improvements. This alternative would permit grazing for 3 months. The reduction would cause the operation to be classified as medium to large. Medium operations tend not to be as self-sufficient and increase the likelihood of becoming an operation at risk.

Alternative 4: This alternative would result in a reduction similar to Alternative 3. There would be an approximate 20 percent reduction in income generated from this permit. This alternative would not require additional investments to improve water sources in Tillman pasture. Without this improvement a rest rotation could not be implemented. If supplemental summer pastures cannot be found it may impact the permittee's overall operations.

Alternative 5: This proposal could generate an estimated \$54,000 in income, which is greater than current gross income. This alternative calls for a change to a yearling operation which would require additional investments each year to purchase yearlings. Thus the net income would likely be similar to current income. The alternative would permit the permittee to graze the desired amount of cattle and reduce the need to seek supplement summer pastures for the operation. This proposal allows for 4.5 months of grazing. The actual period of grazing would still be determined by utilization standards so on some years the permittee may have to find supplemental pastures. This alternative would allow the operation to continue at a self-sufficient level.

2. WILDLIFE - Issue 2

Affected Environment

Threatened, Endangered and Sensitive Species: Several threatened, endangered, and sensitive [TES] species have been documented as occurring within the analysis area. Others that have not been documented require habitat conditions similar to those within the area. Seven species -- the bald eagle, Mexican spotted owl, American peregrine falcon, Little Colorado River spinedace, black-footed ferret, jaguar, and southwestern willow flycatcher -- are listed by the U.S. Fish and Wildlife Service as

threatened or endangered. An eighth species, Blumer's dock, has been proposed for listing as threatened. Threatened and endangered [T&E] species have been given protection by the Secretary of Interior under the Endangered Species Act of 1973. Sensitive species status results from a finding by the Forest Service's Regional Forester. An account will be included in the Biological Assessment and Evaluation for all TES species.

All or portions of six Mexican spotted owl [MSO] protected activity centers and two northern goshawk territories fall within the allotment boundary. Grazing guidelines and recommendations have been developed for both of these species and have been included in revisions to the Forest Plan.

The primary concern with grazing is that overutilization of forage by large ungulates reduces the abundance of prey species for the MSO and goshawk. These prey require insects and seedheads for all or portions of their diets. In areas where grazing is too heavy, insect abundance drops and seedheads are not allowed to develop. Hiding cover for prey species is also of concern. Much of the herbaceous vegetation in the allotment does not provide adequate cover for smaller species, and this may be limiting the abundance of some prey species, either by limiting forage or cover. Heavy browsing on oak and conifers by cattle and elk is also reducing the amount of cover to some prey species. Browsing on oak is retarding the recruitment of additional MSO nesting and roosting habitat.

The Willow Creek drainage (Management Emphasis Area 4-03) parallels the allotment to the west. Although no livestock grazing is allowed in Willow Creek, the effects of grazing near the canyon may influence water quality. AGFD last surveyed Willow Creek for the Little Colorado River spinedace (LCS) in 1997. No LCS were captured during this survey. LCS were last captured in this drainage in 1966.

Species that may occupy habitat that is found exclusively within these canyons include the belted kingfisher, Little Colorado River spinedace, roundtail chub, speckled dace, and bluehead sucker. Surveys for all of these species have been conducted within the past two years but only the belted kingfisher, speckled dace and bluehead sucker have been detected.

Management Indicator Species: There are three Forest Plan Management Areas within the Wallace Allotment and each has wildlife species that have been designated as indicators of management area health. Indicator species for the ponderosa pine, mixed conifer, and aspen forest (Management Area 4-01) include the yellow-bellied sapsucker, mule deer, turkey, goshawk, pygmy nuthatch, elk, Abert's squirrel, red squirrel, hairy woodpecker, and Mexican spotted owl. The range of yellow-bellied sapsuckers does not extend into Arizona. When management indicator species for the A-S National Forest were designated, the yellow-bellied and red-naped sapsucker were considered the same species. These two birds are now separate species and the red-naped sapsucker, whose range includes all of Arizona, is now used as the indicator species. Of the 10 indicator species listed for this management area, mule deer, turkey, goshawk, elk, Abert's and red squirrels, and Mexican spotted owls are known to be present within the allotment. Red-naped sapsuckers, pygmy nuthatches, and hairy woodpeckers are believed to exist in the area but surveys for these species have not been conducted. All of these birds are cavity nesters, using either conifer or deciduous tree cavities. Grazing would not effect current availability of snags within the allotment.

Health of the pinyon-juniper woodland (Management Area 4-02) is gauged by plain titmouse, mule deer, elk, and antelope populations. All of these species are present within the allotment where pinyon-juniper woodlands occur. Elk are substantially more abundant in this and other management areas of the allotment than they were in the early 1970s. Mule deer populations have declined over the same period of time. Antelope use of the allotment is limited and occurs only in the northern extents. Limited water, lack of herbaceous cover for fawns, and predation on fawns restrict antelope population growth in this area.

Lincoln sparrows, yellow-breasted chats, Lucy's warblers, and aquatic macroinvertebrates are indicators of riparian health (Management Area 4-03). There is actually very little riparian within the allotment; Willow Canyon is outside of the allotment but parallels some of the western allotment boundary. No formal songbird surveys have been conducted in riparian habitat in the allotment or in Willow Canyon, with the exception of Southwestern willow flycatcher (SWWF) surveys. None of the management indicator bird species were detected during the SWWF surveys. Macroinvertebrates have been surveyed in Willow Canyon by the AGFD but results of the survey have not yet been released.

It is important to note that several indicator species are also game species whose populations are managed by the Arizona Game and Fish Department (AGFD). The populations of elk, mule deer, antelope, turkey, and to a lesser extent, Abert's and red squirrels, are affected by hunting pressure in addition to habitat conditions.

Analysis of the Alternatives

Alternative 1: Removing livestock from the allotment would improve conditions the fastest for TES species. Wild ungulates would be allowed to graze 10% of the forage produced which would provide 90% of the total herbaceous production to other wildlife species and resource needs. The primary benefit of this alternative would be that recovery of range and watershed conditions would be quicker than in any of the other alternatives. Improved range and watershed conditions equate to better habitat for wildlife. Increases in hiding cover and available forage are expected to result in higher densities and a wider distribution of insects, small mammals, and other wildlife species that depend on grasses and annuals for food and cover. Increases in these prey groups would be likely to benefit several TES species that use the allotment. Mexican spotted owls, northern goshawks, flammulated owls, and occult little brown bats are examples of TES species that would benefit from increases in these prey groups. Browse species, which in some cases provide important nesting habitat for wildlife, would achieve the highest vigor under this alternative.

More abundant food enhances the physiological condition of animals, which often results in higher birth or clutch rates and better survival of young. The survival rate of northern goshawk young, for example has been shown to be significantly higher when prey is abundant and the time parent birds must be away from the nest to search for food is minimal (Dewey and Kennedy 1997). Voles, important in the diet of Mexican spotted owls, are known to be more abundant in meadows where grasses provide quality forage and cover (Ward and Block 1995). Recruitment of individuals into TES species populations would likely be higher with this alternative than any of the others because it would provide the best prey conditions. This could allow delisting objectives for some T&E species to be met sooner and prevent listing of some sensitive species that are under consideration.

Several wildlife species on the allotment may currently occur in reduced numbers because low level cover in meadows, openings, and along riparian corridors is less than adequate. Reduced vegetative cover often results in increased vulnerability for species that act as prey for others. Whether or not this is beneficial for predators depends on the prey species and type of habitat. Some predators capture more prey in heavier cover simply because of the increase in prey availability. Alternative 1 would increase the amount of cover more than any of the other alternatives. Amphibians, reptiles, insects, small mammals, and birds that rely on herbaceous ground cover would become more abundant as cover improves. This, in turn, could increase the populations of wildlife species that prey on these smaller species as well.

Implementing this alternative would preclude the development of some waters and the reduction in pinyon-juniper densities that are planned for in other alternatives. The lack of water in the Tillman and

Butte Pastures has limited the distribution of some wildlife species; distributions of these species would continue to be limited under this alternative. If pinyon-juniper densities are not reduced, habitat for some sensitive species would continue to be limited on the allotment. Swainson's hawks, ferruginous hawks, and prairie falcons are examples of species that require open savannah and grassland conditions and would continue to have only a small amount of suitable habitat available to them if this alternative is implemented.

It is anticipated that forage use by wild ungulates would not exceed the 10% forage utilization standard allowed them. If use by wild ungulates exceeds 10%, benefits to other wildlife species would decrease accordingly. As long as forage use by wild ungulates does not approach that prescribed by the other alternatives, this alternative would provide the greatest benefit to wildlife as a whole.

Alternative 2: This alternative would retain the existing grazing system which has contributed to the poor conditions present today. High utilization of grasses, forbs, and browse by livestock and wild ungulates would continue to restrict some wildlife populations. The 5/16 livestock entry date for this alternative would result in lower grass height and seedhead development in whichever pasture is grazed first. Insect, small mammal, and bird populations that forage on grasses and forbs, and the seedheads they produce, would remain suppressed. Wildlife that preys on herbivorous and granivorous species, including Mexican spotted owls, northern goshawks, flammulated owls, and several species of bats, would not experience the benefits of increased prey that other alternatives would provide. High use on browse would also continue under this alternative. The lack of recruitment of aspen and oak would continue to limit opportunities for cavity nesters and wildlife species that forage on oak mast.

Cover would not improve for those species that live in the herbaceous strata. TES amphibians, reptiles, small mammals, and birds that require tall, dense grasses for cover would continue to be limited in abundance. Vulnerability for these populations would remain high because of inadequate cover. Mexican spotted owls, flammulated owls, bats, and other wildlife that forage on populations that prosper in high quality cover would remain limited in part because of less than optimal prey availability. Retention of existing range and watershed conditions could slow the recovery of some T&E species and may increase the likelihood that some sensitive species would be listed as threatened or endangered.

Ungulate trampling of wildlife habitat would be highest under Alternative 2 because this alternative would allow the highest number of ungulates and livestock AUMs on the allotment. Paine *et al.* (1996) found that livestock damaged an average of 75% of grassland bird nests, with eggs and young being either crushed by an animal's muzzle, trampled by a hoof, or kicked out of the nest.

This alternative would provide for no new water developments or pinyon-juniper treatments. The lack of water in the Tillman and Butte Pastures has limited the distribution of some wildlife species; distributions of these species would continue to be limited under this alternative. If pinyon-juniper densities are not reduced, habitat for some sensitive species would continue to be limited on the allotment. Swainson's hawks, ferruginous hawks, and prairie falcons are examples of species that require open savannah and grassland conditions and that would continue to have only a small amount of suitable habitat available to them if this alternative is implemented.

Compared to the other alternatives, this alternative would provide the least amount of benefit to wildlife.

Alternative 3: Alternative 3 is the District's proposed action. It would reduce livestock numbers by approximately 23% and AUMs by 54% from current numbers. Combined livestock/wild ungulate

forage utilization would be expected to average 25% in key areas across the allotment. Seventy five percent of the total herbaceous production would not be grazed and would be available for non-game wildlife and other resource needs.

Alternative 3 would improve wildlife forage and cover conditions faster than Alternative 2 but not as fast as Alternative 1. Forage utilization levels would be higher by 15% than in Alternative 1, which would result in less of the total herbaceous production available to provide forage and cover for non-grazing wildlife species. Alternative 3 would provide more forage and cover to non-grazing wildlife species than Alternative 2 simply because use levels would be lower under Alternative 3. A livestock entry date of 7/1 compared to 5/16 in Alternative 2 would allow cool season grasses to achieve greater height and more seedhead development in pastures grazed first. This would enhance the beneficial effects of fewer ungulate numbers and reduced forage utilization in providing non-grazing wildlife more forage and cover than in Alternative 2. Forage and cover in key areas would be about equal among Alternatives 3, 4, and 5 as long as forage use does not exceed an average of 25% in key areas in grazed pastures. At a forage utilization level of 25% in key areas, Alternative 3 can be expected to improve habitat conditions for insects, small mammals, and other wildlife species that depend on quality herbaceous forage and cover. Threatened, endangered, and sensitive wildlife species preying on species that use the herbaceous layer would also be expected to benefit from this alternative.

Trampling would be more of a concern under this alternative than Alternative 1 due to the presence of livestock. Trampling would be significantly less under this alternative when compared to current conditions (Alternative 2) because of the substantial reduction in ungulate numbers. The later livestock entry date for Alternative 3 would also allow riparian areas and streambank soils more time to dry out before being subject to livestock trampling. Marlow and Pogacnik (1985) found that riparian degradation can be tempered by deferring livestock use until after streambank soil moisture content has dried to <10%. This soil moisture level is more likely to be achieved with a 7/1 entry date than with a 5/16 entry date. The effects of livestock trampling to wildlife in grazed pastures under this alternative would likely be comparable to Alternative 4 and slightly less than Alternative 5.

Range developments proposed in this alternative would improve water availability and distribution to wildlife species in the Tillman and Butte Pastures. This could be a benefit to some species and adversely affect others. Elk, deer, and antelope would benefit from the water developments, as would some non-game species that have territories near the drinkers. Other non-game species may not benefit because of higher amounts of trampling in an area where this effect is now caused only by wild ungulates. Pinyon-juniper density reduction treatments proposed in this alternative would begin steps toward providing a better balance of VSS classes, which would improve conditions for most wildlife species that use the pinyon-juniper woodlands.

Alternatives 3, 4, and 5 would be about equal in their effects to wildlife and would benefit wildlife more than Alternative 2 but not as much as Alternative 1.

Alternative 4: Alternative 4 would have many of the same effects as Alternative 3. The main difference between these two alternatives would be that no grazing would occur in the Tillman Pasture in Alternative 4 because no water would be developed. The lack of water would continue current conditions in this pasture, which would restrict distribution for elk, deer, and antelope but also limit trampling damage to ground nesting birds and small mammals. Continued rest in the Tillman Pasture would provide more forage and cover for insects, birds, and small mammals using the herbaceous stratum than if the pasture was grazed. It is anticipated that forage use by wild ungulates would not exceed the 10% forage utilization standard allowed them. If use by wild ungulates exceeds 10%, benefits to other wildlife species would decrease accordingly.

Alternatives 3, 4, and 5 would be about equal in their effects to wildlife and would benefit wildlife more than Alternative 2 but not as much as Alternative 1.

Alternative 5: Alternative 5 would have many of the same effects as Alternatives 3 and 4. The number of AUMs would be the same as in Alternatives 3 and 4. The differences between this alternative and Alternatives 3 and 4 would be an earlier livestock entry date of 6/1 and the grazing of yearling cattle instead of full grown cows with calves. The number of cattle would be higher in this alternative than in Alternatives 3 and 4 because of allowances for weight differences between yearlings and adult cows.

Forage and cover for wildlife species would be comparable to Alternatives 3 and 4 because AUMs would be equal among these three alternatives. A 6/1 entry date could result in slightly less forage and cover for some wildlife species during the month of June in the first pasture grazed. The distribution of yearlings across the allotment is generally better than adult cattle which is likely to offset many of the effects of an earlier livestock entry date. Forage and cover is expected to improve for insects, birds, and small mammals under this alternative.

Even though more cattle would be on the allotment under Alternative 5, trampling by livestock would be about the same as in Alternatives 3 and 4. The fact that yearling livestock are lighter reduces their impact to soils and vegetation. Better distribution among yearling cattle also reduces the effects of trampling, especially in wet meadow and riparian habitats.

Alternative 5 is similar to Alternative 4 in that no grazing would occur in the Tillman Pasture because no water would be developed. The lack of water would continue current conditions in this pasture, which would restrict distribution for elk, deer, and antelope but also limit trampling damage to ground nesting birds and small mammals. Continued rest in the Tillman Pasture would provide more forage and cover for insects, birds, and small mammals using the herbaceous stratum than if the pasture was grazed. It is anticipated that forage use by wild ungulates would not exceed the 10% forage utilization standard allowed them. If use by wild ungulates exceeds 10%, benefits to other wildlife species would decrease accordingly.

Alternatives 3, 4, and 5 would be about equal in their effects to wildlife and would benefit wildlife more than Alternative 2 but not as much as Alternative 1.

3. WATERSHED, SOILS & RIPARIAN CONDITION - Issue 3

Affected Environment - Watershed & Soils

Watershed condition was determined for the Forest Plan in 1987. At that time, the Chevelon Creek watershed within the analysis area was estimated to be in satisfactory condition. Clear Creek Watershed was estimated to be in unsatisfactory condition. Areas within these watersheds consisting of a pinyon-juniper vegetative type are generally found to have unsatisfactory or impaired soil conditions due to the following circumstances: impaired water infiltration (resulting in excessive runoff) caused by poor distribution, and relatively low amounts of organic material in the soil. These conditions result in accelerated soil movement when coupled with the effects of increasing canopy-cover and the over-utilization of remaining forage by wild and domestic ungulates.

The Arizona Department of Environmental Quality documents water quality in Chevelon Canyon Creek and East Clear Creek as fully supporting the designated uses of cold water fisheries (A&Wc), fish consumption (FC), full body contact (FBC), agricultural irrigation (Agl) and livestock watering (AgL) within the Chevelon Ranger District (ADEQ 1998). However, the project areas are

hydrologically connected to Chevelon Creek near Winslow (site 150200008-003), approximately 30 miles north of the Forest boundary, where the designated uses are not fully met due to measured high levels of copper, lead and turbidity.

Watershed conditions shown below were taken from the Environmental Impact Statement, completed in 1997, for the Forest Plan. The information is displayed in acres by watershed and allotment.

Watershed	Total Area	Satisfactory	Satisfactory Untreatable	Unsatisfactory
Chevelon Creek	10,247	8,173	145	1,931
Clear Creek	39,692	25,747	589	13,353

Best Management Practices for grazing (see Appendix C), when fully implemented, are effective in protecting water quality. Monitoring of implementation and effectiveness of BMPs will be accomplished. In addition to monitoring range condition, monitoring of effective ground cover will be used to determine whether watershed condition is improving in key areas within the allotment.

Analysis of the Alternatives

Alternative 1: Watershed condition would improve in open grassland due to reduced effects from grazing ungulates, so long as wild ungulate populations do not increase. Areas under dense pinyon-juniper canopy would not improve since this requires removal of competing overstory. Areas under ponderosa pine overstory should remain in satisfactory condition since litter and duff are responsible for maintaining soil stability and reducing overland flow.

Alternative 2: Watershed condition on each allotment would not improve unless actual use is monitored and cattle movement occurred at or before maximum allowable use. Areas under dense pinyon/juniper canopy would not improve due to the effects of competing overstory and overuse of remaining forage. Areas under ponderosa pine canopy should remain in satisfactory condition.

Alternatives 3, 4, and 5: Watershed condition would improve on Wallace Allotment due to the effects of balancing ungulate numbers with available forage. Plant density and vigor in the open grasslands should increase, resulting in improved ground cover conditions, infiltration rates and resistance to overland flow. Proposed range treatments to reduce pinyon/juniper overstory would reduce competition for light and nutrients, allowing grass and litter cover to increase. Areas under ponderosa pine overstory should generally remain in satisfactory condition.

Affected Environment - Riparian

Riparian condition is determined using the Proper Functioning Condition (PFC) methodology (USDI 1993). Three basic categories are used to describe condition: proper functioning (PFC), functional-at-risk (FAR), and non-functional (NF). Ratings of FAR and NF are considered to be in unsatisfactory condition by the Forest Service. The riparian areas inventoried and their corresponding condition class are indicated on the attached map (Appendix H). Willow Creek and West Chevelon Canyon are inaccessible to cattle from the Wallace Allotment, although wild ungulates may utilize these areas. Current upland watershed condition is unsatisfactory in areas associated with pinyon-juniper overstory, and contributes to the riparian condition of areas hydrologically connected to the Wallace Allotment.

Condition	Cabin Draw Miles Surveyed/Evaluated	% of Reaches
Proper Functioning Condition	2.25	100
Condition	Hart Canyon Miles Surveyed/Evaluated	% of Reaches
Functional At Risk - Upward Trend	4.25	100

Analysis of the Alternatives

Alternative 1: Riparian areas with woody riparian species would improve, due to less impacts on the woody species from elimination of livestock. Meadow reaches would continue to improve, with graminoids likely increasing in cover and density due to reduced grazing pressure. It is estimated that recovery time for riparian areas to reach PFC or trend towards PFC time for riparian areas functioning at risk or not properly functioning would be one decade after the alternative has been fully implemented in the upper meadow reaches, and similar responses in the canyon reaches due to improved upland watershed condition.

Alternative 2: Concentrated grazing within the riparian areas by cattle would compact wet soils, reduce effect ground cover, and destabilize stream banks where the entry date is mid May, which is considered to be 20-30 days too early for the higher country. The meadows composed mainly of graminoids may decline if ungulate use is not monitored carefully and livestock are moved when reaching desired utilization levels. Riparian recovery would be expected to occur at the slowest rate of all alternatives due to effects from over utilization of forage in uplands, within the Hart C and riparian area.

Alternatives 3, 4 and 5: Woody riparian species would improve due to balancing livestock numbers with capacity. Over use of herbaceous production is likely to occur until wild ungulates are balanced with their estimated capacity. Recovery in Alternative 4 and 5 could be a little faster than 3 due to the Tillman pasture not being grazed, although no cattle grazing will occur in alternative 3 until improvements to the Tillman pasture water supply are constructed. Consequently, it is estimated that recovery time to PFC or trending towards PFC for riparian areas functioning at risk or not properly functioning on the Wallace Allotment would be one to two decades after the alternative has been fully implemented.

4. RANGE VEGETATION

Affected Environment

The major herbaceous plants in the higher elevation areas of the allotment include Arizona fescue, mountain muhly, screwleaf muhly, junegrass, squirreltail, *bromus* spp., Kentucky bluegrass, redtop bentgrass and pine dropseed. Other species include ponderosa pine, Gambel oak, aspen, mountain mahogany and elderberry; the Gambel oak is heavily hedged.

The lower elevation herbaceous plants include blue grama, threeawn, sand dropseed, needle and thread, squirreltail and western wheatgrass. Other species include cliffrose, algerita, winterfat, fourwing saltbush, sage spp., pinyon pine, juniper spp. and snakeweed; the cliffrose is heavily hedged.

The forage production on the allotment averages approximately 160 lbs per acre. Forage production is typically higher in the open areas as compared to areas having dense trees and a high canopy. Range condition is a measure of vigor, composition and density of vegetation. Range conditions vary from Very Poor to Good on the allotment, with the majority of the acres in Poor condition. Densities of

pinyon-juniper trees in the Tillman and the Butte Pastures are limiting the production of forage species and range conditions.

Range condition classifications were verified by ocular estimate during field reviews to confirm herbaceous forage production. Range condition within each allotment is displayed by acreage, pasture, and grazing capability class for each analysis area.

Range Condition	Full Capacity Range	Potential Capacity Range	No Capacity Range	Unavallable Range
Very Poor	0	6,064	423	0
Poor	34,489	0	0	0
Fair	911	0	0	707
Good	20	0	0	0
Total:	35,420	6,064	423	707*

* This acreage includes private land, mineral pits, and water.

Analysis of Alternatives

Alternative 1: This alternative would have no livestock on the allotment. Wild ungulates would have 100% of the available forage for their use. The desired allowable utilization on the allotment would be 10% use in key areas on key species. There would not be any wildlife monitoring areas on the allotment. AGFD would monitor wildlife in the key areas on the herd unit as a whole. The cool-season grasses would still be used before the range is ready.

If the utilization is kept at the 10% use level during the spring and the fall on key species, the range condition, plant vigor, composition and density of plants, and forage production would improve the fastest in the Waters, Barney and the Grama pastures. The range conditions and forage production would not increase and could decline in the Tillman and the Butte pastures, due to the lack of opening maintenance and pinyon-juniper treatments.

Alternative 2: This alternative would continue with the current permitted livestock grazing situation (440 head for 2244 AUMs) and also the same wildlife numbers. The current forage distribution provides 66% amount to livestock and 34% to wildlife, based on current forage needs. This alternative would not balance permitted livestock use with allotment capacity. This alternative would result in expected high utilization levels (55 to 75% utilization, depending on if 3 or 4 pastures are used in the rotation). The entry date for cattle would be May 16, which in most years is too early for range readiness, especially in the Wallace and the southern halves of the Grama and Barney Pastures due to the higher elevation, more snow fall and cooler temperatures during early spring which would delay plant growth.

Key areas would be heavily utilized (50 to 90%). These wildlife utilization levels would be expected in the early spring, before the range is ready, and also in the fall. Although there are currently no wildlife monitoring stations on the allotment to measure utilization, these use levels would be expected in the riparian areas and wetter meadows on the allotment, especially in the Waters Pasture. The draws and uplands within all pastures would receive heavy use on selective species by wild ungulates. The wild ungulates would tend to use the lower elevation pastures during the winter, because of high snowfall in the higher elevation. Therefore the Butte and the Tillman Pastures would receive heavy browsing of desirable browse plants during the late fall winter and early spring.

With the expected levels of grazing intensities, the range conditions, vigor, density of plants and composition of desirable plants would decline. There would also be an increase in undesirable plants, there by reducing range conditions, forage production and capacity.

Alternative 3: This alternative would permit 295 had for 1032 AUMs. The forage distribution for this allotment would be 60% of the available forage for livestock and 40% for wildlife, which would meet the desired conditions. The total utilization is expected to be between 20 and 30% averaging 25%. Pasture rotations and capacity were developed so that livestock would be moved when the utilization in the key areas was 25%. This alternative would balance permitted livestock use with allotment capacity. The entry date for livestock in this alternative would be June 1. Typically by this time period, the plants have enough growth and the soils are not saturated, that the range readiness for the allotment has been met. For the interim the grazing system would be deferred 4 pasture system until water is furnished to the Tillman Pasture, then the grazing system would become a 5 pasture rest rotation, both with 3-1/2 months of use. Rest would be a benefit for the plants, because it will provide rest from livestock grazing for 1 year. With the utilization levels, rest rotation grazing system and grazing periods most plants would complete their growing cycle and become more vigorous. The addition of the pipeline into the Tillman and part of the Butte Pastures, would allow for more of the allotment being available for use and would provide for good distribution of livestock and wildlife in these pastures.

The allotment would receive 2810 acres of pinyon-juniper treatments, mainly in the Tillman Pasture. These treatments would move VSS conditions toward desired conditions. These treatments should increase the range conditions by allowing more favorable plant species to grow. The vigor of the existing forage plants should also increase, due to lower competition. The slash remaining from these treatments would provide a microclimate for plants, provide protection to the plants from grazing ungulates and provide soil protection. This would allow desirable grass species to become established. The forage production and range conditions over time in these treatment areas should reach fair conditions, based on an expected increase in vigor, composition and density of plants.

This alternative calls for approximately 2593 acres of maintenance of existing openings, mainly in the Butte Pasture. This maintenance would increase or maintain forage production and range conditions, by not allowing pinyon and juniper trees to invade, which would reduce the vigor and density of forage plants.

The allowable use by wildlife would be 10%, on the allotment. This should be measured through the AGFD monitoring by key areas on the District (herd unit) as a whole. There would be one key area on this allotment, which would make it easier to assess actual wildlife utilization on this allotment. There would be wildlife grazing on the allotment, before the expected readiness date is met, but if wildlife utilization is held to 10% on the allotment, the improvements listed above should still occur.

This alternative would slightly benefit range conditions and forage production over the other alternatives, because of the rest rotation, pinyon-juniper treatments, opening maintenance, utilization levels and the pipeline system.

Alternative 4: This alternative would permit 295 head for 1032 AUMs. The forage distribution would be 60% of the available forage for livestock and 40% of the available forage for wildlife. The total utilization is expected to be between 20 and 30%, averaging 25%. Pasture rotations and capacities were developed so that livestock would be moved when the utilization in key areas is 25%. It would be expected that this alternative would balance permitted livestock use with allotment capacity. The livestock entry date would be July 1. Typically by this time period, plants should have enough growth and the soils are not saturated, that the range readiness for the allotment have been met. A four pasture deferred grazing system would be used for a 3 1/2 month time period. The pastures

used in the rotation would be the Grama, Barney, Butte and Waters. The Tillman Pasture would not be grazed by livestock, but would remain part of the allotment.

There would be approximately 2810 acres of pinyon-juniper treatments, mainly in the Tillman Pasture. These treatments would move VSS conditions toward desired conditions. The treatments would improve the condition of this pasture by increasing the composition, vigor, forage production and density of desirable species. The overall range conditions in these treatment areas should increase and the forage production would also increase, within a short time period. This would occur by reducing undesirable plant cover, which would allow more favorable plant species to grow. The vigor of the existing forage plants should also increase, due to lower competition. The slash remaining from these treatments would provide a microclimate for plants, provide protection to the plants from grazing ungulates and provide soil protection. This would allow desirable grass species to become established. The forage production and range conditions over time in these treatment areas should reach fair conditions, based on an expected increase in vigor, composition and density of plants. The range conditions in the Tillman Pasture should improve quicker in this alternative and alternative 5, than with any of the other alternatives.

This alternative calls for approximately 2593 acres of maintenance of existing openings. This would occur mainly in the Butte Pasture. This maintenance would increase or maintain forage production and range conditions, by not allowing Pinyon and Juniper trees to invade, which would reduce the vigor and density of forage plants.

The allowable use by wildlife would be 10%, on the allotment. This should be measured through AGFD monitoring by key areas on the herd unit as a whole. There would be one key area on this allotment, which would make it easier to assess actual wildlife utilization on this allotment. There would be wildlife grazing on the allotment, before the expected readiness date is met, but if wildlife utilization is held to 10% on the allotment, the improvements listed above should still occur.

Alternative 4 and 5 are about equal in their effects to range, both should improve range conditions and forage production on the allotment.

Alternative 5: This alternative would permit 425 head of yearlings for 1032 AUMs. This alternative would allow for the 60% livestock distribution of allowable forage and 40% for wildlife. The expected utilization levels would be between 20 to 30%, averaging 25%. Pasture rotations were developed according to the capacities for each pasture. It would be expected that this alternative would balance permitted livestock use with allotment capacity. The livestock would enter the allotment on June 1. Typically by this time period, plants should have enough growth and the soils are not saturated, that the range readiness for the allotments would be met. The pasture rotation would be a 4 pasture deferred grazing system (Waters, Grama, Barney and Butte). The Tillman pasture would be used as an opportunity pasture (meaning that if water and forage were available that use would be permitted). It is estimated that the Tillman pasture would be used 1 to 2 times in a 10 year period.

There would be approximately 2810 acres of pinyon-juniper treatments, mainly in the Tillman Pasture. These treatments would move VSS conditions toward desired conditions. These treatments should increase the range conditions by allowing more favorable plant species to grow. The vigor of the existing forage plants should also increase, due to lower competition. The slash remaining from these treatments would provide a microclimate for plants, provide protection to the plants from grazing ungulates and provide soil protection. This would allow desirable grass species to become established. The forage production and range conditions over time in the treatment areas should reach fair conditions, based on an expected increase in vigor, composition and density of plants.

This alternative calls for approximately 2593 acres of maintenance of existing openings. The maintenance would occur mainly in the Butte Pasture. This maintenance would increase or maintain forage production and range conditions, by not allowing pinyon and juniper trees to invade, which would reduce the vigor and density of forage plants.

The allowable use by wildlife would be 10%. This should be measured through AGFD monitoring key areas on the herd unit as a whole. There would be one key area on this allotment, which would make it easier to assess actual wildlife utilization on this allotment. There would be wildlife grazing before the expected readiness date is met, but if wildlife utilization is held to 10%, the improvements listed above should still occur.

Affected Environment - Vegetation

The desired conditions for Vegetative Structural Stages distribution for the pinyon-juniper woodland is 20% in each major VSS class. The Forest Plan directs that 20% is to be managed for old growth. It should be noted that this distribution is a Forestwide objective, and there is no intent to meet this on any given parcel, such as an individual allotment or even a single District. There is no attempt to address VSS distributions in ponderosa pine stands since no treatments are proposed. This analysis would be done in future ecosystem analyses. Watershed and forage production is not expected to improve in the untreated areas where canopy covers exceed 40%.

Analysis of Alternatives

Identical treatments for Wallace Allotment are proposed in Alternatives 3, 4 and 5 where changes would occur in 33% of the existing stands. Most treatments are in stands classified as VSS 5, moving them into other VSS classifications; about 58% of the stands would be retained. The following table displays the current distribution and the proposed treatments by VSS classification following treatment.

VSS Class	CURRENT		PROPOSED	
	Acres	%	Acres	%
1	3,039	19	3,039	19
2A	0	0	533	3
2B	0	0	0	0
2C	0	0	0	0
3A	34	<1	1,189	7
3B	0	0	0	0
3C	0	0	0	0
4A	1,204	6	2,174	13
4B	0	0	0	0
4C	0	0	0	0
5A	824	5	976	6
5B	7,949	50	6,210	39
5C	3,216	20	2,145	13

6. HERITAGE RESOURCES

The effects of grazing on heritage resources, and any proposed change to a more intensive grazing management system, are of concern. By letter of March 16, 1995, the Regional Forester and the Arizona State Historic Preservation Officer clarified the process for addressing this concern. Implementation of that process will satisfy compliance with the National Historic Preservation Act and

NEPA. For any of the proposed alternatives, a Forest Archeologist must be consulted if ground-disturbing range developments or treatments are proposed to ensure that the requirements of the National Historic Preservation Act are met.

Within the context of grazing projects, heritage resources may be directly affected by trampling and by construction of improvements or implementation of woodland conversion/maintenance activities. Cultural sites may be indirectly affected by natural processes, primarily sheet- or gully-erosion subsequent to loss of vegetative cover. It is noted that trampling by ungulates has been an on-going process for centuries prior to the introduction of cattle. Similarly, long term geologic cycles of aggradation and degradation have operated longer than human history. Maintenance, replacement or reconstruction of existing facilities are not considered undertakings and do not require additional survey. Of main concern, therefore, are the proposed construction and vegetation treatment projects. Potential impacts to sites, however, are easily avoided through project redesign once proper inventories are completed.

Affected Environment

More than 42% of the allotment has been surveyed, some 11% using sampling tactics and over 26% with complete inventory. There are 424 prehistoric sites identified, all of which appear to be short-term use areas; none has been formally evaluated. Known, but uninventoried, historic sites relate to early homesteading and logging.

Location of heritage sites is influenced by soil type, slope, aspect, elevation, access to water and arable land. The majority of identified sites are located on gentle slopes near water and arable land. Throughout this portion of the Districts, prehistoric sites are concentrated within the forest-woodland ecotone while historic sites appear to be more directly tied to perennial waters.

None of the known prehistoric sites are standing ruins or cliff dwellings, site types recognized as susceptible to grazing impacts. None of the sites are identified as having traditional cultural values.

Analysis of the Alternatives

Alternative 1: No livestock grazing is permitted under this alternative. Therefore, the potential for heritage resources to be directly affected by livestock trampling is eliminated. Ground cover should increase, minimizing the effects of erosion.

Alternative 2: This alternative would continue current management with forage use exceeding estimated availability. With the continuation of grazing, ground cover would be expected to decrease which would continue to cause indirect impacts to heritage resources by accelerated site deterioration from erosional processes.

Alternatives 3, 4, and 5: Under these alternatives, livestock numbers are balanced with the estimated grazing capacity. Ground cover should increase, minimizing the effects of erosion to heritage resources. The continuation of grazing at or below historic levels is not expected to result in negative effects to heritage resources.

7. AIR QUALITY

The Arizona Department of Environmental Quality has determined that the airsheds within the Districts are "in attainment" (satisfactory condition). None of the alternatives propose actions that would detrimentally affect air quality.

VI. RANGE WITHOUT LIVESTOCK OBLIGATION

This area is located generally to the south of the fenced allotments, extending across the Mogollon Rim to the Coconino National Forest on the west and the Tonto National Forest on the south. There are areas fenced to exclude livestock from Chevelon Canyon, West Chevelon Canyon, Clear Creek, and Willow Creek, all of which are included in the range without livestock obligation. This is all shown on the attached map (Appendix H).

The area encompasses 49,589 acres within portions of T13, 14, and 15N, R13 and 14E, G&SRM. Elevations range from 6,500 to 7,900 feet. The topography is generally characterized by flat to moderate ridges that run north to south, but steep canyons occur along the major drainages. The area is generally covered with trees, the dominant overstory species being ponderosa pine and mixed conifer, with pockets of aspen and riparian. Management emphasis areas include Forested Land, Woodland, Water, Developed Recreation Areas, and Riparian.

The following table summarizes the range condition analysis (figures are in acres).

Range Condition	Full Capacity Range	Potential Capacity Range	No Capacity Range	Unavailable Range
Very Poor	14,331	5,021	5,305	466
Poor	35,102	0	0	0
Fair	137	0	0	0
Good	19	0	0	0
Total	49,589	5,021	5,305	466*

* This acreage includes private land, mineral pits, and water.

There are no actions proposed for this area.

VII. CUMULATIVE ENVIRONMENTAL CONSEQUENCES

Cumulative effects consider past, present and foreseeable future actions. The boundaries of the cumulative effects analysis were determined based upon the issues identified and the direct and indirect effects upon each resource. There are no known significant cumulative effects associated with the proposed actions. Following is the cumulative effects analysis for the four allotments.

Social & Economic - The Chevelon portion of the Chevelon/Heber Ranger Districts and Coconino County were used at two different scales to examine cumulative effects for social and economic factors. The four allotments discussed in this environmental assessment make up all the allotments with livestock obligations, thus cumulative effects on the district scale is largely a summation of effects discussed in previous sections.

The current permits (Alternative 2) authorized 1930 cattle for 3.5 to 5 months. This generates approximately nine jobs and \$3,200 in payments to the county. All other alternatives would result in a decline from these numbers. The current permits also have the potential to generate almost \$225,000 in gross income from Forest lands, although this figure has probably been less over the past ten years due to range conditions and drought. Coconino County is a tremendously large county with a large land base. The county has experienced a large reduction in payments to the county from 25% funds over the past ten years largely due to reductions in timber sale receipts.

All the allotments are within Coconino County which, in 1992, had approximately 200 cattle operations. Only 44 operations had greater than 100 head. All the operations in this analysis are medium or larger (>100 head). These type of operations tend to be less dependent on National Forest permits for their livelihood and should be able to continue ranching even at a reduced level. Still the

total loss of grazing on Forest lands coupled with a marginal operation on private land may further entice the permittees to seek other options for their land or require family members to seek off-ranch employment.

The grazing alternatives all provide possibilities for the ranching culture to continue to exist, although at varying levels. If similar alternatives are selected across the Forest, the traits associated with the ranching life-style will continue, although there may be some threat to the customs and culture that have been the keystone to some of the small rural communities for the past century. Even under the current situation the ranching culture is not as dominant as it has been in the past.

The more diverse the economic and social underpinnings of a region, the more stable the region will be. Coconino County has a relatively diverse economy, with the service sector being the largest, thus a small reduction in one sector will not have significant effects on the overall economic sector. This can also be said of Navajo, Gila, and Maricopa counties where the permittees reside and do a portion of their business.

Wildlife - In general, wildlife would benefit from the action alternatives that balance use with capacity. There would not be an improvement and there could be a possible decline in wildlife conditions if use is not balanced with capacity

Watershed, Water Quality & Soils - No long term negative effects to soil productivity, water quality or quantity are expected with the implementation of the preferred alternatives of the Chevelon Canyon, Clear Creek, Limestone and Wallace Allotments. Although the monitoring site in Chevelon Canyon at Winslow does not fully support designated uses at this time (ADEQ 1998), the distance between the Forest and monitoring site, along with extensive reductions in acreage under timber sale activity, extensive livestock grazing reductions, intensive management of ungulates along sensitive streams, and reduction of road- and recreation-generated sediment are expected to cumulatively reduce impacts to Chevelon Creek and eventually to the Little Colorado River. Livestock number reductions and excluded areas would result in less competition with wild ungulates, which would further improve soil productivity, water quality and timing of runoff.

Riparian Areas - No long term negative effects to recovery to or maintenance of Proper Functioning Condition of riparian areas within the 4 allotments is anticipated with the implementation of the preferred alternatives listed above. Livestock grazing is currently impacting riparian condition, primarily in upper watersheds and meadows.

Range - Under the Action alternatives which balance use with capacity, there would be an improvement in range conditions. For those Action alternatives which do not balance use with capacity, there would not be an improvement, and likely a decline in range conditions.

Vegetation - Vegetation treatments proposed under the Action alternatives would increase or maintain forage production and watershed and range conditions. The minimum of 20% of woodland stands retained as VSS 5 would be met. There are no foreseeable future woodland treatments proposed.

Heritage Resources - The effects attributable to livestock grazing are identical in nature to those which have been occurring for centuries. The potential effects of proposed woodland treatments and/or structural range developments are administratively controllable. None of the alternatives propose actions that would detrimentally affect heritage resources.

Commercial Timber - The Nagel, Wilkins Canyon, Limestone and Upper Willow areas are scheduled for analysis within the next five years; it is expected that timber sales and prescribed burning projects would be proposed. Reducing tree densities and burning slash and litter would likely

increase the amount of herbaceous ground cover which would improve watershed, range and habitat conditions. The proposed grazing actions should have little or no effect on harvesting or burning.

Fuelwood - Firewood cutting occurs in the pinyon-juniper woodlands; in ponderosa pine and mixed conifer forests it is limited to dead and down trees. The woodland treatments proposed under various Action alternatives would enhance opportunities by making more fuelwood available, but otherwise the proposals would have little effect.

Recreation - Recreation within the allotments is limited to the developed campgrounds at Bear Canyon Lake, Chevelon Canyon Lake and Chevelon Crossing, and to dispersed opportunities for hiking, mountain bike and horseback riding, nature watching/photography, and game hunting. Fence construction, proposed under various Action alternatives, could pose a slight physical impediment to some of these activities.

Air Quality - The Arizona Department of Environmental Quality has determined that the airsheds within the Districts are "in attainment" (satisfactory condition). None of the alternatives propose actions that would detrimentally affect air quality. Cumulatively, none of the AMPs for the Forest propose additional actions that would have adverse effects to air quality.

VIII. AGENCIES, GROUPS, AND PERSONS CONSULTED

The Forest made extensive efforts to determine Key Issues, concerns, and Desired Future Conditions that might affect the Environmental Assessment process. An Interdisciplinary Team developed the preliminary scoping documentation for the allotments, which include Clear Creek, Chevelon Canyon, Limestone, and Wallace. Some 135 members of the public, interested private groups, grazing permittees, tribal and county governments, and state and federal agencies were sent the scoping report. The mailing list is part of the Project Record. Concerned responses were addressed through written replies, telephone conversations, and/or informal meetings.

A number individual meetings were held with the grazing permittee to discuss management issues and proposed actions. These are documented in the Project Record.

The following individuals participated in all or some of the process and contributed information and views to the analysis:

Mike O'Haco, Grazing Permittee, Clear Creek Allotment
Raymond Fitzgerald, Grazing Permittee, Limestone Allotment
Doy Reidhead, Grazing Permittee, Wallace Allotment
Bob Ellsworth, Previous Grazing Permittee, Chevelon Canyon Allotment
Hal Earnhardt, Current Grazing Permittee, Chevelon Canyon Allotment
Bruce Palmer, US Fish and Wildlife Service
Gary Hase Jr., Arizona State Lands Department
Arizona Department of Environmental Quality
Arizona Game and Fish Department
Kendell Hughes, Range, USFS, Chevelon/Heber Ranger Districts
Noe Gonzalez, Range, USFS, Chevelon/Heber Ranger Districts
Bruce Donaldson, Heritage, USFS, Lakeside Ranger District
Brian Dykstra, Wildlife, USFS, Chevelon/Heber Ranger Districts
Chris Nelson, Watershed & Soils, USFS, Supervisor's Office
David Seesholtz, Economics, USFS, Supervisor's Office

The following made up the Interdisciplinary Analysis Team:

Kendell Hughes, Team Leader (7/99 - present), Range Staff - USFS, Chevelon/Heber RD
Clay Baxter, Team Leader (through 6/99), Range Conservationist - USFS, Lakeside RD
Steve Richardson, GIS/Data Base Manager - USFS, Chevelon/Heber RD
Brian Dykstra, Wildlife Biologist - USFS, Chevelon/Heber RD
Gloria Robbins, Writer/Editor (through 12/98) - USFS, Chevelon/Heber RD
Bruce Donaldson, Writer/Editor (1/99 - present) - USFS, Lakeside RD
Sherrie Adams - Arizona Game and Fish Department

APPENDIX A

**POTENTIAL ISSUE CONSIDERED
BUT NOT ANALYZED IN DETAIL**

A determination needs to be made whether to allocate grazing capacity on lands that have been acquired by the Forest since implementation of the 1987 Forest Plan. The potential issue centers around the location of these acquired lands in relationship to big game winter range. Acquired lands in critical big game winter range are not to be grazed by domestic livestock unless their inclusion in a grazing system better meets the needs of big game objectives (Forest Plan, pg. 75-1). There is one acquisition that has occurred.

Allotment	Acres	Legal Description	Date Acquired	Critical Winter Range
Clear Creek	94	Sec. 6, T14N, R13E	Nov, 1987	Yes

The parcel is on the Clear Creek Allotment, and is mostly within PC or NC range with little or no capacity. The calculation of forage for the determination of livestock capacity was made after providing 40% of the available forage for the estimated population of elk and deer. Therefore, the minor amount of livestock grazing that may occur on this parcel is determined not to be an issue for this analysis so long as the allowable use levels are not exceeded.

APPENDIX B

ALTERNATIVE CONSIDERED BUT NOT ADOPTED

One alternative was prepared for the "area without livestock obligation." This area is within the Chevelon analysis area. The alternative, as proposed, included no livestock grazing but did have three proposals for wildlife projects, two water-related and one for fencing. This alternative was dropped from consideration because there were no identified needs to address at this time.

APPENDIX C

BEST MANAGEMENT PRACTICES

In 1972, the Federal Water Pollution Control Act (FWPCA) Amendments became law. The Clean Water Act (CWA) amended the original act, with further modifications occurring with the Reauthorization Act of 1987. Together, these laws provide the authority to manage water quality on Forest lands with the objective to restore and maintain the chemical, physical and biological integrity of the nation's waters.

Section 319 of the amended CWA provides authority for each state to prepare a nonpoint source (NPS) water quality management program that includes cooperation with federal agencies. As part of that cooperation the states have recognized the Forest Service as a designated management agency for NPS water quality management. They have recognized our Integrated Resource Management (IRM) process for developing Best Management Practices (BMPs) to control NPS water pollution on Forest lands.

The Arizona Department of Environmental Quality, Watershed Unit (formerly Nonpoint Source Unit) will provide water quality certification for fully finalized projects when the following information has been submitted for their review:

- 1) A detailed map showing exact location of the project;
- 2) A precise description of the activities associated with the project; and,
- 3) A water quality management plan, which shall include:
 - a) An identification of rivers, streams or water bodies which will, with reasonable probability, be effected by the activities;
 - b) The management practices (BMP/Guidance Practices) to be implemented by the owner/operator to maintain compliance with Surface Water Quality Standards; and,
 - c) A monitoring plan to document implementation of the Water Quality Management Plan and compliance with Surface Water Quality Standards.

The information required items above can be found within the environmental assessment, monitoring plan and project record for allotment analysis. This satisfies the conditions of the Intergovernmental Agreement between the State of Arizona and USDA Forest Service, Southwestern Region, 1991 for projects affecting the waters of the United States.

Connectivity to stream segments identified in the 1998 Arizona Water Quality Assessment shall be established. Allotments with grazing activities that affect stream segments that are considered non-attaining of water quality standards for designated uses by the State should be considered a high priority for completion.

A BMP is a practice or combination of practices that are determined (by a state or designated area-wide planning agency) through problem assessment, examination of alternative practices, and appropriate public participation to be the most effective, practicable (including technological, economic, and institutional considerations) means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals.

A handbook was prepared to assist the owner/operator of a Rangeland Livestock Grazing Activity with the selection of best management practices (BMPs) for voluntary compliance with A.R.S. 49-202.01. This draft publication was developed by the NPS Technical Advisory Committee Group on Livestock Grazing Activities. The following are excerpts from this handbook that relate directly to the allotment management plans developed on the Forest.

1. The goal of maintaining or improving the quality of water should be included in management plans for livestock grazing activities. While the goal of the Clean Water Act is to improve water quality, some waters have acceptable quality which should be maintained.
2. The location, timing and intensity of livestock grazing activities should be controlled with objectives of achieving soil cover to prevent accelerated erosion and to protect water quality.
3. Structural range improvements, such as fences, water development, trails and corrals, should be planned, constructed and utilized in a manner to enhance or maintain water quality.
4. Land treatments to manage vegetation or practices to reduce erosion should be planned, implemented and maintained to minimize adverse impacts on water quality.
5. Livestock management activities, such as parasite control, feeding and salting, should be done in a manner to protect water quality.

Specific activities to maintain or improve water quality for the allotments follow:

1. *Brush or woodland management treatments*, if implemented to improve soil quality, should be accomplished in a manner that will retain at least 5 tons/acre of treatment-generated large woody debris (3-inch and larger) dispersed evenly across the site. Ground cover within two years of treatment should be at or above the tolerance ground cover needed to protect soil productivity and hydrologic function. TES map units 51, 53 and 54 require 40% effective ground cover to maintain hydrologic function of the soil. Grazing management or maintenance measures should be applied to enhance the success of the treatment. This may involve two growing seasons of rest to let herbaceous cover become established. Use of temporary fencing or modified rotation of livestock may be required. Utilize BMP implementation form for mechanical treatment to evaluate land treatments with regard to potential water quality impacts.
2. *Prescribed fire treatments* should be applied only under conditions where the intensity and rate of spread of the fire are controlled. To protect soil productivity, fire intensity should be low to moderate to prevent loss of soil nutrients, organic matter and the alteration of soil physical properties, such as structure and pores, that would reduce infiltration of water into the soil. Utilize BMP implementation and effectiveness form for prescribed fire to evaluate the treatment with regards to potential water quality impacts.
3. *Seeding projects* should be implemented in areas where native seed is scarce, or in areas where eroding upland and riparian areas are contributing directly to sedimentation in stream channels, especially in areas used as filter strips to mitigate other management practices. Provide a period of protection from grazing to promote establishment of herbaceous plants.
4. *Planned grazing systems* should be implemented to a) maintain or improve plant cover for the purpose of properly using the available forage, b) increase efficiency by uniformly using all suitable parts of each grazing unit, c) reduce erosion and improved water quality, d) ensure a supply of forage throughout the grazing season, e) increase production with improved quality of forage, f) enhance wildlife habitat, g) promote flexibility in the grazing program, and h) buffer the adverse effects of drought. Proper stocking and improved distribution of cattle should be major considerations for evaluating effects of implementing a system.
5. *Grazing intensity* should maintain enough cover to protect the soil or improve the quantity and quality of desirable vegetation. Allowable use should be adjusted by range condition class on fully and potentially capable land. Key grazing areas should be monitored to determine when cattle should be moved to prevent overuse.

6. *Salt* should be utilized to improve livestock distribution. Salt a reasonable distance away from water or natural congregating areas such as roads, trails, and saddles in hills, but avoid key areas. Move salt when distribution objectives are not being met or to correct localized overuse problems.

7. *Access roads* for the maintenance of grazing improvements should be engineered to facilitate reasonable control and disposal of water, to control erosion, and to make the best possible use of topographical features. Access roads should not be placed along or parallel to the stream channel within the streamside management zone. Crossing should be perpendicular to the stream and the number of crossings should be minimized. Road gradients should not exceed 10% except for short lengths where more acceptable design criteria are prevented. All cuts and fills should be stabilized. Drainage structures should be engineered to provide adequate surface drainage to meet site specific criteria and runoff conditions. Culverts, bridges or grade dips should be provided at all natural drainage ways. Roadside ditches should be engineered to provide surface drainage for the roadway and deep enough to serve as outlets for subsurface drainage. Drainage channels should be sited on stable grades or protected with structures or linings for stability. Rolling dips or water bars should be incorporated into design criteria to control surface runoff; these should be maintained periodically to ensure proper function. Structures should be placed on all water bar or rolling dip outlets to trap sediment and slow erosive force of water. Lead-out ditches should not be placed directly into water courses. Water quality should be protected during and after construction by erosion control facilities and maintenance. Filter strips, sediment and water control basins, as well as other accepted conservation practices should be used and maintained as needed.

Monitoring the condition of land, water, vegetation or compliance with management plans for a project should meet the intent of the water quality certification rules. The following are examples of monitoring (I = Implementation, E = Effectiveness) currently used on National Forests in Arizona:

- Production/utilization studies (I, E).
- Range improvement construction and inspections (I, E).
- Permittee compliance, adhering to annual operating plan requirements (I).
- Contingencies for drought established and implemented (I).
- Road maintenance inspections (I, E).
- Stream channel surveys (for example, T-WALK, GAWS, Region 1 methodology) (E).
- Parker 3-step monitoring (E).
- Daubenmire transects (E).
- Paced transects (E).
- Ocular ground cover estimates (E).
- Soil condition evaluation (E).
- Proper Functioning Condition evaluations at specified intervals (E).
- Best Management Practices Implementation and Effectiveness (I, E).

APPENDIX D

MONITORING PLAN SUMMARY

There are three phases of monitoring: implementation, effectiveness, and validation.

The purpose of **implementation monitoring** is to ensure that the actions described in the decision document are implemented as described. It will ensure that proper scheduling of pasture use is implemented through the annual operating plan. Also, it will ensure that any required changes in permitted livestock numbers is scheduled.

The purpose of **effectiveness monitoring** is to ensure that management standards are met. It will ensure that range readiness and allowable herbaceous forage utilization standards are met.

Range readiness checks may be conducted 15 days prior to the scheduled entry date. Plants will be determined ready for grazing by measuring new leaf growth on key species. Soils will be firm, and moisture will be at or below field capacity. The actual forage utilization on key herbaceous forage plants will be noted at key areas to monitor wild ungulate use.

Key forage species may include Kentucky bluegrass, blue grama, brome, squirreltail, junegrass, sedge, spike muhly, mountain muhly Arizona fescue, and western wheatgrass. This list may be adjusted as necessary to reflect those species receiving the most grazing pressure at a particular time of year.

Grazing utilization is a point-in-time measurement of herbaceous forage removed by a grazing animal. Forage utilization will be measured on key forage species in keys areas. Methodology is described in FSH 2209.21.

Livestock Monitoring Schedule: Common to Alternative 2 for all allotments is monitoring that would occur once per year.

Common to Alternative 3 for all allotments is the following monitoring schedule: (1) The first forage monitoring will occur just prior to livestock entering a pasture. This will determine wild ungulate forage use before livestock entry. (2) The next monitoring will occur at the midpoint of the scheduled use period for each pasture. Livestock distribution will be noted. Midpoint monitoring will determine whether the anticipated forage utilization will be met. Based on results, additional monitoring surveys may be necessary to ensure that the maximum level of use is not exceeded. If utilization is within 5% of the desired level, the permittee will be asked to begin to move his livestock to the next pasture. (3) The final monitoring will occur in each pasture at the end of the growing season (late September through October). This will determine the total forage utilization that occurred as a result of both livestock and wild ungulates. If allowable use is exceeded, adjustments may be made to livestock numbers the following year. (4) Monitoring data will be provided to the grazing permittee, AGFD, and USFWS.

Common to Alternative 4 for all allotments and Alternative 5 for the Chevelon Canyon, Clear Creek and Wallace Allotments is monitoring that would occur once per pasture.

Wild Ungulate Monitoring: The AGFD will conduct wild ungulate forage monitoring at existing sites which exclude livestock. These site will be used to determine forage utilization that is occurring in key areas across the game management unit by wild ungulates. Monitoring will assist the Department in setting big game population objectives.

Best Management Practices effectiveness monitoring is used to gauge possible causes, degree and duration of effects on the beneficial uses of water. A copy of the Standard Form is in the Project Record.

The purpose of **validation monitoring** is to determine if projected changes have occurred following project implementation. Changes in plant composition, vigor, and density will be measured in key areas in an effort to determine if movement toward desired conditions is occurring. Measurements will be made by reading the Parker 3-Step Clusters on the allotment.

APPENDIX E

STANDARD MITIGATION MEASURES

All allotments under analysis on the Chevelon/Heber Ranger Districts share the following proposed mitigation measures. Mitigation measures pertain to actions recommended to reduce or resolve any effects incidental to the proposed project activities.

The measures shown below will be followed for all action alternatives. Most have been used on many previous projects and are considered to be very effective in reducing environmental impacts.

Mitigation Measure	Purpose	Effectiveness
Archeological approval will be obtained prior to ground-disturbing activities	Protection of heritage resources	Almost always effective
Slash generated from woodland control projects will be treated in accordance with Best Management Practices	Create habitat for small animals (prey-species) and hiding-cover for large ungulates	Usually effective
Fences will be built in conformance with Forest standards: the bottom wire will be smooth and a minimum of 20" from the ground; the top wire will not exceed 42" from the ground; and wooden stays will be used	Increase the longevity of the fence, and accommodate the movement of elk, deer and pronghorn antelope	Mostly effective
Soil and water best management practices (BMPs) will be followed (see Appendix C)	Reduce erosion and sedimentation	Almost always reduces impacts
Retention of all existing snags and recruitment of potential snags in treatment areas	Enhance wildlife habitat	Mostly effective

APPENDIX F

GLOSSARY

ALLOTMENT: A designated area of land available and authorized for livestock grazing, or one that has the potential for livestock grazing in the future.

ALLOTMENT MANAGEMENT PLAN: A long-term (generally 10 years) operating plan which describes management objectives and the management of livestock grazing on public land prepared in consultation with the permittee(s) involved.

ANIMAL MONTH: A month's tenure on the range by one animal of any class.

ANIMAL UNIT: For the summer/fall period, one mature cow with a calf less than six months of age, or the equivalent.

ANIMAL UNIT MONTH: The amount of forage necessary for the sustenance of an animal unit or its equivalent for a period of one month.

ANNUAL PLANT: A plant that completes its life cycle and dies in one year or less.

AVAILABLE FORAGE: That portion of the herbaceous production on capable range that is usable by grazing animals (ungulates) without detriment to the plant. The ungrazed portion of the plant also provides a number of important functions such as soil cover, fine fuel for periodic fire, and habitat for small animals. Also see Range Capability Classes and Total Herbaceous Production.

BEST MANAGEMENT PRACTICE (BMP) : A practice or combination of practices, approved by the Arizona Department of Environmental Quality, that is determined to be the most effective and practicable (technologically, economically, and institutionally) means of reducing the amount of pollution from nonpoint sources to a level compatible with the achievement of water quality goals.

BROWSE: That portion of leaf and twig growth on shrubs, woody vines and trees available for animal consumption.

CARRYING CAPACITY (domestic or wild ungulate): The maximum stocking rate possible which is consistent with maintaining or improving vegetation or related resources. It may vary from year to year within the same area due to fluctuating forage production caused by varying climatic factors.

CLASS OF LIVESTOCK: Description of age and/or sex for a particular kind of livestock; cow, bull, yearling, calf, ewe, ram, and lamb are examples.

COOL SEASON SPECIES: In the Southwest, a species which accomplishes the major portion of its growth during the spring using residual winter moisture.

COW-CALF OPERATION (c/c) : One for which breeding cows comprise most of the range herd. The emphasis is on production of weaned calves, which are usually sold, and not upon readying livestock for market.

CROSSING PERMIT: Authorization to move livestock across public land for any legitimate purpose.

DRIVEWAY: An area used for driving or moving sheep by herders across the Forest. This is usually, but not always, associated with permitted sheep on the Forest.

ENCLOSURE: An area fenced to confine animals to an area; corrals and holding traps are examples.

ENDANGERED SPECIES: Any species, designated by the USFWS under provisions of the Endangered Species Act, which is in danger of extinction throughout all or a significant portion of its range.

ENVIRONMENTAL ASSESSMENT (EA): A concise public document for which a federal agency is responsible. An EA serves to (1) briefly provide enough evidence and analysis for determining whether to prepare an environmental impact statement (EIS) or a Finding of No Significant Impact (FONSI); (2) aid an agency's compliance with the National Environmental Policy Act (NEPA) when no EIS is needed; and (3) facilitate preparation of an EIS when one is needed.

EXCLOSURE: An area fenced to exclude ungulates.

FORAGE: All browse and non-woody plants that are available and acceptable to grazing animals or that may be harvested for feeding purposes. Usually measured in pounds, the weight may be expressed as either green, air-dried, or oven-dried. The term may also be modified as to time of production such as annual, current year, or seasonal forage production.

FORAGE USE:

Proper use, for the purposes of range analysis, is defined as the degree of grazing use plus trampling damage that an individual species can sustain during the growing season while maintaining its vigor, forage production, and reproductive capacity. Proper use is based on morphological and physiological characteristics of each individual species.

Allowable use is defined as (1) the degree of utilization considered and attainable on various parts of an allotment considering the present nature and conditions of the resource, management objectives and levels of management; or (2) the amount of forage planned to be used to accelerate range improvement.

FORB: Any broad-leafed non-woody plant, other than grasses or grasslike species.

FULL CAPACITY RANGE (FC) : See Range Capability Classes.

GEOGRAPHIC INFORMATION SYSTEM (GIS) : A type of information management system which provides for entry, storage, manipulation, retrieval and display of spatially oriented data.

GRAZING CAPACITY: The total number of animals which may be sustained on a given area based on proper use of the total forage resources available.

GRAZING PERMIT: Official written permission authorizing the privilege to graze a specific number, kind or class of livestock for a specified time period on a defined rangeland area.

GRAZING SEASON: A period of grazing to obtain optimum use of the forage resource. On public lands, it is the established period for which grazing permits are issued.

GRAZING SYSTEM: A systematic sequence of grazing use and nonuse of an allotment to meet multiple use goals by improving the quality and amount of vegetation.

Deferred system: Deferment involves the delay of grazing in a pasture until the seed of key forage species is mature (seed set). Deferment may be for cool season species, for warm season species, or both.

Rest system: Rest is distinguished from deferment in that the range receives nonuse for a full year rather than just during the plant growth period.

Rotation: Rotation involves the movement of livestock from one pasture to another on a scheduled basis.

GROUND COVER: The percentage of material, other than bare ground, covering the land surface. It may include live and standing vegetation, litter, gravel, cobbles, stones, boulders and bedrock.

GUIDELINE: A statement of recommended procedure for achieving an objective.

HEDGED: A term used to describe the appearance of woody plants that have been repeatedly browsed so as to appear artificially clipped.

HERBACEOUS: Non-woody vegetation, such as grasses, grasslike plants, and forbs. See Total Herbaceous Production.

INTENSIVE GRAZING: Grazing management that controls distribution of livestock and duration of use on the range, usually by fences, so parts of the range may be rested during the growing season.

INTERDISCIPLINARY ANALYSIS TEAM (IDT) : A team of individuals with different areas of expertise, formed to provide a coordinated, integrated information base for overall land use planning and management.

KEY AREA: A relatively small portion of a pasture or management unit selected because of its location, use, or grazing value as a monitoring point for grazing use. Key areas, if properly selected, will reflect the overall acceptability of current grazing management over the pasture or management unit as a whole.

KEY SPECIES: Forage species whose use serves as an indicator of the degree of use of associated species.

LIVESTOCK: Domestic ungulates such as cows, sheep and horses.

NEPA ANALYSIS: The analysis that is done during preparation of documents required under the National Environmental Policy Act, particularly environmental assessments (EA) and environmental impact statements (EIS).

NO CAPACITY RANGE (NC) : See Range Capability Classes.

NONUSE: The absence of permitted livestock grazing on current year's forage production.

OVERGRAZING: Grazing which exceeds the recovery capacity of an individual species or of the plant community; often results in a deteriorated range.

OVERSTOCKING: Placing a number of animals on a given area that will result in overuse if continued to the end of the planned grazing period.

OVERUSE: Utilizing an excessive amount of the current year's growth which, if continued, will result in range deterioration.

PASTURE: Land that is separated from other grazing areas by a fence and/or natural barrier.

PERENNIAL PLANT: A plant that has a life span of two or more years.

PERMITTEE: One who holds a permit to graze livestock on state, federal or certain privately owned lands.

POTENTIAL CAPACITY RANGE (PC) : See Range Capability Classes.

PRESCRIBED BURNING: The use of fire as a tool to achieve a management objective on predetermined area under conditions where the intensity and spread of the fire are controllable.

PROPER FUNCTIONING CONDITION (PFC) :

Riparian-Wetland Areas: Riparian-wetland areas are functioning properly when adequate vegetation, landform and/or large woody debris are present to dissipate stream energy associated with high water flows. A properly functioning area will serve to 1) reduce erosion and improve water quality; 2) filter sediment, capture bed load, and aid in floodplain development; and 3) improve flood-water retention and ground-water recharge. The functioning condition of riparian-wetland areas is a result of interaction among rocks, soil, water and vegetation. PFC determinations are not a measure of fish habitat quality.

Uplands: Uplands function properly when biota, ground cover and soils promote the production of vegetation and the capture, storage and safe release of moisture. The functioning condition of uplands is a result of interaction of rocks, soil, climate, biological activity, and landform.

PUBLIC PARTICIPATION: A procedure providing the opportunity for individuals or interest groups to identify issues and concerns associated with the management of public lands; see Scoping.

QUICK-SILVER: A computerized project analysis tool for use by Forest Service managers to predict the economic performance of long term investments. Standardized, established costs and benefits are used to determine project benefit : cost ratios -- for example, the cost of constructing a pasture fence may be weighed against the value of additional AUMs for that pasture. Many benefits are not directly quantifiable -- for example, the construction of an enclosure around a riparian area may ultimately translate into improved watershed conditions; while such improvements are obviously beneficial, how to measure their dollar value is less obvious. Forest Service direction is to use established values only; in their absence no monetary benefit will be established.

The efficiency analysis estimates the rate of return for the projected expenditures by the participating parties. Measures used to conduct an investment analysis include: the present value of benefits, the present value of costs, the present net value, and the benefit : cost ratio. To use an Allotment Management Plan as an example, the measures would be defined as follows:

Present value of benefits represents the present value of grazing on the allotment over the next 10 years, along with the present value of the grazing fees over the next 10 years .

Present value of costs represents the present value of maintenance and range improvements, along with the present value of the costs of range inspections, permit administration, monitoring, and materials for structural improvements.

Present net value represents the present value of benefits minus the present value of costs.

The *benefit : cost ratio* represents the present value of benefits divided by the present value of costs.

RANGE: Open, wooded and/or forested lands which support an understory or periodic cover of herbaceous or shrubby vegetation amenable to certain range management principles or practices.

RANGE CAPABILITY CLASSES:

Full Capacity (FC): Those areas which can be used by grazing animals under proper management without long-term damage to the soil resource or plant community. They are normally on stable soils.

Potential Capacity (PC): Areas which can be used by grazing animals under proper management or have the potential to become stable forage producing sites. The site stability often is impaired, or range improvements are not adequate under existing conditions to obtain the necessary grazing animal distribution. These areas often produce 50 pounds or less of air-dried forage due to dense tree canopies. When determining grazing capacity, conservative allowable use assignments may be made on these sites.

No Allowable Capacity or No Capacity (NC): Areas that are incapable of being grazed by domestic livestock without long-term damage to the soil resource or plant community under reasonable management goals. Examples include areas under natural conditions that are not capable of producing vegetation, soils that are not capable of producing more vegetation cover than is needed to prevent excessive erosion, and slopes over 80 percent. Grazing capacity will not be assigned to these sites even though some livestock use may occur.

RANGE CONDITION: A subjective expression of the status or health of the vegetation and soil relative to their combined potential to produce a sound and stable biotic community. Soundness and stability are evaluated relative to a standard that encompasses the composition, density, and vigor of the vegetation and physical characteristics of the soil (FSH 2209.13 Sec. 40.5).

RANGE IMPROVEMENT: An activity or program designed to improve production of forage, change vegetation composition, control patterns of use, provide water, stabilize soil and water conditions, or provide habitat for livestock and wildlife. Improvements, sometimes called range developments, may be structural or nonstructural.

Structural Improvement: Any development requiring placement or construction in order to facilitate management or to control distribution and movement of animals. Such developments may include fences, wells, troughs, pipelines, and cattleguards.

Nonstructural Improvement: Any treatment which improves resource condition and/or forage production. Such developments may include seeding, prescribed burning, or plant control through chemical, mechanical, or biological means.

RANGE INVENTORY: The systematic acquisition and analysis of resource information needed for planning and managing rangeland. The information acquired through range inventory; also called range analysis.

RANGELAND: An area on which the historic climax vegetation was predominantly grass, grasslike plants, forbs and/or shrubs.

RESEARCH NATURAL AREA: An area set aside to preserve a representative sample of an ecological community. This is usually done primarily for scientific and educational purposes.

RIPARIAN ECOSYSTEM: A transition between the aquatic ecosystem and the adjacent terrestrial ecosystem, identified by soil characteristics and distinctive vegetation communities that require free or unbound water. Riparian ecosystems often occupy distinctive landscapes, such as flood plains, alluvial benches, or wet meadows.

SCOPING: An early and open public process for determining the scope of issues to be addressed in an environmental assessment and for identifying the significant issues related to a proposed action.

SEASON OF USE: The interval during which livestock grazing is permitted on a given range area, as specified in the grazing permit.

SHRUB: A plant that has persistent, woody stems and relatively low growth; generally, one that produces several basal shoots instead of a single bole.

SOIL MOISTURE: The water content stored in the interspace of the soil.

STANDARD: Minimum acceptable level used to measure success in achieving a resource objective.

STOCKING: The act of placing livestock on rangeland.

STOCKING RATE: The number of specific kinds and classes of animals grazing or utilizing a unit of land for a specified time.

SUMMER RANGE: An area that is accessible to livestock and wild ungulates during the summer grazing season; may include the fall period as well.

TERM PERMIT: A document authorizing grazing for a stated number of years (usually 10), as contrasted to a temporary permit which provides for year-to-year authorization.

THREATENED SPECIES: Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, as designated by the US Fish and Wildlife Service under the Endangered Species Act.

TOTAL HERBACEOUS PRODUCTION: The sum of all herbaceous growth across a range. This includes range not capable for grazing, such as No Capacity areas, as well as capable range (Potential Capacity and Full Capacity areas). While that part of herbaceous production that is grazed by ungulates is called forage, not all herbaceous production should be consumed or considered for forage because 1) it may be in non-capable range areas where, by direction (FSH 2209.21 Sec. 23.3), the growth is not counted toward livestock capacity, and 2) on both capable and non-capable range, the growth provides other ecological functions such as watershed protection, soil development, and structure for small animals and insects. *Available forage* is that portion of herbaceous production in capable areas that is appropriate for consumption by ungulates. See Available Forage and Range Capability Classes.

UNGULATE: Any hoofed animal, including ruminants such as cattle, deer, elk, and antelope.

UNPALATABLE SPECIES: Plant species that are not readily eaten by animals.

UPLANDS: Land at higher elevation, in general, than the alluvial plain or low stream terrace; land above the foot slope zone of the hill slope continuum. Uplands are all those lands outside of the riparian-wetland and aquatic zones.

UTILIZATION: The proportion of a year's forage production that is consumed or destroyed, for instance through trampling, by grazing animals.

WARM SEASON SPECIES: In the Southwest, a plant which accomplishes most or all of its growth after the summer rains begin, but is usually dormant in the winter.

APPENDIX G

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WATERSHED: A region or area bounded peripherally by a water parting feature, such as a ridge, and which ultimately drains to a single watercourse or body of water. The term encompasses the entire upland, or catchment, area as well as the drainage net.

WATERSHED HEALTH: The term is inclusive of a wide variety of related concepts. The health of a well-functioning watershed can be assessed by many characteristics. Watersheds that fail to function properly and produce abnormally high flows or large amounts of sediment are caused by a variety of factors, some of which may be cumulative, and some compensating. A properly functioning watershed is characterized by low flood peaks, a stable channel and bedload, low soil erosion, high ground cover in litter and live plants, high water infiltration rates, and stable riparian areas with floodplains. Riparian condition is therefore directly dependent on, and a part of, watershed health. When any influencing factor is altered, changes in watershed health may be expected. For example, if a fire removes plant litter and live plants, water is able to run off soil surfaces unimpeded, which produces high peak flows in the stream channel along with substantial sediment loads. As a result the riparian area may destabilize, leading to further erosion and sedimentation.

WETLANDS: Those areas that are inundated or saturated by surface- or groundwater at a frequency and duration sufficient to support a prevalence of vegetation adapted for life in saturated soil conditions.

WINTER RANGE: Range that is suitable for grazing during the winter months when most plants are dormant; may include the spring as well.

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APPENDIX H

FIGURES

- Figure 1: General Location Map
- Figure 2: Chevelon Canyon Allotment proposed treatments Alt. 3 & 5
- Figure 3: Chevelon Canyon Allotment proposed treatments Alt. 4
- Figure 4: Chevelon Canyon Allotment proposed pasture configuration Alt. 5
- Figure 5: Clear Creek Allotment proposed treatments Alt. 3
- Figure 6: Clear Creek Allotment proposed treatments Alt. 4 & 5
- Figure 7: Limestone Allotment proposed treatments Alt. 3
- Figure 8: Limestone Allotment proposed treatments Alt. 4
- Figure 9: Wallace Allotment proposed treatments Alt. 3
- Figure 10: Wallace Allotment proposed treatments Alt. 4 & 5
- Figure 11: District Wide proposed improvements (pushes and pipelines)
- Figure 12: Riparian Condition Inventory

Appendix I

The following are responses to comments received during the thirty day public notice and review period.

The following response addresses comments received from Richard Remington, Arizona Game and Fish Department.

Comment: The commentor indicates that in discussions with a representative for the new permittee on the Chevelon Canyon Allotment, that livestock weights would likely be greater than that of the original permittee's livestock.

Response: Cattle weights which were provided by the original permittee were used for this process. If there are major differences in cattle weights leading to more forage consumed by the new permittee's cattle, it should be detected with monitoring.

Comment: The commentor indicates that in previous discussions and agreements, wild ungulate use should be 12-13% in obligated areas, instead of the 10% as was stated in the EA.

Response: The 10% use stated in the EA is the correct figure.

Comment: The Department would like the opportunity to coordinate with the District on the proposed water developments to ensure that benefits to both wildlife habitat and livestock management are achieved.

Response: The approximate locations for these proposed waters were identified through this process and are displayed on the maps included in the EA. The Department would be welcome to help locate and layout these projects on the ground.

Comment: The Department recommends that monitoring activities under Alternative 5 for Clear Creek and Wallace allotments adopt monitoring strategies outlined in the Alternative 3 description.

Response: After consideration of monitoring strategies and cost, we feel that the most effective strategy is to monitor utilization after livestock leaves each pasture.

Comment: The Department would like clarification on who will be responsible for monitoring.

Response: The Forest Service is responsible for monitoring, and permittees may be asked to assist with monitoring to some degree in the future, but it is not part of this process or decision.

Comment: Document states that AGFD will conduct forage monitoring at a site fenced to exclude livestock (see Fig. 4), but figure 4 is not of a livestock enclosure.

Response: This error will be addressed in the final EA.

Comment: The Department suggest that the individual figures be labeled, to aid in the review of the EA.

Response: Your comment will be considered.

Comment: You indicate there are 11 key area monitoring sites on the District and that these sites and monitoring protocol have been coordinated with the District. The Department feels that it may not be appropriate to include an additional monitoring site in the EA prior to coordinating with the Department on the matter.

Response: The statement written on page A-6 of the EA was an error. Monitoring sites will be coordinated with the Department. The wording in Appendix D (page A-6) of the EA will be changed to read as follows: The AGFD will conduct wild ungulate forage monitoring at existing sites which exclude livestock. These sites will be used to determine forage utilization that is occurring in key areas across the game management unit by wild ungulates. Monitoring will assist the Department in setting big game population objectives.

The following reponse addresses comments received from Rick Erman, Jeff Burgess and Steve Gallizioli.

Comment: The cost to the public of developing water sources on certain pastures are high compared to the value received. It would be better to spend funds on riparian exclosures or to rest the pastures. Specific comments were made to the Chevelon Canyon Allotment.

Comment: The costs of proposed range improvements such as fencing and water developments exceed by quite a bit, the expected benefits from livestock grazing.

Comment: How will the proposed expenditure of dollars, benefit other forest users beside the permittee?

Response: These comments revolve around whether it is a good business decision, for the permittee or the Forest Service, to make the proposed investments. As far as the permittee is concerned, it is impossible for the Forest Service to determine what is "good" for the permittee as that is a subjective determination. The EA (pages 9-10, 29-30, 47-49, and 68-70) discusses the importance of recognizing that although the projections appear very precise numerically, they should be viewed merely as indicators. First, there are a variety of assumptions underlying the derivation of these indices. Second, these indices apply to a "typical" regional situation, rather than the specific local case. The projections then, while realistic, serve better as indicators of *relative* change rather than as measures of *actual* change.

These costs and benefits also only deal with quantifiable economic factors, such as cost to build a fence and potential increase in permittee income. Quite often it is non-quantifiable variables they weigh heaviest in the decision. The EA (pages 11, 31, 49, 70) and the "Social Analysis" (project file) discuss the fact that livestock producers stress the importance of the quality of life that ranching provides them and their families. Owning livestock is important as a way of reaffirming ties to their ancestral lands and heritage. Preserving this working relationship with the land so it can be passed on to their children along with a feeling of self-sufficiency is a cornerstone of their values.

As for the Forest Service, it is somewhat of a similar situation. Once again the projections best serve as indicators of *relative* change rather than as measures of *actual* change and are best used to compare

between various alternatives. The financial efficiency analysis that was performed provides an investment analysis for readily quantifiable variables. "The investment analysis displays a variety of costs and benefits associated with the alternatives. All estimated costs associated with range improvement and maintenance activities are displayed, but quantifiable values were not established for all improvements. An example of this would be the Pinyon-juniper treatments for Alternatives 3-5 for Chevelon Canyon Allotment. The costs of these treatments were used but no economic value was placed on the benefits of these improvements. There will also be a "value" that is qualitative in nature for other resource areas such as watershed improvement, range condition, and wildlife. Alternative 1, no grazing will also have "values" associated with it but no attempt was made to quantify them in an economic sense as there are not any local studies to provide good information. There are, however, intuitive values associated with these actions." (EA, page 10).

The decision maker, which is the Chevelon/Heber District Ranger for these projects, will consider the economic costs and benefits of each alternative along with other environmental consequences. There are no requirements that a decision needs to be based solely upon economic considerations or that a project needs to have a specific economic return. Of course most managers want to reach resource objectives in an efficient manner. Thus the analysis was designed so certain economic factors and social factors could be considered along with benefits and impacts to natural resources. The decision maker is then able to consider the costs associated with water developments and other treatments such as pinyon-juniper "pushes" along with benefits to the permittee and local economy along with non-economic factors such as improved watershed conditions and wildlife habitat.

The following responses addresses comments received from Rick Erman.

Comment: Where will the District and "Third Party" find the necessary dollars to do the proposed work? Who is the "Third Party"?

Response: Because no course of action has been decided upon yet there is not a specific proposal for the District to take to potential third parties. However the District has been quite successful in the past in obtaining grants to contribute towards certain aspects of particular projects. Partners and funders tend to be interested in those portions of a project that benefit their mission. Examples include the Rocky Mountain Elk Foundation funding or contributing labor to improve the distribution of water or to improve grasses and browse species by pushing pinyon-juniper thickets. The Arizona Department of Environmental Quality may be interested in the same project because it improves watershed conditions. The basic assumption of approximately 1/3 of the total costs being covered by a third party was used to analyze economic effects.

As for how the District will find the necessary funds to complete the proposed work there are a variety of means. In addition to appropriated funds, which are the Forest Service's "normal funds", there are a variety of grants for which specific activities or proposals qualify. The District may also get partners to fund greater than 1/3 of the total costs to reduce the amount of appropriated funds needed to fund the project. As with any decision and as stated in the EA it is necessary to fund certain activities first prior to other activities being able to take place.

Comment: The District should amend each proposed AMP where antelope currently exist or where antelope historically existed so that livestock management methods are not detrimental to antelope in

anyway. If that is not possible then the District should develop an alternative that considers the needs of antelope first and livestock second.

Response: It is true that habitat conditions on the Forest are not favorable for antelope as they were near the turn of the century. This can be attributed to several factors including wildfire suppression and past livestock grazing practices. It is not the intent of the District to revert the forest or habitat back to presettlement conditions. The forest is managed for a balanced distribution of Vegetative Structure Stage (VSS) classes (see page 3 of EA). During analysis of existing VSS classes in the pinyon-juniper woodlands, the District recognized the need to reduce the density of pinyon-juniper in some areas. These treatments are identified in the preferred alternatives for the Clear Creek, Wallace and Chevelon Canyon Allotments and will result in an increase in the amount of suitable antelope habitat on the Forest. However, the majority of suitable antelope habitat in Game Management Unit 4A will continue to exist north of the Forest Boundary.

Coyote predation on antelope fawns is well documented. As noted in the comment letter, reducing coyote populations seems to elicit a positive response in antelope populations. It is also likely that poor habitat conditions in some areas of GMU 4A are causing fawns to be more vulnerable to coyote predation. The District recognizes the need to improve habitat conditions for antelope and other wildlife species in the allotments and has incorporated measures into the preferred alternatives to address these concerns.

Specifically, the preferred alternative for the Clear Creek Allotment prescribes rest from livestock grazing until certain herbaceous vegetation vigor standards are achieved. When livestock are allowed back on the allotment, it would be with 42% fewer AUMs than are currently permitted. In the Wallace Allotment, the preferred alternative would implement a deferred grazing system with 54% fewer AUMs than currently are permitted on the allotment. The preferred alternative for the Chevelon Canyon Allotment would reduce AUMs by 80%. In the preferred alternatives for all of these allotments, combined grazing utilization by livestock and elk would average 25% in key areas and prescribed treatments would reduce pinyon-juniper densities over approximately 11,879 acres of suitable and potential antelope habitat. These actions are designed to increase the amount of suitable antelope habitat and improve cover for antelope fawns, which should reduce their vulnerability to coyote predation.

Antelope are only one of many wildlife species that utilize habitat on the northern portion of the District. Others, including elk, mule deer, songbirds, and small mammals also are found in that area and require habitat conditions that do not entirely mirror those of antelope. The actions outlined in the preferred alternatives support a diversity of wildlife habitat while still providing for livestock grazing, but at reduced levels.

The following response addresses comments received from Jeff Burgess.

Comment: Why will alternative 5 for the Wallace Allotment, result in better resource conditions than alternative 4, since alt 4, will permit fewer cattle and have a shorter season of use?

Response: The EA did not indicated that alternative 5 would result in better resource conditions than alternative 4, but indicated that the effects appear to be about the same. The grazing season would be slightly longer per pasture (between 5 and 12 days) and there would be more grazing animals, but these

animals would be light yearlings, which would consume less forage than the mature cows, as proposed in alternative 4.

The following response addresses comments received from Liz Wise, White Mountain Conservation League.

Comment: The League supports the District's selection of Alternative 3 for each of the four allotments as the proposed action.

Response: We appreciate your support but believe some clarification is needed. Alternative 3 was chosen as the preferred alternative for the Chevelon Canyon and Limestone Allotments and Alternative 5 was selected as the preferred alternative for the Wallace and Clear Creek Allotments.

Comment: The consensus forage distribution process would provide 60% of the forage in the Chevelon Herd Unit to livestock.

Response: The forage distribution agreement between the Chevelon-Heber District and Arizona Game and Fish Department specifies that 50% of the available forage on the Forest's portion of the Chevelon Herd Unit be distributed to livestock and 50% be distributed to elk, deer, and antelope. Approximately 50,000 acres of the analysis area are not within any of the four allotments and would not be grazed by livestock. Livestock would be allowed to graze 60% of the available forage within each of the four allotments. Elk, deer, and antelope would be allowed to graze the remaining 40% of available forage within the allotments and would have 100% of the available forage on areas not grazed by livestock. When the entire acreage of the District is considered, this amounts to a 50:50 distribution of forage.

The following response addresses comments received from Forest Guardians.

Comment: The commentor states the EA must analyze a range of reasonable alternatives.

Response: The formulation of alternatives is driven by significant issues identified in scoping 40 CFR 1501.2(c). For an alternative to be reasonable, it must meet the stated purpose and need, and address one or more issues. The minimum number of alternatives considered for the allotments included: Alternative 1, No Action; Alternative 2, Current Situation; and Alternative 3, Proposed Action. Five alternatives were considered for the Chevelon Canyon, Clear Creek, and Wallace Allotments, and four alternatives were considered for the Limestone Allotment. Appendix B of the EA also describes an alternative considered but eliminated from detailed study.

Comment: The commentor states that NEPA requires the Forest Service to take a 'hard look' at alternatives which emphasize different factors but lead to differing results.

Response: The commentor is referred to Section II, III, IV, and V of the EA for the detailed analysis of the alternatives.

Comment: The comments states the EA must consider and disclose adequately the cumulative impacts of the proposed action.

Response: Past, present, and reasonably foreseeable future actions were considered in the analysis as documented in the EA, Chapter VII, and the specialists reports found in the project record.

Comment: The commentor states the Forest Service must comply with the National Forest Management Act (NFMA) by evaluating the Allotment's suitability for grazing.

Response: The NFMA requires the identification of the suitability of lands for resource management (16 U.S.C. 1604(g)(2)(A)). The suitability of lands for domestic livestock grazing is determined at the land and resource management level as part of the forest planning process. The Forest Plan is the proper and only level at which suitability per the requirements of 36 CFR 219.2 is made. The Apache-Sitgreaves Forest Plan fully complies with the requirements through the analysis process applied in preparation of the Forest Plan (Forest Plan EIS Appendix B, Forest Planning Model, on file in the Forest Supervisor's Office).

Suitability is a NFMA consideration and there is, therefore, no requirement to conduct additional suitability analysis at the point of allotment management plan development which is a NEPA level analysis. At the allotment planning level, site specific grazing capacity of lands is evaluated. Lands identified as not capable for grazing are not considered when determining livestock capacity.

Comment: The commentor states the analysis did not meet the requirements of Forest Service Handbook 2209.11 "Range Project Effectiveness Handbook" for economic analysis.

Response: Forest Service Handbook 2209.11 "Range Project Effectiveness Handbook" was removed from the Forest Service directives system.

Comment: The commentor states the Desired Future Conditions were not described in the EA.

Response: The commentor is referred to the EA, Chapter I, Section C - Desired Future Conditions, pp. 2-3.

Comment: The commentor states a cultural resource clearance is required for all surface disturbing projects.

Response: Effects to heritage resources were considered in the analysis as documented in the EA, Chapters II, III, IV, V, and VII, and the specialist report found in the project record. Consultation with the State Historic Preservation Officer was also completed as documented in the project record. For the ground disturbing improvements or treatments proposed, additional surveys and consultation with the Forest Archaeologist will occur to ensure the requirements of the National Historic Preservation Act are met.

Comment: The EA fails to discuss the potential natural community (PNC) of vegetation on the allotments.

Response: The "Terrestrial Ecosystem Survey of the Apache-Sitgreaves National Forest" contains the information on PNC for the entire Forest and has been incorporated by reference into the Project Record (on file at the Chevelon-Heber Ranger District). The information contained in this publication was utilized in the preparation of the EA.

Comment: The commentor asserts that no Biological Assessment or consultation with the United States Fish and Wildlife Service was completed as part of this analysis.

Response: A Biological Assessment and Evaluation (BAE) was completed for each of the allotments analyzed in the EA. Consultation (as required in Section 7 of the Endangered Species Act) with the USFWS was completed in the fall of 1999 for these allotments. The biologist conducting the analysis concluded the preferred alternatives would result in an improvement in baseline conditions for listed species.

Comment: The commentor feels an EIS is required to analyze the impacts of the proposed range improvements.

Response: An EIS is required for a major Federal action with significant environmental effects. Construction of range improvements would not be considered as such. The range improvements included in the EA were analyzed within the context of the alternatives and also included in the BAE.

Comment: The presence of additional fencing might cause mortality in raptor and other bird species populations.

Response: Mortality of individuals of some bird species may occur as a result of new and existing allotment fencing. However, mortality caused by fencing will be limited in extent and is not expected to adversely affect listed bird species or result in a trend toward listing of sensitive bird species that exist on the District. A discussion of the impacts of range improvements to TES species is included in the BAE.

Comment: The commentor feels that it is unsound scientifically to build upland waters in ponderosa pine and mixed conifer forests without reducing livestock numbers.

Response: The preferred alternatives would reduce the livestock numbers on these allotments.

Comment: The commentor feels that an assessment of the status of cryptogamic soils should be completed as part of the EA.

Response: Cryptogamic crusts are evident within these allotments. These crusts serve many roles, from increasing surface roughness and resistance to raindrop impact, to providing a source of nutrients for some plants. The crusts are most prevalent in areas where there are large interspaces between litter and plant basal area. Crusts on these allotments occur under moderate to heavy pinyon-juniper canopy cover. These areas see little animal use, as forage is not generally available to ungulates. The crusts are considered to be a pioneer plant in these degraded conditions. The EA and the project record contain cryptogamic crust discussions.

Comment: The commentor feels that not enough emphasis was given to the protection and restoration of riparian habitats on the allotments. Specifically that riparian fencing alone is inadequate.

Response: Riparian fencing is not the only thing that is being done to protect and restore riparian habitat. Actions such as reduced livestock numbers, shortened seasons and timing of use, and woodland treatments have also been proposed on these allotments to improve riparian conditions.

Comment: The commentor feels that impacts to riparian ecosystem functions and ecosystem physical structure were not examined in sufficient detail.

Response: The Forest uses "Proper Functioning Condition" (USDI 1993) as described in the environmental assessment as the method to determine riparian condition. Factors evaluated in PFC methodology include assessments of hydrologic function, vegetative function and soils-erosional deposition functions of riparian habitats. Twenty streams and their tributaries were inventoried over the past two years totalling more than 140 miles of riparian inventory. The District feels that this assessment is adequate to determine riparian condition and function.

Comment: The commentor wants to know "if most of the allotment was in fair condition, what condition was the rest of the allotment in, and what are the numbers".

Response: The range conditions are identified and displayed in the Range & Vegetation section for each allotment within the EA.

Comment: The commentor wants to know what the erosion rates are, what are the standards to be met and are standards currently being met.

Response: Erosion rates were estimated from the Terrestrial Ecosystem Survey (TES 1987), and from field verification. Areas that were estimated to have current soil loss above tolerance soil loss were classified having Potential Capability (PC). These areas would not meet forest plan standards and were either not assigned capacity, or were assigned a very low percentage of allowable use to improve resource conditions. These areas are included with other areas of very low forage productivity and are identified in the project record.










Comment: The commentor feels that the EA did not determine whether riparian habitats on these allotments are meeting Forest Plan Direction and Regional Guides and that it lacked the information to determine whether riparian conditions are currently meeting forest plan standards and guidelines.

Response: The specific standards mentioned in the comments pertain to Class 1 and 2 riparian areas in the Forest Plan standards and guidelines. The streams listed in these categories are Chevelon Creek, Willow Springs Creek, Willow Creek, Clear Creek and Woods Canyon Creek. Willow Springs Creek is outside of area being analyzed. The rest of the creeks in question and their tributaries have had PFC assessments. Each allotment chapter contains a riparian section. The riparian section contains a summary of the riparian areas surveyed, the condition of riparian area, the miles surveyed/evaluated and the percentage of each condition class. The project record also contains additional riparian information. The information collected and contained within the project record and EA indicates whether the specific riparian area meets or does not meet Forest Plan Standards and Guidelines.

Comment: The commentor feels like this allotment Decision Notice, FONSI and EA violate that legally binding agreement by failing to identify Best Management Practices (BMPs) to ensure compliance with state and federal water quality laws.

Response: There currently is not a Decision Notice or a FONSI for these allotments. The commentor is referred to appendix C, which contain the BMPs.

Chavelon Allotments
 Chavelon-Heber R. D.
 Apache-Sitgreaves N. F.
 General Location of the
 Chavelon Allotments

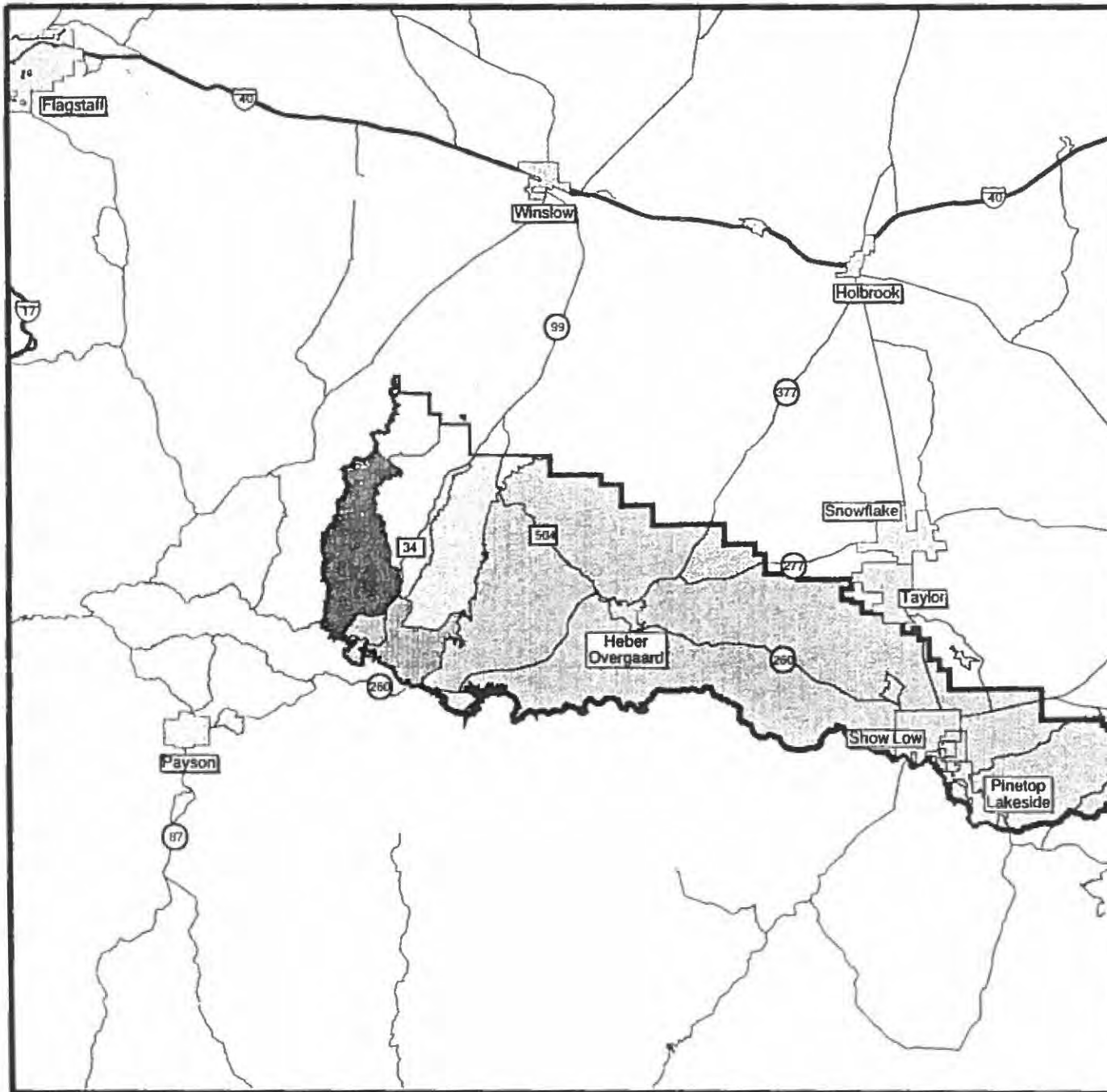
-  Apache-Sitgreaves N. F. Boundary
-  Chavelon Canyon Allotment
-  Clear Creek Allotment
-  Limestone Allotment
-  Wallace Allotment
-  Area Without Cow Obligation
-  Cities and Towns
-  Interstate
-  State and Other Roads

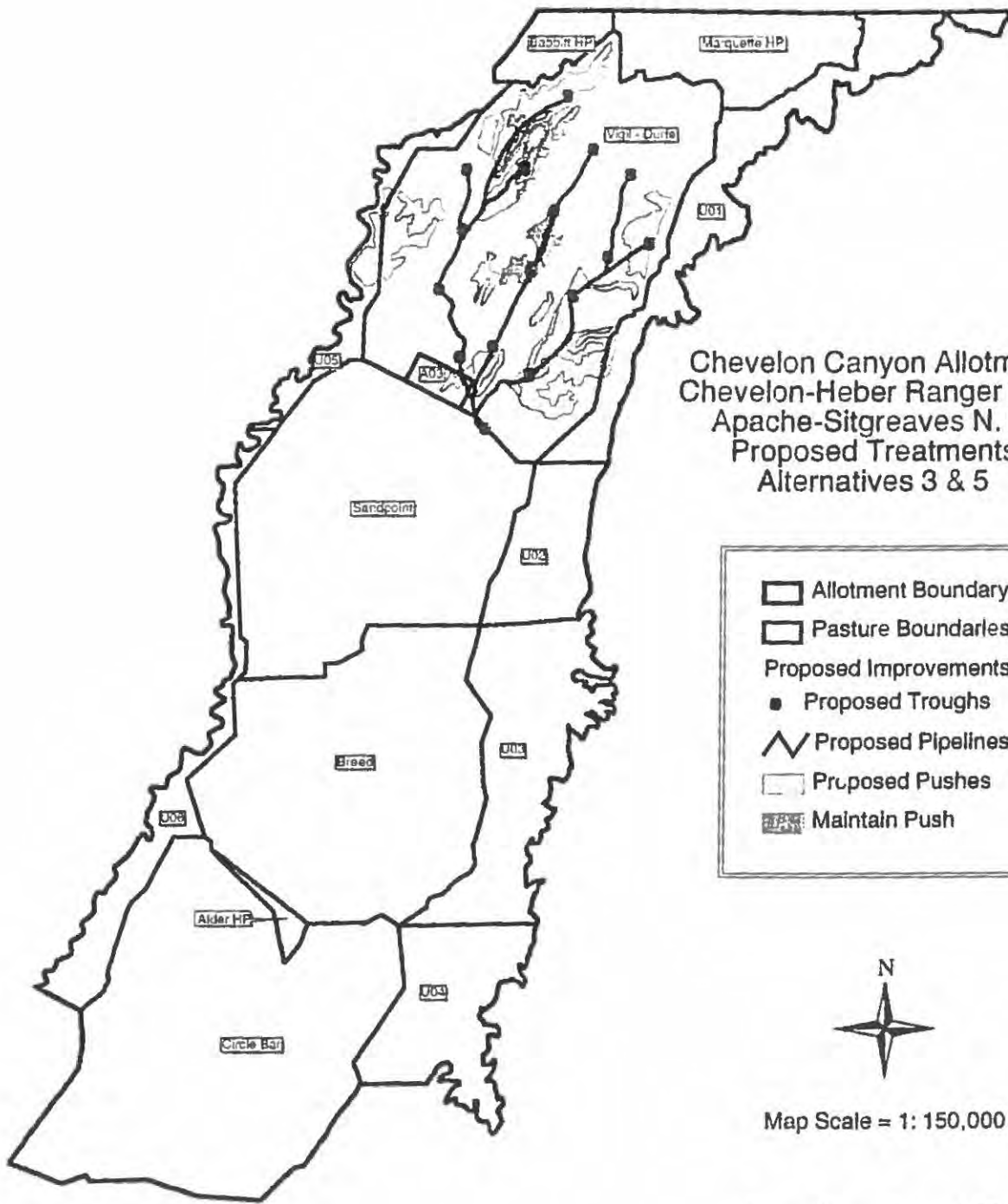


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Figure 1





Chevelon Canyon Allotment
 Chevelon-Heber Ranger Dist.
 Apache-Sitgreaves N. F.
 Proposed Treatments
 Alternatives 3 & 5

□ Allotment Boundary
 □ Pasture Boundaries
 Proposed Improvements:
 ● Proposed Troughs
 √ Proposed Pipelines
 □ Proposed Pushes
 □ Maintain Push

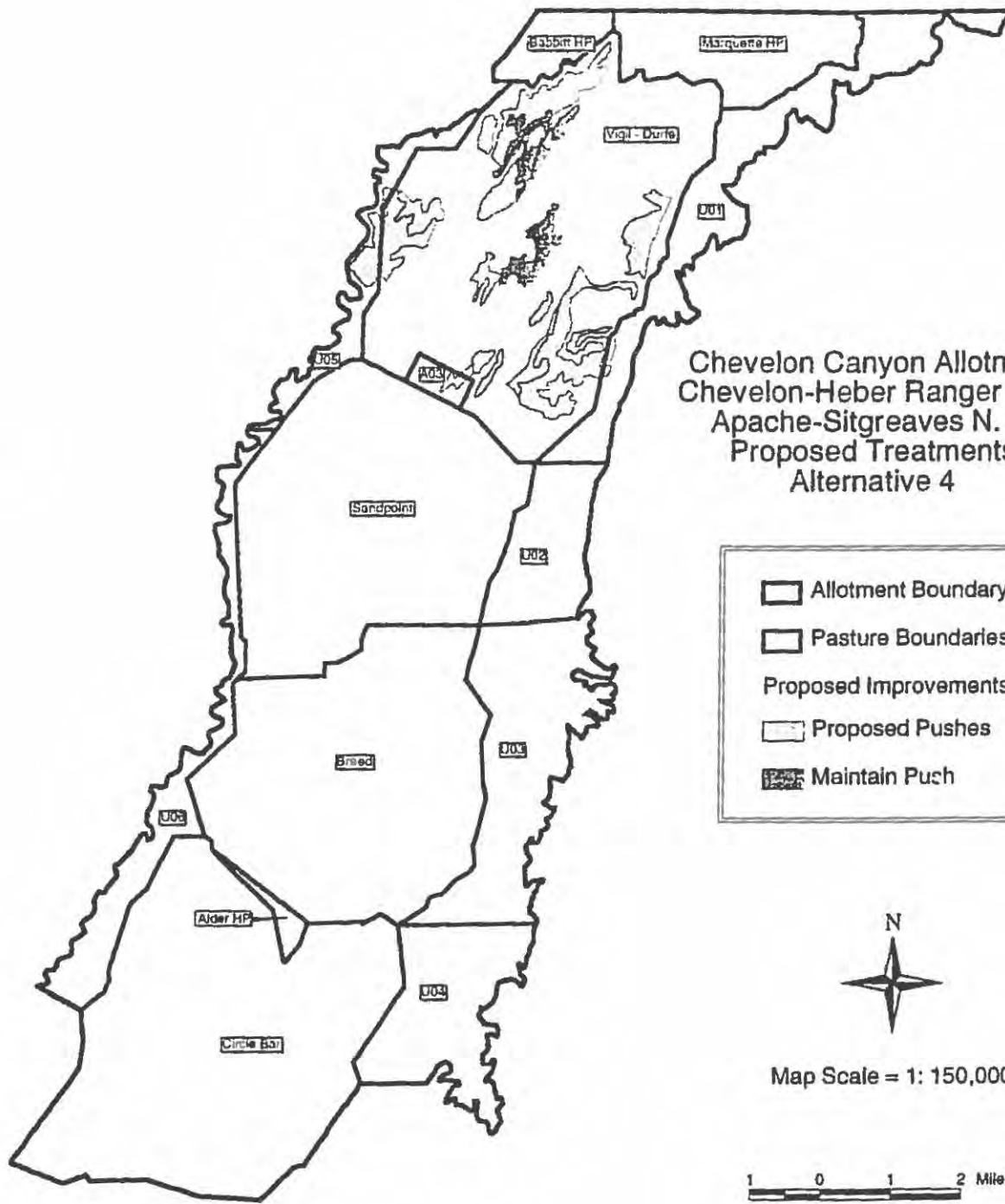


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Figure 2



**Chevelon Canyon Allotment
 Chevelon-Heber Ranger Dist.
 Apache-Sitgreaves N. F.
 Proposed Treatments
 Alternative 4**

	Allotment Boundary
	Pasture Boundaries
Proposed Improvements:	
	Proposed Pushes
	Maintain Push

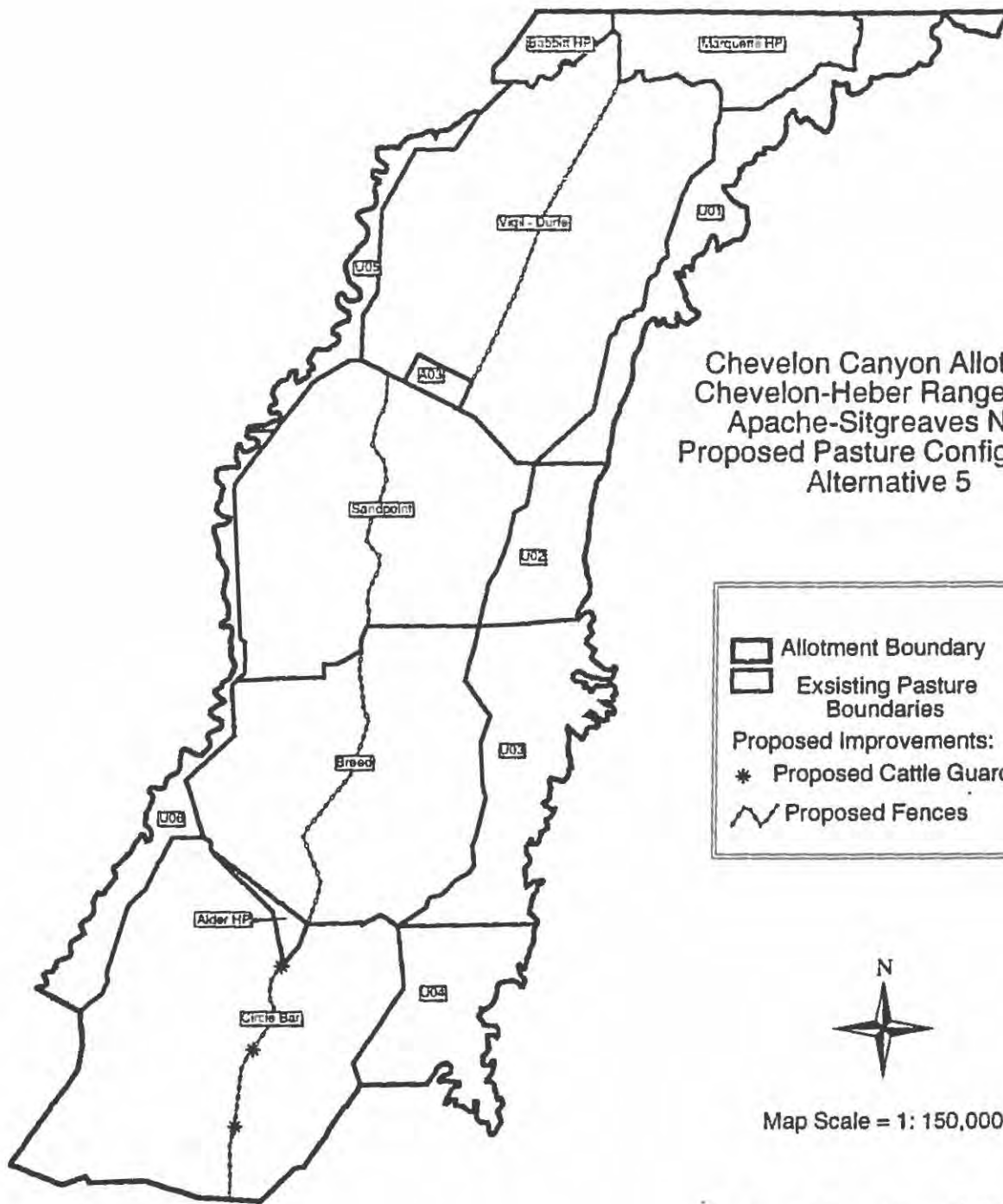


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Figure 3

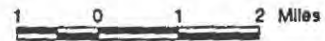


Chevelon Canyon Allotment
 Chevelon-Heber Ranger Dist.
 Apache-Sitgreaves N. F.
 Proposed Pasture Configuration
 Alternative 5

Allotment Boundary
 Existing Pasture Boundaries
 Proposed Improvements:
 Proposed Cattle Guards
 Proposed Fences



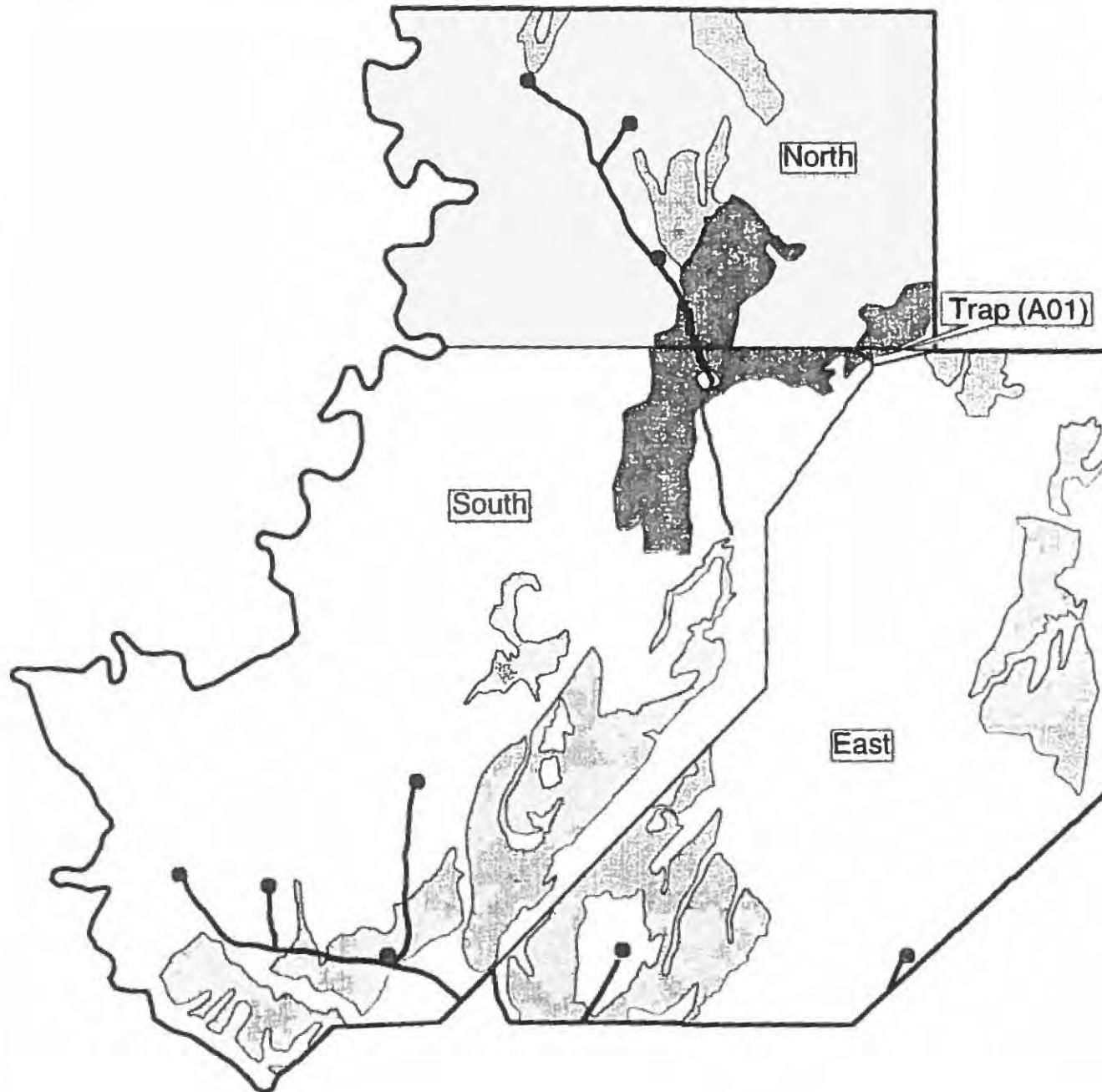
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Figure 4

Clear Creek Allotment
 Chevelon-Heber R.D.
 Apache-Sitgreaves N. F.
 Proposed Treatments
 Alternative 3

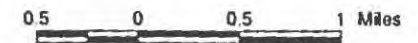


Legend

- Allotment Boundary
- Pasture Boundaries
- Proposed Improvements:**
- Proposed Troughs
- Proposed Pipeline
- Replace Pipeline
- Proposed Pushes
- Maintain Pushes



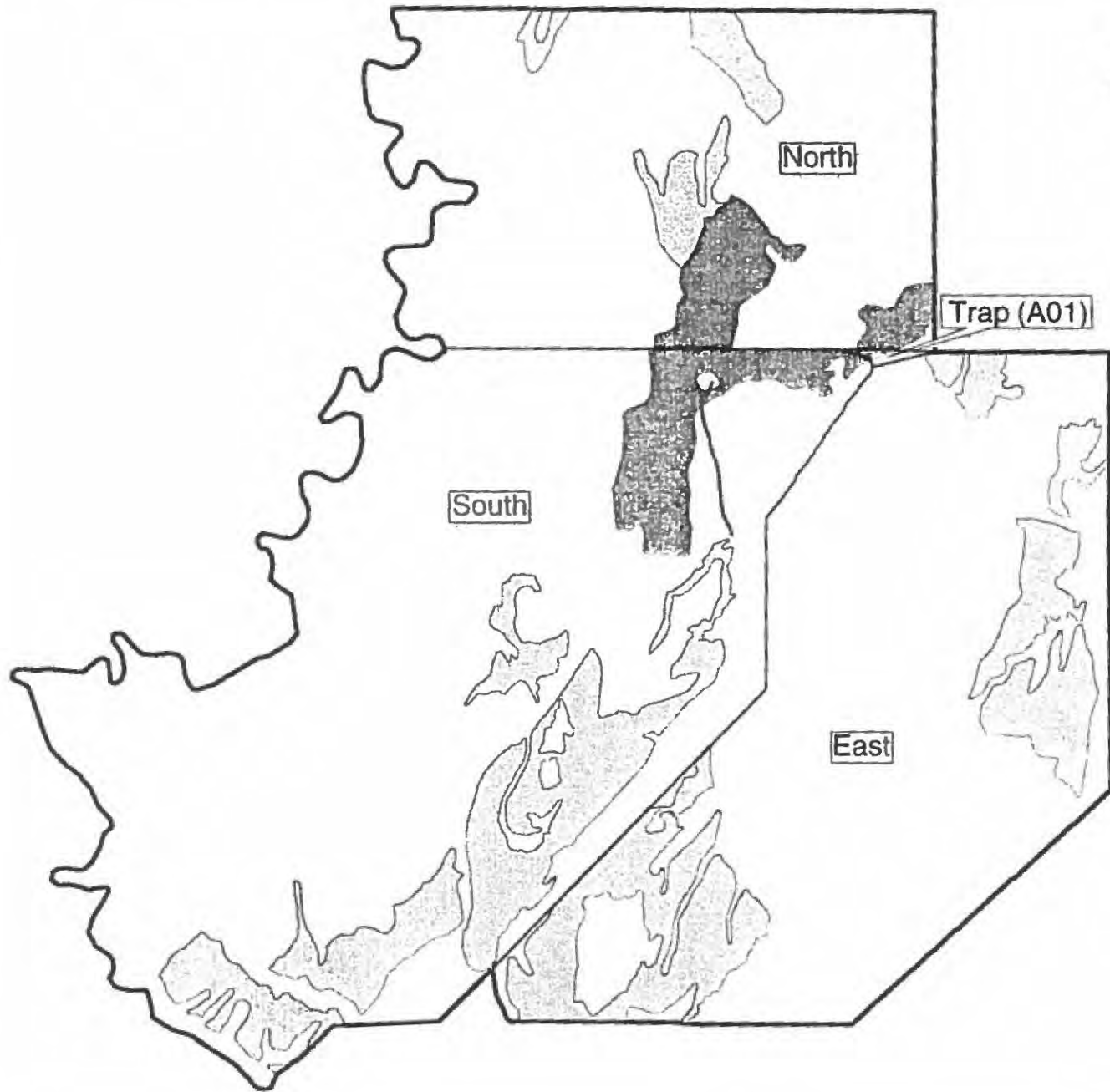
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Figure 5

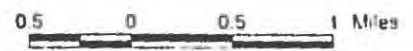
Clear Creek Allotment
 Chevelon-Heber R.D.
 Apache-Sitgreaves N. F.
 Proposed Treatments
 Alternatives 4 & 5



- Allotment Boundary
- Pasture Boundaries
- Proposed Improvements:
- Proposed Troughs
- Replace Pipeline
- Proposed Pushes
- Maintain Pushes



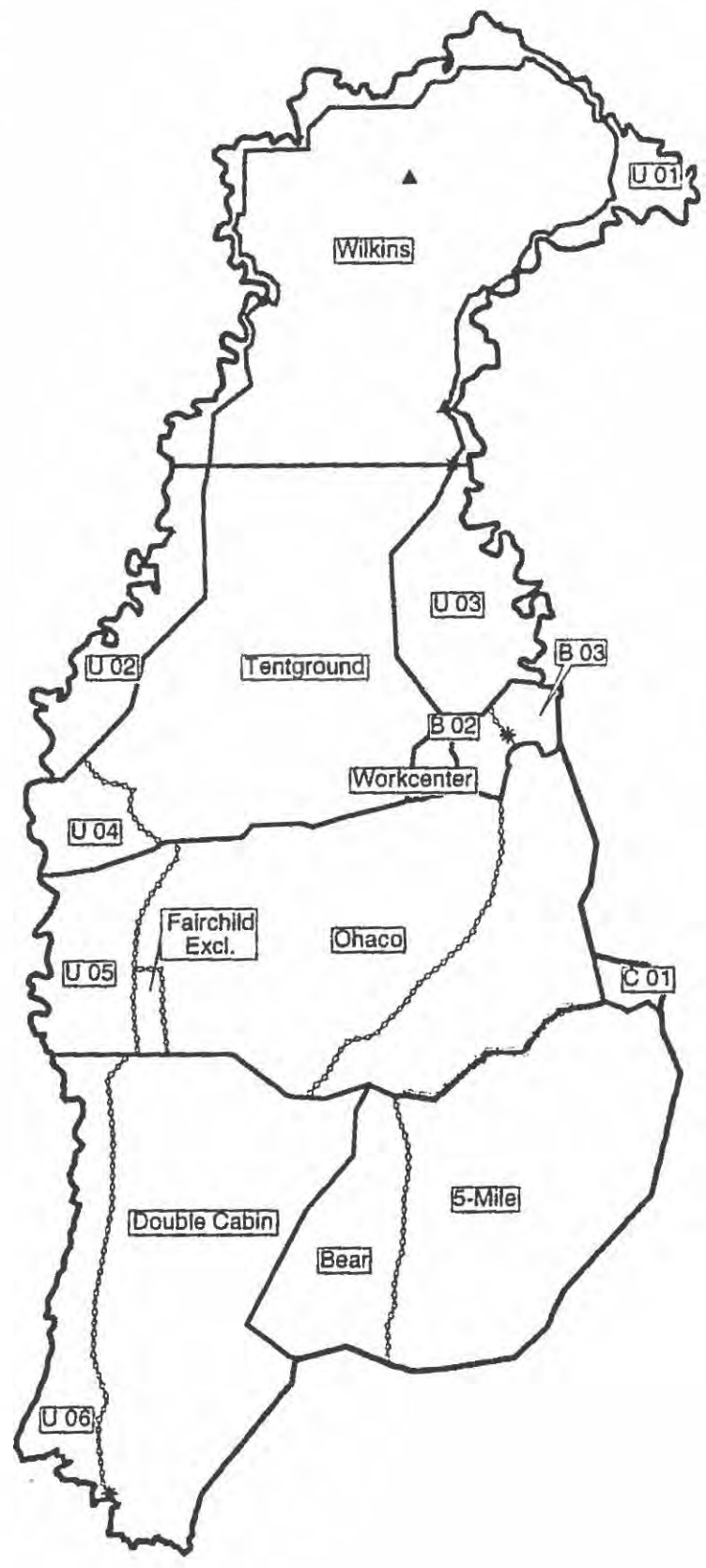
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Figure 6

Limestone Allotment
 Chevelon-Heber R. D.
 Apache-Sitgreaves N. F.
 Proposed Treatments
 Alternative 3



Allotment Boundary
 Existing Pasture Boundaries
 Proposed Improvements:
 Proposed Stock Tanks
 Proposed Cattle Guards
 Fence Proposed for Removal
 Proposed Fences



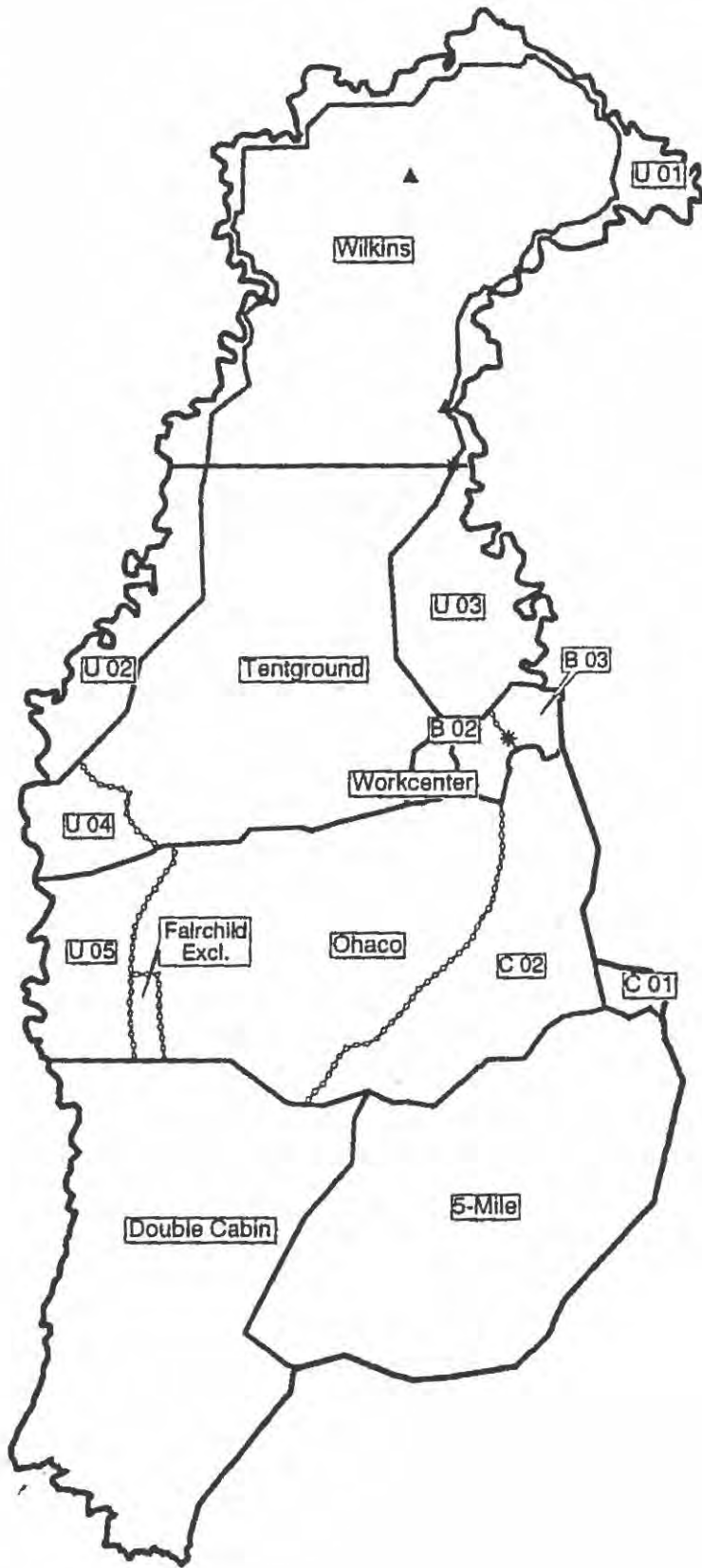
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Figure 7

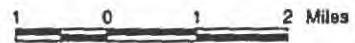
Limestone Allotment
 Chevelon-Heber R. D.
 Apache-Sitgreaves N. F.
 Proposed Treatments
 Alternative 4



 Allotment Boundary
 Existing Pasture Boundaries
 Proposed Improvements:
 Proposed Stock Tanks
 Proposed Cattle Guards
 Proposed Fences



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Figure 8

Wallace Allotment
 Chevelon-Heber Ranger Dist.
 Apache-Sitgreaves N. F.
 Proposed Treatments
 Alternative 3

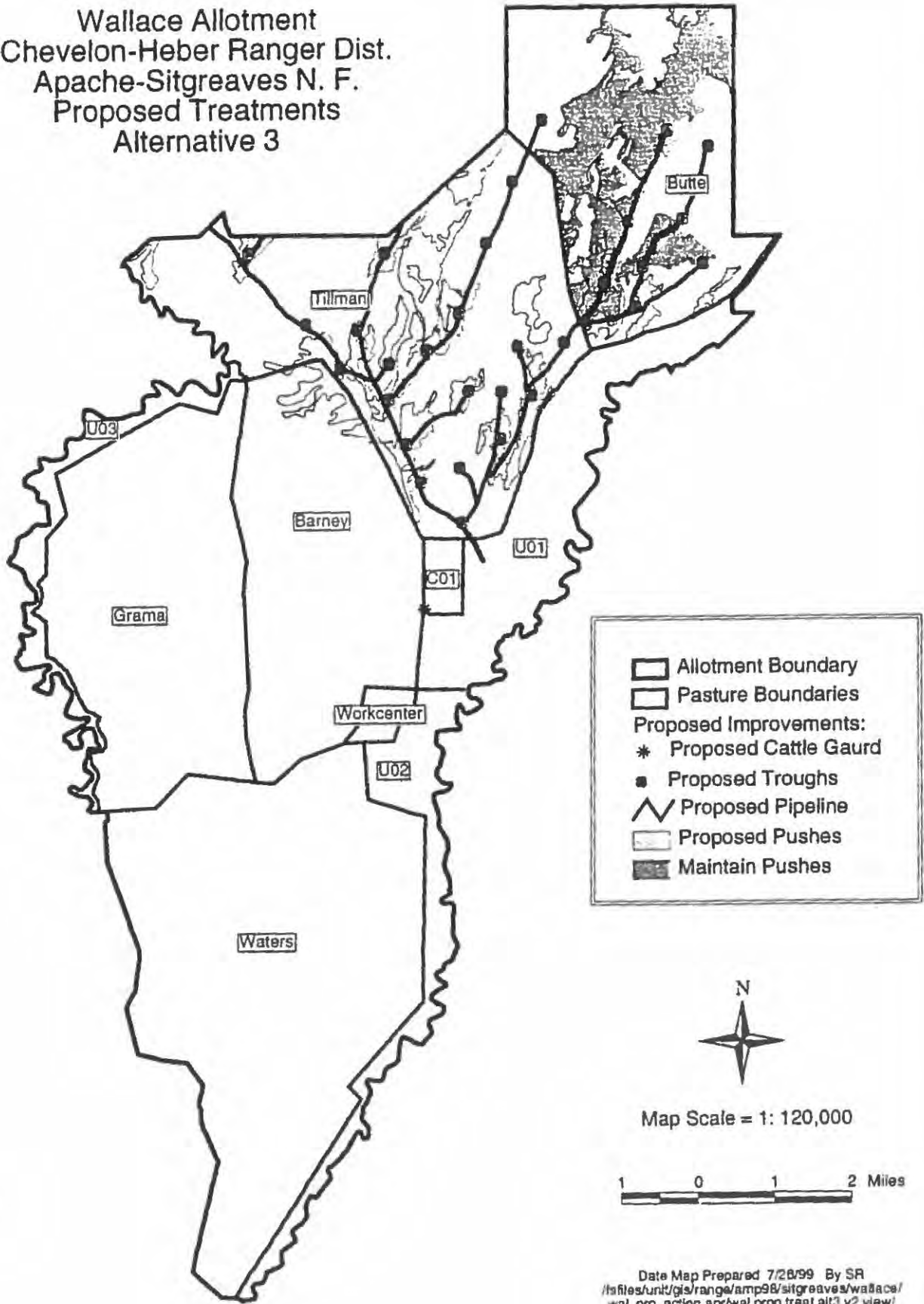
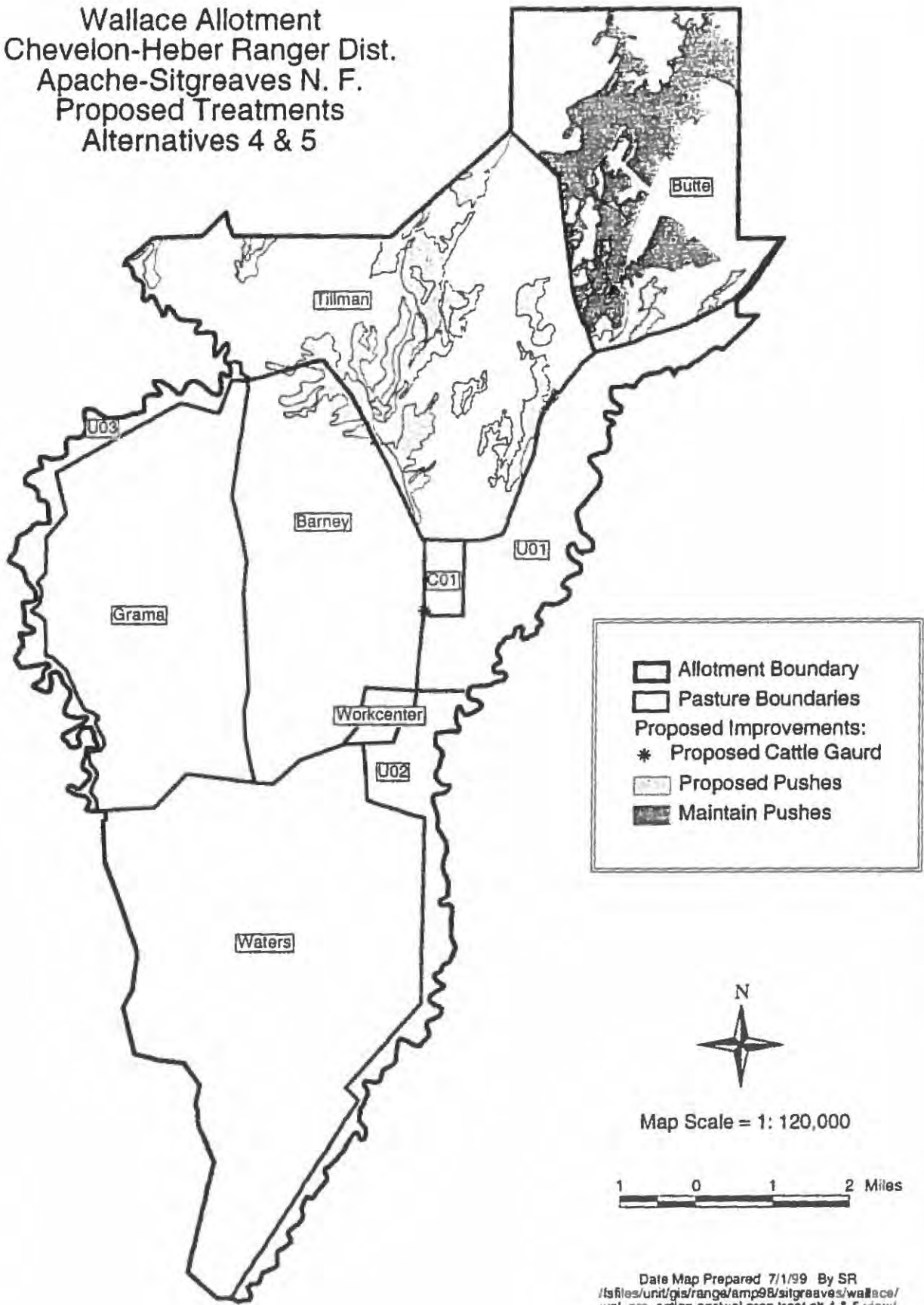


Figure 9












Wallace Allotment
 Chevelon-Heber Ranger Dist.
 Apache-Sitgreaves N. F.
 Proposed Treatments
 Alternatives 4 & 5



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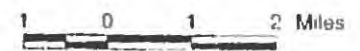
Figure 10

**Chevelon Allotments
Chevelon-Heber R. D.
Apache-Sitgreaves N. F.
Proposed Improvements**

-  Allotment Boundaries
-  Pasture Boundaries
-  Chevelon Canyon
-  Clear Creek
-  Limestone
-  Wallace
- Proposed Improvements:**
-  Proposed Troughs
-  Proposed Pipeline
-  Replace Pipelines
-  Proposed Pushes
-  Maintain Pushes



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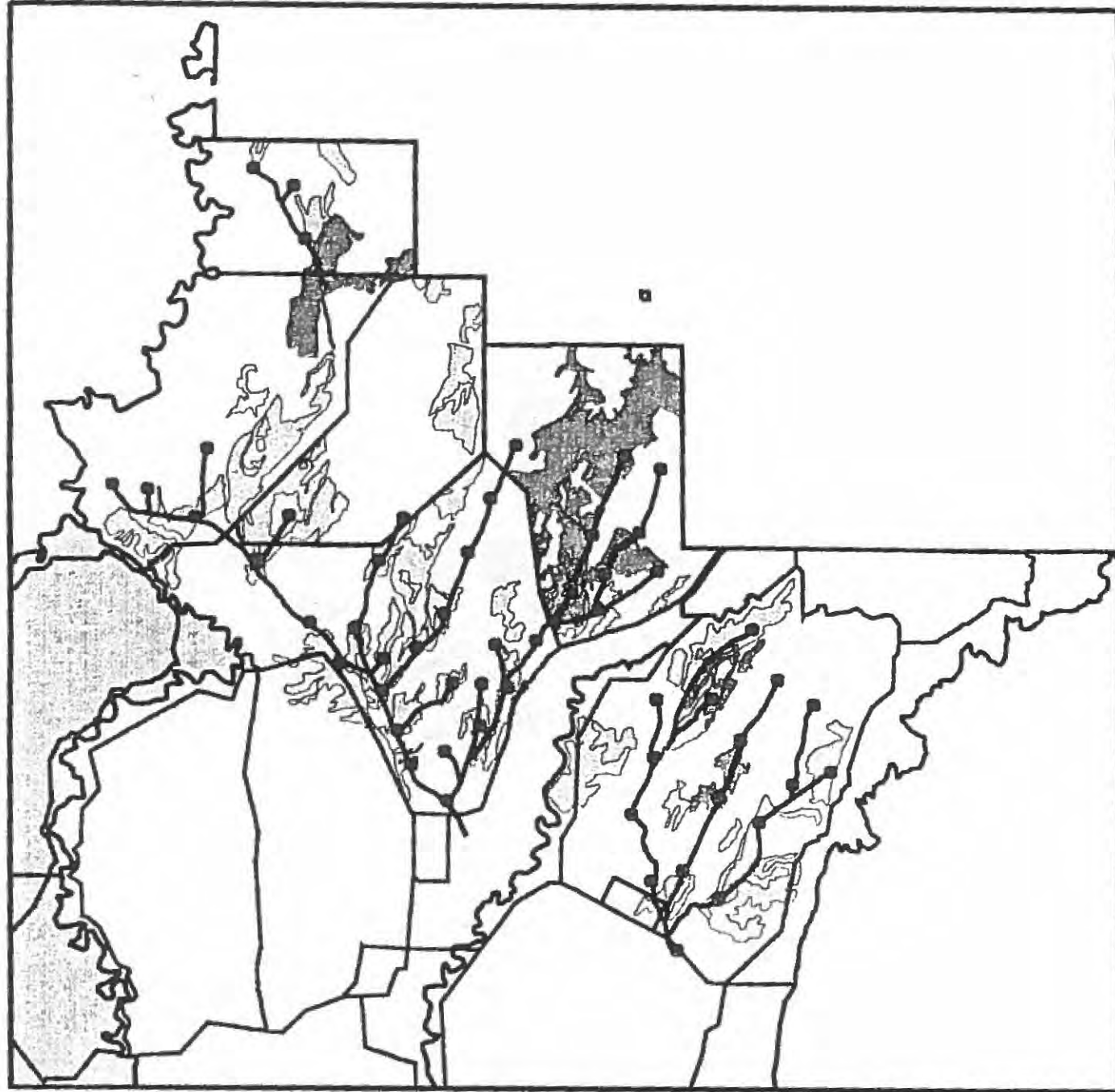


Figure 11