UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
Tonto National Forest

REPLY TO: 2230 Permits

September 29, 1977

SUBJECT: Wildlife Habitat Analysis of Bar X Allotment and Sheep Driveway (Walnut Creek-Mogollon Rim) Cattle and Sheep Use

TO: Forest Supervisor, Tonto NF

The information in the above titled report has been gathered by the Forest Biologist over a four and one-half year period. I have worked with three separate District Range Conservationists, two District Rangers, three Supervisor's Office Range Specialists, four representatives of Arizona Game and Fish Department plus other Forest disciplines.

It is my opinion that the combination of uses placed on the land plus the intensity of use has had a serious impact on the wildlife resource. This combination of uses has drastically reduced forage production, increased soil compaction and erosion, and opened up the country to extensive human disturbance. Of the three basic needs of all wildlife species (food, water, cover), food and cover have received the most damage. This has been accomplished by reducing or eliminating the herbaceous portion of the primary producers which in turn lowers the ability of the area to support viable populations of wildlife species that one would expect to find there. The use most responsible for the decline in habitat quality is without a doubt the excessive consumption of herbaceous vegetation by livestock.

It is also my opinion that the responsibility, policy and objectives espoused in the Forest Service manual have not been adhered to. The Forest Service is probably very much in violation of the Multiple Use Sustained Yield Act. Last, but not least the Forest Service on the study area is not living up to its responsibility as stewards of these lands and as such are letting down the people of the nation.

R. E. Burraychak

RONALD E. BURRAYCHAK
Wildlife Management Biologist

Admin Draft
Not FS Policy

Analysis of Impacts From Major Uses of the Land

within the

Boundaries of the Bar X Allotment

and that portion of the

Sheep Driveway Between Walnut Creek and Mogollon Rim

Submitted to: Bruce B. Hronek
Forest Supervisor
Tonto National Forest

Submitted by: Ronald E. Burraychak
Wildlife Management Biologist
Tonto National Forest

Date: July 1, 1977

An analysis of the data gathered for this report intermittently over a four and one-half year period leads me to conclude that the combination of uses plus degree of intensity of use has severely damaged the former wildlife resource. This combination and intensity of uses has drastically reduced forage production, increased soil compaction and erosion, opened up most of the country to human disturbance and degraded the quality of Haigler Creek. Of the three primary needs of all wildlife species (food, water and cover) food and cover have been the most severely damaged. This has been accomplished by reducing or eliminating the hebaceous portion of the primary producers which in turn lowers the ability of the area to support viable populations of wildlife species that one would expect to find there. The use most responsible for the decline in habitat quality is without a doubt the excessive consumption of herbaceous vegetation by livestock.

The author of this report has spent seven to ten days each year since 1972 on this allotment. Travel has been by foot, horse and truck. Uniform coverage of the area has been accomplished. Work time has been spent on production-utilization studies, timber and fuelwood coordination, and on this report. The photos used in this report are an indication of this coverage.

It has become quite apparent over these four and one-half years that serious sheet and gully erosion are continual occurrences. There is substantial acreage of soils commonly referred to as churning soils. It is apparent that once these soils start this process that very little grows on them and that they are highly erodible. On the other areas, the soil appears to be severely compacted. This should be discussed by a soil scientist.

Erosion and compaction affect the ability of an area to produce herbaceous vegetation in two ways.

1. With herbaceous vegetation at a small fraction of potential and with very little litter on the ground to catch, absorb and slowly percolate rainwater through the soil to plant roots, there is a drastic increase in water runoff. This is further accelerated by soil compaction from the hooves of livestock. An understanding of the problem represented here can be easily obtained by partially filling glass jars with sand in one, loose loam in a second, packed loam in the third and packed clay in the fourth. Add an equal amount of water to each and observe the absorption rate of each. Repeat the experiment with an equal amount of litter in each jar and observe. It will become apparent that the compacted soils without litter does not absorb water rapidly. Under natural conditions this water would run off. Obviously it is of no value to the vegetation where it fell. What you have in this instance is essentially a man-made drought. When these conditions exist on ranges in poor condition and where rainfall is of high intensity and short duration you have all the man caused ingredients for diaster.

This cause and effect relationship means that existing vegetation will not be as vigorous as it should and in turn the reproductive and germination potential are greatly reduced. On an overgrazed range, the surface of the soil is hotter, drier and more compact than on one properly grazed. The maximum use of yearly rainfall cannot be utilized by existing vegetation because a good percentage of it runs off the area taking particles of soil with it. It is not available to the vegetation. This creates a man-made drought. It magnifies the impact of any occurring natural drought.

2. The water moving over the surface of the ground (runoff) carries with it particles of soil. When soil loss exceeds buildup, erosion occurs. The loss of the upper productive soil layer reduces the capability of the area to produce former amounts of herbaceous vegetation. At some point in time, if this trend continues, the capability of the area to produce vegetation is greatly reduced.

What has been eliminated or greatly reduced is soil, a substantial portion of the foundation upon which food chains and more complicated food webs are built. This can be likened to the fact that 100 tons of hay will support X number of cattle per year; one ton will support what fraction of that number. The effect on wildlife is infinitely more complicated than this example, but the end result is the same.

This is illustrated in the following quotes from "Our Wildlife Legacy" by Durwood L. Allen and extensively supported in the literature. "We could search out many other example to illustrate that all wildlife is rooted in the soil. The earth and its vegetation are the foundations for a pyramid of animal life. In the broad lower levels of this structure, a multitude of creatures, most of them small, feed directly on plants in which earth minerals and air gasses have been united into digestible compounds by light power from the sun. Animals in levels higher up eat the ones below them, though all make use of some food directly. And still higher in the pyramid and still fewer in number, are the large and dominant animals, the ones that can, and do, eat the animals that eat the animals, that eat the plants."

"Preliminary research data from the Rocky Mountain Forest and Range Experiment Station, Flagstaff, Arizona indicates that on nonforested and forested ranges that estimates of herbaceous vegetative biomass needed to support consumer biomass has approximately a ratio of 10 to 1. This is assuming the herbage is of the type that can be utilized. Consumer organisms include domestic livestock, deer, elk, rodents, insects, predators, birds, etc.

It is quite obvious from comparisons of grazed versus ungrazed areas on the Bar X and Sheep Driveway that production on grazed areas ranges from one-fourth to one-sixth of that on ungrazed exclosures. If the 10 to 1 ratio holds true and the production comparisons are accurate, it can then be said that based on production and consumption of herbaceous vegetation by wildlife that the present condition of the allotment before grazing is capable of supporting only one-fourth to one-fifth the vertebrate biomass that it has a potential of producing. This loss in itself is startling, but only when competition for this reduced production enters the picture, does the outlook for a variety of wildlife really look grim.

Pleasant Valley Ranger District Conservationist utilization figures for the allotment and driveway show use each year over the entire allotment to be in excess of 75% with the more accessible areas 90%+. The outlook would not be so grim if the condition trend was stabilizing or starting to rise. Trend studies on the allotment show that vegetative conditions are deteriorating, not improving. This is occurring on lands that our soil people state are moderate in productive potential and have a high erosion hazard. Other factors to be considered when evaluating the quality of habitat for wildlife are the number of vegetative types encountered, how they are interspersed, and the value of each type regarding the degree of diversity that can be expected in both plant and animal life. We must also consider how common is the occurrence of each type state or nationwide.

In general the more diverse the plant species in a vegetative type and the more vegetative types coming together to form a vegetative mosaic on an area, the more diverse the wildlife species expected to be found there. The following vegetative types are found on allotment and driveway, listed in descending order of acreage occupied:

1. Pinyon-juniper
2. Ponderosa pine (pine oak, mixed conifer)
3. Grassland
4. Interior chaparral
5. Riparian

Plant and animal species diversity is broken down by plant communities by Drs. Balda and Johnson, Northern Arizona University, as follows:

Plant

Highest Diversity

Riparian: Woodland
Desert Scrub: Paloverde Sahuaro Desert Scrub

High Diversity

Coniferous Forest
Evergreen Woodland: Oak Woodland
Evergreen Woodland: Juniper Pinyon Woodland

Medium Diversity

Chaparral
Grassland

Lowest Diversity

Desert Scrub: Great Basin
Desert Scrub: Creosote Bush-Bursage and Saltbrush-Desertthorn

Animal Diversity

Habitat	No. of Species	
Riparian	211	
Paloverde Sahuaro Desert Scrub	166	High
Coniferous Forest	161	
Oak Woodland	147	
Grassland	134	Moderate
Juniper-Pinyon Woodland	116	
Creosote Bush Desert Scrub	116	
Chaparral	101	
Great Basin Desert Scrub	78	Low

We know without the existing intrusions that:

1. Vegetative productivity is rated moderate.
2. There are five vegetative types with a moderate degree of interspersion.
3. Plant and animal diversity would average a moderate rating.

There are a number of intrusions and activities that have modified the area. These include roads, airport, former homesteads, logging practices, fuelwood cutting, recreation, fuelbreaks, powerlines, subdivisions, P. J. control, stock tanks, spring improvements and grazing by livestock. Of these various activities, only one had had a significant impact on the width and length of almost the entire area; this being grazing by livestock. This is pointed out so that one does not get the impression that degradation of wildlife habitat throughout the allotment and driveway is caused entirely by livestock. Some of the other uses have as drastic an effect on the wildlife resource, but occur on much smaller acreage.

There are several fundamental facts that have to be understood before one can comprehend the impacts of overuse or a combination of uses on a particular section of country to wildlife in general. These facts are that all living things require food, water, cover (from weather, predators, for loafing, nesting, etc.) usually year-round. During the course of the year there are changes in the diet of most species as one or more food sources go in and out of season. Water needs vary from season to season as do cover requirements. When their needs are reduced below the minimum needs of the animal, population on an area are greatly reduced or eliminated. This is why diversity of vegetative species in a community and diversity in a vegetative community are so important. In a diverse situation, more animals can meet their living requirements year-round than in a less diverse environment because there is simply more to choose from and less chance of total failure in either food or cover supply. There are wildlife species that are very adaptable to changes in environmental conditions that regulate the availability of food, water, cover. These animals can eat a variety of foods, go without water for sustained periods, get water from their foods or travel to a water source or tolerate extremes in weather conditions. These species can best be exemplified by the coyote whose adaptive ability makes it difficult to eliminate from an area.

There are other species with such specific food, water, cover, breeding, etc. requirements that elimination of one condition from an area eliminates the species. Examples of this are cavity nesting birds, marsh nesters, river spawning fish, etc. These are easier to eliminate than the species exemplified by the coyote. Unfortunately we have more of the less adaptive than highly adaptive animals.

The word wildlife does not define an object or thing, but rather the whole array of vertebrate species found on an area. Each has differing specific and non specific requirements for survival and propagation into perpetuity.

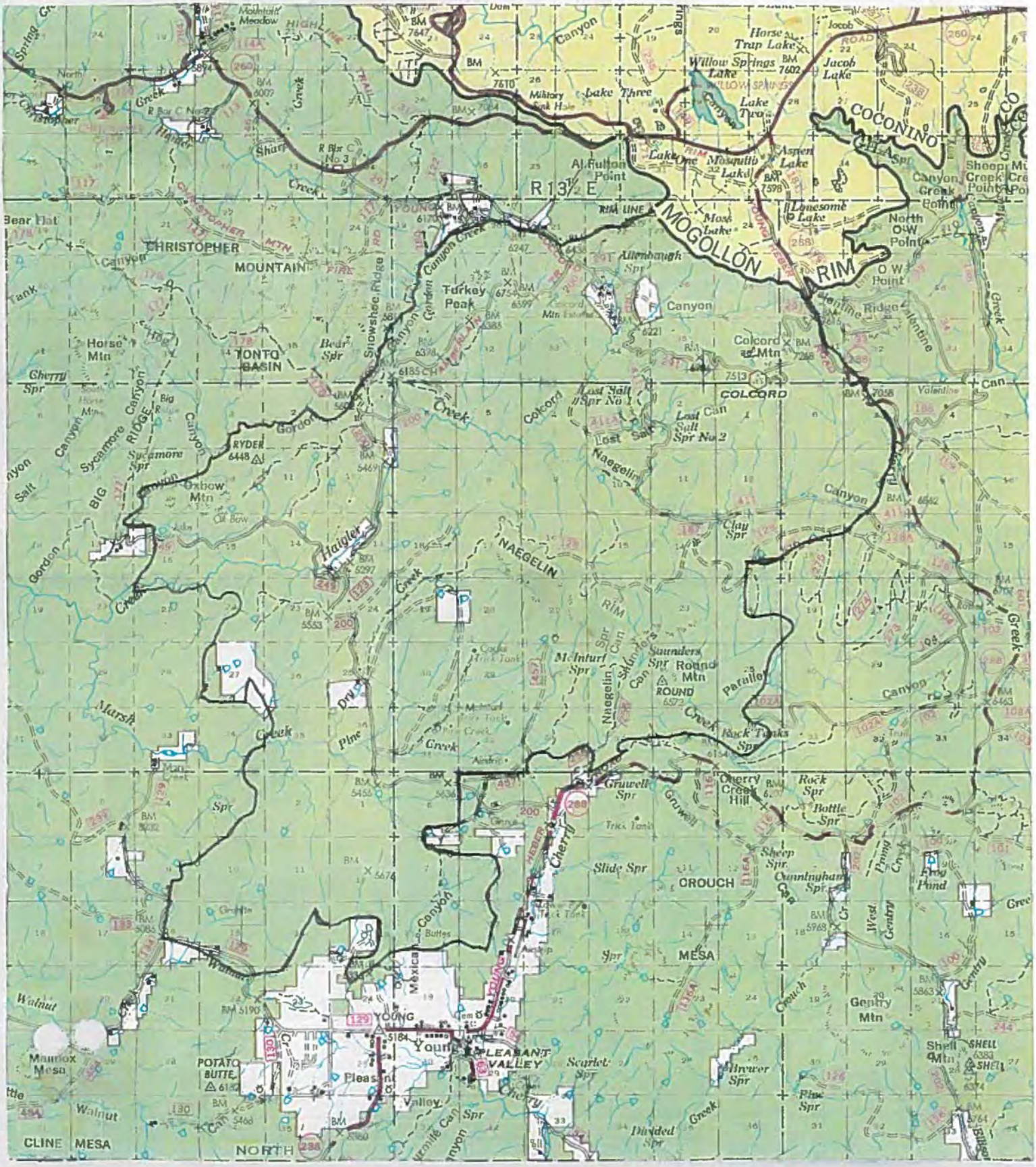
It is imperative that one have at least an elementary comprehension of wildlife and their basic needs before an understanding of the magnitude of damage to this resource from the combined uses can be understood.

I've listed a dozen basic uses of the driveway and allotment all of which are justified to some degree. All have an impact on wildlife, some good, some bad. These will be addressed.

1. Roads - Roads and trails are in abundance throughout all but the most rugged portions. Up to a point, these have some benefit in distributing the hunter throughout the area. These same roads carry the poacher and illegal collectors of wildlife. The more miles of road, the less effective is wildlife law enforcement since there is very seldom an increase in manpower to offset this problem. There is also X number of acres of habitat eliminated for each mile of road plus an even greater acreage made unuseable to some species of wildlife because of the disturbance factor created by the activities associated with the roads. The higher the use, the greater the disturbance factor. Also road builders delight in criss-crossing or paralleling streams. These streams often receive damaging quanities of silt from this source.

Often the roads bring more people to the stream than the fisheries and vegetation can take without damage. Haigler Creek is an example of this. The following map and photos illustrate some of the problems plus the extensive road and trail system. Many of the trails are not shown on the map.

Map of Bar X Allotment and adjoining sheep driveway.



1. Loss of habitat.
2. Area of disturbance from road use.

In areas such as the above with food and cover absent, most wildlife species are very conspicuous by their absence. The photo illustrates a rather sterile wildlife environment.

The fording and paralleling of streams by roads, together with a deteriorated watershed, increase the amount of silt that the stream has to carry. This material is carried by the faster moving water and deposited in slow or still waters. When this occurs, bottom flora and fauna are covered over and die, gravel and sand spawning areas are covered over and lost. The stream loses its productivity.

Haigler Creek pool filling in with silt.

Silt deposit on a rubble area of Haigler Creek.

This road is associated with the campground at Haigler Creek Crossing on the Chamberlain trail. Campground is located on an old stream channel. This location is also grazed.

The next two photos show somewhat less disturbed portions of Haigler Creek upstream and downstream from the road crossing and camping area.

Upstream

Downstream

2. Former homesteads and subdivisions - The settling of country by homesteaders had a definite impact on the wildlife resource. These people plowed the land, converted vegetation, diverted water, grazed livestock, built roads and trails, hunted the land, etc.. These activities made changes in the environmental condition of the homestead and surrounding area. These changes had an effect on the area's wildlife.

Today many of these old homesteads are being subdivided. With subdivision come new roads, powerlines, sewage problems, increased poaching and human disturbance, additional predators in the form of household pets and increased demands for fuelwood. On these lands there is often all the activities normally associated with residential areas plus continued grazing by Bar X cattle and by the resident's animals.

The following four photos show the various conditions that exist on these areas. They are in order of increasing states of degradation to wildlife in general.

The Gillette Ranch. Not subdivided to date. Minimal disturbance. Some vegetative disturbance.

Colcord Estates showing powerline, house, and little or no herbaceous vegetation on the ground. Area is also grazed.

This subdivision adjoins Haigler Creek and is still grazed.

This place in the Colcord Estates isn't letting anything go to waste. On this property even the bark on the oak trees has been eaten killing the trees. Conditions such as this have no value to any wildlife species.

3. Powerlines and fuelbreaks - These items can have both beneficial and detrimental effects depending on their location, width and design. The benefits gained stem from the creation of openings in dense stands of conifers. This increases diversity within the forest and increases the amount of herbaceous vegetation. What has happened on the Bar X and Sheep driveway is that livestock concentrate in these openings for both feeding and moving about. When these openings are long, straight and wide, benefits decrease because ease of poaching and distance affected by disturbances are increased. These openings also increase ease of access into undisturbed areas by recreationists and hunters further increasing the disturbance factor.

Opening associated with a small powerline. On large 500 KV lines these openings can be several hundred feet in width.

4. Timber harvesting and fuelwood cutting - Historically the management of wood products on the study area for sustained yield has been poor. This is shown by the fact that the forest allowable cut has been declining over the years. On the Payson Ranger District it has been recently found that approximately 40% of the District mapped I-10 Timber-Wildlife emphasis has been found not producing timber.

The demand for fuelwood has increased significantly in recent years. It has only been in the last few years that any interest has been shown toward managing this product for sustained yield. On large blocks of forest land woodcutting has reduced or nearly eliminated the large old alligator juniper trees. These trees are preferred by woodcutters on the Tonto.

The leaving of dead standing trees until the last couple of year was looked upon as something shameful. On timber sales virtually all dead standing trees were cut as a matter of practice. What was on the ground was piled and burned. Somehow the thought prevailed that this benefited wildlife because the canopy was opened up and allowed herbaceous vegetation to increase. Part of this was true. What wasn't looked at was all the damage that these practices caused plus the fact that as fast as the herbaceous vegetation started to grow there was a cow or sheep to clip it off so that any benefits accrued were of short duration.

What happened on these lands was that:

1. Those populations of species that thrived in a virgin Ponderosa Pine, Ponderosa Pine-Oak, or Ponderosa Pine Alligator Juniper stands were greatly depleted or eliminated.

2. Some forty odd species of cavity nesting birds were greatly depleted because most snags were cut down. These are the trees that these birds have their nesting cavities. A cavity nesting bird does not all of a sudden develop the ability to construct a different type of nest in the absence of cavities. It instead fails to breed and its numbers dwindle.

3. The clean forest floor practiced by timber and fire people eliminated a prime cover source for ground living vertebrates.

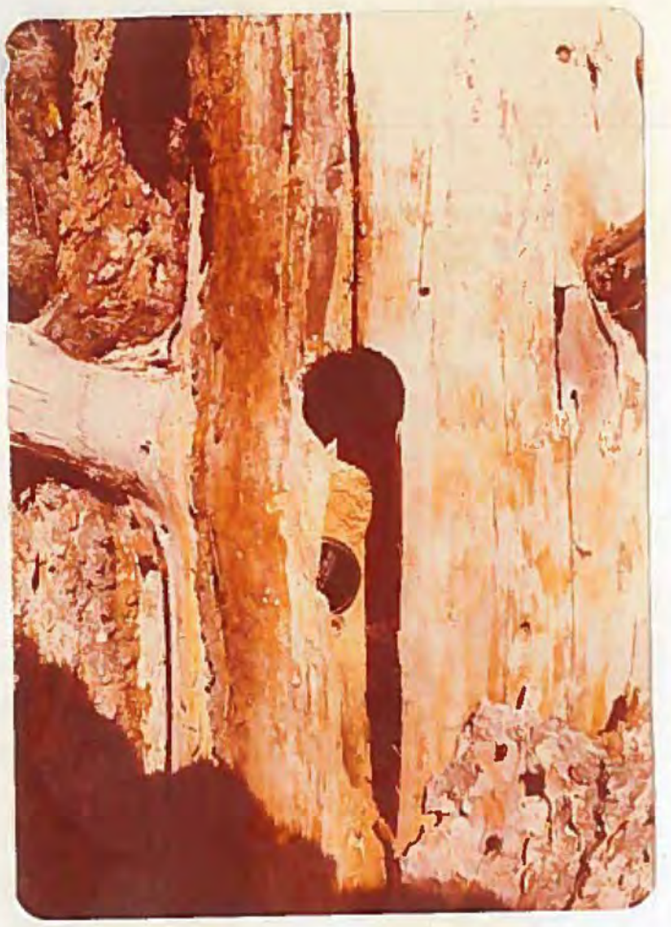
4. The porcupine control projects, practiced at one time virtually extirpated this species from much of the timber type.

5. All kinds of roads associated with timber harvesting opened up virtually all the timber type to vehicular traffic, increasing the disturbance factor manyfold

6. The thinking that non timber species of trees were weeds and that these should be eliminated at will, decreased the diversity of vegetation in some parts of the forest.

7. Thinning practices increased the distance that one could see from the roads. These open areas adjacent to well traveled roads were no longer useable by several game species due to increased disturbance. Wildlife species have varying tolerances to man and his activities. Those species that are actively pursued for sporting values often times are the most wary of contact with people. This is understandable, even animals aren't too enthusiastic about siding up to something that has a habit of blasting holes in it.

The following photos illustrate some of the points made above.



Cavities in dead trees used by over forty species of birds. Cavities are also used by a variety of mammals and some reptiles. Studies by Dr. Balda, Northern Arizona University and others show that under optimum conditions 2.5 to 3 snags in excess of 12 inch DBH are needed. On the Tonto some have as little as 1 snag/10 acres.

Ground cover whether from a hollowed out log, tall grass or piled brush is vital to the survival of all ground vertebrates. A place to hide from enemies or protection from the elements.

This rather inaccessible part of the allotment shows plant diversity, good cover plus herbaceous vegetation or food source.

The preceding photos indicate what should be on the allotment and driveway. The following photos show what is there instead.

This photo typifies the Pine type between Naegelin Rim and PH12-Colcord Road Junction. One may not be able to describe this as biologically sterile, but it is fast approaching that stage. Timber management practices have significantly accelerated the trend in this direction. All the impacts one through seven listed under Timber harvesting and fuel-wood practices occur on this area.

Photo along 128 Road on top of Naegelin Rim. What livestock have not gotten-the woodcutters are trying to. Only adjectives such as disaster, negligence or mess can describe situations such as this.

The large alligator juniper are preferred by both local and commercial cutters. The large trees started growing before the time of Columbus and cannot be replaced in the life times of many future generations. These trees are important to deer, elk, turkey, bear, jack rabbit, etc. as both a food and cover source is restricted at present to trees over 14-inch DBH. Very little taking of this species is permitted.

This photo typifies the better pine sites. The trees are under 120 years of age, few dead standing trees, little ground cover and what little herbaceous vegetation occurs there is closely mowed. In the absence of food and cover in sufficient quantities to meet the necessities of life there is a absence of wildlife. This photo is from the Colcord area.

A shift from the Colcord area to Naegelin Rim shows no change in habitat condition. It remains very poor at best.

Grazing - This particular use, placed on the Bar X sheep driveway acreage, has the potential for causing great harm to the wildlife resource if practiced in excess due to the fact that the activity occurs across the breadth and width of the area. It is imperative that at the start of this discussion that I again remind you that all living things need food, water and cover of sufficient quantity to meet the necessities of life. These living things need these items in combination with each other. Water in abundance is of no value if food and cover are lacking. The same holds true if you have all the food that an animal can eat, but no available water of any type. I point this out because water does not appear to be the limiting factor for the near lack of wildlife on the study area. This is usually the first smoke screen used in defense of a charge that overgrazing is affecting wildlife. All these waters are beneficial to wildlife. I concede this point, but only on those areas with sufficient food and cover to sustain viable, diverse populations of wildlife species. Without food or cover, water by itself has no value because there is little or nothing there to utilize it.

My observation after extensively covering the Bar X allotment and adjacent sheep driveway is that food and cover in sufficient quantity to sustain viable and diverse populations of wildlife is absent. It is my further observation that what forage is produced is unavailable to wildlife on a yearlong basis because of the excess consumption by livestock. What cover is available, is totally limited to either trees or brush and that the same are in general the primary producers throughout. What are greatly reduced or missing are an abundance of grasses and forbs, especially bunch grasses and cool season growers. This eliminates or reduces in numbers those wildlife species dependent on grasses and forbs for perpetuation and maintenance of viable local populations. This leaves then, highly mobile populations of species, or those that can fulfill their life requirements in brush or trees. We are speaking here of grasses and forbs in various vegetation types throughout the study area.

The following photos are representative of the lack of food and cover available to wildlife on the area. They are indicative of the degree of over utilization, non-management and the failure of the Forest Service to live up to its responsibilities as stewards of these lands. We are letting down the people of this nation who have trusted the management of their lands to us.

In openings in the Ponderosa Pine type herbaceous vegetation of nearly any species is mowed to the roots. Little if anything is left for elk, deer, etc. This photo taken in vicinity of Colcord Rd. - Chamberlain Trail.

Dropping lower into the pinyon-juniper type. Herbaceous vegetation fares no better. Ground cover and plant cover are poor, litter absent and sheet erosion evident. Photo taken in the Oxbow Mountain area.

In the mixed pinyon-juniper browse type herbaceous vegetation is nearly absent, sheet erosion evident, highly palatable browse species dead, decadent and severely over utilized. Photo taken in the Naegelin Rim - Pine Creek Area.

The Pine Creek cattle exclosure shows how drought conditions have the habit of occurring on one side of a fence and not the other. Drought also seems to follow wherever the range is over utilized.

The lens cap in the center of the photo is intended to give the reader of the document a perspective of distance between plants, plant vigor, plant production and utilization.

Several pastures have received short periods of rest with some favorable response. The effort is inadequate to meet the physiological requirements of the plant species or improvement in plant vigor or to reverse the downward trend in range condition. In the interim period the other pastures look like the previous photos. When the rested pastures are grazed, utilization is in excess of 80-90% and they too take on appearance of near total consumption.

This photo south of Oxbow Mountain shows an erosion gully. The greenery is not from grass, but from a small composite that dominates the area.

An estimated 1200 acres of pinyon-juniper were pushed in the 60's to try to increase forage production to offset the over stocked range. As one can see about the only thing green are the junipers coming back. These efforts have met with total failure. Photo east of Pine Creek under Naegelin Rim.

Grassland area crossed by the Chamberlain Trail. Again, no available food or cover for wildlife.

The area around Roscoe Tank is heavily eroded. The soils are the churning vertisol type mentioned earlier. Perennial grasses are absent on the worse areas.

This area east of Pine Creek is receiving use by both cattle and sheep.

In some instances the piling of brush in erosion gullies has been used in an attempt to stop erosion. This is an example of treating the effect, but ignoring the cause. This photo is west of the Bar X headquarters.

Beside gully erosion there is sheet erosion. The soil deposited behind the down limb gives some indications of the extent of this problem. This photo taken in the Oxbow Mountain area.

If one recalls from the early stages of the report the importance of soil to the potential productivity of the land and how this relates to wildlife, one can see from the preceding photos that this precious commodity is moving off the allotment and driveway. It should also be noted in all these photos, that herbaceous food and cover are nearly absent and that without these the land can support very few wildlife species and only small populations of these at best.

There have been many studies to show that overgrazing is detrimental to the wildlife resource. In his paper on this subject before the forty-first North American Wildlife and National Resource Conference, Washington, D. C. in March of 1976, Steve Gallizioli, Arizona Game and Fish Research Supervisor points out the damage to productivity from soil loss. He quotes from numerous sources the impact to elk, turkey, deer and small bird populations. Scott 1975 and Merrill 1975 support his position about wild turkey populations. Danback and Good 1940, Monson 1941 and Battery and Shields 1975 support the position on small bird populations.

Weins and Dyer 1975 point out that light to moderate grazing of range lands doesn't hurt the avian communities, but that severe use may produce profound changes in all aspects of the avian communities.

Dasmann 1966 sums it up nicely with the following statement, "Most of our severe wildlife problem areas today are associated with lands that have in one way or another, been misused." The Bar X and sheep driveway area most definitely have been misused, overused and abused.

It can be argued that a certain percentage of the vegetation on the area has been removed by wildlife or insects. This was something in need of considering, so with the possibility in mind, a simple comparative study was initiated to measure the difference in use between grazed and ungrazed area. What was measured and compared were production utilization and animal droppings of the two areas. The results are most imformative. The compared sites are adjacent to each other, are on similar soils and have the same temperature and amount of precipitation. The droppings of four animals known to inhabit the area were counted. These were deer, rabbit, cow, horse. The findings were:

1. Production - 1200 lbs./acre ungrazed area
   200 lbs./acre grazed area

2. Utilization - Less than 5% on the ungrazed area
   80%+ on the grazed area

3. Average pellet groups of rabbit/acre in ungrazed plot is 300.
   Average pellet groups of rabbit/acre on grazed area is 77.

6. Cow use inside of ungrazed area 0.

7. Cow droppings per acre on grazed area averaged 165.

8. Horse droppings per acre on the grazed area averaged 15.

What this little analysis shows is that use by wildlife in the ungrazed area is much greater than on the grazed yet the use on the vegetation in the ungrazed plots is less than 5% though wildlife concentrations are significantly greater there. I conclude from this that the vast majority of herbaceous vegetation consumed on the allotment and driveway by domestic livestock and not wildlife. Other exclosures on the forest indicate that this is generally the case.

The following photos illustrate the difference in production and use in and out of an ungrazed plot.

This photo shows the fence line contrast on the east side of the Pine Springs plot.

In the above photo taken in the Colcord Estates area. The summer home resident fenced off a piece of the erosion gully. Note the difference in vegetative production in the fenced non-grazed and unfenced grazed areas.

The following information is submitted to illustrate the probable effect that overgrazing has had on the driveway. The information was obtained from the P.U. studies on the Pleasant Valley Ranger District by the District Range Conservationist.

1. The portion of the driveway northeast of FH12 shows that in the pine type in 1972, forage production averaged 50 lbs./acre with 65+ percent utilization. Areas that were seeded, in recently logged areas, had 400 lbs./acre with 80 percent utilization.

In 1975, after two years of rest, there is 50 to 100 lbs./acre with less than 10 percent use. The logged areas average 200 lbs./acre with less than 10 percent use.

2. From Naeglin Rim to FH12, in 1975, an average of 50 lbs./acre was produced with 80 percent utilization. In the Clay Springs-Naeglin Rim Section, there is virtually no measurable forage production. 1975.

3. From Pleasant Valley airport to the McInturf place. (P.J. type). In 1975 an average of 100 lbs/acre was produced with 80 percent utilization. Estimated 1975 optimum production was 800-1000 lbs.

4. From Pleasant Valley airport to Steer pasture (grassland). In 1975 an average of 200 lbs./acre was produced with 80 percent utilization. Estimated optimum production was 1000 to 1200 lbs./acre.

5. From Steer pasture to Walnut Creek - P.J., chaparral-grass. In 1975 an average of 50 lbs./acre was produced with 68-80 percent utilization.

Estimated optimum production in areas #3 and #4 was obtained by comparing study plots with similar soils and precipitation, but lacking grazing pressure.

In this section of the analysis, several points previously made will be further clarified pictorially. The first four photos show the basics of life, food, water, cover. As you can see, food and cover can be synonymous.

34 Rd. P.V.R.D. prior to junction with 33 Rd. This area borders on the driveway. Fair grass stand offering herbaceous feed plus cover.

South exposure of Naegelin Rim. One of few isolated areas within driveway that at present is capable of supporting wildlife species one would expect to be found there. Food, water, cover available.

Ground cover is an absolute necessity for ground nesting species such as Brewer's blackbirds, as this nest along Canyon Creek will attest to.

Water is in good supply and well dispersed from Walnut Creek to Clay Springs.

The following photos are representative of the driveway. Of primary interest is the scarcity of herbaceous vegetation. It should become apparent even to the untrained eye that what is shown will support only low numbers of cattle and sheep. It also holds true that numbers of herbivorous wildlife species will be low, but wildlife (unlike livestock) have broad and varying interrelationships and interdependencies. The complexity and biomass of wildlife species is dependent on the amount and diversity of primary production both in plant species and vegetative types.

(1) Photos 1-3 show the most productive range area of the driveway. This is the grassland country in the vicinity of the airport and Chamberlain trail. Photo 1 shows a deceptively green grassland area. The three areas indicated on the photo show: 1. An invasion of false alfalfa. 2. Active erosion gully formation. 3. Invasion of broom snakeweed on a sheep bedding area.

(2) Looking north towards Naegelin Rim.

(3) Photo 3 showing cows in driveway. By looking at the horse's feet one can get a good perspective of herbaceous production.

(4) Close view of a bedding area.

(5) Photos 5-8 show the P.J. type through its various states of degradation. It should be apparent that at best, pickings are skimpy and at the poorest livestock and wildlife would have to be totally dependent on juniper for life's necessities.

(6)

(7)

(8)

(9) Photos 9 through 12 are above Naegelin Rim. Photo 9 is at the junction of Roads 33-34 and has received 2 years rest from grazing pressure.

(10) This photo shows the contrast between inside and out of the exclosure at Clay Springs.

A list of those wildlife species that one would expect to be found in the allotment and driveway area follows. Included is an indication of their dependency on herbaceous vegetation whether direct or indirect.

A. Species ~~of mammals~~ directly dependent on herbaceous vegetation:

Order rodenta (moles, mice, rats, ground squirrels, chipmunks, etc.)

Black tailed jackrabbit	Cottontail rabbit
Elk	Javelina

~~Gambel quail~~ ~~Grass nesting avian species~~ Desert tortoise Mearns quail

B. Species that probably can survive without herbaceous vegetation:

Porcupine	Abert's squirrel
Arizona gray squirrel	

C. Species indirectly dependent on herbaceous vegetation:

1. These animals are either omniverous or feed on animals dependent on this vegetation.

Order insectivora - shews	Black bear
Raccoon	Ring tailed cat
Gray fox	Coyote
Mountain lion	All skunk species

Bats - insectivorus, insects dependent on vegetation.

2. Species where herbaceous vegetation is an important part of diet seasonally.

White tail deer	Mule deer

D. Degree of dependence of avian species to herbaceous vegetation.

Morning dove - directly
Merrian's turkey - directly and indirectly
Roadrunner - indirectly
Nighthawks - indirectly (insectivorus)
Hummingbirds - part of diet from flowery forbs
Horned lark - dependent
Swallows - indirectly (insectivorus)
Steller's jay - indirectly and directly (mostly insectivorus)
Scrub jay - indirectly and directly (mostly insectivorus)
Raven and crow - directly and indirectly (mixed diet)
Pinyon jay - insects constitute a part of their diet
Clark's nutcracker - insects constitute a part of their diet
All raptorial species - indirectly
Gambel quail
Mearns quail
Various ground nesting grassland species (horned lark meadowlark, lark sparrow etc.

What is needed for wildlife on the study area are:

1. A combination of cool and warm season grasses that are in a vigorous condition.
2. Riparian bottoms with a multi-storied canopy with an equal distribution of age classes of woody species and an abundance of good cover.
3. 2.5 to 3 snags/acre of trees larger than 12 inch DBH.
4. Diversity of woody species, forbs, grasses and trees.
5. Enough dead down material to offer cover in the conifer type.
6. Thinning prescriptions that maintain or enhance screening and thermal cover.
7. Closing all unnecessary roads and jeep trails.
8. Clean waters.
9. Sufficient ground cover to allow viable populations of ground living, breeding, feeding, nesting species to survive.
10. Blocks of even age stands of ponderosa pine to remain small in size.
11. Timber sales that are in a mosaic pattern across the area rather than one sale being a continuation of the last.
12. Management of renewable resources such as fuelwood to be on a sustained yield basis.
13. Adequate cover up to water sources.
14. A grazing management system that takes into consideration these needs of wildlife.

Actually the first thing needed is to reverse the downward trend in range condition, get back plant vigor, get some litter on the ground and stop the severe loss of soil.

The above can be accomplished by:

1. The Forest Service living up to its responsibilities as stewards of the land.
2. Adjust stocking to a level that will allow range condition to reverse itself from downward to upward.
3. Design a management plan that will allow the physiological requirements of the vegetation to be met and will assure both cool and warm season growers to exist. It should also assume that the cover requirements of ground nesters are met. The plan should consider the basic needs of wildlife.
4. Eliminating cattle-sheep dual use on the sheep driveway.
5. Design management plan with input from wildlife biologist.

I would, in closing, like to stress the basic needs of wildlife (food, water, cover) are not being met on the allotment and driveway. Plant vigor is very low, grazing is far in excess, management is non-existent and soils - the base upon which the food chain is derived is washing down the drainages. The ability of the area to produce vegetative biomass is reduced each year. Remember the 10 to 1 ratio between vegetation needed to support 1 pound of vertebrate biomass whether the vertebrate is a cow, a man or wildlife. The less vegetative production, the less vertebrate production. The user of the land suffers, wildlife suffers and the people of the nation suffer in the end.

What is needed is for those in the decision making position to think of the resource being destroyed and be strong of heart rather than cartilaginous spined.

It is the author's hope that at this stage of this report that it is obvious even to a person who has no biological background, that the Bar X allotment and sheep driveway are in a serious state of degradation and that without some change in the amount of and type use that the area is receiving that in the near future the area will be able to support much less vertebrate biomass than its present low level. The ability of the area to support cows, wildlife or vegetation is decreasing every year.

In the appendix there are twelve excerpts from "Influence of Grazing on Plant Succession of Rangeland" by Ellison, Lincoln 1960, The Botanical Review Vol. 26, No. 1 that describes in a classic manner the physical and biological changes that occur on rangelands that are abused by overgrazing. Also included in this section of this appendix are numerous excerpts from many noted authorities on range problems and range and wildlife conflicts.

I do not profess to know all the ramifications of how we as land managers have allowed this poor excuse for land management to exist. I only know as a biologist that the Bar X Allotment and the sheep driveway are in bad shape from an ecological point of view. If our management objective is resource degradation then we can be proud of the job that we are doing. Enclosed in the Appendix are some quotes from the Range and Wildlife sections of the Forest Service manual stating our objectives and policy. It is obvious that on the Bar X and sheep driveway that we are not meeting our range objectives or following our own policy.

Appendix

46-48 Quotes from Forest Service Manual on Range and Wildlife objectives, Policy, etc.

49-50 Range study comparison grazed versus ungrazed areas.

51-58 Evaluation of Bar X - Sheep Driveway Livestock - Wildlife Conflicts by Steve Gallizioli, Research Chief, Arizona Game and Fish Dept.

59-66 Bibliographical information to support position in this report.

Quotes From Forest Service Manual

2201.21 - Secretary's Regulation

(a) Authority - The Chief, Forest Service, is authorized to develop, administer and protect the range resources, and permit and regulate the grazing use of all kinds and classes of livestock on all National Forest System lands and on other lands under Forest Service control.

2202 - Objectives

1. a. Provide nationwide leadership in Forest range conservation, development, and utilization - including woodlands and brush - covered wildlands in mountainous areas.

b. Develop the range resources on all National Forest System lands to their reasonably attainable potential, and manage them for sustained grazing in harmony with interrelated uses.

2203 - Policy

2203.1 - For All Forest Service - Administered Lands

2. Develop the range resources to their reasonably attainable potential and manage them on a sustained yield basis in harmony with other uses and resource values.

2205.1 - Coordination with resources.

2205.14 - Wildlife Management

1. When there is a direct competition for forage between livestock and big game, endeavor to arrive at an equitable balance of use in cooperation with States and other concerned.

2. Reserve equitable forage and cover for wildlife, particularly on big game winter range. Consider the effects of range management systems on wildlife.

3. Livestock management plans and range improvement programs will be coordinated with wildlife management plans. For example:

a. Considering the needs of both livestock and wildlife in all rehabilitation programs which include modification of the habitat.

b. Reserving areas of undisturbed cover on brush-tree control projects.

c. Planning fences to allow for movement of big games.

d. Considering the needs of both livestock and wildlife in all water developments.

4. Coordinate grazing of livestock and big game to protect fisheries. Depletion of vegetation along streambanks and in the watershed results in sedimentation of the stream and the loss of shade-producing cover. Proper range stocking is essential. In some cases, fencing of existing and potentially good trout streams may be justified to protect fishing waters.

5. Preserve food and cover supply for upland game birds, waterfowl, and small game.

6. Recognize the needs of wildlife when installing range improvements by:

a. Fencing springs at water developments to provide cover nesting habitat for upland game birds.

b. Ensuring escape of small animals and birds from range water developments.

2205.14 - Wildlife Management

2221 - Stocking of Ranges

2221.02 - Objective - To make the most efficient and sustained use of the range consistent with the needs of other resources, and the uses and the dependence of the local communities.

2600

Zero Code

"A variety and abundance of wildlife is an expression of a rich, unpolluted environment."

"Hence the status of wildlife in an area can be used as an indication of the general condition of the environment. The incentive to maintain or enhance wildlife environments is provided by the Multiple Use - Sustained Yield Act of 1960 and the Environmental Policy Act of 1969."

2602 - Objective

1. National Forest System Lands. The Forest Service wildlife habitat management objectives are to:

a. Develop and maintain, in cooperation with the states and in harmony with the national environment and with other uses of the land, a pattern of wildlife and fish habitats on National Forest and National Grassland Areas that will best meet the needs of people now and in the future.

A comparison of a range site within the Pine Creek Range Study plots and an area in the NW quarter of section 13, T10½N, R13E, was made on May 12, 1976.

This information is summarized on the attached table and illustrated by the attached photos.

The area within the Pine Creek plots was fenced and excluded from livestock use in 1942, a part of the Bar X allotment. The 1966 range analysis classified the area as being in poor condition with a downward trend. It also recognized the need for juniper control work. The juniper control work was accomplished in 1970.

Both sites are located on soils classified as being within the Show Low soil series. Show Low series soils are found on a major portion of the pinyon juniper vegetative type on the allotment. These are indicated by map symbols 69 and 70 on the allotment soils map. The sample site within the Bar X pasture is representative of range condition on Show Low soils on the allotment.

Both sites are similar in elevation, aspect and slope. Precipitation is judged to be similar. Both areas have endured similar drought periods over the years.

Major difference between the two sites are:

1. Juniper has been removed mechanically from the Bar X pasture site. No control work has been done within the Pine Creek plots.

2. The Bar X pasture site has been used by livestock for at least 80 years. The Pine Creek plot site was closed to grazing in 1942.

Comparison of the two areas clearly indicates the following:

1. Livestock use is responsible for the downward trend and poor range condition of the Bar X pasture.

2. The presence of juniper does not contribute to poor range condition. Juniper control is not effective in improving range condition, so long as overstocking occurs and continous grazing is practiced.

Those participating in the study were Rick Kvale, Pleasant Valley District Range Assistant, Rich Martin, Forest Hydrologist; Howard Broderick, Forest Soil Scientist, Mike Yeager, Supervisor R-5, Arizona Game and Fish Department; Jack Davis, District Manager, Arizona Game and Fish Department; and Bill Fleishman, Forest Range and Wildlife Staff.

Data sheets for soil sampling plots are attached.

	Perennial Forage Plants Composition	Perennial Forage Plants Density	Soil Type	Annual Plant Abundance	Utilization Perennial Plants	Trend in Range Condition	Comments
Pine Creek Study Plots	Bouteloua curtipendula " hirsuta " gracilis Aristida Spp. (Tall) Agropyron smithil Poe fendleriana Sitanion Hystrix Sporobolus cryptandrus Eriogonum wrightii Dales Spp.	50%	Show Low 2" A horizon High productivity Low sensitivity 1000 lbs/A	Few 6 weeks fescue principal annual plant.	None	Up	Evidence of deer was in plot. Gullies Healing, cool season and warm season perennial grasses present. Very few annual forbs and grasses. well distributed through plot. Grasses growing under Juniper trees Vigor, good, few dead plants reproducing.
Bar X Pasture Juniper Control Area	Boutelous curtipendula " hirsuta " gracillis Eriogonum wrightii	18%	Show Low 1" A Horizan High productivity Low sensitivity 1000 lbs	Numerous Estimate fillaree abundant. 6 weeks fesure common Indian wheat common.	80%	Down	Cool season species absent-vigor poor. Side-oats grama found only where protected by juniper debris. Annual forbs: Indian wheat and fillaree common with low productivity. Blue grama sod with poor vigor. No evidence of deer use.

MEMO TO: Mike Yeager, Regional Supervisor, Arizona Game & Fish
Bruce Hronek, Supervisor, Tonto National Forest

FROM: Steve Gallizioli, Research Chief, Arizona Game & Fish

REF: Range tour of Bar X allotment

DATE: 2 May 1977

On October 27-28 I made a tour of the Bar X allotment with Ron Burraychak, Wildlife Biologist for the Tonto National Forest. Kelly Neal was to have been along on the tour for at least one day but had car problems and had to cancel out. Jack Davis had also been invited but apparently was unable to make it because of the forthcoming deer season.

In the two days, Burraychak managed to show me a large part of this allotment. The tour was done entirely by pickup truck but the road situation was such that we managed to get into practically every portion of the area.

This allotment runs through several vegetation types from ponderosa pine, and mixed conifer at the higher elevations, down through pinyon-juniper, chaparral, and some grassland in the lower elevations near the town of Young.

It was difficult to find any spot on this allotment that hadn't been heavily overgrazed. Only on some of the very steep and rocky slopes overlooking Haigler Creek did I observe any perennial grasses (except inside several study plots).

One of the most severely abused areas is the sheep driveway, a strip varying in width but as much as two miles wide, running from the lowest reaches to the top of the Rim. The driveway is used by domestic sheep when they are trailed up to the higher elevations in the spring and back down in the fall. When not being used by sheep, the area is grazed by cattle. As a result of the heavy grazing pressure herbacious vegetation has been eliminated over most of this driveway. In the ponderosa pine type on the Naegelin Rim much of the driveway istotally devoid of vegetation. The situation isn't much better at the lower elevations. However, at the time of this survey, deciduous trees, particularly Gambel oak, had shed their leaves and the leaf cover tended to subdue the visual impact, unlike the situation in the ponderosa pine.

Browse was heavily used throughout the allotment. Each time I left the pickup for a closer look I failed to see any evidence of use by deer or elk. Nor were there any deer or elk pellet groups in any of the areas I looked at closely. I know there are deer and elk in this area and I recognize they have to forage on the vegetation, but I failed to find any evidence of use by these species. At the lower elevations the grasslands have been heavily invaded by weeds, mostly several species of small composites. What grasses persisted lacked vigor and were clearly having difficulty competing with the weed invaders. Nowhere did I find any evidence that desirable forbs had replaced the grasses eliminated by overgrazing.

MEMO TO: Mike Yeager/Bruce Hronek 2 May 1977

One of the most conspicuous symptoms of severe range abuse was the erosion prevalent throughout the allotment. The topsoil, or at the very least the "A" horizon, which is the most productive part of a soil profile, is essentially gone over large areas. In the Naegelin Rim area mentioned before, the surface soil is totally gone and little more than bare rock remains. The situation isn't much better at lower elevations but, again, the leaf cover tended to obscure the significance of soil loss in areas with deciduous trees. Erosion gullies, some of them are deep enough to hide a horse and rider, scarred the landscape in many places. One of the most severely eroded regions was the Colcord Estates summer home area. This privately owned area has been subdivided but those lots not actually fenced are still being grazed by Bar X cattle. The result is some of the worst gully erosion of the entire allotment.

Even though it was cool with overcast skies on both days, we saw no deer, no elk, no turkey, essentially no wildlife as a matter of fact, except three Abert squirrels and five band-tailed pigeons. As we proceeded over the area I watched for tracks in sand and mud. I failed to so much as see a deer track, turkey track, or anything I was reasonably sure was an elk track. If I had to draw any conclusion about wildlife on the basis of this short survey it would be that all major game species are at an extremely low density. If I had to make an educated guess as to reasons for the scarcity of wildlife I would have to conclude the most likely suspect is the severe overgrazing by livestock.

SG:rb

Heavily used mountain mahogany. Left photo was taken on a ridge near ranch headquarters; right photo higher up in the edge of ponderosa pine. Photos were taken in October and cattle had already used most of current annual growth leaving little for wintering big game.

Severe erosion caused by overgrazing in pinyon-juniper type. Not an isolated example.

Severe erosion on privately owned land at Colcord Mtn. Estates resulted from overgrazing by Bar X cattle. Though private property, parts of these meadows are not fenced to exclude cows.

Portion of sheep driveway in ponderosa pine type. Essentially all herbaceous vegetation is gone leaving only rock and gravel.

This is fairly typical of the grassland type on this allotment. Photo taken not far from Young.

Fence line contrast at Pine Springs plots. This too is in the sheep driveway and demonstrates the severity of use.

Contrast between ungrazed exclosure at Battle Springs and outside. In addition to all herbaceous vegetation having been grazed off the slopes, erosion has piled up silt against the fence in the foreground to a height of a foot or more.

Bibliographical Information to Support Position

Steve Gallizioli, Improving Fish and Wildlife Benefits in Ranger Management. Forty-first North American Wildlife and Nat. Res. Conf., Wash., D.C. March 1976

"In Arizona the single most important range management problem which limits attainment of potential fish and wildlife benefits can be summed up neatly in one very short and single phrase: Overgrazing by Livestock."

"Soil loss due to decades of overgrazing has irreparably diminished the productivity of millions of acres of rangeland."

"Mackie (1970) in Montana and Skolin, et. al. (1968) in Oregon have reported that Elk use on an area was inversely related to cattle use. When cattle moved in elk moved out. Arizona studies on the Beaver Creek watershed yielded similar results."

"The merrian turkey is yet another specie that evidently suffers from the effects of overgrazing. Recent data from one of Arizona's turkey areas showed the following: 580 poults per 100 hens on an ungrazed area compared to 150 poults per 100 hens on grazed areas. A reduction in nesting cover is suspected to be the cause of lower poult production in the grazed areas."

"Buttery and Shields (1975) recently reviewed a number of papers reporting the results of studies in many parts of the country. Almost invariably populations declined in the presence of too many head of livestock. They also cited the beneficial effects that occurred. When a severely overgrazed area was placed under proper grazing management resulting in more than 100 percent increase in the small bird population."

Merrill, Leo B. - Effect of Grazing mgmt. Practices, on Wild Turkey Habitat. Proceeding of the Third National Wild Turkey Symposium, Pub., The Texas Chapter of the Wildlife Society, 1975.

"On the Edwards Plateau of Texas, heavy continuous grazing by cattle, sheep, and goats has caused a severe decline in forage density and vigor, and has reduced the range carrying capacity for livestock and various wildlife species (Merrill 1959).

"Wild Turkey nests were found only in pastures where a good grass cover developed." (Merrill 1975)

"Although turkeys were observed in the moderately grazed pastures with fair grass cover, no nests were ever found there and neither turkeys nor nests were found in the heavily grazed pastures with poor grass cover." (Merrill 1975)

"The heavily grazed pastures, regardless of livestock combination, developed poor grass stands entirely inadequate for nesting cover. They produced little seed, berries, or other food for wild turkeys." (Merrill 1975)

Scott, Virgil E., Erwin L. Boeker, Ecology of Merrian's Wild Turkey on the Fort Apache Indian Reservation. Proc. of the Third National Wild Turkey Symposium, Pub. The Texas Chapt. of the Wildlife Society. 1975

"Perhaps the prime ingredient of optimum turkey habitat is diversity of mast producing overstory trees, shrubs, and forb and grass communities. A complete failure of food would rarely occur in these conditions and cover requirements would be met in all seasons."

"Use of stock watering tanks by turkeys during dry seasons suggest that the maintenance of consistent free water supply would enhance populations, particularly in the drier portions of the turkey's range."

"When planning a timber harvest, forest managers should leave clumps of mature ponderosa pine, particularly those where turkeys already roost. Reduction to 16m 2/hc tree basal area in a roosting site may cause turkeys to change sites or move. Isolation of potential roost sites from other cover, as in juniper eradication programs may also be detrimental to turkeys."

Evenden, Fred G., 1975 Proc. of the Symposium on Mgmt. of Forest and Range for Nongame Birds. Direct Interactions Between Humans and Birds.

"Birds certainly fulfill the synonyms of "pleasure" for humans. They bring happiness, delight and enjoyment." They bring pleasure in the following catagories: 1. sight and sound, 2. captives, 3. recreation.

He further points out that there is some profit to mankind in the following areas; 1. Scientific relations, 2. Environmental health, and in commerce.

Hamilton, Robert B. and Robert E. Noble. 1975, Plant Succession and Interactions with Fauna., Proc. of the Sym. on Mgmt. of Forest and Range Habitats for nongame birds.

"The best way to have maximum bird species diversity is to have maximum habitat diversity with all habitats preserved in reasonable quantity and in favorable geographic locations."

"Management in National Forests is like management as practiced by large timber companies except that multiple use considerations are supposed to be made. This has resulted in controversy as the champions of various special uses pressure for their desired usage to become predominant."

(Note) Climax species eliminated or greatly reduced - Silviculture treatments - removal of dead or dying trees, loss of old age trees, tendency towards monocultures, vertical stratification in vegetation of birds.

"Obviously bird species diversity can be increased in a timber stand if one increases the vegetative strata within the stand. Frequently this can be accomplished by accepting a basal area somewhat less than the optimum basal area for growing timber alone. The reduced basal area will permit some openings in the canopy and therefore permit vegetative strata to develop beneath the crop trees."

Note: Set back successful stage - attract species with an affinity for that stage.

Weins, John A. and Melvin I. Dyer - 1975 - Rangeland Avifaunas: Their Composition, Evergetics, and Role in the Ecosystem - Non Game Syn.

"However the observed fluctuations in densities and biomass and the wide distributions of dominant forms may produce a general "resiliency" in rangeland avifaunas, so that moderate habitat alterations (such as light to moderate grazing) produce only slight efforts. More extreme habitat changes, such as heavy grazing or agriculture cultivations may produce profound changes in all aspects of the avian communities, generally tending in the direction of increasing simplicity."

"Rangeland bird populations have evolved in association with large grazing mammals (e.g. bison), and this moderate grazing pressures have only slight influence, and are in fact probably beneficial in creating small-scale environmental heterogeneity."

Buttery, Robert F. and Paul W. Shields, 1975. Range Management Practices and Bird Habitat Values - non game sym. An aggregate of available information.

"Overmire (1963) in a northcentral Oklahoma study found that populations of dickcissels and Bell's vireos were 50% lower on grazed than ungrazed lands. He felt that grazing reduced the number of suitable nesting sites. Smith (1940) in another Oklahoma study, found that in the mixed grass prairie, birds quickly disappeared from overgrazed lands. However, as shown by Weatherhill and Keith (1969), grazing by domestic livestock is not necessarily in itself unacceptably detrimental to bird habitat. Moderate grazing may improve habitat in some cases, for species such as the mountain plover and meadowlark."

"Dambach and Good (1940) found in an Ohio study that protected woods supported more than twice the bird population - both in individuals and species--than did grazed woods. They also noted that 50% of the species found in the grazed woods were hole-nesters as compared to 31% in the protected woods. None of the species in the grazed woods nested on the ground and only one, the indigo bunting, nested in herbaceous or shrubby cover."

"From the bird habitat standpoint, yearlong grazing is probably the most detrimental of the grazing systems because understory, and in some cases midstory vegetation is never allowed to rest. Unless the range is very lightly stocked the amount of vegetation present is likely to be insufficient to provide adequate food and cover for seed eating birds that nest on or near the ground."

"Although no specific grazing system was mentioned, Monson (1941) in an Arizona Study, reported that when a severely deteriorated range was placed under proper grazing management and water spreading dams installed the result was a greater than 100% increase in the small bird population. How much of the increase can be attributed to grazing management and how much to water spreading was not determined, but the study dramatically illustrated the importance of good range management to bird habitat."

Stoddart and Smith - Range Management 1955 - page 310-313.

"The most accurate indexes of overgrazing are the early changes that take place in the vegetation as a result of plant succession. Grazing gradually reduces the more desirable plants and makes available soil nutrients and moisture for less desirable plants."

"The palatable shrubs can be used as a guide to range use. The presence of dead stubs of browse and a hedged appearance warn the observant stockman that grazing should be decreased.

"Removal of soil from rangelands by wind or water is an index of the severity of use in the past. Where water has been the eroding agent, gullies are usually present, though considerable sheet erosion may take place before gullies are found. On the steep topography characteristic of much of the west, gullies ordinarily appear soon after erosion becomes excessive and are valuable indicators of too heavy grazing."

Some of the plants that Stoddart lists as indicatory of overgrazing that are found on the allotment include snakeweed, cactus, loco weed, sunflower, three awn, six-weeks dropseed, pensteman, mullein, wild buckwheat.

Ellison, Lincoln 1960 - Influence of Grazing on Plant Succession of Rangelands. The Botanical Review Vol. 26 No. 1.

"Most of this vast area has been so heavily grazed for so long that the original plant cover has been depleted and in many places destroyed."

The economic and ethical consequences of range mismanagement go far beyond damage to the forage resource. There is very little of the western range where, because of depletion of the plant cover by overgrazing, accelerated erosion has not destroyed a portion of the soil mantle and thus reduced the productivity of the site."

"The more palatable species are eaten down thus rendering the uneaten ones more conspicuous. This quickly throws the advantages in competition to the side of the latter. Because of more water and light, their growth is greatly increased. They are established to store more food in their propagative organs as well as to produce more seed. The grazed species are correspondingly handicapped in all these respects by the increase of less palatable species and the grasses are further weakened by trampling as stock wanders about in search of food. Soon bare spots appear that are colonized by weeds or weedlike species. The weeds reproduce vigorously and sooner or later come to occupy most of the space between the fragments of original vegetation. Before this condition is reached, usually the stock are forced to eat the less palatable species, and these begin to yield to the competition of annuals. If grazing is sufficiently severe, these too may disappear unless they are woody, wholly unpalatable, or protected by spines."

"A depleted range may be heavily utilized by the same number of animals that would make only light use of the same range in good condition."

"Generally speaking, the effect of grazing certain species in a community is to handicap those species and encourage others under range conditions where the animals cannot be controlled as they are in pastures, the effect of selective grazing is commonly to reduce the proportion of palatable species. Some exceptions have been noted in which the quality of the vegetation has been improved by grazing, but in light of the number of examples to the contrary, these are truly exceptional. Obviously differences in palatability are not the whole explanation for trends under grazing; difference in growth form or phenology may also play an important part."

"Because overgrazing has been the rule on rangeland, not only has plant composition been changed by grazing pressures, but the vegetation has been thinned and in many instances destroyed. As a result of some degree of denudation, accelerated soil erosion is inseparably linked with overgrazing on arid lands the world over (Shanty, 1935, Jacks and Whyte, 1939)."

"The effect of grazing in both reducing standing herbage and accumulation of mulch is to encourage evaporative loss and to create a ligher warmer drier microenvironment."

"Attention has already been called to the observation by Dysterhuis and Schmutz (1947) that a remarkably deep and continuous layer of earthware casts occurred beneath an undisturbed prairie mulch. Such a continuous layer was absent beneath the considerable mulches that had been developed on grazed land. In want of much information on the effects of grazing on animal life in the soil, this observation suggests, at least that the effects may be profound."

"One of the best known effects of overgrazing on insects is an increase in numbers of grasshoppers (Weese, 1939; Smith 1940a, 1940b; Clark 1948)."

"Small mammals harvest vegetation and thus compete in some degree with domestic livestock. The degree of competition is probably most severe, as it is between big game and livestock, on depleted range."

"It is widespread thinning of the plant cover by close grazing and trampling and consequent soil exposure; that lessens infiltration and encourages overland flow, the immediate cause of erosion."

"There are enough examples of severe overgrazing of range vegetation so that everyone who has been interested in the matter at all knows that reduction of plant cover by overgrazing leads to accelerated soil erosion by wind or water."

Costello, David F. - 1957- Application of Ecology to Range Management - Ecology, Vol. 38 No. 1.

"We go to greath lengths in the control of noxious plants or the eradication of rodents and predators. Usually these are simply manifestations of overgrazing, which can be controlled by better livestock management."

"When we learn to justify range management practices on a long-time National Welfare basis--not on expediency, temporary needs, or financial difficulties experienced by individual range managers and operators--we will be on the road to preservation of our forage resources."

Humphrey, R. R., 1949--Field comments on the Range Condition Method of Forage Survey. Journal of Range Management Vol. 2, No. 1, pages 1-6.

"Rather generally on open grasslands, an increase in litter indicates an improvement in condition moderate to abundant litter provides a surface layer of organic material that protects the soil surface from the erosive and puddling actions of raindrops and surface runoff. It also constitutes part of the raw material for humus formation. And likewise, important an accumulation of litter indicates that past grazing use was not abnormally heavy."

Lewis, James K., 1969 - The Ecosystem Concept in National Resource Management Edited by George Van Dyne, Academic Press, New York and London 1969.

"In "Grazing Problems in the Southwest and How to Meet Them," J. G. Smith (1899) described range deterioration in terms of (1) Reduction in the grazing capacity; (2) "...disappearance of the best grasses...," (6)"..... ground is trampled and compacted...," (7) "...decrease in fertility (of the land) through exposure of the surface layers to the sun and air," (8)"..... less of the rainfall absorpted...," (9) "...destructive action of torrential rains."

"However, in the developing countries of the world, "...deterioration is continuing at an alarming rate, especially in arid and semi-arid regions ..... The shocking fact is that badly needed production from natural grazing lands has been cut in half as a penalty against mismanagement while destruction continues. A hungering world gets hungrier while a valuable natural resource erodes away for lack of national programs and proper management" (R. E. Williams et. al., 1968)."

"...Poutlor (1967) stressed the range resource....as the food and cover base for both wildlife and domestic livestock populations and as the core of watershed protection and quality on millions of acres."

"...Range management is the management of a renewable resource composed mainly of one or more range ecosystems for the optimum, sustained yield....."

"Sustained yield requires continuous energy flow with orderly cycling of matter. The restrictions imposed by the worse sustained determines the maximum rate of usage under the constraints of the controlling factors."

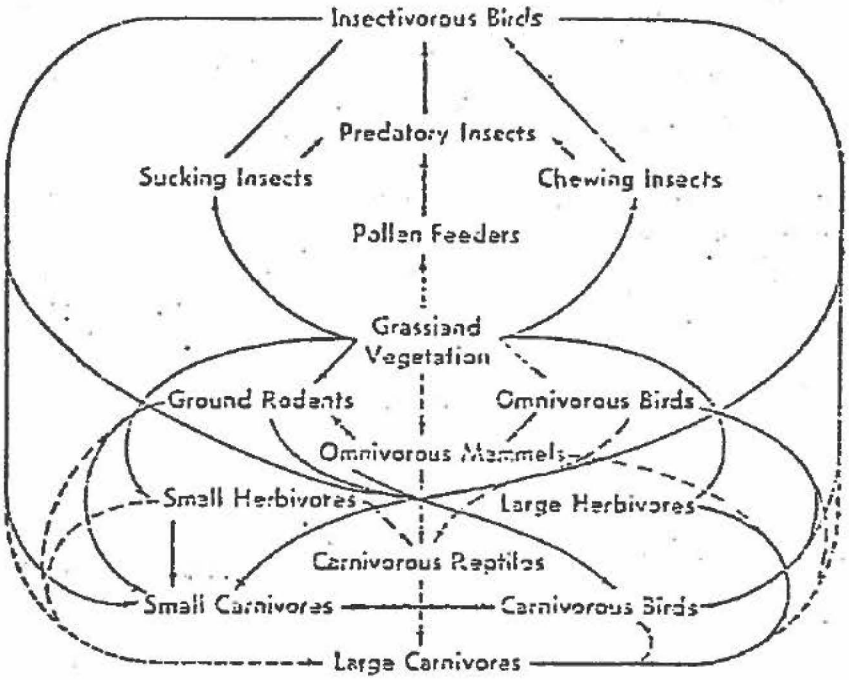


FIG. 3. Food web of the grassland biome (modified from Carpenter, 1940).

It has been repeatedly documented in scientific journals and taught in range courses that when an area is over grazed the following happens:

1. The more palatable species lose vigor and over a period of time die out to be replaced with less palatable species.

2. Mulch cover is reduced.

3. There is a change in microclimate to a drier, warmer site.

4. Trampled soil becomes compacted, less percolation of moisture through the soil, more surface runoff-causing a continuous man made drought situation.

5. May have a serious effect on the soil fauna, composed mainly of small invertebrates organisms and decomposers.

"As Leopold (1966, p. 204) commented, "You can get away with murder in the glaciated northern United States and go back 50 years later and revise the whole system of land use and the country will absorb it. But you make one mistake in the arid west and it is semi-permanent."

"The restoration of depleted land is the concern of both individuals and society. The land is the heritage of generations yet unborn-The wealth of all mankind, the bread basket of the world. Loudermilk (1962) said, "... the condition of land and its natural resources, is a measure of the stability, of the success, and of the promise of a people...it is no more possible to build a safe and prosperous social structure on eroding or wasting lands, than to build a house on sinking sands."

Wildlife Biology - Raymond F. Dasmann - 1966 - p. 29, 35 and 36.

"Thus considering energy relationships above, it is the quantity of green plants that must determine the numbers of plant-eating animals, and the quantity of the latter which determines the numbers of meat eaters."

"A stable ecosystem is characterized by a constant turnover of materials, and by a balance between losses of materials from the system and their replacement from atmosphere or substrata."

"Some of our lands have been pushed too far. A point of no return is reached, at which the rate of erosion or the extent of soil destruction is too far advanced to allow recovery within a calculable period of time. Some of our western ranges, grazed heavily year after year by too many livestock, have reached this stage. Only the slow processes of weathering and of primary biotic succession can eventually rebuild soil and vegetation in these areas."

"Most of our severe wildlife problem areas today are associated with lands that have in one way or another been misused."