United States
Department of
Agriculture

Forest Service

December 2017

Final Environmental Assessment

Diamond Rim Grazing Analysis

Payson Ranger District, Payson, Arizona

Gila County, Arizona

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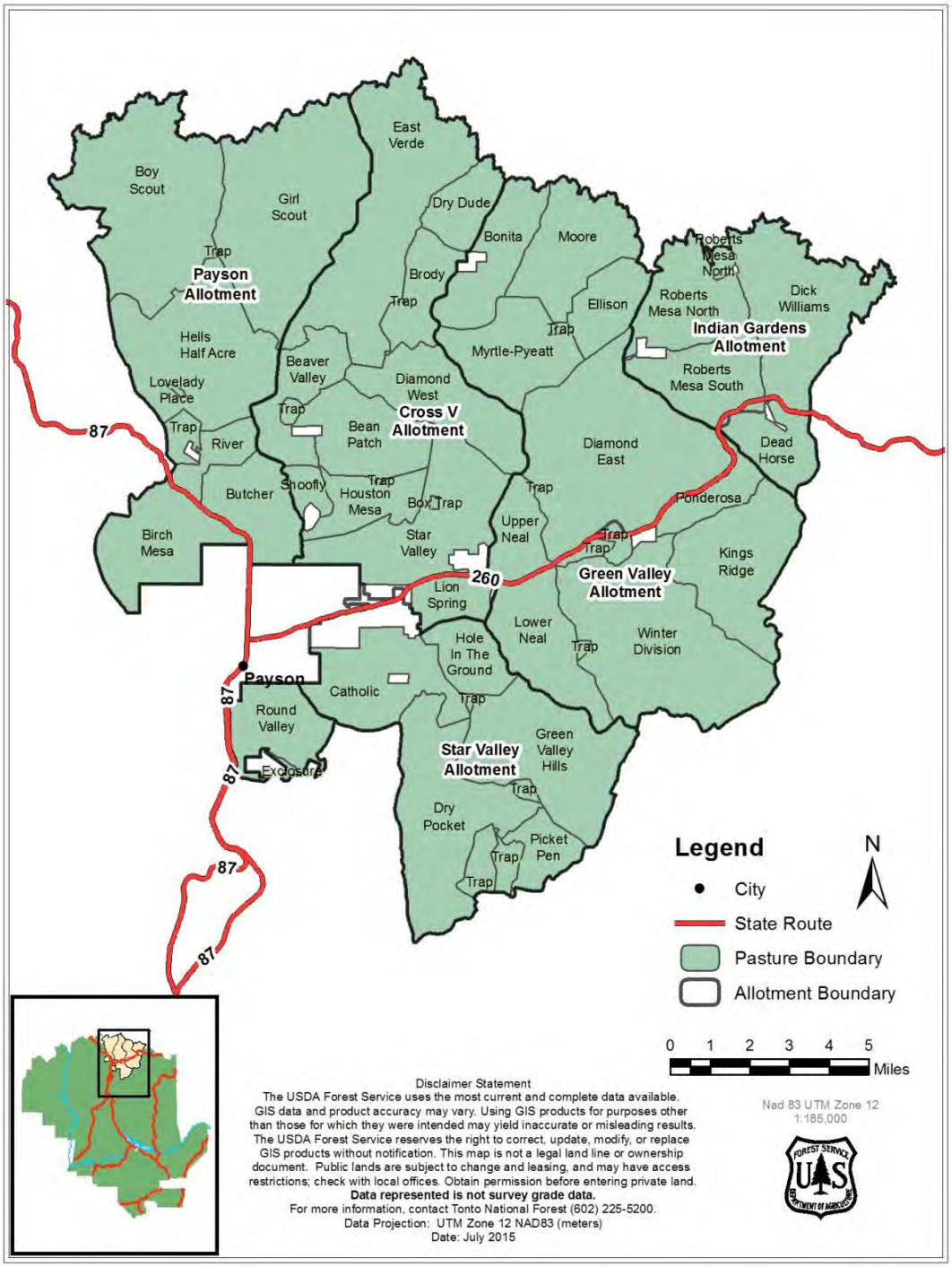
Chapter 1: Purpose of and Need for Action

Background

The combined Payson, Cross V, Star Valley, Green Valley and Indian Gardens allotments, referred to as the Diamond Rim grazing allotments, consist of approximately 163,752 acres and compose the central third of the Payson Ranger District. The allotment complex is bounded on the north by the Mogollon Rim, to the west by AZ State Route 87 (approximately), to the south by Round Valley Subdivision and Tonto Creek and to the east by the Christopher Mountain/Ellinwood grazing allotment. Diamond Rim grazing allotments are accessible by AZ State Routes 87 and 260. Elevations vary from about 3,200 feet in Tonto Creek to about 7,600 feet at the top of the Mogollon Rim (Figure 1). Vegetation is diverse and ranges from juniper grasslands to ponderosa pine and mixed conifer plant associations with piñon-juniper and chaparral vegetation types found in the mid elevations. Precipitation averages range from 18 to 29 inches annually depending on location within the allotments.

Figure 1: Diamond Rim Allotments



Payson/Cross V: The Payson and Cross V allotments were paired together as one grazing unit and authorized 177 to 207 adult cattle yearlong (CYL) from 1968 to 2001. Currently permitted numbers are 250 adult CYL.

Star Valley: The Star Valley Allotment was historically managed as a single unit and numbers fluctuated from 186 adult CYL + 70 yearlings from 1968 to 1995. After 1995, permitted numbers changed to 114 adult CYL + 10 yearling carryover from 1/1 to 5/31.

Green Valley/Indian Gardens: From the mid-1980s to 2001, Green Valley and Indian Gardens allotments were grazed together as one unit and authorized 95 to 300 adult CYL; prior to 1980, 300+ adult CYL were authorized. Current permitted numbers for the Green Valley/Indian Gardens Allotments are 255 adult CYL + 30 yearlings from 1/1 to 10/31.

Prior to 2005, each allotment was operated as either a separate, yearlong grazing allotment with an individual term grazing permit, or allotments were paired and grazed yearlong with a single heard that rotated through the pastures of the paired allotment. The previous permittee had voluntarily destocked the allotments for personal convenience in 2001. In 2005, the permits were waived with the sale of the base property to the current permittee after four years of complete rest from grazing on the allotments. Shortly after the waiver to the current permittee, a National Environmental Policy Act (NEPA) analysis and decision resulted in the selection of an alternative that reduced the stocking rate to 380 CYL. The current permittee appealed that decision based on the lack of permittee input into the analysis. The decision and appeal were vacated in favor of a new analysis with permittee involvement. The Payson Ranger District had made the previous decision based on the Little Green Valley Complex (LGVC) analysis. The LGVC was a comprehensive project that included the analysis of fuels and fire and wildlife in addition to grazing under one proposed action. As a result of an internal review of that analysis, it was determined that the scope of the project was too large and it should be narrowed and focused on grazing authorization. The subsequent scope change necessitated the development of a new project. The initiation of that new project, the Diamond Rim Grazing Analysis (DRGA), was authorized by the Payson District Ranger on January 28, 2015.

Since 2005, the Diamond Rim grazing allotments have operated under two term grazing permits issued to a single operator who has run a single herd across the allotments. Total permitted numbers for the two term grazing permits are 619 adult cattle yearlong or 10,050 animal unit months (AUMs[1]), 30 head of yearlings for 10 months (1/1 – 10/31) on the Indian Gardens/Green Valley allotments, and 10 head of yearlings for 5 months (1/1 – 5/31) on the Star Valley allotment (Table 1).

[1] **AUM**: Animal Unit Month. The amount of forage needed by an "animal unit" (AU) grazing for one month. The quantity of forage needed, based on the cow's weight, and the animal unit is defined as one mature 1,000 pound cow and her suckling calf. It is assumed that such a cow nursing her calf will consume 26 pounds of dry matter of forage per day. A conversion rate of 1.32 is used to calculate AU's for adult cattle and 3/4 is used to calculate AU's for yearlings. (Holecheck, 2012).

Table 1: Permitted Numbers and Season of Use by Allotment

ALLOTMENT	KIND	CLASS	NUMBER	AUMS	SEASON OF USE
Star Valley	CATTLE	COW/CALF	114	1,806	3/1-2/28
		YEARLINGS	10	35	1/1-5/31
Green Valley & Indian Gardens	CATTLE	COW/CALF	255	4,039	3/1-2/28
		YEARLINGS	30	210	1/1-10/31
Payson & Cross V	CATTLE	COW/CALF	250	3,960	3/1-2/28
			TOTAL	**10,050**	

Current Management

The Diamond Rim allotments have been operated since 2005 under an authorization of up to 380 AUs yearlong based on a 2005 decision. Because of this limited stocking rate and restrictions placed on some pastures, the permittee has not been utilizing the entire range of the allotments. The Diamond Rim allotments have been managed under an adaptive management strategy that utilizes a stock and monitor approach for determining allotment and pasture rotations (Forest Service Handbook 2209.13 Chapter 90). Because of non-use and absence of regular maintenance numerous pastures were unusable due to degraded infrastructure. During this time, range conditions have remained static or improved, demonstrating that the previously appealed 2005 NEPA decision substantially underestimated the carrying capacity of the allotments.

Current management direction is as follows:

- Up to 380 adult cattle on the Diamond Rim grazing allotments on a yearlong basis (figure 3, appendix A).
- Winter Pastures (October through April)
- Summer Pastures (May through September)
- Pastures Closed to Grazing
- Pastures Restricted to Two Weeks of Grazing; Birch Mesa, Catholic Peak, Dead Horse, Round Valley, Ponderosa and Dick Williams

Table 2: Current Management: Winter pastures (October through April)

Allotment	Pasture
Cross V	Diamond West, Star Valley
Star Valley	Dry Pocket, Green Valley Hills, Hole in the Ground, Picket Pen
Payson	Hell's Half Acre
Green Valley	King's Ridge, Lower Neal, Upper Neal, Winter Division

Table 3: Current Management: Summer pastures (May through September)

Allotment	Pasture
Cross V	Bean Patch, Brody, Dry Dude, Houston Mesa, East Verde[2] Lion Springs*, Beaver Valley*
Star Valley	
Payson	Butcher, Boy Scout*, River (Flowing Springs)*
Green Valley	Bonita, Ellison, Moore, Myrtle, Diamond East
Indian Gardens	Robert's Mesa North, Robert's Mesa South*

**Pastures Restricted to Two Weeks of Grazing*

Table 4: Current Management: Pastures Closed to Grazing

Allotment	Pasture
Cross V	
Star Valley	Catholic Peak
Payson	Birch Mesa, Round Valley
Green Valley	Ponderosa
Indian Gardens	Dead Horse, Dick Williams

Existing Condition

The existing range condition on the Diamond Rim grazing allotments is generally stable with an upward trend overall. Current monitoring data is summarized in Appendix B, Table 1. Data was collected at monitoring locations which are commonly referred to as key areas. These key areas are defined as a relatively small portion of a rangeland selected because of its location, use, or grazing value as a monitoring reference point for grazing use (Holechek et al. 2004). Key areas are intended to be within a single ecological site or plant community, responsive to management actions, and indicative of the ecological site or plant community they are intended to represent (ITT, 1996a).

Of four sites rated in poor condition, two were in an upward trend, one was stable and one was in a downward trend. The site with a downward trend was located in a holding trap (KA2); a small area designated to gather cattle. Because of the short term concentration of cattle in this area, it does not represent the pasture or allotment it is contained in and therefore is not a valid comparison. All other sites were in either a stable or upward trend and in fair or good condition. The central highlands of Arizona have been under some level of drought condition according to most current drought monitoring services for much of the last 10 years. Given this, monitoring data should be seen as representing conditions under less than ideal precipitation. Many of the trends apparent in the plant communities represented are consistent with what is expected in the normal range of variation of southwestern ranges under some level of drought stress. (Current precipitation levels have improved over the last year and a half, however, this is not represented in the data.) See appendix B for trend data.

[2] Time in East Verde pasture is limited to no more than 30 days.

Approximately 1,082 acres of extensive fuel reduction treatments and grassland restoration projects have been applied to the area of Houston Mesa, north of Payon. These projects were conducted within Payson Wildland Urban Interface (WUI) under the Shoofly Juniper Thinning Project Decision Memo (2009) by the permittee in coordination with the Forest Service.

The permittee has installed required improvements to mitigate impacts to the endangered Chiricahua leopard frog (CLF) in coordination with U.S. Fish and Wildlife Service (USFWS). Numerous improvements to range infrastructure have been made in the intervening years, in addition to maintenance of much of the existing infrastructure. The permittee has been actively engaged in numerous watershed level projects to address range conditions related to woody species encroachment and invasive species management. Significant portions of the project area have benefitted from fuels treatments and prescribed fire. Wildlife projects across the project area have led to significant habitat improvements for threatened and endangered species and have protected unique and sensitive wetland areas from grazing impacts.

A discussion of existing conditions by resource area can be found in the Existing Condition section of Chapter 3 of this document. Data describing the existing condition is derived from both qualitative and quantitative monitoring methods[3] used in accordance with the Interagency Technical References (ITT, 1996b, revised 1999), Region 3 Rangeland Analysis and Management Training Guide (USDA-FS, 1997), and the Region 3 Allotment Analysis Guide and include:

- Parker 3-Step method
- Common Non-Forested Vegetation Sampling Procedures (CNVSP)
- Reading the Range (RTR)
- Relevé sampling protocol
- Repeat Photography

Desired Condition

Desired conditions for the analysis area are based on Forest Plan guidance, site-specific knowledge of the allotments, and current scientific information related to the project area. In general, desired condition for the allotments based on the actions associated with grazing management are to improve soil and water quality, when possible, augment water supplies when compatible with other resources, and enhance riparian ecosystems, when possible, by improved management.

The Forest Plan identifies management prescriptions and management emphasis for particular management areas across the Tonto National Forest. The Diamond Rim Allotments are within portions of the 1985 Tonto National Forest Plan (Forest Plan) Management areas 4C (Hellsgate Wilderness), 4D (Mogollon Rim Area) and 4F (General Management Area). See appendix B for more information on the management areas.

[3] Complete descriptions of these protocol can be found in the appendix

Overall desired condition for the analysis area is maintenance and/or restoration of sustainable ecosystems with effective grazing management. Effective grazing management involves implementing prescribed grazing strategies that achieve multiple management goals and outcomes. This includes:

Vegetation

- Implementing grazing management strategies to reduce and/or more effectively manage invasive plants, such as Weeping lovegrass in the Dude Fire Area
- Increase water availability in Houston Mesa, Star Valley, Bean Patch, Butcher, Shoofly, Ellison, Green Valley Hills, Dry Pocket, Picket Pen, and Birch Mesa pastures
- Improve pasture rotation planning and flexibility by providing additional working and handling facilities and range improvements

Soil, Water, and Riparian

- Maintain vegetation to achieve, or be move toward, satisfactory watershed condition (Forest Plan p. 44) and at least 30 percent effective ground cover (Forest Plan p. 40).
- Satisfactory soil conditions should be maintained. Impaired soil condition (15 percent) should be in an upward trend, moving towards satisfactory conditions within one decade in areas where the potential exists to restore soil productivity and hydrologic function. Unsatisfactory soil condition (6 percent) should be moving towards impaired condition within one decade in areas where the potential exists to restore soil productivity and hydrologic function. Soils should have the ability to accept, hold, and release water and nutrients.
- Soils are well protected by vegetation, litter, or rock and show minimal evidence of current sheet or rill erosion. Soil compaction and disturbance is minimized to maintain resource values and sustain outputs. (FSH 2509.18, *Soil Management Handbook,* 1999)
- Maintain residual herbaceous vegetation along the greenline or streambank whenever precipitation is expected;
- Minimize the annual impacts to seedling and sapling riparian woody species; and
- Optimize riparian tree and shrub establishment, especially following episodic, regional winter storms;
- Increase the density, vertical and horizontal canopy cover of woody riparian tree species;
- Increase the proportion of obligate and facultative riparian species; and
- Maintain or increase canopy cover of herbaceous species to 25 percent.

Reaching desired conditions for riparian areas and stream channels would depend not only on management activities, but on climatic events. Both drought and floods have the potential to affect riparian areas and stream channels. High flows (less frequent than 10 year recurrence interval) are likely to scour impaired or unstable channels. Even moderate flows (less frequent than 2 year recurrence interval) could cause unstable channels to widen or incise.

Purpose and Need for Action

The purpose and need of this proposed action is for authorization of livestock grazing in a manner that moves toward Forest Plan objectives and desired conditions. Authorization is needed on these allotments because:

- Where consistent with other multiple use goals and objectives there is Congressional intent to allow grazing on suitable lands. *(Multiple Use Sustained Yield Act of 1960, Wilderness Act of 1964, Forest and Rangeland Renewable Resources Planning Act of 1974, Federal Land Policy and Management Act of 1976, National Forest Management Act of 1976)*
- The allotments contain lands identified as suitable for domestic livestock grazing in the Tonto Forest Plan and continued domestic livestock grazing is consistent with the goals, objectives, standards, and guidelines of the forest plan.
- It is Forest Service policy to make forage available to qualified livestock operators from lands suitable for grazing consistent with land management plans. *(FSM 2203.1; 36 CFR 222.2 (c)).*
- It is Forest Service policy to continue contributions to the economic and social well-being of people by providing opportunities for economic diversity and by promoting stability for communities that depend on range resources for their livelihood. *(FSM 2202.1)*

A management plan is in place and livestock management is shown to be meeting or moving toward desired conditions. However, there is a need for change:

- This group of allotments has not been fully stocked for a significant period of time due to a previously appealed Decision as well as a delayed NEPA analysis for a watershed level project.
- Issues have been identified related to water quality, utilization standards, recreation conflicts, and non-native species management, which require management direction.

Proposed Action

The Payson Ranger District, of the Tonto National Forest, proposes to continue to authorize livestock grazing on five allotments using an adaptive management strategy as defined in Forest Service Handbook (FSH) 2209.13, Chapter 90. Management tools, improvements and resource protection strategies are discussed in detail in Chapter 2. Authorization would be for management of these allotments as one unit to achieve resource objectives and management goals. Proposed permitted numbers would allow up to a maximum of 619 CYL and 40 head of yearling carryover equivalent to 10,050 AUMs year-long. The Diamond Rim grazing allotments would be utilized throughout the year under a rotational grazing plan in order to provide adequate rest to individual pastures, which would allow plants an opportunity for growth or recovery. Pasture use may be deferred in order to accomplish other resource goals related to fire, fuels and habitat in addition to recovery for grazing schedules. While some portions of the allotments are more suitable for winter use and others more for summer, the use of each pasture would be varied within the appropriate season over time, in order to prevent the establishment of patterns of repeated use. The goal would be to allow for complete deferment of individual pastures, for up to a year, periodically, based on site specific utilization and recovery. With a

few exceptions, all pastures would be available for grazing within the limits of forage availability and appropriate season of use based on current resource conditions. These exceptions are:

- The Fen (Peat Bog) would continue to be excluded from grazing completely in order to protect this unique site.
- The Round Valley pasture/allotment would remain closed to grazing until significant juniper removal and re-seeding projects have been separately analyzed and completed.
- The riparian area of Tonto Creek in the Dick Williams pasture would be grazed only between the dates of October 1 and May 1, within the normal limits of utilization for a riparian zone stated in the Forest Plan. This will minimize impacts to riparian vegetation and recreation along Tonto Creek. Fence excluding this area would be maintained by the permittee prior to such use and would allow the permittee to use Dick Williams pasture in months outside authorized dates for Tonto Creek.
- A livestock exclosure would be created around the Horton Springs, approximately five acres in size, to mitigate concerns regarding cattle impacts to campers. Within this exclosure, the spring itself would be double fenced to keep elk out of the spring itself. Fence for this site would be provided and constructed by Forest Service personnel and/or volunteers using material provided by the Forest Service.
- The Indian Gardens Administrative site, which is 45 acres in size, would remain a Forest Service administrative site to be used by the Payson Ranger District. Cattle would not have access to this site in order to preserve the forage resource for Forest Service livestock
- An exclosure would be created around the Shoofly Ruins by the Forest Service to protect this heritage site from additional grazing impacts.
- Weeping lovegrass would be managed with specific guidelines and utilization standards which would take into account the effects of intensive management of this species on all resource values (ie. wildlife, forestry, soils, hydrology, fire, recreation)(See proposed action in Chapter 2 for more details).
- A monitoring plan would be maintained as part of the allotment management plan (AMP). Monitoring tools are presented in detail in Chapter 2.
- Standard structural range improvement projects would be completed across allotments as specific needs are identified and funding is available. The types of improvements could include:
    - Additional pasture division fencing
    - Holding trap development
    - Stock drive development
    - Livestock handling facilities development
    - Spring development and exclosures
    - Development of dirt tanks
    - Development of additional pipelines and troughs
    - Development of additional trick tanks and catchments

The purpose of such improvements would be to facilitate grazing management, improve livestock distribution, reduce undesirable effects to riparian vegetation, protect and enhance wildlife habitat and

improve the rangeland resource toward desired conditions. Additional analysis would be completed for site-specific improvements.

Decision Framework

The Payson District Ranger is the official responsible for a decision regarding authorization of grazing allotment management in this analysis. Based on the analysis in this document and the supporting project record, the District Ranger would issue a decision notice stating whether or not livestock grazing would continue to be authorized and, if so, in what manner. Implementation of a decision to continue livestock grazing would occur through an AMP and annual operating instructions (AOI). These would include any management actions, mitigation measures, and monitoring requirements necessary to the decision. These documents would also describe authorized numbers of animals, season of use, allowable utilization standards, and terms of the grazing permits. The decision resulting from this analysis would relate only to grazing activities and those actions pertinent to the management of those activities in the project area.

Public Involvement

Payson Ranger District range personnel worked with the permittee and a variety of specialists to collect data from 2006 through 2013. The Payson Ranger District range staff officer worked with the current permittee to develop a Proposed Action that incorporated permittee management objectives along with Forest Plan goals and objectives. While some input received during the previous scoping and comment periods for the LGVC NEPA helped shape the foundation for this Environmental Assessment level of analysis (EA), the Diamond Rim Grazing Analysis represents a new project, with a narrower scope over the same five grazing allotments covered in the LGVC project area. Comments provided to LGVC do not count as a substantive comments for this project.

The Diamond Rim Grazing Analysis was conducted utilizing a combined Scoping/Notice and Comment period 36 CFR 218.24. The Proposed Action was made available to the public on April 15, 2015. This was followed by a 30 day Scoping/Notice/Comment period and then an additional 30 day period to allow for a responce to comments. Comments received have been responded to and are part of the public record.

Following public scoping, the interdisciplinary team (ID Team) met to review comments and determine if there was a need to develop additional alternatives to the proposed action. As a result of this meeting, issues were identified by the ID Team which are addressed in effects analysis. These issues are summarized below.

- Grazing access to Tonto Creek and Horton Creek: The frequent use of riparian zones for recreational activities such as camping has the potential to lead to conflicts between recreational users and the grazing operation.
- Round Valley: High levels of historic OHV use in the Round Valley area, as well as significant erosion and sedimentation into Gibson Creek. High levels of elk use in this area may be compounded by cattle grazing in an area with limited forage value. Riparian values would likely decline with almost any level of grazing. This pasture would potentially be re-opened to grazing

only after significant juniper removal and seeding efforts have been undertaken. Any such projects would require separate analysis.

- Effects to wildlife: There may be potential conflicts between various wildlife species and the grazing operation as well as opportunities for cooperation in habitat development or maintenance. There are multiple species and proposed critical habitat within the project area that were not evaluated until recently.
- Wilderness Values: A significant number of improvements lie within the Hellsgate Wilderness Area. Some of these improvements require maintenance that can more readily and efficiently be conducted using equipment that is not acceptable under wilderness guidelines. Maintenance for these improvements is outside the scope of this EA and would be evaluated separately.
- Water quality: Water quality issues exist on Tonto Creek, which is an impaired stretch for *E. coli* in the vicinity of the Dick Williams pasture, during the summer months. Use by cattle in this timeframe could further complicate this issue.
- Utilization guidelines on Weeping lovegrass: While there appears to be value in the use of higher utilization limits and intensive grazing in the management of this non-native, invasive grass, there may be negative impacts to other resource values as well. There is a need to establish guidelines as to what level of utilization is acceptable, where this may be applied and under what circumstances.

Chapter 2: Alternatives Including the Proposed Action

Background

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (*40 CFR 1502.14*). This chapter describes alternatives to be considered for the Diamond Rim Grazing Analysis and analyzed in detail in Chapter 3. The ID Team of Forest Service specialists developed two alternatives: 1) The Proposed Action, and 2) No Action/No Grazing/No Improvements. Public comments received in response to the proposed action, as well as concerns raised by the project ID Team, provided goals for alternative methods for achieving the purpose and need. The ID Team reviewed scoping comments and determined that issues identified in Chapter 1 would be adequately addressed through the two alternatives. These alternatives were designed to meet the purpose and need for action, conform to existing land use plans, and satisfy the legal and regulatory requirements for rangeland management. In a few cases, there have been changes made from the Draft EA in the text and organization of this final document. Changes have been made for the sole purpose of clarifying presentations of the alternatives including the proposed action.

This section presents alternatives in comparative form, illustrating the differences between the alternatives and providing a basis for choice between alternatives by the decision maker and public. Some of the information used to compare the alternatives is based upon the design of the alternative (i.e., rest rotation versus deferred, rest-rotation, grazing systems) and some of the information is based upon the environmental, social, and economic effects of implementing each alternative (i.e., the amount of riparian impact caused by rest rotation versus deferred grazing systems).

It should be understood that “yearlong” grazing, as it is mentioned throughout this EA, includes the opportunity to select various pastures to graze during each month of the year, and that cattle are not continuously grazing all areas on an allotment all year. Further, under a variety of livestock grazing strategies using pasture rotations, where there is yearling grazing, it is common that at any one time throughout that same year over 75 percent of the acres on the allotment(s) are being rested from grazing. This occurs because of planned deferred or rest rotation of individual pastures within an allotment(s). Growing season rest, during the warm season growth period in July, August and September is crucial to forage species on southwestern ranges. Complete, yearlong deferment is important periodically to allow for overall ecosystem health of all species and for habitat and watershed development.

Based on comments received from scoping and the US Fish and Wildlife Service, several clarifying actions have been described in greater detail as permitted in 36 CFR 220.7(b). Alternatives described here are the same that were described in the draft document that was previously released to the public.

Alternatives Considered In Detail

Alternative 1 - No Action/No Grazing/No Improvement Projects

Under this alternative term grazing permits on all Diamond Rim Grazing allotments within the project area would be cancelled, reducing permitted AUM's to zero in the allotments for a period no less than 10 years, following guidance in *36 CFR 222.4* and Forest Service Manual (FSM) 2231.62. Existing improvements no longer functional or needed for other purposes, including interior fences, cattle guards, and water developments would be evaluated for continued usefulness and removed as necessary. Exterior allotment boundary fences would be assigned to neighboring permittees for maintenance. Continued maintenance of existing water developments may be adversely affected. Under Chapter 90 regulations, a "No Grazing" alternative must be considered in any Range NEPA analysis.

Alternative 2 - Proposed Action

The Forest Service, in cooperation with the current grazing permittee, propose to renew the livestock grazing authorizations on five allotments using an adaptive management strategy as defined in FSH 2209.13, Chapter 90. This includes the maintenance of the currently permitted numbers of 619 AU's with 40 head of yearling carryover, equivalent to 10,050 AUM's, including improvements necessary to ensure continued proper distribution of grazing impacts and mitigations necessary to address wildlife and recreational concerns.

Aspects of the current permittee's suggestions have been incorporated into this alternative. The Diamond Rim grazing allotments would be managed as one operational unit, to achieve resource objectives and management goals.

With the exception of the Fen (Peat Bog), Round Valley pasture, Indian Gardens administrative site, an grazing exclosure around Horton Spring, and seasonal limitations on Tonto Creek, all pastures would be considered for grazing within the seasonal limitations of the forage resources in that pasture. Estimated production and capacities for each pasture are listed in the appendix. These estimates would serve as a guideline to be further refined by stock and monitor results as the herd size increases to the upper limit of the permits. It is expected that it would take several years to slowly increase the total size of the herd to the full numbers listed on the permits through natural increase from the base cow herd. This would allow management and the Forest Service to adjust grazing schedules according to site specific measures such as utilization, rain and growing conditions, forage recovery, need for rest or potential deferment and the development of additional infrastructure to provide for adequate distribution of livestock across the area.

Upper elevation pastures within the Diamond Rim grazing allotments are generally dominated by Weeping lovegrass and are more suitable for spring/summer use because it is more palatable and nutritious during this active growing season. These pastures are Bonita, Brody, Dry Dude, East Verde, Ellison, Moore, Myrtle, Dick Williams, Boy Scout, Girl Scout, Dead Horse, Diamond E, Roberts Mesa N. and S. and Ponderosa.

Lower elevation pastures are less dominated by Weeping lovegrass and are more suitable for winter use (Diamond W., Dry Pocket, Green Valley Hills, Hells Half Acre, Hole in the Ground, Kings Ridge, Lower Neal, Picket Pen, Star Valley, Upper Neal, Winter Division, Holding E. and W.). However, there are some pastures in each of these groups that could be used in either season, depending on rainfall and growing conditions.

In addition there are mid-elevation pastures that could be used in either winter or summer grazing depending on conditions (Birch Mesa, Bean Patch, Butcher, Shoofly, Catholic Peak, River, Houston Mesa, Beaver Valley and Lion Spring).

Authorization

Proposed authorized livestock includes a core cow/calf herd with carryover from natural increase. Livestock may be distributed in two or more herds as follows:

- Mature cow/calf spring calving herd
- First calf heifer/fall calving mature cow herd
- Yearling herd
- Ranch horse/mule herd (up to 20 riding/packing stock used for working the allotment) to be identified in the AOI each year and grazed throughout the year in traps and holding pastures.

Permitted numbers would be set at 10,050 animal unit months (AUMs).[4] This proposed permitted stocking rate is equivalent to the combined existing stocking rate on the two term grazing permits associated with the Diamond Rim grazing allotments:

- 619 Cows CYL with 30 yearlings for 10 months = 10,015 AUM's
- 10 yearlings for 5 months = 35 AUM's
- 10,015 + 35 = **10,050 AUMs**

The current stocking level of 380 head was based on adherence to a 2005 Decision Notice and subsequent appeal. While that analysis is for the full permitted numbers, initial stocking would be allowed to increase incrementally, through natural increase, with additional stock as appropriate.

Grazing schedule

The Diamond Rim grazing allotments would be managed using a rotational grazing system. Deferment or rest of pastures periodically may be necessary in order to accomplish other resource goals and objectives related to fire, fuels or habitat needs. The arrangement of these allotments generally favors use of high elevation range (above 5,500 feet) in warmer months and low elevation range (approximately 3,200 feet to 5,000 feet) in colder months. This is due to the fact that many of the higher elevation portions of these allotments have significant amounts of Weeping lovegrass. While higher levels of utilization would be allowed on this non-native invasive species, this would not be done at the expense of the long term health and survival of more desirable native species.

One cow with calf equals 1.32 Animal Unit (AU); one dry cow equals 1.0 AU; one yearling animal (9-18 months) equals 0.7 AU; weaned calves less than nine months of age equal 0.5 AU; one mature horse or mule equals 1.2 AU

A detailed Allotment Management Plan (AMP) would be developed using these parameters for planning pasture moves with the intent of providing rest within a growing season as well as longer term deferments over multiple years, both of which are important in restoring and maintaining ecosystem health and function.

Pasture movements within a season would be dictated by utilization levels, growing conditions and the need to provide planned rest and to vary the season and intensity of pasture use so as to eliminate the development of use patterns. Grazing intensity would be managed to allow for the physiological needs of plants. Anticipated days within each pasture would manage intensity and frequency of defoliation. Distribution of grazing impacts would be assessed on an ongoing basis to determine where specific improvements may be useful, based on the need to adaptively manage the development of infrastructure to achieve the desired result.

Herbaceous forage utilization would be set at a conservative utilization level, approximately 30-40% of current year's growth on key perennial species, measured at the end of the growing season, allowing for the physiological requirements of vegetative growth and reproduction, and to ensure progress towards meeting desired conditions previously identified (Holecheck, 2012). This would also provide for adequate soil cover throughout the winter months.

Weeping Lovegrass Utilization Guidelines and Management

Weeping lovegrass (*Eragrostis curvula)* is a non-native, invasive species which was seeded in much of the project area after the Dude fire in 1990. This species has significantly different growth characteristics than the species native to this area. Without having the ability to adapt management to meet the challenges presented by this species, it would not be possible to effectively manage these areas in a way that would benefit the native plant community.

Exceptions to the herbaceous forage utilization guidelines would apply to areas dominated by the Weeping lovegrass within the following pastures: Roberts Mesa N., Ellison, Moore, and Bonita. In these pastures, utilization may reach 60 percent. Seeding of native species in these areas may occur, as funding is available, in coordination with intensive grazing management. Such utilization would only take place as part of a pre-approved, planned, application of this management tool on a case by case basis. Such approval and planning would be identified in the permittee's AOI and may only be authorized as part of that document. Application of this utilization standard outside of this requirement would not be allowed.

Significant stands of lovegrass also exist in the following pastures: Dry Dude, Brody, Dick Williams and the northern half of East Verde. In these pastures standard utilization guidelines of not more than 45 percent on upland species would apply and intensive management of this species using higher utilization levels would not be authorized. This group of pastures would provide a control group which may be used as a comparison to the four pastures listed as candidates for intensive management strategies.

Grazing studies related to higher utilization limits on lovegrass have shown promise in reducing denisties and allowing native perennials to re-establish. Dr. Jim Sprinkle, with University of Arizona Agricultural Extension, assisted in conducting cooperative grazing studies with the permittee and the USFS in 2008

and 2009 and. The purpose of these grazing studies was to demonstrate the use of higher levels of utilization and supplemental feeding to manage the Weeping lovegrass stands in the Roberts North pasture. The results of this study and the resulting report have been included as reference material for this analysis. The next step in exploring this management tool is to expand its use to a landscape level while documenting the effects on resource values.

Additional resource protection measures:

- Mitigation measures such as herding away from riparian areas and/or the use of attractants may be required to maintain proper utilization in riparian areas while achieving the desired utilization of Weeping lovegrass.
- This lovegrass target managment may not take place in the immediate vicinity of the Highline Trail. Both the increased concentration of cattle and the removal of Weeping lovegrass as groundcover may have a negative impact on the soil stability of the trail.
- Utilization and trend monitoring would be conducted in order to document the effects of this lovegrass targeted management. Pastures scheduled for this type of management would have utilization cages in place prior to grazing each season, in order to document the utilization levels achieved.
- After three years of such use, complete rest would be required.

Management Tools

If monitoring indicates desired resource conditions outlined in Chapter 1 are not being achieved, there are tools, or administrative actions that would be used to modify management. Such changes may include administrative actions to adjust the specific number of livestock and/or animal unit months (AUMs), specific dates for grazing, class of animal, or pasture rotations. These changes would not exceed limits for timing, intensity, duration, and frequency, as described in the proposed action.

Necessary changes would be implemented through Annual Operating Instructions (AOI), which would adjust use based on current productivity and resource conditions. The AOI would also include mitigation measures and Best Management Practices to avoid or minimize effects to wildlife, soil and water quality. Modifications to the AOI may be implemented at any time throughout the grazing season in response to unforeseen environmental concerns such as drought, fire, flood, etc., or management and livestock operation concerns.

The following is a list of when administrative actions would be necessary in the management of this allotment:

- Monitoring shows management objectives have not been achieved or that trend toward achieving desired conditions is not improving or improving at an adequate rate.
- Annual indicators of grazing use or grazing guidelines are not met.
- Climatic events, fire, flood, or uses and activities detrimentally impact resource conditions and a modification of grazing use is needed to provide for recovery of the site.

There are several types of administrative actions that could take place within the allotment. These actions would comply with the Forest Plan and mitigations detailed later in this section. The following list is some of these actions:

- Extending or shortening time in a pasture based on utilization levels in uplands and riparian areas;
- Assessing the readiness of a pasture and changing its position in the rotation for the season;
- Time or season of pasture use;
- Resting a pasture for one or more growing seasons;
- High intensity, short duration, or other grazing system;
- In the event of extended drought, severe fire, or depleted rangelands, complete removal of livestock until rangelands have recovered;
- Decrease or increase herd size within the limits of the permitted numbers;
- Temporarily closing off water in a portion of a pasture to manipulate grazing pressure and intensity of use;
- Use of salting and mineral blocks to aid in distribution, especially away from critical areas such as riparian areas;
- Herding livestock;
- Excluding livestock from specific areas temporarily or permanently for other resource objectives; or
- Changing or limiting season of use to minimize impacts to riparian vegetation and water quality

If monitoring indicates desired conditions are not being met, district range specialists, in consultation with the permittee and resource specialists as appropriate, may:

- Evaluate the potential cause for not meeting desired condition or indicator such as utilization
- Evaluate the need to implement alternative actions under an adaptive management strategy
- Generate documentation necessary in the AOI and/or permit and allotment files for the action to be implemented. As necessary, conduct additional site specific surveying, such as for cultural resources.

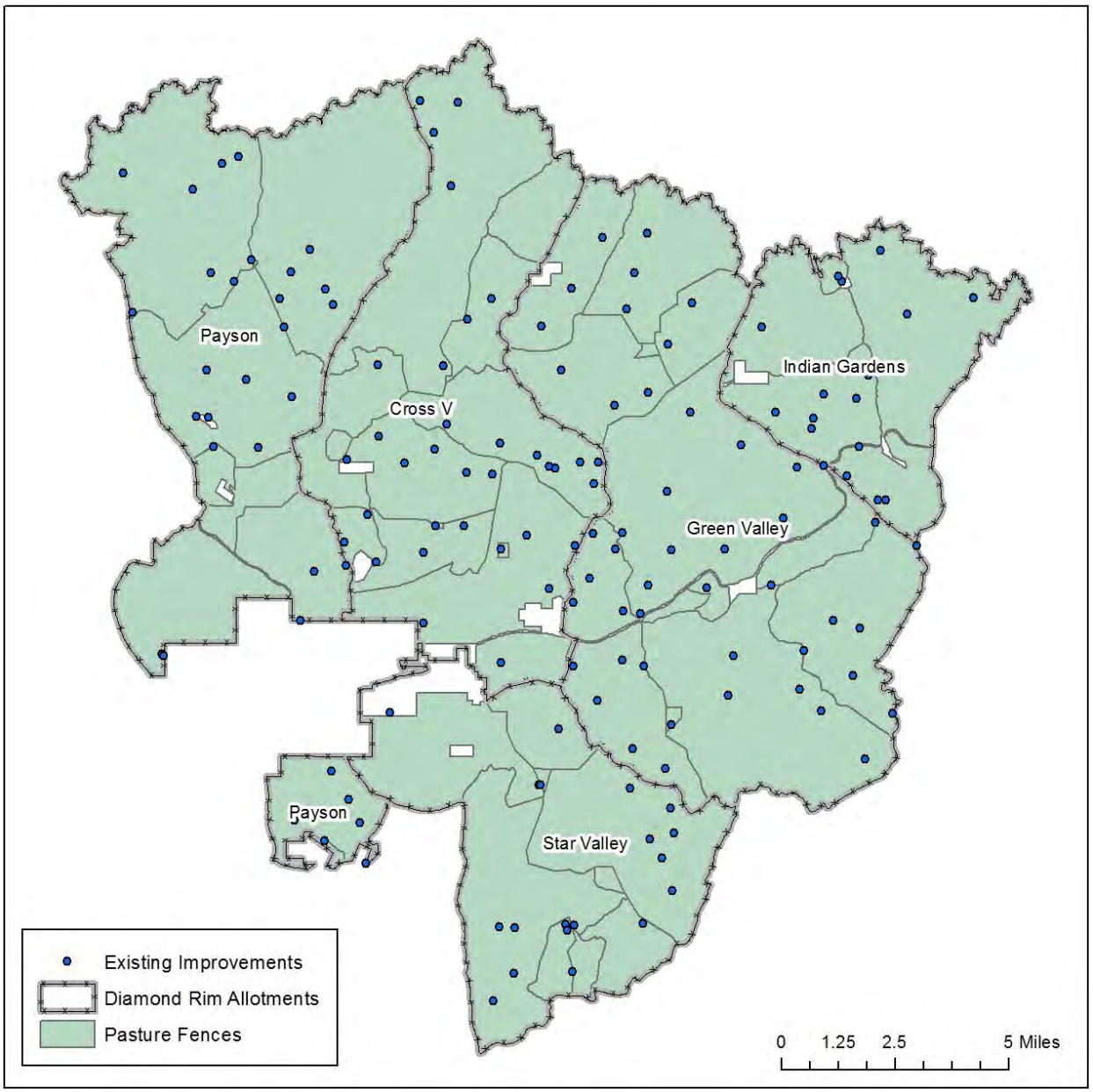
Improvements

Existing range improvement infrastructure must be brought up to agency standard prior to installing any new developments. An exception to this may be granted if a particular existing improvement is determined, because of location, competing uses, livestock needs, or type to be beyond its useful life. Such improvements would then be removed. District range specialists would determine whether identified structural improvements are necessary or need to be modified or removed.

Cleaning of existing earthen livestock tanks, creation of new earthen livestock tanks or placement of new above ground drinkers, routine maintenance of existing improvements, and construction of new livestock fencing are included within the proposed action.

Existing earthen tanks and above ground drinkers on the Diamond Rim Allotments are shown in Figure 2.

Figure 2: Existing Range improvements on Diamond Rim Allotments



The effects of adding range improvements in the future are disclosed in this document. As conditions change or the need arises for additional range improvement infrastructure, projects would be authorized following required clearances on a site specific basis (ie archeological or Minimum Requirements Decision Guide (MRDG) in Wilderness). If the following resource protection measures are followed, no addtional biological clearances would not be required.

Although there are no site specific locations for development of new watering sites, the following resource protection measures would be followed when conducting routine maintenance of existing

tanks or fences and constructing new water sites or fences to minimize impacts to threatened and endangered species and Forest Service sensitive species:

- New watering developments (earthen stock tanks, above ground drinkers, troughs, etc.) would not be developed within 300 ft. of perennial streams and would not be developed in any species' proposed or designated critical habitat, at any special status species occupied site or constructed during sensitive breeding seasons.
- In the action area, livestock grazing or livestock management activities will occur within Protected Activity Centers (PACs) or Post-Fledgling Areas (PFAs), but fence construction or maintenance utilizing mechanized equipment would not occur inside PACs and PFAs during each species' breeding season or within 1,000 feet of an active eagle nest (exceptions may occur on a case by case basis or where recent surveys indicate non- breeding or infer absence).
- New spring developments would be constructed with the spring box designed so that residual flow is left at spring head to prevent dewatering
- New fencing would be constructed using a "wildlife friendly" design which includes upper three strands barbed wire, top wire not to exceed 42 inches and lowest strand smooth wire set at 16-18 inches to allow wildlife to safely pass under.
- Permittee will notify USFS Range and Wildlife staff 60 days prior to the maintenance cleaning of any stock tank or drinker occupied by or within dispersal distance of a CLF occupied site.

Traps, holding pastures and livestock handling facilities may be constructed if needed in the future in association with these pastures, depending on management needs. For the purpose of this analysis it is important to make a distinction between these features and to identify the expected management in each.

- **Trap:** an enclosure of less than ten acres, with a water source for livestock, where cattle may be gathered and left for a short period of time. Animals left in such an enclosure for more than 12 hours may be fed certified weed free hay. Utilization within a trap is assumed to be 100 percent.
- **Holding pasture**: a small pasture greater than ten acres in size, with a water source for livestock, where cattle may be gathered and left for short periods of time, where natural vegetation is sufficient for their nutritional requirements. Utilization within a holding pasture would be more uniform and higher than in regular pastures due to the proximity to water and the small size of the pasture. Utilization within a holding pasture may not exceed 50 percent, measured at the end of the growing season.

All improvements would be constructed to Forest Service standards (FSH 2209.22 – Structural range Improvement Handbook) and inspected for approval by Forest Service personnel, with appropriate permit modifications. Many improvements on FS allotments are now accomplished using grant money from Arizona Game and Fish Department and Natural Resources Conservation Service (NRCS) cost share programs, which may carry additional specifications and design criteria on a site specific basis.

Wilderness

Motorized equipment could potentially be used in the Hellsgate Wilderness to maintain existing infrastructure where necessary. "Existing" means the improvements are not new developments and are

already established. Maintenance could involve bringing motorized equipment, such as small dozers and/or chainsaws, inside wilderness boundaries. Dozers and/or frontend loaders may be used to clean and repair dirt stock tanks. Chainsaws could be used to clear trails and fence lines of excess brush buildup in preparation for heavy maintenance and/or reconstruction activities. **Any such activity within the Hellsgate Wilderness area would require a minimum tools analysis (MRDG) and a signed authorization from the Regional Forester** which is outside this analysis. Existing improvements located in the Hell's Gate Wilderness include:

- El Grande Tank (# 3268)
- Ripper Tank (# 3266)
- Squaw's Nest Tank (# 0873)
- King Division Fence (# 3242)
- Neal Division Fence (# 3249)
- Star V Green Fence (# 3186)
- Squaw Basin Fence (# 3523)
- Pocket Pasture Fence (# 3525)

Allotment Access

The Tonto National Forest is currently planning the implementation of Travel Management Rule (TMR). TMR is intended to analyze alternate motorized routes in order to provide access and a recreational experience sufficient so users no longer feel the need to travel off established roads and trails. Once routes are established maps would be available to the public and modified as necessary to reflect any changes. Enforcement of the TMR is necessary to assure compliance.

According to the final Travel Management Rule, motor vehicle use exempted from designation includes "Motor vehicle use that is specifically authorized under a written authorization issued under Federal law or regulations" (36 CFR 261.13(H)). Grazing permits fall under this exemption.

For clarification, the following on-going activities requiring motor vehicle use off of designated routes would be authorized by the grazing permit to conduct livestock grazing activities on National Forest System lands within the Tonto National Forest:

- Off-road vehicle use by pickup, trailer, ATV, UTV, or motorcycle needed to transport materials or machinery to maintain structural range improvements (fences, corrals, cattle guards, pipelines, water delivery systems, troughs, earthen banks) assigned in Part 3 of the grazing permit as the permit holder's responsibility for maintenance is authorized. Existing routes or the shortest, most direct route to the improvement must be used and new route construction (i.e. blading a path) is not allowed without additional authorization.
- Using an off-road vehicle to place supplements in strategic locations for livestock management purposes may be authorized by the District Ranger in your Annual Operating Instructions when requested.
- Vehicle use to gather or move livestock off-road is not authorized.

Cross-country motorized travel is not allowed when conditions are such that cross-country travel would cause unacceptable natural and/or heritage resource damage.

Off-road use of heavy equipment (i.e. backhoe, dozer, loader, etc.) may be authorized by a separate permit modification for range improvement development as needed.

No additional Section 106 compliance is required for specific limited-use authorizations already covered by separate NEPA decisions per the Region 3 Region-wide Travel Management protocol with the Arizona SHPO.

Cross-country travel to construct new structural and non-structural range improvements will be analyzed and authorized under the appropriate level of NEPA, including compliance with Section 106 of the National Historic Preservation Act and other existing resource protection regulations.

Motor vehicle use in designated wilderness areas will continue to be managed consistent with the provisions of the Wilderness Act (Section 4(d)(4)(2)) that provides for limited exceptions for grazing livestock as further defined in the Congressional Guidelines (FSM 2323.22).

Permittee access to manage allotments would be provided through a combination of the designated Forest system roads and other access needs identified in their Term Grazing Permit or Allotment Management Plan. Road maintenance required to access range improvements or livestock management must receive a road use permit for any road work. In the event of significant future deviations from "current access needs" for motorized use as authorized by a Term Grazing Permit, there may be the requirement for additional NEPA analysis on a site specific basis. The AOI authorizing each year's grazing activity would include a brief discussion of the use of vehicles and ATV's within the designated road system, any single purpose use roads or trails, and a description of the annually anticipated level of cross-country travel and access consistent with the Part 3 of the Term Grazing Permit and/or AMP.

Monitoring

The objective of monitoring is to determine if management is being properly implemented and if the actions are effective at achieving or moving toward desired conditions.

Monitoring for the effectiveness of the long term grazing management in reaching desired condition as well as monitoring for the implementation of the grazing strategy within a grazing season would be conducted.

Effectiveness and Implementation Monitoring

Effectiveness monitoring includes measurements to track condition and trend of upland and riparian vegetation, soil, and watersheds, as condition and trend relate to resource management objectives. Examples of effectiveness monitoring indicators include, but are not limited to pace transects, pace quadrat frequency, dry weight rank, ground cover, Parker 3-step and repeat photography. Monitoring would occur at established permanent monitoring points. Both qualitative and quantitative monitoring methods would be used in accordance with the Interagency Technical References, Region 3 Rangeland Analysis and Management Training Guide, and the Region 3 Allotment Analysis Guide. These data are

interpreted to determine if management is achieving desired resource conditions[5], if changes in resource condition are related to management, and to determine if modifications in management are necessary. Effectiveness monitoring would occur at least once over the ten-year term of the grazing authorization, or more frequently, if deemed necessary.

Implementation monitoring would occur yearly and would include such things as pasture inspections, reports, forage utilization measurements in key areas[6], livestock counts, and facilities inspections. Utilization measurements are made following procedures found in the Interagency Technical Reference and with consideration of the Principles of Obtaining and Interpreting Utilization Data on Southwest Rangelands, or the most current acceptable method. The purpose of implementation monitoring is to determine if grazing meets conservative use guidelines in upland and riparian areas. It has been well documented that a conservative approach to grazing management may provide a resilient plant community that would be more likely to remain stable and/or improve over time (Holechek, 2004).

Allotment Inspections/Compliance Monitoring

Compliance monitoring is a form of implementation monitoring that documents whether or not livestock are distributed in correct pastures and areas authorized for grazing. It also includes but is not limited to, improvement maintenance inspections, forage utilization and livestock counts. These inspections would occur throughout the grazing year.

Inspections and Compliance monitoring trips to an allotment may be coordinated with the permittee. When possible the permittee would be present during such allotment visits, however, it is not a requirement that the permittee be present for such visits to an allotment.

Information would be collected through various monitoring methods such as routine pasture inspections, end of season utilization monitoring, and Parker Three-Step monitoring in cooperation with the permittee. Specific schedules for monitoring would be flexible from year to year based upon resource needs, which may change with climatic variations and management changes. Monitoring for plant cover, vigor, recruitment, and diversity, using techniques described in aforementioned publications, would ensure that wildlife needs and riparian and watershed conditions were moving toward desired conditions.

Monitoring methods could include, but are not limited to utilization and stubble height monitoring, annual riparian monitoring, and photo point protocols. Data would be used, along with supporting information to determine when livestock must be moved from one pasture to another and to make any necessary adjustments to livestock numbers and/or season of use (determined in AOI).

Utilization measurements are followed by procedures found in the Sampling Vegetation Attributes (1999), Utilization Studies and Residual Measurements (1999). Possible data monitoring could include

[5] Desired resource conditions and management objectives for each resource area are identified and discussed in Chapter 3 of this analysis.

[6] Key areas are defined as a relatively small portion of a rangeland selected because of its' location, use, or grazing value as a monitoring reference point for grazing use

browse utilization measurements, perennial grass stubble height measurements, photo points, and or height/weight relationships for certain perennial grass species. Utilization would be monitored on key forage species, which are native perennial grasses along with native perennial shrubs that are palatable to livestock.

At a minimum, monitoring would include use in key areas and locations selected outside of key areas. Data collection procedures and interpretation would consider guidance contained in the Principles of Obtaining and Interpreting Utilization Data on Southwest Rangelands (Smith et al. 2007) publication.

Final utilization and stubble height readings would be taken at the end of pasture use, along with end of growing season use of each year. Utilization may be assessed at any point during the season with regard to effects on stubble height requirements, litter and soil conditions. Annual monitoring would follow accepted Forest Service protocols set by the Region 3 Training Guide.

While monitoring techniques as described above would be conducted in key areas, these would not be the sole locations for gathering information from the grazing allotment to make within season or annual adjustments about the timing, intensity, duration, or frequency of livestock grazing in a given grazing season. The overall condition of the allotment, and such things as distribution patterns or rangeland improvement conditions could be assessed at any given time to help make such adjustments.

Key Areas

Key areas are described in "Sampling Vegetation Attributes" (ITT, 1996b) as indicator areas that are able to reflect what is happening on a larger area as a result of on-the-ground management actions. A key area should be an area representative of the range as a whole, an area where livestock use occurs, located within a single ecological site and plant community, and be a minimum of 100 yards from fence lines, exclosures, roads, and trails.

Key areas include but are not limited to:

- Benchmark locations
- Additional locations that meet definition above

Benchmarks

Condition and long-term trend monitoring would be conducted in some of the key areas used for annual monitoring. Information would be used to determine if the area is meeting or moving towards desired conditions. Long-term trend data would be used to measure changes in plant community composition, cover, structure, soil conditions, frequency, and management of grazing in a trend status. Annual adjustments may be conducted in order to meet long-term desired conditions.

Periodic monitoring, on decade intervals, for vegetation trend would include cover and frequency, in which Parker 3 Step Clusters or other similar procedures would be used.

Long-term monitoring would follow accepted Forest Service protocols determined by the Region 3 Training Guide, including documents listed above.

Utilization Monitoring

Forage utilization would be managed at a level corresponding to light to moderate grazing intensity in order to provide for grazed plant recovery, increases in forage production, and retention of herbaceous litter to protect soils. Conservative use equates to 30 to 40 percent on herbaceous species. Excessive use (greater than 40%) on key species in a selected key area may be used as a basis to modify management practices or take administrative actions necessary to reduce utilization in subsequent grazing seasons. Management actions could include immediate removal of livestock if the pasture is still in use, or deferment of the pasture in next year's rotation to provide rest during the growing season. It is inherent in the term "conservative use" that watershed conditions and vegetative ground cover would be optimized as appropriate to various range sites. Allowable use is summarized in Table 5.

Table 5: Vegetation Use Thresholds

Vegetation	Use Threshold
Upland Herbaceous Use	30-40% of current year's growth
Upland Browse Species	50% of current year's growth
Riparian Herbaceous Use	Limited to 40% of plant species biomass for deergrass and maintain 6-8 inches of stubble height for emergent species such as rushes, sedges, cattails, and horsetails; measured during grazing season.
Riparian Woody Species	Limited to 50% of leaders browsed on upper 1/3 plants up to 6 feet tall

The goal is to achieve conservative use in the uplands. This strategy recognizes the importance of adaptive management. Management actions include, but are not limited to; adjustments of timing, intensity, frequency, and duration of grazing to reach resource objectives (FSH 2209.13 - Chapter 90). The document "Principles of Obtaining and Interpreting Utilization Data on Southwest Rangelands" would provide guidance for utilization data collection and interpretation.

Utilization would be monitored on key forage species, which may be native perennial grasses, Weeping lovegrass, or browse species that are palatable to livestock. Monitoring would include use in key areas, but may include monitoring outside of key areas. Payson Ranger District range personnel, the permittee, and cooperators would be responsible for monitoring livestock grazing utilization. Over time, changes in resource conditions or management may result in changes in livestock use patterns. As livestock use patterns change, new key areas may be established and existing key areas may be modified or abandoned in cooperation with the permittee.

Riparian Utilization Monitoring

In general, monitoring riparian utilization would be a higher priority than upland monitoring since riparian zones would tend to be impacted first and are more sensitive to grazing pressure. When these guidelines are reached in a pasture with riparian habitat, it may initiate a movement to the next scheduled pasture. If riparian utilization has been reached and upland utilization is under the authorized levels, measures such as herding away from riparian zones, providing salt and/or attractants *(protein supplements)* in upland areas, and managing access to water sources may be used to extend the stay in

the pasture. Excess utilization in riparian zones would not be authorized in order to accomplish the desired utilization in upland areas. Additional infrastructure may be required if this is a regular occurrence.

Utilization measurements in riparian areas may also be assessed using the Sampling Vegetation Attributes (ITT, 1996), Utilization Studies and Residual Measurements (ITT, 1996), and Multiple Indicator Monitoring (Burton 2011). However, utilization of critical riparian areas would be measured seasonally while livestock are in pasture, and can include a more recent accepted riparian method. . Changes in riparian vegetation and stream channel geomorphology condition and trend would be measured, preferably by riparian specialists, on 5 to 10 year intervals.

Noxious Weed Monitoring

Noxious weeds located in these allotments would be treated as necessary. Permittee and Forest Service would coordinate weed inventory and treatment. Noxious weed monitoring is carried out at the same time as allotment inspections are conducted. As noxious weed populations are found they would be mapped, monitored, and treated. Treatment methods would follow guidelines established in "Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds" (2005).

Wildlife Monitoring

In conjunction with the District Wildlife Biologist, projects related monitoring may occur on Mexican Spotted Owl (MSO) areas, according to United States Fish and Wildlife Service protocols. Range management related monitoring trips would be spread throughout owl breeding season (March 1 through August 31) and limited to 7 or fewer trips per Protected Activity Center (PAC), annually and would comply with the following:

- Stops to collect range data would be generally between 0.5-and-2 hours.
- Range monitoring would take place during daylight hours when owls are not actively foraging.

Heritage Resources Monitoring

In conjunction with the Forest Archaeologist special care would be taken to protect heritage resources (historic and prehistoric sites) from the impacts of range construction projects or livestock concentrations. Archaeological surveys would be conducted prior to construction of any new range improvements and/or location selection where impacts to heritage resource sites must be avoided. Existing range facilities (water troughs, corrals) where cattle regularly congregate are periodically inspected to determine whether or not livestock are causing damage to heritage resource sites.

Forest Plan Amendment

A project specific Forest Plan amendment would be necessary for the actions proposed in this alternative, or any range management actions on the allotment, to align the Forest Plan with the current programmatic Agreement (PA) for cultural resources management. To clarify, currently, the Forest Plan for all management areas has a standard and guideline that states:

"For any proposed surface disturbing activity, the following standards will apply:"

4. Sites listed in, nominated to, eligible for or potentially eligible for the National Register will be managed during the conduct of undertakings to achieve a "No Effect" finding, in consultation with the State Historic Preservation Officer" (p. 38-1).

As part of the proposed action, the above language will be removed from the standard and guideline for the implementation of the grazing authorization as described for this alternative.

All other elements—numbered bullets—associated with the standard and guideline in the Forest Plan will remain unchanged and require compliance, including:

1. The Forest Service will comply with the National Historic Preservation Act (as amended) and the PA" (p. 38-1).

Under the National Historic Preservation Act, the Agency official must determine the effects of the undertaking on historic properties. The effect can be "no effect," "no adverse effect," or "adverse effect." The category now used by the State Historic Preservation Office and the Forest Service, to more accurately describe the level of impact where sites are not completely avoided but not adversely effected, is "No Adverse Effect." By following the direction in standard number one, cultural resources are protected in compliance with law, regulation and policy.

Resource Protection Measures

Wilderness

Management emphasis for wilderness is on wilderness values. It provides for livestock grazing and recreation opportunities that are compatible with maintaining wilderness values and protecting resources. Section 4(c) of the *Wilderness Act of 1964* defines minimum requirements for administrative actions in wilderness areas, which includes grazing. Wilderness resources must be considered when preparing range improvement construction standards and techniques (2323.26a).

Section 4(d)(4)(2) in FSM 2320.5 states that "…wilderness designation should not prevent the maintenance of existing fences or other livestock management improvements, nor the construction and maintenance of new fences or improvements, which are consistent with allotment management plans and/or which are necessary for the protection of the range."

Compliance with the *Wilderness Act* within the Hellsgate Wilderness area is important and expected of all users on the allotments. The permittee should strive to maintain the untrammeled, natural conditions within wilderness areas. **No motorized equipment should be used in wilderness areas without obtaining authorization from the Regional Forester**.

Wildlife

- Site specific information regarding precise location and timing of the various and projects described above (water developments, pastures and fencing) are not available at this time, the Forest Service would implement the following actions to protect listed species:

    - The Forest Service would conduct site specific analysis of effects to listed species and/or proposed species or designated and/or proposed critical habitat before projects are implemented.
    - If the Forest Service determines that projects "may affect" any listed and/or proposed species or designated and/or proposed critical habitat, section 7 consultation with the Service would be reinitiated.
- All water developments would include wildlife access and escape ramps. Waters would be kept available to wildlife year round.
- All reconstructed fencing would be built to Forest Service standards to provide for wildlife passage through the fence. At a minimum, this would be a four-strand fence with smooth bottom wire 16-18 inches off the ground and a total height of 42 inches or less.
- Livestock grazing or livestock management activities could occur within Mexican spotted owl (MSO) PACs, but no use of mechanized equipment would occur within PACs from March 1 through August (breeding season).
- Fencing in Dick Williams Pasture would be maintained to prevent unauthorized livestock access to Tonto Creek prior to Labor Day.

Heritage

Protection measures identified for range improvements include:

- Prior to ground disturbing management practices being implemented, archaeological surveys would be conducted for areas which have no previous survey coverage, or have outdated surveys which do not conform to current standards.
- Relocation or redesign of proposed range improvements and ground-disturbing management practices to avoid direct and indirect impacts to historic properties.
- Relocation of existing range improvements and salting locations sufficient to ensure the protection of historic properties being impacted by concentrated grazing use.
- Fencing or exclosure of livestock from individual sensitive historic properties or areas containing multiple sensitive historic properties being impacted by grazing.
- Periodic monitoring to assess site condition and to ensure that protection measures are effective.
- Protection and preservation of mature Emory oak stands which have been identified by Western Apache as having importance for subsistence and traditional and ceremonial uses.

Alternatives Considered But Eliminated From Detailed Study

Permittee Proposal

The Permittee Proposal is derived from some of the grazing related aspects of the previous Proposed Action from the LGVC EA. Many aspects of the permittee proposal have been incorporated in the Proposed Action. The items outlined below represent the aspects of the permittee proposal that could not be incorporated in the proposed action.

This proposal included a request to allow a temporary increase in permitted capacity, of undetermined magnitude, beyond the permitted numbers when conditions were deemed to be favorable. This could not be considered further, since it would be a violation of NEPA, as well as established Forest Service policy for the agency to go beyond the grazing capacity analyzed in the associated NEPA process.

The permittee proposal placed no limits on the application of intensive grazing management focused on Weeping lovegrass. Grazing trials conducted previously on this allotment have shown a temporary reduction in the prevalence of this non-native invasive species under very rigorous, intensive grazing management, with utilizations as high as 80 percent. These trials relied heavily on the use of attractants to focus the use in order to accomplish the desired effect and maintain cattle nutrition. This aspect of the permittee proposal would be further analyzed only as a tightly controlled management option under very specific circumstances and only up to 60 percent utilization. The ID Team for the Diamond Rim Grazing analysis felt that without such restrictions, the potential for adverse effects to other resource areas was too high and that excessive focus on this approach could easily lead to negative grazing impacts to other resource values within the project area.

The permittee proposal included several vegetative management projects related to woody species treatments as well as potential herbicide applications to invasive species. The ID team members felt that these projects, while having merit, should be analyzed separately. The primary goal of the DRGA project should remain focused strictly on the analysis of the grazing aspects of the management of these allotments.

After extensive development of the Proposed Action with input from the current permittee into the EA, and review by the Regional office, this proposal was dismissed from further analysis and withdrawn from consideration.

Comparison of Alternatives

This section provides a summary of the effects of implementing the alternatives. The indicators in the first column of the following table 6 were generated by tracking issues identified by scoping and compare how those would be affected by each alternative.

Table 6: Comparison of Alternative by Issue

Selected Issues	Alternative 1 – No Livestock Grazing/ No Improvement Projects	Alternative 2 – Proposed Action - Adaptive Management at Current Permitted Numbers with improvements and mitigations
Livestock Capacity	None, closed to grazing.	Up to 619 cow/calf pairs plus 40 yearlings, depending upon current resource conditions.
Soils and Vegetation Conditions	Likely improved condition and upward trend in native grass communities. Continued decline of native grass communities in areas with Weeping lovegrass	Conditions same as Alt. 1, but slower trend in native grass communities.

	No Weeping lovegrass management strategy	Weeping lovegrass management strategies continue to develop. Native perennial grasses within Weeping lovegrass areas have improved potential to recover.
	No monitoring.	Both effectiveness and implementation monitoring would continue on an annual basis
	No management implemented to change conditions	Adaptive Management options are implemented to resolve problems.
Tonto Creek/Water Quality	No Change in water quality issues related to *E. coli*. Coming from upstream septic fields.	No Change in water quality issues related to *E. coli*. , due to restriction on grazing use of Tonto Creek between May 1st and Sept. 15th
	No Recreation issues related to grazing access to Tonto Creek	No Recreation issues due to grazing restriction on Tonto Creek
Round Valley	Range infrastructure is removed. With limited resources for maintenance, water availability may decline.	Maintenance of infrastructure is assigned to the permittee. Water for livestock and wildlife is maintained.
	No change in range condition	Pasture remains closed to grazing until juniper treatments are separately analyzed and implemented.
	No change in range condition	Future woody species management in juniper stands provides improved forage response and improved soil condition
Wildlife	Recovery efforts related to various species continue with no grazing impacts	Recovery efforts related to various species continue with protections in place to address grazing impacts wherever practical. Effects to CLF may still occur.
Wilderness	No maintenance of infrastructure within the Hellsgate wilderness area. Dirt tanks eventually cease to function and provide water for wildlife.	Maintenance of infrastructure within the Hellsgate wilderness area is the responsibility of the permittee within the MRDG guidelines. Dirt tanks remain functional and provide water for wildlife and livestock.

Chapter 3: Affected Environment and Environmental Consequences

This chapter summarizes physical, biological, social, and economic environments of the project area and effects of implementing each alternative on that environment. It also presents the scientific and analytical basis for comparison of alternatives presented in chapter 2. Additional information has been added that was not included in the original draft, intended to clarify and help specialists with their analysis.

Range

The existing conditions for the upland vegetation within the Diamond Rim allotments is summarized in chapter 1 of this document. Additional summary information that was previously found here in the draft EA, intended to help readers understand the affected environment and environmental effects associated with the Alternatives described within this document, has been moved to the appendix. Additional field data may also be found in Appendix B.

Affected Environment

Grazing is a significant issue identified by the ID team in Chapter 1. There has been improvement on most of the allotment vegetative conditions under current management. However, areas in need of improving have been identified in several areas. The Proposed Action has been designed to improve unsatisfactory areas as well as maintain or improve conditions for the remainder of the allotment that are in satisfactory vegetative condition.

Effects Analysis[7]

General Effects of grazing

Ecosystem processes (energy, nutrients, and water) in arid and semiarid plant communities are affected by grazing herbivores. Removal of herbaceous vegetation, trampling and hoof action, and fecal and urine deposits by domestic and wild ungulates can positively or negatively impact plant communities depending on the number of animals and length of time they are present on a site. Domestic livestock, mainly cattle and sheep, were introduced on western rangelands in the late 1800s and early 1900s (Manier and Hobbs 2007). Grazing effects of wild and domestic ungulates differ primarily due to the fact that managers have very little control over the timing, intensity and duration of use by wildlife.

Shifts in plant community composition are caused by a range of natural disturbances. While grazing can cause shifts in vegetation state, it is not always the leading cause. Often, grazing pressures are removed with the idea that its absence would allow the vegetative community of a specific site to return to historical conditions (Ruyle and Dyess 2010). Historical conditions of the site may not be reached even with the removal of grazing. Altered soil characteristics such as water infiltration rates (Castellano and Valone 2007), seed source deficiencies, and presence of exotic or invasive plant species are additional

[7] Effects of each alternative are described in detail. Some effects and vegetation types are combined to avoid redundancy. Calculations and effects were clarified following public comment.

limitations (Ruyle and Dyess 2010). In addition, lack of frequent fire, a historical natural disturbance of Southwestern rangelands, has changed overstory structure, which in turn has changed composition and abundance of herbaceous species (Reynolds et al. 2012). Global climate change also poses important implications on state changes in vegetation caused by climate or other disturbances, further decreasing the chances that disturbed sites would return to historical conditions without intensive human management (Ruyle and Dyess 2010). The introduction into this area of Weeping lovegrass, which is a non-native invasive species, has also significantly changed the potential for these range sites.

Alternative 1 (No Grazing) – Direct and Indirect Effects

Vegetative composition

Vegetation Type: Semi-desert Grasslands, Pinyon-Juniper (PJ) Grasslands, and Pinyon-Juniper (PJ) oak woodlands:

Removal of grazing from semi-desert grasslands, PJ grasslands and PJ oak woodlands that have been grazed intermittently for more than 50 years can directly and indirectly affect the current state of ecosystem processes. Manier and Hobbs (2007) conducted a study to show how vegetative communities respond to grazing from wild and domestic ungulates in a sagebrush steppe with PJ stands in Colorado. These authors compared herbaceous and shrub plant cover, primary production of biomass, Carbon: Nitrogen ratios of biomass, species richness or diversity and bare ground in grazed and un-grazed sites. Shrub cover was significantly higher in the un-grazed plot than in plots grazed by wild and domestic ungulates, while total herbaceous cover did not differ between grazed and un-grazed treatments. This finding is consistent with other studies such as that conducted by Browning and Archer (2011), where long-term exclusion from grazing (with the absence of fire) increased shrub (*Prosopis* spp.) abundance in desert grasslands in southeast Arizona.

Species richness was reduced in the un-grazed treatment and above ground net primary production was higher in both grazed treatments than in the un-grazed treatment (Manier and Hobbs 2007). These results may be applicable to other semi-desert and semiarid PJ grasslands, such as those that reside on the southern portion of DRGA, because vegetative structure is similar and both domestic cattle and wild ungulates (Rocky Mountain elk, mule deer, and white tailed deer) occupy these vegetative communities. According to Manier and Hobbs (2007), total exclusion of large ungulates (wild and domestic) may reduce species biodiversity.

Another study conducted at Appleton-Whittell Research Ranch compared seasonal differences in water infiltration rates on grazed and un-grazed soil on semiarid grasslands in southeastern Arizona. Infiltration rates, total basal perennial grass, and shrub cover were higher in un-grazed soils (Allington and Valone 2011). Shrub cover results are consistent with previous studies (Manier and Hobbs 2007), but herbaceous cover was significantly lower on grazed vs. un-grazed sites (Allington and Valone 2011) contrasting with results reported in Manier and Hobbs (2007). It appears that knowledge of soil type and management of grazed areas may be important in determining if removal of grazing would move a vegetative community to a state where energy, water, and nutrient processes are functional. On the DRGA, absence of grazing from sites with soils highly susceptible to compaction and/or erosion may

benefit from the no grazing alternative, if those areas are showing signs of compaction and/or erosion under current management.

Vegetation Type: Ponderosa pine/ mixed conifer forest:
Grazing levels would be light, although wild ungulates such as mule deer, Coues white-tailed deer, and elk would still impact herbaceous and browse plant species. These impacts are expected to be minimal. It is predicted that the physiological growth requirements of the forage plants would be favored in all key areas under this Alternative. Therefore, all areas on the allotment would likely increase in desirable forage plant densities such as perennial bunch grasses and forbs. Additionally, there would be an increase in plant species composition and improved vigor of forage plants within the allotment. Overall forage production (biomass) would also increase with no livestock grazing by cattle. The overall effect would allow for the quickest recovery in unsatisfactory areas and improve vegetative conditions overall across the allotment (Arnold, 1950).

Restoration

Vegetation Type: Semi-desert Grasslands, PJ Grasslands, and PJ oak woodlands:
Soil erosion can hinder improvements in vegetative composition by as many as 20 years in desert systems (Holechek et al. 2004). Vegetative sites that have crossed an ecological threshold to a state where a return to a perennial grass dominated site is unlikely, removal of grazing may not achieve desired resource conditions without additional restorative efforts (West et al. 1984). The same prediction holds for the DRGA; the action of grazing removal from a site may not achieve desired conditions by itself.

Removal of livestock would decrease bare ground with the accumulation of litter while reducing compaction from livestock trampling and grazing. Recovery of vegetation and soils across the allotments would be slow and depend upon the level utilization the areas received in the past. A response from no grazing may be greater in these vegetation types on the allotments since they contain more grasses and forbs than in the Ponderosa pine/Mixed conifer forest types. It is expected that with the accumulation of litter and reduction of bare ground, there would be less run off from precipitation and more water available to vegetation. Annual recruitment may increase which would benefit native wildlife such as rabbits, deer and elk. An increase in annuals and other grasses would increase soil percolation and increase subsurface organic material.

Restoration projects such a juniper thinning or prescribed burning would not be pursued or planned for by Forest Service range staff or permitees, however these projects may take place by District Fire and Wildlife personnel.

Vegetation Type: Ponderosa pine/ mixed conifer forest:
Implementation of Alternative 1 would not necessarily restore the reference or historical structural and species composition characteristics in ponderosa pine/mixed conifer forests alone. Only reintroduction of fire and application of informed, mechanical, grazing, or other biological treatments would move current forest conditions toward desired conditions.

Absence of grazing from specific areas within ponderosa pine/mixed conifer forests in the DRGA project area could produce a range of adverse effects. First, the nearly 28,480 acres burned during the Dude Fire covers almost half of this vegetation type in the project area. The high intensity, severe and uncharacteristic nature of this fire shifted historic species composition of the understory and overstory components to a shrub-dominated state with sparse groups of ponderosa pine trees.

Removal of grazing from pastures in the ponderosa pine/ mixed conifer vegetation type dominated by the introduced species Weeping lovegrass would not result in positive effects to vegetative composition or ground cover. Weeping lovegrass evolved with grazing ungulates and can only be controlled with planned intensive, targeted grazing disturbance by large ungulates in combination with occasional fire disturbances. Grazing removal from this herbaceous species may cause adverse or undesirable effects on vegetative composition, ground cover, and fire regimes. Grazing would no longer be available to be used as a tool under this alternative.

Uncharacteristic stand-replacing fire would drive ponderosa pine/mixed conifer forests in the absence of grazing unless other management practices such as thinning, mechanical or biological treatments are applied to these systems (Reynolds et al. 2012).

Subsequent seeding of native grass species and non-native Weeping lovegrass resulted in a Weeping lovegrass-dominated herbaceous understory alternating spatially with a shrub or manzanita dominated understory. Weeping lovegrass is a robust, drought and fire tolerant bunchgrass graminoid that develops large tussocks, if not burned or grazed frequently (U.S. NRCS Plants Database 2012). Monoculture stands of Weeping lovegrass have limited the ability of native grasses and forbs to establish across the entire portion burned in the Dude Fire.

From 2008 to 2010, a study was conducted to test if high intensity grazing of dense stands of Weeping lovegrass would increase native herbaceous species ability to establish. Data in 2009 and 2010 confirmed that other native herbaceous species were able to become established in stands of Weeping lovegrass and frequency of Weeping lovegrass decreased post grazing (LGVC Range Monitoring Data Summary 2009 to 2010). Overall, Weeping lovegrass was greener and had less decadent plant material post grazing (U of A 2012).

In ponderosa pine/mixed conifer not burned in the Dude Fire, Weeping lovegrass is still present and has potential to spread. Implementing alternative 1 in these areas would allow the current increase in species diversity to persist, but would not allow for control of Weeping lovegrass by occasional herbaceous removal by livestock. Effective control of noxious weeds would be limited to hand-pulling, burning, or chemical treatment.

Range Improvements

Under the No Action alternative, range improvements would no longer be maintained by the permitee. Existing boundary fences would be assigned to adjacent permittees (where applicable). Interior fences and other infrastructure may be removed, as funding or workforce allows. Water developments, important for wildlife may be maintained where feasible using other program funds or volunteers.

Often, recreational users take advantage of existing corrals and water developments to care for their horses or mules while using National Forest System trails. Additionally, some wildlife species may have grown accustomed to reliable water at water developments, so there may be short-term negative impacts to their populations without those water sources.

Noxious Weeds

Absence of grazing in these vegetation types would remove one vector of spread in the project area, but the spread of weed seeds would continue naturally on upland vegetative sites. In the absence of grazing, seeds could still be dispersed by humans via domestic animals, contaminated hay, uncertified seed, off-highway vehicles, and heavy road maintenance equipment. Existing infestations would still receive consistent treatment in the absence of grazing. Absence of grazing would also decrease observations of any new noxious weed establishments, and would limit the control to chemical or manual removal only.

Grazing Strategy for Weeping lovegrass

The No Action alternative does not have a grazing strategy for weeping lovegrass. Lovegrass would likely continue to be lightly grazed upon my native ungulates and other wildlife. Low levels of herbivory on weeping lovegrass would likely lead to decadent and less palatable lovegrass. Implementation of Alternative 1 in Weeping lovegrass dominated areas of ponderosa pine/mixed conifer forests on this allotment would decrease herbaceous species diversity, increase the risk of catastrophic wildfire due to unmanaged stands of Weeping lovegrass, and negatively impact ecosystem function.

Drought and Climate

The No Action alternative does not impact the occurrence of drought.

Climatic carbon dioxide levels (CO_2), temperature, and precipitation would play a role in vegetation structure. Higher temperatures would create hotter conditions and change soil moisture regimes (Izaurralde et al. 2011). High altitude plants may not be readily adaptable to higher temperatures and may be negatively affected as a result. This is undesirable because higher altitude herbaceous plants are generally more nutritious than lower altitude plants (Bertrand et al. 2008), so their deterioration would negatively impact wildlife and other herbivores. Some studies have reported that increased CO_2 would significantly increase Carbon 3 pathway plant production, indicating that shrubs and woody species would become more prevalent. (Hatfield, et al., 2011) As a result, increased levels of shrub and woody species may contribute to a vegetative structure that leads to stand-replacing or uncharacteristic wildfire (Reynolds et al. 2012). The absence of livestock would decrease CO2 emissions within the project area but would not affect climatic conditions

Fire

A natural disturbance on Southwestern forests and rangelands, fire behavior may be affected by the removal of livestock due to a possible increase in shrub cover (Manier and Hobbs 2007). Removal of grazing would allow herbaceous components to build up to a level where more frequent fires could re-enter the disturbance regime (Laughlin et al. 2006).

Frequent, low intensity fire has played an important role in how ponderosa pine/mixed conifer forest structure and species composition has been shaped. The grass-forb-shrub community is the basis on which tree groups and individuals have been arranged. This herbaceous and shrub component are important for maintaining frequent surface fires (Reynolds et al. 2012). Absence of grazing the herbaceous (grass-forb) component could allow necessary fine fuels to carry low intensity, frequent fire through these forests.

Alternative 2 (Proposed Action) – Direct and Indirect Effects Vegetative composition:

Vegetation Type: semi-desert grassland/PJ grassland/PJ oak woodland:
The predicted effects of the Proposed Action on semi-desert grassland, PJ grassland and PJ oak woodland vegetation types may vary depending on the trends in climate and precipitation over time. Monitoring in the portions of these allotments that have been grazed regularly over the last ten years has shown a range of responses to grazing pressure, rest and precipitation, which is well within the range of natural variability associated with these vegetation types in the southwest. During dry periods some components of the plant community would decrease and during wet periods, under appropriate management, these same components would recover. Flexibility in the stocking rate up to the proposed permitted numbers would allow managers to respond to short term changes in precipitation by either increasing or decreasing the annual authorization accordingly to achieve outcomes desired on a pasture by pasture basis. No adverse direct or indirect effects are anticipated.

Vegetation Type: Ponderosa pine/ mixed conifer forest:
Where present in these vegetation types, grasses, forbs, and shrubs are selected for grazing by livestock. Excessive grazing of these components may reduce plant diversity and decrease soil stability. These also play roles in maintaining natural fire regimes and help limit pine seedling establishment. Grazing impacts on vegetation may be mitigated by timing of use, head management (yearlings), adjustment of stocking rates, addition of range improvements, limiting utilization rates, and conformance with the Tonto Forest Plan (Allen, et al, 2002).

This alternative would limit forage utilization to conservative levels (up to 40 percent for grasses, forbs, and shrubs). This is within the range recommended for grazing in the southwestern United States. Most rangeland grasses and forbs can have 35 percent to 45 percent of their leaves and stems removed every year and still remain healthy and productive so that plants can photosynthesize and manufacture energy to produce more leaves, stems, and seeds (Holechek 1988). With the grazing utilization stipulations, the Proposed Action would maintain or improve upland vegetation productivity and condition by maintaining utilization levels that have been authorized leading up to this document.

Restoration

Livestock impact soils by compacting and loosening soil from trampling and trailing in addition to selecting for forage species. Direct impacts depend on the duration, timing, class or kind of livestock, and intensity of grazing. Grazing management can moderate the effects of livestock grazing. The proposed grazing strategy outlines in the proposed action was designed to maintain or improve conditions across the DRGA.

There are no specific restoration projects in the proposed action.

Range Improvements

Addition of range improvement may play a key role in helping move current conditions towards desired conditions and helping to achieve management objectives set forth in this analysis. Standard structural range improvement projects would be completed across allotments as specific needs are identified and funding is available. The types of improvements could include:

- Additional pasture division fencing
- Holding traps and traps around dirt tanks
- Livestock handling facilities
- Spring development and exclosures
- Construction of dirt tanks
- Placement of additional pipelines and troughs
- Development of additional trick tanks and catchments

Wells & Storage Tanks

Direct impacts would include disturbance to vegetation around the well site from the well drilling equipment. This would be localized to an area approximately 10' x 15' around the well. Sediment from the drilling would be spread out around the well site. Approximatly 100 square feet of vegetation resources would be impacted by storage tank placement.

Pipelines & Troughs

Proposed improvement locations would be designed to following existing roads and areas that have been previously disturbed, minimizing impacts to existing vegetation where possible. Vegetation would be directly impacted in the short-term by the installation of pipelines and troughs. Direct impacts would include full removal of some vegetation species within the footprint of the project (up to 60" across) before or during installation using hand or power tools. Indirect impacts would include trampling or defoliation of established vegetation during installation, and expansion of invasive species into disturbed areas. Pipe would be weaved through and around existing vegetation causing minimal impacts. The surface disturbance from pipeline is expected to be minimal. Levels of moderately higher use would be expected to occur in areas within ¼ mile from trough locations.

Fence

The construction of additional fence for grazing exclosures/corrals/traps and study areas may have impacts to vegetation resources through the partial clearing of woody vegetation for fence line construction and maintenance, typically 6' on either side of the fence. Additional impacts may occur from livestock and wildlife that may use the fence line as a travel corridor.

Stock/Trick Tanks

The installation of a tank includes using a bulldozer to dig the tanks, build berm around the tank, and construct bar ditches to collect water. Cross country travel may be utilized to access the site. Incidental

tree and shrub removal may take place in the footprint of the tanks. Tanks are typically 100 feet by x 100 feet in diameter and 8-10 feet deep.

Areas near future improvements may experience high levels of use, but distribution opportunities for livestock, would be improved. Utilization around current improvements such tanks or troughs may also decrease because of the additional water troughs elsewhere in pastures. Any future range improvement tiered to this EA would be required to complete additional heritage and biological clearances.

Noxious Weeds

Weeping lovegrass, a grazing-tolerant grass species introduced from African savannahs dominates the herbaceous component of pastures within the 1990 Dude Fire Area. Weeping lovegrass flourishes with grazing pressure and higher intensities of grazing on this grass type may improve quality of forage in the stand and open niches for other herbaceous species to establish. Unlike the *semi-desert grassland/PJ grassland/PJ oak woodland* vegetation type, the Weeping lovegrass dominated *ponderosa pine/mixed conifer* units would be more likely to see an increase in species diversity and forage production if grazed conservatively during consecutive dry years at an appropriate stocking rate.

Grazing strategy for Weeping lovegrass

In pastures[8] within the Dude Fire Area, the proposed or higher utilization rate (60%) could be applied during wet years and would improve vegetative composition. The proposed stocking rate could be applied during dry years for shorter periods of time and would not adversely affect ecosystem function. As discussed under the No Action Alternative, the effects of utilization up to 60% on weeping lovegrass would reduce decadent plant material and result in higher palatable lovegrass. It has been documented that native herbaceous species may become establishment in lovegrass monocultures with this strategy. In areas where lovegrass does not dominate the landscape, allowing 60% utilization on it would likely result in greater than the Proposed Action's 40% utilization on native perennial grasses and other herbaceous species. This excessive utilization would likely contribute to decrease photosynthesis, reduced carbohydrate storage, reduce root growth, and less seed production on native perennial grasses. It could also reduce the ability to compete with other non-grazed, undesirable plants. Utilization of native perennial grasses and other herbaceous species in excess of 40 percent would also likely lead to reduced ground cover, less rainfall infiltration, and increased runoff (Holechek, 2010).

Drought and Climate

The Proposed action would not affect drought. Drought conditions would be monitored with the Standardized Precipitation Index[9] (SPI). Rain gauges may also be used to monitor precipitation within various areas of the allotments. Utilization strategies during drought would be adjusted to compensate for decreased plant growth and would allow for residual forage for wildlife food and thermal cover.

[8] Pastures proposed for a 60 percent utilization are East Verde, Dry Dude, Moore, Bonita, Dick Williams, Brody, Roberts Mesa North, Ellison, Myrtle-Pyeatt, Holding and Diamond pastures.

[9] https://www.ncdc.noaa.gov/oa/climate/research/prelim/drought/spi.html

Fire

The proposed action would directly affect wildland fire within the project area through the reduction of fuels such as grasses, forbs, and brush. The removal of fuels would reduce fire's ability to spread through dry fuel loads. Livestock may trample fine fuels which creates a more compact fuel bed reducing its flammability and ability to spread.

Alternative 1 (No Grazing) - Cumulative Effects:

Implications of historic unregulated livestock grazing, fire suppression and logging on North American Southwestern rangelands in the late 1800s and early 1900s (Moore et al. 2010; Reynolds et al. 2012) must be considered as a lasting effect across the project area. Ecological processes may benefit from livestock removal on some semi-desert grassland and PJ grassland types, if climatic variables remain more or less constant. If, however, more frequent and longer droughts persist as predicted (Izaurralde et al. 2011), then plant communities would not necessarily benefit from the absence of grazing.

Continued maintenance thinning of PJ woodland-grassland mosaics by the permittee on Houston Mesa would cease under alternative 1. If these PJ mosaics do not benefit from the continuation of thinning by the permittee, completed treatments are not likely to be maintained and this vegetation type could shift back to a less desirable canopy cover and vegetative state. Alternatively, absence of grazing could allow for more comprehensive prescribed fire treatments, if funding is secured.

Removal of grazing from Hellsgate Wilderness would have variable effects. Recreationists may experience a more "wild" experience due to the absence of cattle. The absence of ranch managers overseeing livestock and Forest Service and other agency personnel monitoring on horseback in the wilderness would decrease the observation and control of illegal activities and overall safety of Hellsgate Wilderness.

Ceased maintenance of water and fence improvements may have undesirable implications for wildlife. Wild ungulates such as mule deer, elk, white tailed deer, and Coues' white tailed deer depend on many livestock watering facilities. Since their reintroduction in 2009, Chiricahua leopard frog (CLFs) have traveled from introductory springs (which are physically excluded from wild and domestic ungulates) and earthen stock tanks in excess of one mile away and have coexisted with wild ungulates and domestic livestock, sometimes taking shelter in ungulate cloven hoof prints. Absence of cattle would essentially cease all maintenance of such earthen stock tanks and developed springs, imposing potential water shortages for CLF and many other wildlife species.

Other activities taking place in the project area such as recreation, hunting, logging, thinning, and mining would continue to persist in the absence of grazing. OHV use would persist on and off authorized or unauthorized roads, waterways would still receive recreational impacts, and fire would still be suppressed in most cases.

Absence of cattle may increase safety on State Route 260 by decreasing chances of accidents. ADOT highway construction projects within the DRGA project area would not have to plan around the

permittee's cattle movement schedule and vice versa. Absence of cattle in the project area would remove the need for private lands to be fenced out at the landowner's expense.

Under the No Grazing scenario, improvement in resource conditions are expected to be mild to moderate over the long-term as vegetative conditions slowly recover from long-term livestock grazing on the allotment. Vegetation (fuels) would likely continue to build up as no livestock would be removing above ground biomass. This may increase the probability of wildfire within the allotment which may have increased negative impacts to vegetation and soil resources. Uncharacteristic stand-replacing fire would drive ponderosa pine/mixed conifer forests in the absence of grazing unless other management practices such as thinning, mechanical or biological treatments are applied to these systems (Reynolds et al. 2012).

The effects of climate change and drought may impact vegetation condition of the allotment, however, the continued absence of livestock grazing pressure may lessen plant stress, thereby reducing or slowing these effects.

Alternative 2 (Proposed Action) – Cumulative Effects

The Diamond Rim Grazing allotments have been active livestock grazing allotments with livestock grazing occurring in some form in the project area for over a century. The environmental effects of past grazing practices are reflected in the current description of the affected environment for the allotment.

The Proposed Action grazing practices are not expected to contribute toward any downward trends in resource conditions on the allotment. Re-authorizing grazing for an additional 10-years is not anticipated to contribute additional adverse impacts to allotment resource conditions as described in Chapter 3. Monitoring has demonstrated that current management has resulted in improvements to vegetative condition in the allotment. A flexible management livestock rotational system with a selective rest-rotation strategy, light to conservative grazing intensity, and the potential for additional range improvements are not expected to result in significant direct or indirect negative effects to vegetation and are likely to maintain or improve the overall vegetative condition of the allotment.

The proposed grazing management strategy has the potential to move semi-desert grassland, PJ grassland and PJ oak woodlands toward desired conditions and ecosystem function, if stocking levels are promptly adjusted to vegetation and ecosystem needs. The flexibility of maintaining two or three herds of varying sizes allows appropriate stocking levels to be applied in proper vegetation units at optimum seasons of the year without compromising the overall level of AUMs. A single herd at the proposed stocking level could adversely affect ecosystem function in some vegetation units as indicated above depending on unit size, vegetative composition, climate, and duration of grazing.

In general, effects of a yearlong grazing system in this ecological region would be mostly beneficial as long as each vegetation unit receives the correct period of rest at the appropriate time of year. Grazing schedules would be determined by previous use, previous rest, season of use, precipitation, growing conditions on a pasture by pasture basis and specific goals for various vegetation types on a pasture by pasture basis. No adverse cumulative effects are anticipated.

Soils

The allotments are located primarily within the Transition life zone (Lowe 1964). The primary vegetation types are pinyon-juniper/oak woodland, ponderosa pine, chaparral and seral grasslands dominated by Weeping lovegrass created by the 1990 Dude Wildfire. Topographical features range from nearly level valley and elevated plains to steep mountains occupied by the Interior Chaparral vegetation type to very steep mountains and escarpments along the Mogollon Rim and Hellsgate Wilderness Area. Elevations range from about 3,500 feet in Houston Pocket (southern portion of the allotments) to 7,800 feet on the face of the Mogollon Rim (northern portion of the allotments). Precipitation ranges from about 12 to18 inches in the Sonoran desert and semi-desert grassland vegetation type in the southern most point of the allotments to about 32 inches in the Mixed Conifer vegetation type along the Mogollon Rim to the north.

Soil Condition Evaluation (FSM 2500)

Soil condition is primarily determined by evaluating surface soil properties. This is the critical area where plant and animal organic matter accumulate, begin to decompose and eventually become incorporated into soil. It is also the zone of maximum biological activity and nutrient release. The physical condition of this zone plays a significant role in soil stability, nutrient cycling, water infiltration and energy flows. The presence and distribution of the surface soil is critically important to productivity.

While soil condition is an important element in determining general watershed condition, it is not intended to be a stand-alone process for evaluation of site specific conditions such as soil mass movement, stream channel health or sediment yield.

Soil Condition Categories (FSM 2500)

Ecological land units are assigned a soil condition category which is an indication of the status of soil functions. Soil condition categories reflect soil disturbances resulting from both planned and unplanned events. Current management activities provide opportunities to maintain or improve soil functions that are critical in sustaining soil productivity. Following is a brief description of each soil condition category:

- *Satisfactory* - Indicators signify that soil function is being sustained and soil is functioning properly and normally. The ability of soil to maintain resource values and sustain outputs is high. Satisfactory soils have properties that allow the infiltration of water and the ability to resist erosion (stable) (U.S.Forest Service 1999). Properties such as granular surface soil structure, soft consistency, low bulk density and large pores allow rapid and deep entry of water (U.S.Forest Service 1999). Healthy soils also have appropriate amounts of litter and plant cover to help rebuild or maintain soil organic matter, maintain nutrient levels and resist erosion (U.S.Forest Service 1999).

- *Impaired* - Indicators signify a reduction of soil function. The ability of soil to function properly has been reduced and/or there exists an increased vulnerability to degradation. An impaired category should signal land managers that there is a need to further investigate the ecosystem

to determine causes and degrees of decline in soil functions. Changes in management practices or other preventative actions may be appropriate.

- *Unsatisfactory* - Indicators signify that loss of soil function has occurred. Degradation of vital soil functions result in the inability of soil to maintain resource values, sustain outputs, and recover from impacts. Soils rated in the unsatisfactory category are candidates for improved management practices or restoration designed to recover soil functions.

- *Transitional* (U.S.Forest Service 1999) – If soils do not have the properties of a stable soil, they should at least be showing signs of improvement. Signs of improvement include the development of a softer and looser surface horizon, minimal conspicuous rills, gullies, pedestaled plants, exposed roots, soil deposited on the uphill sides of logs, rocks, and larger plants or other signs of accelerated erosion. If erosion is evident, there should be signs that they are stabilizing. Positive signs are gullies starting to heal over and plants re-colonizing eroded areas.

Terrestrial Ecosystem Survey (TES)

TES (now known as Terrestrial Ecosystem Unit Inventory or TEUI) was completed and a report published in 1985 (U.S. Forest Service TES Report 1985). This information served as a basis for delineating and calculating acres of vegetation types, soil condition classes, and provided existing soil and ecological information, including soil production potential, suitability, hazards, and limitation of management activities. The TES survey identified 46 map (ecological) units in the Diamond Rim Grazing Analysis (Appendix A). These units were aggregated into similar potential vegetation types resulting in nine major climax vegetation types and one seral grassland type that resulted from the 1990 Dude Fire.

Appendix A (Mapping Unit Legend) lists each map unit, taxonomy including soil depth, soil particle size class (texture), surface soil texture and rock fragments, climatic class, soil temperature regime, and soil condition.

Table 7: Percent (%) Slope acres by Project Area & Allotment

Slope category (%)	DRGA	Payson	Cross V	Star Valley	Green Valley	Indian Gardens
0 – 15	19,312	4,993	5,769	1,736	5,491	1,323
15 – 40	40,801	10,699	10,547	3,660	12,047	3,848
40 – 80	40,914	10,254	9,106	5,122	12,039	4,393
> 80	62,668	13,293	9,850	13,839	18,815	6,871
Total	163,695	39,239	35,272	24,357	48,392	16,435

Table 8: Soil Condition Class by Allotment (acres)

Condition Class	DRGA	Payson	Cross V	Star Valley	Green Valley	Indian Gardens

Condition Class	DRGA	Payson	Cross V	Star Valley	Green Valley	Indian Gardens
Satisfactory	76,464	17,246	15,373	3,037	25,072	15,736
Satisfactory – Impaired	17,794	5,197	4,804	1,665	6,128	0
Satisfactory – Unsuitable	32,741	8,312	1,981	8,483	13,255	710
Impaired	1,120	529	42	549	0	0
Impaired – Unsatisfactory	35,247	7,895	13,077	10,379	3,896	0
Unsatisfactory	61	0	0	61	0	0
No Data	208	84	0	124	0	0
Total	163,653	39,263	35,277	24,298	48,351	16,446

Semidesert Grasslands

The 1985 TES survey reported the following ecological units (TES map units depicting soil, climate, and potential plant community) and conditions for semidesert grasslands. Semidesert grassland ecological units are located along similar latitudes in Dry Pocket, Picket Pen and associated Holding pastures but are characterized by significantly different soil types, slopes and erosion hazard. Unit 3060 consists of 61 acres of deep, fine, gravelly loam Typic Haplustalfs. Soil condition was rated unsatisfactory with moderate erosion hazard and 0 to 15 percent slopes. Unit 9239 consists of 450 acres of rock outcrops and Torriorthents, Ustorthents and Ustochrepts soil types. Soil condition was rated satisfactory and unsuitable for grazing because slopes are greater than 40 percent. Livestock may incidentally graze in areas rated unsuitable; however the bulk of their time is generally spent on slopes less than 40 percent.

Piñon-Juniper (PJ) Grasslands

The 1985 TES survey reported the following soil types and conditions for Juniper Savannah/PJ Grasslands. Units are located across a large portion of the project area in Houston Mesa, Shoofly and Hells Half Acre pastures and consist of similar soil types. Units 3710, 3711, 3712 and 4140 represent 728 acres of deep, gravelly to very cobbly loam Typic Haplustalfs. Soil condition was impaired to unsatisfactory with slight erosion hazard on 0 to 15 percent slopes in units 3710 and 4140, which make up most of the juniper savannah ecological unit. Units 3711 and 3712 had impaired soil conditions with severe erosion potential on 15 to 80 percent slopes but make up a small portion of the Juniper Savannah ecological unit.

Piñon-Juniper-Oak (PJ Live Oak (Northern & Southern types) Woodlands, Arizona Cypress and Chaparral)

In PJ Live Oak Woodlands (Northern & Southern) ecological units, the 1985 TES survey reported the following soil types and conditions across the southern two-thirds of the DRGA project area. Typic Haplustalfs with deep, gravelly to cobbly loams with clayey soils comprise most of the units in this ecological unit. Soil condition was satisfactory in units 3821, 3822 and 4175 with severe erosion hazard.

Soil condition was impaired in units 3521, 3730, 3731, 4161 and 4170 with moderate to severe erosion hazard (Appendix A).

Typic Ustochrepts with deep and moderately deep, loamy-skeletal gravelly loams make up approximately one third of the units. Soil condition was satisfactory in units 3339, 3753, and 4457 with moderate to severe erosion hazard. Soil condition was impaired in units 3752 and 4240 with slight to moderate erosion hazard (Appendix A).

The large remaining unit in this ecological type resides in the Hellsgate Wilderness on steep, rock outcrops consists of a combination of Haplustalfs, Ustochrepts and Ustorthents. Unit 9349 has severe erosion hazard. Soil condition is rated satisfactory but unsuitable for grazing because slopes are greater than 40 percent. Soils on slopes greater than 40 percent are inherently unstable but functioning properly and normally. Livestock may incidentally graze in areas rated unsuitable however the bulk of their time is generally spent on slopes less than 40 percent.

The large remaining unit in this ecological type resides in the Hellsgate Wilderness on steep, rock outcrops consists of a combination of Haplustalfs, Ustochrepts and Ustorthents. Map unit 9349 has severe erosion hazard. Soil condition is rated satisfactory but unsuitable for grazing because slopes are significantly greater than 40 percent. These soils on slopes greater than 40 percent are inherently unstable but functioning properly and normally. Livestock may incidentally graze in areas rated unsuitable; however the bulk of their time is generally spent on slopes less than about 40 percent.

Arizona Cypress

Arizona Cypress ecological units contain loamy-skeletal mixed mesic Lithic Ustochrepts with very gravelly, sandy loams and moderately deep clay-skeletal mixed mesic Typic Haplustalfs with gravelly loams. Soil condition was satisfactory in units 4468 and 4469 with severe erosion hazard (Appendix A).

Chaparral

In chaparral ecological units, Typic Haplustalfs with clayey-skeletal or loamy-skeletal mixed mesic cobbly or gravelly sandy loam soils are dominant in two of the three units. Soil condition was rated satisfactory and satisfactory to impaired with severe erosion hazard in units 4176 and 4241, respectively. The largest unit (4242) is composed of Lithic or Typic Ustochrepts with loamy-skeletal mixed mesic very gravelly sandy loam or loam soils. Soil condition was rated satisfactory with severe erosion hazard in this unit (Appendix A).

Ponderosa Pine (Eastern & Western Types): Existing Condition and Effects Analysis

Approximately two-thirds of the ecological units in the Ponderosa Pine (Eastern and Western types) are composed of Udic Haplustalfs with fine loamy mixed mesic deep gravelly to cobbly loam soils (Appendix A). Soil condition was satisfactory with slight erosion hazard in units 5165, 5250, 5550 and 5650 while soil condition was satisfactory with severe erosion hazard in units 5251, 5252 and 5651.

The remaining third of ecological units is dominated by Udic Ustochrepts with loamy skeletal, mixed mesic gravelly loams. Soil condition was satisfactory with severe erosion hazard in units 5351 and 5352.

Soil condition was satisfactory with moderate erosion hazard in unit 5350 and unsuitable with severe erosion hazard in unit 5368 (Appendix A)

Mixed Conifer: Existing Condition and Effects Analysis
Ecological units 6250, 6251 and 6252 are composed of Glossoboric Hapludalfs with fine, mixed mesic deep gravelly to cobbly loam soils. Soil condition was satisfactory with slight erosion hazard in unit 6250 and severe erosion hazard in 6251 and 6252.

Glossoboric Hapludalfs with loamy-skeletal, mixed mesic gravelly loams and Typic Eutrochrepts with calcareous, loamy-skeletal mixed mesic deep gravelly loams are dominant in unit 6368. Soil condition was satisfactory to impaired with severe erosion hazard.

Typic Udorthents with sandy-skeletal mixed frigid and mesic gravelly sandy loams were dominant in unit 6405. Typic Ustorthents with sandy-skeletal mixed mesic gravelly sandy loams were also common in this unit along with rock outcrops. Soil condition was satisfactory with severe soil erosion hazard (Appendix A).

Typic Eutrochrepts with loamy-skeletal mixed, mesic deep gravelly sandy loams were dominant in unit 6652. Soil condition was satisfactory with severe erosion hazard (Appendix A).

Most satisfactory soils occur in ponderosa pine and mixed conifer vegetation and some pinyon-juniper oak woodlands, Arizona cypress, and chaparral vegetation types. These map units and soils have high amounts of effective ground cover from pine needle litter that protects soils from accelerated erosion. These soils are fully capable of supporting livestock grazing and still allow for maintenance of soil productivity when utilization guidelines are not exceeded.

Impaired or unsatisfactory soils generally occur in juniper savannah and pinyon-juniper grasslands, semidesert grasslands, and some PJ oak woodlands. These soils have reduced nutrient cycling functions (reduced species composition, diversity, and litter cover or show signs of accelerated erosion). These soils are capable of supporting livestock grazing under conservative or light allowable use while still allowing maintenance of soil productivity. This is dependent on utilization guidelines not being exceeded under an adaptive management strategy.

Livestock grazing should be managed at an intensity that would improve vegetative ground cover and composition to enhance soil function (minimize soil erosion, promote water infiltration, and enhance nutrient cycling) and to improve quality and quantity of native, perennial vegetation. Livestock grazing should also be managed on all soils at an intensity that would maintain or improve effective ground cover (defined as the sum of percent litter and percent total plant basal area) to enhance soil function and improve quality and quantity of native, perennial vegetation.

Fenn: Existing Condition and Effects Analysis
DRGA is one of the largest fens (peat forming wetlands that receive recharge and nutrients almost exclusively from groundwater) in Arizona. The only other known extensive peat deposits in Arizona occur as marshy areas along the Little Colorado River in Navajo and Apache Counties. These deposits

include two meadows near Joseph City totaling 345 acres. These deposits are two to eight feet deep while the peat deposits in Little Green Valley are at least 20 feet deep in places. The DRGA site has a sequence of layers of peat intermingled with deposits of sand and gravel. The bottom layers of peat have been age dated by researchers at NAU to be approximately 2700 years old. The lower layers of peat contain many plant parts that are so well preserved that a paleobotanist could reconstruct the ancient plant community of the bog. The layers also contain a rich pollen record that would enable researchers to determine past plant communities of the surrounding area and track them through time which would reveal much about changing climates. The alternating layer of gravel and peat could indicate flooding sequences brought about by changing climates that would be useful for an archaeologist in correlating other studies of climate change.

A 20 foot deep head cut (an eroding face on the downstream end of the bog) was migrating upstream for many years. Comparison of 1946 aerial photos with 1988 photos revealed that the head cut migrated upstream approximately 750 feet between those years. In 2011 the Forest Service with the cooperation of Arizona Department of Transportation, Ames Construction Inc. (ADOT's contractor for the DRGA portion of the Highway 260 construction project), John Anderson (the private landowner upstream of the head cut), The US Army Corps of Engineers (404 Permit), and the Arizona Department of Environmental Quality (401 Certification) constructed a head cut control structure at the face of the head cut.

The maximum likelihood of success of the structure is dependent on maintaining good vegetative conditions on the top of the bog. Dense vegetation would encourage infiltration into the bog and help to slow stream flow velocities before flood flows reach the structure. To provide good vegetative ground cover the Forest Service has constructed a 10 acre exclosure around the portion of the valley that lies on NFS lands to exclude both elk and livestock.

Effects Analysis

Direct Effects

Grazing and Grazing Related Activities

Livestock grazing can affect soil quality in several ways. Hoof action of cattle can directly impact soils by compacting soils. The risk for compaction is greatest when soils are wet (USDA NRCS 1996). Compaction decreases water infiltration, restricts rooting depth, and increases the hazard of water erosion (USDA NRCS 1996, 1998, 2001). Trailing by cattle on steeper slopes can physically displace soils, leading to erosion. Trampling by cattle in certain circumstances can temporally increase water infiltration rates but tend to decrease long-term rates (Roundy et al. 1992). Grazing can, under certain conditions, increase planting of grass seeds and seedling emergence (Winkle and Roundy 1991).

Cattle tend to concentrate on flatter areas especially if they are fairly open. Holechek and Pieper (1992) reports that cattle tend to use 10 to 30 percent slopes thirty percent less often than 0 to 10 percent slopes and 30 to 60 percent slopes sixty percent less often than flats. Slopes over 60 percent are seldom

used. Because of the tendency of cattle to use flatter slopes, areas of impacted soils are more likely to be found on gentler slopes.

Range improvements (e.g. fencing, water developments) can have slight, localized, short-term impacts to soils during construction. Building new fences and developing waters, as mentioned in the proposed action, would have extremely small, localized direct impacts to soils.

Soils in less than satisfactory condition are generally on gentler slopes. Even with good management, flatter areas would still have a tendency to receive heavy use since these areas are favored by livestock. Key areas, established to monitor cattle use, are normally on flatter, more open areas. If monitoring of grazing intensity of these areas shows acceptable use, other parts of a pasture can be expected to have acceptable levels of impacts.

Indirect Effects

Grazing and Grazing Related Activities
Cattle indirectly impact soils by removing vegetation resulting in a loss of protective cover including litter. Loss of vegetation and litter reduces infiltration and exposes soils to raindrop impact and overland flow thus leading to soil crusting and increased erosion. Reduced vegetative cover can also result in a loss of soil organic matter and a reduction in soil microbes which play a significant role in nutrient cycling. Soils that are lower in organic matter have poorer structure which can also affect infiltration and root growth. Building fences and developing waters would indirectly affect soils by improving distribution of cattle resulting in a net positive effect. Other management actions, such as salting and water development, that affect livestock use patterns can improve cattle distributions and lessen impacts to heavily used areas but could lead to increased use of other areas that had been previously unused or lightly used. According to Pierson et al. (2002), inherent characteristics of a soil type in combination with the vegetative community type and level of vegetative cover play key roles in estimating site scale soil loss.

Environmental Consequences- Alternative 1 (No Action)

No Grazing- all rangeland management activities would cease on the allotment and the term grazing permit would be cancelled following guidance from *36 CFR 222.4* and Forest Service Manual 2231.62. Structural range improvements would be evaluated for agency maintenance or removal.

Direct and Indirect Effects*:* (common to all upland ecosystems unless otherwise noted)

- General Effects: compaction decreases water infiltration, restricts rooting depth, and increases the hazard of water erosion (USDA NRCS 1996, 1998, 2001). Therefore, the quickest and most likely recovery from soil compaction due to past heavy grazing activities would normally occur with complete protection from grazing. The amount of time required for complete recovery after degradation can vary from several years to decades depending on the severity of the impacts and the nature of the ecosystem. Although soil conditions that are currently less than satisfactory are largely attributable to cumulative effects of historic grazing, continued grazing could slow or prevent recovery in some areas. This alternative is likely to lead to the fastest

overall improvement but even with complete rest it may take more than ten years for some areas with impaired and unsatisfactory soil condition to improve to a better condition class. The micro-relief of soil surfaces increases with moderate stocking rates (Thurow 1991). In the absence of grazing, the lack of hoof prints decreases opportunities for surface water detention in some soil types.

- Effects on biological (cryptogamic) crusts: biological crusts play an important role in some ecosystems in the analysis area. Crusts bind and protect soil from both water and wind erosion. Preliminary studies show reduced germination of cheatgrass (*Bromus tectorum*) on soil crusts. Grazing can have detrimental effects on the amount of biological crusts (Beymer and Klopatek 1992). This alternative is most likely to increase the cover of biological crusts and their ecological benefits.

- Effects of removing improvements: effects of removing any improvements would be a minor, localized, short-term disturbance to soils.

- Effects of not seeding/planting native vegetation: areas that would benefit from planting native vegetation may not improve or improve as rapidly; however, natural recovery may be enhanced since grazing pressure would be removed.

Environmental Consequences- Alternative 2 (Proposed Action)

Current Management- Maintains the Currently permitted numbers of 619 head CYL or 10,050AUM's- Additional improvements to infrastructure would be proposed in order to address livestock distribution, wildlife needs and recreational conflicts.

Direct and Indirect Effects*:* (common to all upland ecosystems unless otherwise noted)

- **General effects:** Stocking rate of grazing livestock effects soil micro-relief (created by litter cover, vegetation growth and topography) and consequently the ability for soil surfaces to capture and store water (Thurow 1991). Moderate stocking intensity has the potential to increase the micro-relief of soils with hoof prints from livestock (Thurow 1991). However, heavy stocking rates have the potential to break down soil aggregates to loose dust in dry soil conditions and compact soil aggregates to a hard surface in wet conditions (Thurow 1991). Compaction decreases water infiltration, restricts rooting depth, and increases the hazard of water erosion (USDA NRCS 1996, 1998, 2001). Soil conditions that are currently less than satisfactory are largely attributable to cumulative effects of historic grazing and current management. Under this alternative, fewer impaired and unsatisfactory soils would not be grazed. Soils most likely to have impaired or unsatisfactory condition occur on flatter areas, areas most likely to be used by livestock. These areas are likely to continue to receive use. If allowable use guidelines are not exceeded in these areas they should begin to improve. Soil improvement is not likely to occur as quickly as under a No Action/No Grazing alternative except in areas not scheduled to be grazed.

- Herding and salting: herding and salting would have an overall positive indirect effect by improving cattle distribution but could create undesirable effects in some areas by drawing cattle into places that previously received no use or only light use.

- Effects on biological (cryptogamic) crusts: biological crusts play an important role in some ecosystems in the analysis area. Crusts bind and protect soil from both water and wind erosion. Preliminary studies show reduced germination of cheatgrass (*Bromus tectorum*) on soil crusts. Grazing can have detrimental effects on the amount of biological crusts (Beymer and Klopatek 1992). Biological crusts on sandy soils are less susceptible to disturbance when moist or wet; on clay soils, when crusts are dry. In general, light to conservative stocking in early- to mid-wet season is recommended (U.S.BLM, 2001).

- Direct effects of higher utilization standards for Weeping Lovegrass in selected pastures. In an effort to reduce the frequency of Weeping lovegrass in some pastures currently dominated by this non-native species higher utilization standards would be used with the intent to increase the frequency of native grass species. In a study (Bernau, et. al. 2013) conducted on the Roberts Mesa North pasture, utilization levels of 60% resulted in small increases in percent bare ground. Percent bare ground was 12% in sites targeted for higher utilization and 7% in control sites with standard utilization levels. The small increase in bare ground in the control sites would have a negligible effect on runoff and erosion.

- Indirect Effects of higher utilization standards for Weeping lovegrass in selected pastures Adherence to utilization standards for riparian areas in pastures selected for higher intensity grazing on lovegrass should not result in additional impacts to riparian areas and stream channel.

Cumulative Effects

Cumulative effects include the direct and indirect effects of the proposed action and alternatives when added to all past, present, and reasonably foreseeable future actions. Activities include:

- Past and current grazing: past grazing actions have resulted in soil erosion and compaction while current management has, in some cases, prevented or slowed recovery.

- Long-term fire suppression: A long history of fire suppression has altered the characteristics of many ecosystems. Conifer forests generally have greater fuel loading and a greater density of trees. Other ecosystems (some woodlands, juniper savannas, and semi-desert grasslands) have had an increase in woody plants. Some chaparral stands have become decadent and are at an increased risk of wildfire.

- Recent wildfires in the project area include Dude (1990), National (2002), August (2002), Webber (2004), Zane (2005), February (2006), Rim (2009), Water Wheel (2009), Horton (2011) and Big Canyon (2012).

- Travel Management: Unauthorized cross country travel can negatively impact soils and vegetation through direct impacts on soils and removal or degradation of herbaceous or woody vegetation. The Travel Management Rule is intended to analyze alternate motorized routes in order to provide access and a recreation experience sufficient so vehicle operators no longer feel compelled to travel off established roads or trails. Enforcement of the Travel Management Rule is imperative to assure compliance. Improperly maintained roads can cause soil erosion where runoff from roads is allowed to concentrate. Road maintenance that includes Best Management Practices should reduce sedimentation into the streams and be beneficial to the watershed. Roads can be a source of concentrated runoff which can lead to localized soil erosion down slope from roads. Road maintenance that includes BMPs should reduce erosion and be beneficial to the watershed.

- Introduction of non-native invasive plants has led to an increased risk of erosion and wildfire.

- Climate: Recent and on-going drought and possible future climate change can also impact conditions.

Alternative 1 (No Action)

Cumulative Effects: direct and indirect effects of this alternative, when combined with other past, present or reasonably foreseeable actions (cumulative effects) as listed above, would be generally beneficial to soils and vegetation. Removing grazing would allow impaired and unsatisfactory soils, often affected by compaction, to recover. Some actions such as small mines, gravel pits, and travel management could however affect small, localized areas. Climate change presents additional considerations. Warming and drying of the climate could increase the risk of wildfire especially in fire-dependent ecosystems.

Alternative 2 (Proposed Action)

Cumulative Effects: direct and indirect effects of this alternative, when combined with other past, present or reasonably foreseeable actions (cumulative effects) as listed above, are likely to result in attainment of desired conditions for soils and vegetation but at a slower rate than for alternative 1. Except for those pastures currently excluded under current management from grazing, grazing would occur throughout the analysis area.

Less than satisfactory soils that are not grazed would improve the fastest, but controlling grazing and limiting utilization to a maximum of 40 percent, would allow impaired and unsatisfactory soils, often affected by compaction, to begin to recover. However, recovery from the effects of historic overgrazing is likely to be slower than under the No Action/No Grazing alternative.

Some actions such as small mines, gravel pits, and travel management could however affect small, localized areas. Other activities would be slightly more extensive. Some past actions, however, combined with a lack of some of the possible treatments listed in the Proposed Action could affect much more extensive areas.

Climate change presents additional considerations. While changes that may occur are difficult to predict, adaptive management should allow grazing management to respond to climate variations by adjusting cattle numbers and duration of grazing. Warming and drying of the climate could increase the risk of wildfire especially in fire-dependent ecosystems.

No adverse cumulative effects are anticipated.

Hydrology/Riparian Vegetation/ Water Quality

There are approximately 245 miles of named streams on the USGS 1:24,000 topographic quadrangles within the project area. In addition, there are nearly as many miles of unnamed streams (delineated as blue lines) on the USGS topographic quadrangles. These unnamed streams are the ephemeral and intermittent tributaries to the named streams and are primarily headwater streams dominated by upland vegetation and ephemeral channels dominated by upland and xeric riparian vegetation. They provide the function relating to water quantity, water quality, flood regime, hydrological connectivity, riparian vegetation and wildlife habitat (Meyer et al. 2003, Levick et al. 2007) within the watershed.

According to US Army Corp of Engineers (2013), ephemeral, intermittent and perennial streams are defined as follows:

Ephemeral stream: An ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

Intermittent stream: An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.

Perennial stream: A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.

Existing Conditions

Historic Conditions

The existing condition of watersheds, stream channels and riparian areas has been affected by many factors, both natural disturbances, including drought, fire, and floods, and human activities, including fire suppression and grazing.

Cattle were introduced to Arizona in the late 1870s following the Civil War and the subjugation of the Apaches. During this time period, there was no regulation of grazing. By the early 1890s, one and a half million cattle had been brought to Arizona (Allen 1989). There have been many accounts of the

overgrazing and subsequent drought and flood events that occurred throughout central and southeastern Arizona which resulted in arroyo cutting and washed out stream channels (Wagoner 1952, Dobyns 1981). In 1905, the Tonto National Forest was designated to protect the watersheds that provide water to the Phoenix area.

Range inspection reports for the project area allotments starting in the 1940s, though most of the reports are from the 1960s and onward[10]. The reports indicate that, from the 1940s through the 1980s, salting and feeding occurred in the channel bottoms, flat areas and near water causing cattle concentration and heavy use in these areas.

Recent Flood Events

Stream channels are dynamic systems that are constantly being changed by the water and sediment flowing through the system. These changes obey the natural forces of gravity, friction and fluid cohesion (Janicke 2000). A stable or properly functioning stream channel is dependent on its ability to resist the forces of erosion and would maintain its dimensions (width/depth ratio, gradient, sinuosity) over time without excessive erosion or deposition (Barrett 1993, Rosgen 1996, Mason and Johnson 1999, Janicke 2000). A healthy riparian ecosystem contributes to channel stability by increasing resistance, thereby reducing flood peaks, trapping sediment and increasing groundwater recharge (Briggs 1996). Modifications that cause removal of vegetation would lower the channel's resistance to erosion and lead to an increased frequency and magnitude of flood impacts (Trimble and Mendel 1995, Rosgen 1996, Janicke 2000).

Some of the stream channels assessed in the project area are in impaired or unstable condition (Mason and Johnson 1999) in a large part due to lack of riparian vegetation. These streams are less able to resist the erosive forces of flood waters, even during smaller events of lower water velocities (Janicke 2000). When large flood events with high water velocities occur, the channels experience severe erosion and/or aggradation causing heavy loss of riparian vegetation.

In late January 2008, a weather system off the west coast moved into Arizona that tapped tropical moisture from the south. It brought high precipitation along the Mogollon Rim and the Upper Gila River watershed that caused flooding (Stall and Lader 2008).

In mid-January 2010, three low pressure systems passed through Arizona within a week causing intense rainfall and record flooding south and west of the Mogollon Rim (NOAA 2010).

The USGS gage East Verde River near Childs recorded the fifth highest flow of record at 14,100 cubic feet per second (cfs) in both 2008 and 2010 (USGS 2012). The period of record is 1961 to present (USGS 2012).

Given the initial condition of the stream channels and the magnitude of two rainfall/flooding events at such close intervals, some of the streams within the project area have lost riparian vegetation, been down cut, eroded and experienced excessive deposition (aggraded).

[10] The Forest Service Range Management Planning (2210) files located at the Tonto National Forest Supervisor's Office

Affected Environment

Presently, of 245 miles of stream channels, there are approximately 46 miles of perennial and intermittent stream channels that support obligate riparian vegetation. Obligate riparian vegetation needs a steady supply of surface or sub-surface water. Based on Forest Service reports and historic conditions, the extent of riparian vegetation has been reduced (Croxen 1926, Haskett 1935, Heffernan 2008).

On these allotments, some of the stream channels evaluated in the field are in unstable or impaired condition[11]. Riparian areas and springs have been relied upon as the primary source of livestock water for many years causing stream channels and adjacent riparian areas to receive concentrated grazing pressure.

Key Reaches

A stream reach is defined as any length of stream between two points. Key reaches, similar to upland key areas (ITT, 1996a), are stream channels/ springs/ riparian areas that are representative, responsive to changes in management, accessible to livestock, and contain key species. Key reaches are synonymous with designated monitoring areas (DMA's) defined by Burton et al. (2011) as the location where monitoring occurs. Table 9 displays the key reaches by pasture. The 21 riparian areas identified in Table 9 have the potential to improve within a relatively short time period (10 years) or have reached desired condition, and have been identified as key reaches for this analysis.

Table 9: List of Key Reaches within each Allotment and Pasture

Allotment	Pasture	Key Reach
Green Valley	Holding	Green Valley Creek, Preacher Canyon
	Winter Division	Green Valley Creek
	Kings Ridge	Thompson Draw
	Diamond (East)	Preacher Canyon
Indian Gardens	Dick Williams	Tonto Creek, Dick Williams Creek, Horton Creek
	Dead Horse	Tonto Creek
	Roberts Mesa North	Tonto Creek tributary
	Roberts Mesa South	Big Canyon
Payson	Hells Half Acre	Webber Creek
	River	East Verde River
	Birch Mesa	East Verde River, Ash Creek
	Round Valley	Gibson Creek
Cross V	East Verde	East Verde River
	Star Valley	Houston Creek
	Beaver Valley	East Verde River
Star Valley	Catholic	Houston Creek, Stewart Creek

[11] For a more detailed description of how stream channel conditions are assessed, see Appendix D of this report.

Existing and desired conditions of these key reaches are discussed below, by allotment and pasture. Existing conditions for each stream reach include condition assessment (Mason and Johnson 1999), stream type (Rosgen 1996), and/or monitoring data. In addition, the water sources for each pasture that contains a key reach are described. The availability of alternative, developed water sources within a pasture can lessen the amount of time cattle may spend in riparian areas. Additional key reaches may be considered in Moore and Dry Dude pastures to ensure higher utilization levels authorized for Weeping lovegrass do not cause damage to riparian resources in these pastures. Other key reaches may be identified for pastures that have not been grazed or grazed for only two weeks as livestock grazing is reintroduced to these pastures.

Green Valley Allotment

Green Valley Creek is the main stream in this allotment. It originates just north of Kings Ridge and flows southwest through Little Green Valley. The creek continues flowing southwest to its confluence with Tonto Creek. Green Valley Creek is mostly inaccessible in the Lower Neal Pasture as well as Hole in the Ground and Green Valley Hills Pastures of Star Valley Allotment.

Little Green Valley Meadow. Little Green Valley is one of the largest fens (peat forming wetlands that receive recharge and nutrients almost exclusively from groundwater) in Arizona. The only other known extensive peat deposits in Arizona occur as marshy areas along the Little Colorado River in Navajo and Apache Counties. These deposits occupy about 345 acres and are two to eight feet deep while the peat deposits in Little Green Valley are at least 20 feet deep in places. The Little Green Valley site has a sequence of layers of peat intermingled with deposits of sand and gravel. The bottom layers of peat have been age dated by researchers at NAU to be approximately 2700 years old. The lower layers of peat contain many plant parts that are so well preserved that a paleobotanist could reconstruct the ancient plant community of the bog. The layers also contain a rich pollen record that would enable researchers to determine past plant communities of the surrounding area and track them through time which would reveal much about changing climates. The alternating layer of gravel and peat could indicate flooding sequences brought about by changing climates that would be useful for an archaeologist in correlating other studies of climate change.

A 20 foot deep head cut (an eroding face on the downstream end of the bog) was migrating upstream for many years. Comparison of 1946 aerial photos with 1988 photos indicates the head cut migrated upstream approximately 750 feet between those years. In 2011 the Forest Service with the cooperation of Arizona Department of Transportation, Ames Construction Inc. (ADOT's contractor for the Little Green Valley portion of the Highway 260 construction project), John Anderson (the private landowner upstream of the head cut), The US Army Corps of Engineers (404 Permit), and the Arizona Department of Environmental Quality (401 Certification) constructed a head cut control structure at the face of the head cut. The maximum likelihood of success of the structure is dependent on maintaining good vegetative conditions on the top of the bog. Dense vegetation would encourage infiltration into the bog and help to slow stream flow velocities before flood flows reach the structure. To provide good vegetative ground cover the Forest Service is constructing a 10 acre exclosure around the portion of the valley that lies on NFS lands to exclude both elk and livestock. Excluding livestock and elk should enable vegetation conditions on the top of the bog to improve.

Holding Pasture

The Holding Pasture is located below the peat bog and is used as a transit pasture to hold small groups of cattle for a few days while moving to another pasture. Water in this pasture is provided by one spring and the creeks.

Green Valley Creek. Green Valley Creek is perennial through the Holding Pasture. In 1999 this reach of creek was assessed as impaired (Mason and Johnson 1999) due to lack of riparian vegetation and a high width/depth ratio. Photos from 2006 show a channel bottom full of sedges, spotty deergrass and sapling and pole size sycamore trees lining the bank. The stream has the potential to support more deergrass and probably higher density and diversity of trees. The stream is a Rosgen "B" type confined in a narrow valley bottom with cobbles and boulders. The peat bog on private receives heavy grazing and supports little vegetation. The whole area receives high grazing pressure from elk. The fence between the private and Forest has been found down allowing the private cattle access to the reach in the Holding Pasture. Salt has been placed near the creek in the recent past, facilitating high use on the vegetation. It is unknown whether this salt was placed for livestock use or by hunters in the area. All these factors likely contribute to scouring flows through this reach and limited vegetative recovery.

Preacher Canyon. Preacher Canyon is an intermittent stream that originates north of Diamond Rim and flows west and south to its confluence with Green Valley Creek. The reach in this pasture is dominated by large cobble and boulder and supports deergrass. It is difficult access for cattle so they mainly travel on the road, which parallels the creek. Monitoring in this reach would be primarily on deergrass.

Winter Division Pasture

There are five stock tanks spread out across the pasture, and one spring in Salt Lick Canyon, as well as the creek to supply water.

Green Valley Creek. The reach in this pasture is not perennial, but has water much of the year. Photo points from 2003 to 2011 show an increase in riparian vegetation and decrease in active channel width. The reach was visited in June 2012. Riparian vegetation includes all ages of sycamore, ash, Goodding's and red willow and some alder. The channel varies between wide and shallow with a cobble and sand substrate (Rosgen "F" type), and a narrower channel with boulders and cobble (Rosgen "B" type). It was assessed as slightly impaired due to the wide, shallow "F" sections. There were some elk impacts in the reach.

Kings Ridge Pasture

This pasture is watered by four stock tanks as well as the spring in Salt Lick Canyon.

Thompson Draw. Thompson Draw is an intermittent stream that originates west of Tonto Village and flows east and south to its confluence with Tonto Creek. The creek in this pasture was visited in 1996 and June 2012 just below FR 405. In 1996 there was lots of deergrass and a few willows that showed high use, presumably by elk. In 2012 the vegetation consists of a couple pole sized cottonwoods and walnuts, a patch of coyote willow severely hedged by elk, and spotty deergrass. The channel is a very wide, flat, Rosgen "F" type in unstable condition. This channel may take a long time to recover due to its unstable condition, but the presence of willows indicates enough moisture to support a riparian area.

Diamond (East) Pasture
This pasture is used 30-60 days in the spring or fall. Season of use is alternated annually. It has nine stock tanks and three springs.

Preacher Canyon. The upper reach of the creek in this pasture supports walnut, deergrass and other grasses. Part of the reach is in an exclosure, which is in need of maintenance, but the riparian vegetation continues outside the exclosure. The pasture is only used for a short time but FR 1293, adjacent to the creek, is used as a travel way allowing cattle access to the creek.

Indian Gardens Allotment

The headwaters of Tonto Creek occur in this pasture. Tonto Creek originates above the Mogollon Rim and flows south to its confluence with the Salt River in Roosevelt Lake. The creek becomes perennial below Tonto Spring.

Dick Williams Pasture
This pasture has not been grazed since 2001. Water in this pasture comes from the creeks or springs located in the creeks, with the exception of Baptist Spring which is located at the head of an ephemeral drainage.

Tonto Creek. Photo points for Tonto Creek in this pasture span from 1991 to 2011, with a gap from 1998 to 2007. The photos show a huge response in riparian vegetation during this gap. The upper reach of the creek is a Rosgen "B" type dominated by bedrock and boulders. Moving downstream the channel flattens and widens a bit, but probably remains a "B" type. Most of the channel is stable, with some short reaches of eroding bank.

Dick Williams Creek. Dick Williams Creek is a perennial stream that originates on the Mogollon Rim and flows southwest to its confluence with Tonto Creek. Photos of Dick Williams Creek by the Highline Trail from 2008 and 2012 show a narrow channel dominated by thick herbaceous vegetation. Few riparian trees are visible, there are mainly conifers. The channel is bedrock with banks that vary between very large boulders and fine sediment. The stream would be vulnerable to cattle impacts, but there would be mainly herbaceous vegetation to monitor in this area.

Horton Creek. Horton Creek is a perennial stream that originates just below the Mogollon Rim at Horton Spring and flows southwest (parallel to Dick Williams Creek) to its confluence with Tonto Creek. The mouth of the creek, at Upper Tonto Creek Campground, lies in an exclosure. Above the exclosure, the channel is a Rosgen "B" type dominated by cobbles and boulders with step/pools and small waterfalls. Vegetation is thick in places and consists of sycamore, willow, cottonwood, walnut and false indigo. In July 2012, the willows showed high use by elk. Tall fescue, horsetails and grasses line the narrow channel. Photo points from 1992 to 2012 show an increase in herbaceous and young woody vegetation and a narrowing of the channel.

Dead Horse Pasture
The three stock tanks to provide water occur on the opposite side of the pasture from the creek.

Tonto Creek. Photo points below Kohls Ranch from 1992 to 1998 show an increase in woody and herbaceous riparian vegetation and a decrease in channel width. Willows occur on the stream banks and floodplain and the banks are lined with herbaceous vegetation. A stream cross section completed in 1992 indicated a Rosgen "Bc" type channel dominated by cobble.

Roberts Mesa North

This pasture has four stock tank plus water from a private well, besides the creeks, to provide water.

Tonto Creek Tributary. An unnamed tributary to Tonto Creek lies in the east half of section 5 in this pasture. It was monitored in August 2009 for annual use. The channel supports tall fescue and Kentucky bluegrass. There are also mature alder, sycamore, boxelder, black walnut, Fremont cottonwood, and a couple of willow. Use on woody vegetation was not measured as there were not enough present in smaller size classes. Use on tall fescue averaged about 6 inches remaining stubble height. This stubble height equates to more than 1/3 of total plant height removed, but is within 6-8" remaining stubble that is recommended for emergents. The channel is dominated by bedrock and cobble, but the banks and floodplain consist of finer sediment. This stream has the potential to support more size classes of woody riparian vegetation.

Roberts Mesa South

Water is provided by five stock tanks in this pasture.

Big Canyon. Big Canyon is an intermittent stream that originates on the Mogollon Rim and flows southeast to its confluence with Tonto Creek. The channel, in this pasture as well as in Roberts Mesa North, looks like it had high impacts from recent flood events or from high flows after the Big Canyon Fire (2012). Downstream from the road, it is downcut to bedrock and widened, with the active channel occupying the whole valley bottom. Further downstream there are some places that have maintained a floodplain which supports old sycamore, deergrass, false indigo, walnut, and a couple cottonwoods. There is one spot with a patch of willows with 100% use by elk. This reach does not have enough available, palatable riparian vegetation to provide for statistically valid annual use monitoring as a management tool, but does have potential for an increase in density of riparian vegetation.

Payson Allotment

The main drainage on the allotment is the East Verde River which flows east to west across the middle of the allotment. The East Verde River, which is mostly perennial, originates on the face of the Mogollon Rim on the Cross V Allotment and flows southwest to its confluence with the Verde River. The East Verde River receives supplemental water from C. C. Cragin Reservoir, on top of the Mogollon Rim. The water is delivered by Salt River Project (SRP) to provide water to downstream users.

Hells Half Acre Pasture

This pasture has not been grazed for eleven years. Water in this pasture is provided by springs, one of which is in Webber Creek, six stock tanks and one well near the wildlife exclosure.

Webber Creek. Webber Creek originates on top of the Mogollon Rim and flows south to its confluence with the East Verde River. It is an intermittent stream with reaches of perennial flow supplied by

springs. Webber Spring provides perennial water to the creek in this pasture. In 2000 there was high use on all riparian vegetation and trampling by cattle in this reach. In June 2012, the channel by the spring had the appearance of a wetland. Vegetation in the channel and banks includes Bermuda, sedges/rushes, watercress, fescue, mint, equisetum, monkeyflower, rabbitsfoot and a trace of deergrass. Vegetation on the floodplain and terrace includes false indigo, blackberry, poison ivy, upland grasses, ash, cypress, sycamore and alder. Most trees are pole size or younger. There was high use on sedges and some trampling by elk. The channel is a Rosgen "B" type in stable condition. Much of the channel and banks are bedrock, with a couple sections of eroding soil. Tall fescue is facilitating the formation of new banks/floodplain. This is a vulnerable reach, but with monitored use it should maintain its stable condition.

River Pasture

This pasture has not been grazed since 1998. It is a small pasture with no water other than that provided by the river.

East Verde River. The East Verde River was visited at three reaches in the pasture in June 2012. The first is along FR 272 by a throw-down camping area below Cherry Creek confluence. There are some recreation impacts on the terrace above the river including fire rings and a parking area. The channel is mostly bedrock with distinct stream banks of tall fescue and deergrass. There are thick sedges and rushes which extend across the channel. Most of the trees are pole size and larger and include cottonwood, ash, alder, sycamore and willow. The channel is a Rosgen "B" type dominated by large gravel, rated in slightly impaired condition.

The second reach is just upstream from Flowing Springs Subdivision. There are ATV trails on the floodplain. The banks are lined with pole and larger willow, alder, sycamore and cottonwood, and seedling/sapling willow and alder. False indigo is also present. Tall fescue and *Carex senta* form large, dense banks. There was spotty trampling and grazing impacts from elk. The river is fairly self-protected with bedrock and vegetation. The channel is mainly a Rosgen "C" type with reaches of Rosgen "B" where it narrows. Sediment consists of cobble and gravel with lesser amounts of boulders. The channel was rated as stable.

The third reach is just downstream from the pasture boundary. It looks very similar to the second reach, with a larger floodplain. The floodplain supports large sycamore, cottonwood, willow, some cypress and tamarisk. Deergrass also occurs on the floodplain. This reach was also rated stable.

Birch Mesa Pasture

This pasture has not been grazed for eleven years. The north third is in a fuel break. There is no alternative water to the streams except for three stock tanks in the southern part of the pasture.

East Verde River. The river was visited in this pasture just downstream from Ash Creek in 1992, twice in 1999, and in 2003. Vegetation has consistently been abundant and diverse. Riparian photo points, last taken in 2004, indicate the same. Trees include sycamore, cottonwood, alder, ash, Goodding's and red willow. Herbaceous vegetation is thick and includes sedges, rushes and deergrass. The channel is a Rosgen "B" type and was rated as stable in 1999.

Ash Creek. Ash Creek is an intermittent stream that originates just south of Houston Mesa and flows west to its confluence with the East Verde River. Ash Creek was visited in 2003, and there are photo points from 1998 through 2008. FR 209 follows the creek and crosses several times contributing sediment. The creek supports willow, cottonwood, ash and sycamore. Deergrass lines the banks and is very thick in some areas. Some photos show an increase in vegetation, though in most no change is visible. The channel was classified as a Rosgen "F" type in 2003, but photos from 2008 show more of a "B" type with thick vegetation trapping sediment and forming banks. The channel was rated impaired due to the high amount of sediment from the road.

Exclosure Pasture

There is one well in this pasture, in addition to the creek.

Gibson Creek. Gibson Creek is an intermittent stream that originates just south of Payson and flows southeast to its confluence with Houston Creek. Gibson Creek flows through a private parcel and a large meadow before reaching the riparian reach. The meadow is dissected with large gullies that feed into the creek. The gullies look as though they are beginning to heal with rounded edges and thick grasses in the bottoms, but are still eroding. The channel is not defined, but thick vegetation grows across the narrow valley bottom, including red and Goodding's willows and grasses. There is no herbaceous riparian vegetation. This is a small reach of creek which, along with the meadow above, also receives high elk impacts. Though the vegetation is thick and provides some protection for the creek, it may be difficult to manage when seedlings occur.

Cross V Allotment

The East Verde River originates on this allotment. It flows south through the west part of the allotment.

East Verde Pasture

There are three tanks in this pasture besides water in springs and drainages.

East Verde River. The river in this pasture has been monitored in three reaches. The first is above Rim Trail Estates. This is not a key reach due to lack of palatable riparian species.

The second reach is below Verde Glen. It was monitored for livestock use in 1998 and 2000. In 1998, there was no sign of cattle. In 2000, the herbaceous vegetation showed heavy use. There were not enough palatable, accessible riparian trees to monitor. There was also heavy recreational use with campfire rings, trails, and trash. The channel is a Rosgen "B" type dominated by cobble and boulders with tall fescue and grasses on the banks.

The third reach is below Whispering Pines Subdivision. Photos from 2008 show a wide, cobbly channel with tall fescue growing along the banks and on the floodplain. There are also occasional riparian trees, sycamore and cottonwood, but there seems to be potential for a higher density of riparian vegetation, woody and herbaceous.

Star Valley Pasture

Water in this pasture occurs in three stock tanks, two springs and one well.

Houston Creek. Intermittent in this pasture, Houston Creek originates just below Walnut Flat and flows south to its confluence with Tonto Creek. The reach above the Forest boundary was visited in April 1999 and June 2012. In 1999 the reach was highly impacted by cattle and humans. In 2012, deergrass, which is thick in places, is facilitating the reforming of streambanks. It also grows throughout the channel. There is an occasional old cottonwood and red willow, and false indigo grows thick in places. There are a couple spots of tamarisk. The channel is wide, shallow and sandy. It is likely a Rosgen "C" type channel that was degraded to a Rosgen "F" and is now recovering. ATV trails occur on the floodplain and channel. It also appears that elk use the channel as a travel way, but there was little use on the vegetation.

About a half mile above the Forest boundary, a trail crosses the creek. The channel above the trail is narrower, bedrock at the surface causes it to be wetter and therefore the vegetation is thicker.

Beaver Valley Pasture

This pasture has not been grazed since 2005. The water in this pasture occurs in the river, and occasionally Shoofly Canyon, one off-river spring, and two stock tanks.

East Verde River. The river in this pasture flows through two recreation sites and a private parcel and receives high dispersed recreation use. The reach below Water Wheel was visited in 1999 and 2000. It is a Rosgen "C" type stream with cobble as the dominant sediment. The reach also contains a lot of bedrock, making it fairly stable. Use monitoring in 1999 showed no use by cattle, but high use by elk. Photo points at First Crossing from 1980 to 2008 show an increase in riparian vegetation. Photos from 2009 show cottonwoods, sycamore and deergrass growing along the active channel which is dominated by sand and gravel, with spots of bedrock. There are few distinct streambanks, the upper banks and floodplains consist of cobble and support little vegetation. There may not be enough riparian vegetation to monitor.

Star Valley Allotment

Tonto Creek forms the eastern and southern boundaries of the allotment through Hellsgate Wilderness. It is perennial through the allotment and flows through a steep-sided canyon making it inaccessible to cattle. Green Valley Creek flows north to south through the center of the allotment and is intermittent here.

Catholic Pasture

Besides the creeks, there are two stock tanks in the southeast corner of the pasture.

Houston Creek. Perennial in this allotment, Houston Creek flows north to south through the west side of the allotment. The upper reach in this pasture lies on private land. The lower reach was monitored in July 1998. There was no sign of livestock use, though there was some use on the woody vegetation by wildlife. There was high recruitment of cottonwood and willow along the entire reach. Streambanks were covered with riparian obligate species such as juncus and horsetail. Deergrass was also present. District range staff (Prileson 2012, personal communication) indicates riparian vegetation persists in this reach.

Stewart Creek. Stewart Creek is an intermittent stream that begins in Payson and flows west to east across the middle of this pasture to its confluence with Houston Creek. The lower half of the creek in this pasture supports riparian vegetation, part of which is on private land. The reach below the private was monitored in 2009. There was no use by cattle and light use by wildlife. Vegetation is similar to Houston Creek.

Climate

Climate on the project area is characterized by a bimodal precipitation pattern with about 60 percent occurring as frontal systems in the winter from December to March and about 40 percent occurring as monsoons in the summer from July to September. Summer storms can be more intense than winter storms but are generally of shorter duration and smaller aerial extent.

The nearest climate gage to the project area with current data is Payson. The period of record is 1948-present and the average annual precipitation is 21.37 inches (WRCC 2012). Of the last ten years (2002-2011) the data indicate four years had below average precipitation, two years were above average and four years had missing data (WRCC 2012). For the same years, the temperature was above average four of the years and below average one year, at average one year and missing data for four of the years (WRCC 2012).

Wild and Scenic Rivers

Two streams within the project area, Tonto Creek and East Verde River, have been classified as potentially eligible for inclusion into the National Wild and Scenic Rivers System (USFS 1993). Tonto Creek follows the eastern boundary of the allotment through Hellsgate Wilderness. The potentially eligible portion of the East Verde River within the complex begins at the west boundary of East Verde Park Estates and flows west to the project boundary. The Outstandingly Remarkable Values (ORVs) are listed in Table 10 and there are criteria established to describe these ORVs. Forest Handbook direction is to manage potential wild and scenic rivers to protect their indicated ORVs (FSH 1909.12, Chapter 80, 82.51).

Table 10: Streams Eligible for Inclusion into the National Wild and Scenic Rivers System

Stream Name	Location	Classification	ORVs
Tonto Creek – segment 2	Through Hellsgate Wilderness	Wild	Scenic, Geological, Fish and Wildlife, Riparian
East Verde River – segment 2	From west boundary of East Verde Park Estates to west boundary of L.F. Ranch	Recreational	Wildlife, Riparian

Water Quality

The Arizona Department of Environmental Quality (ADEQ) evaluates the water quality status of waters within the state in a Nonpoint Source Assessment Report (2012a). Seven streams within the project area have been monitored by ADEQ (Table 11). For descriptions of abbreviations of uses, see Table 12.

Bonita Creek is rated Inconclusive for all uses due to one exceedance each for dissolved oxygen, suspended sediment concentration, and *E. coli*.

East Verde River from the headwaters to Ellison Creek is rated Attaining in some uses. The biocriteria standard for cold water fishery (A&Wc) is rated as inconclusive. All other uses are Attaining. East Verde River from Ellison Creek to American Gulch is rated Impaired because A&Ww is impaired for selenium. A total maximum daily load (TMDL) study, initiated in 2010, is ongoing (ADEQ 2012a). So far, there have been no more exceedances of the selenium standard (Sutter 2013).

Ellison Creek is rated as attaining some uses. It is rated as inconclusive for Full Body Contact (FBC) due to one *E.coli* exceedance. All other uses are rated as attaining.

Patton Springs Draw, a tributary to Webber Creek below the Mogollon Rim, is rated as Inconclusive based on insufficient data to assess.

Webber Creek from the headwaters to the East Verde River is rated as attaining some uses. The standard for FBC is rated as inconclusive due to one *E.coli* exceedance. All other uses are attaining. Webber Spring from the Spring headwater to Webber Creek is rated as inconclusive due to insufficient data to assess.

Thompson Draw is rated as inconclusive due to one E.coli exceedance of the Partial Body Contact (PBC) standard.

Tonto Creek, from the headwaters to an unnamed tributary north of Bear Flat, is rated Not attaining/Impaired. A&Wc is Impaired for low dissolved oxygen and Not attaining for nitrogen. FBC is Not attaining for *E. coli*. All other uses are Attaining. TMDL studies were completed in 2004 for nitrogen and *E. coli*, which found sources for the impairments to include inadequate septic tanks and recreational sources (ADEQ 2012b). Projects undertaken to reduce nitrogen and *E. coli* levels include: Gila County septic system upgrades in 2006, R-Bar-C Boy Scout septic improvements in 2007, Tonto Baptist Camp septic upgrade in 2008 (ADEQ 2012b), and adding toilets in the heavy recreation areas by the Tonto National Forest. These measures taken to reduce nitrogen and *E. coli* wouldlikely increase dissolved oxygen. Therefore, the TMDL study for low dissolved oxygen scheduled to begin in 2016 has low priority (ADEQ 2012a).

Tonto Creek from the unnamed tributary to Haigler Creek is rated Not attaining for FBC for *E. coli*. The EPA listed A&Ww as Not attaining for nitrogen and FC as Impaired for mercury in fish tissue (ADEQ 2013). The remaining uses are rated as Inconclusive due to lack of seasonal coverage for core parameters. The EPA also listed Tonto Creek from Haigler Creek to Spring Creek and from Spring Creek to Rye Creek as Impaired for FC due to exceedence of mercury in fish tissue (ADEQ 2013). The remaining uses are rated Inconclusive due to missing core parameters.

Table 11: List of Water Bodies Monitored by ADEQ and their Designated Uses (ADEQ 2012a).

Stream Name	**Designated Uses** (*see descriptions in Table 12*)	**Overall Assessment**

Bonita Creek	A&Wc, FBC, FC	Inconclusive
East Verde River – headwaters to Ellison Creek	A&Wc, DWS, FBC, FC, AGI, AGL	Attaining some uses
East Verde River – Ellison Creek to American Gulch	A&Ww, FBC, FC, AGL	Impaired
Ellison Creek – Headwaters to East Verde River	FC, FBC, AGL, A&Wc	Attaining some uses
Patton Springs Draw – Headwaters to Webber Creek	PBC, AGL, A&Wc	Inconclusive
Webber Creek – Headwaters to East Verde River	FC, FBC, AGL, A&Wc	Attaining some uses
Webber Spring – Spring Headwater to Webber Creek	PBC, AGL	Inconclusive
Thompson Draw – Headwaters to Billy Creek	PBC, A&We	Inconclusive
Tonto Creek – headwaters to unnamed tributary	A&Wc, FBC, FC, AGI, AGL	Not attaining/Impaired
Tonto Creek – unnamed tributary to Haigler Creek	A&Ww, FBC, FC, AGI, AGL	Not attaining /Impaired
Tonto Creek – Haigler Creek to Spring Creek	A&Ww, FBC, FC, AGI, AGL	Inconclusive/Impaired
Tonto Creek – Spring Creek to Rye Creek	A&Ww, FBC, FC, AGI, AGL	Inconclusive/Impaired

Table 12: Descriptions of abbreviations

A&Ww	aquatic and wildlife-warm water fisheries
A&Wc	aquatic and wildlife-cold water fisheries
FBC	full body contact recreation
FC	fish consumption
DWS	domestic water source
AGI	agricultural irrigation
AGL	agricultural livestock watering
A&We	aquatic and wildlife-ephemeral water fisheries
PBC	partial body contact recreation

Designated uses for non-ephemeral, unlisted tributaries above 5000 feet are A&Wc, FBC and FC. Designated uses for non-ephemeral, unlisted tributaries below 5000 feet are A&Ww, FBC and FC. Designated uses for ephemeral, unlisted tributaries are A&We and PBC (A.A.C. R18-11-105).

Watershed Condition Assessment

In 2010, a national effort was launched to assess the condition of all 6th code watersheds on National Forest System (NFS) lands. 6th code watersheds are typically 10,000 to 40,000 acres in size. Twelve indicators were assessed including: water quality, water quantity, aquatic habitat, aquatic biota, riparian vegetation, road and trail network, soil, fire regime or wildfire effects, rangeland vegetation, terrestrial

invasive species, forest cover, and forest health. Each indicator has its own definition of Functioning, Functioning at risk, and Impaired and was assessed a point value based on its condition. Each 6th code watershed was given an overall rating of Functioning, Functioning at risk, or Impaired based on the indicator scores. The results of the assessment for the 6th code watersheds in the project area are listed in Table 13 (USDA 2010). (condition descriptions in the figure correlate with the condition ratings in Table 13 as follows: Good - Functioning, Fair– Functioning at Risk, Poor – Impaired)

Table 13: Sixth Code Watershed Condition.

6th Code Watershed	Condition
Webber Creek	Functioning at risk
East Verde River Headwaters	Functioning at risk
Ellison Creek	Functioning at risk
Upper East Verde River	Functioning at risk
American Gulch	Impaired
Horton Creek-Tonto Creek	Functioning at risk
Houston Creek	Impaired
Green Valley Creek	Functioning at risk
Bull Tank Canyon-Tonto Creek	Functioning at risk
Big Canyon-Tonto Creek	Functioning
Gibson Creek	Functioning at risk
Dry Pocket Wash-Tonto Creek	Functioning at risk

Alternative 1 – No Grazing

Direct Effects. Riparian areas are generally regarded as having high inherent potential for recovery from disturbance (Milchunas 2006). Stream channel and riparian area recovery are considered optimal when the direct effects of livestock grazing are eliminated (Clary and Kruse 2003). The amount of time required for riparian recovery after severe degradation can vary from several years to decades (Clary and Kruse 2003). Recovery is dependent on the size and existing condition of the watershed, stream channel and riparian area (flow regime, channel gradient, dominant channel substrate, watershed area, type and extent of riparian vegetation), future management, climate and natural disturbances (Kindschy 1987, 1994). The riparian vegetation on many of the streams on these allotments has made substantial recovery, though the channels need more time to be fully functional. Implementation of this alternative would allow recovery or maintain or improve the existing condition of the riparian areas and stream channels

Indirect Effects. The soils within the allotment are mostly in satisfactory condition. A small percentage of the allotments are in impaired or unsatisfactory condition, mainly in the flatter areas (see soils section in this chapter). The No Grazing Alternative usually provides the most rapid increase of upland vegetative cover, species diversity, and improvement of impaired and unsatisfactory condition soils. These changes reduce surface runoff, dampen peak flows, and decrease the probability of channel adjustments, impacts to riparian vegetation and loss of channel function. Implementation of this alternative should maintain or improve the existing condition of the upper watersheds.

Consistency with the Riparian Area Management Direction. The No Grazing Alternative eliminates the direct and indirect effects of cattle grazing to recovering stream channels, riparian areas and watersheds within the allotments. This alternative meets the intent of Forest Plan direction to protect, manage, and restore riparian areas.

Alternative 2 – Proposed Action

Direct Effects of Grazing. The existing condition of riparian areas, riparian vegetation utilization, residual vegetation heights and availability of off-channel water developments are the elements most likely to affect riparian area and stream channel condition and recovery. Some of the stream channels on the allotments are in impaired or unstable condition (Mason and Johnson 1999). In some pastures, most of the water available to livestock is located in springs and riparian areas.

The riparian utilization guidelines are intended to maintain or increase existing riparian vegetation. The proposed action recommends mitigating the direct effects of livestock grazing in key reaches by using riparian utilization measurements (implementation monitoring) (ITT 1999, Burton et al. 2011). If riparian area utilization guidelines are followed and cattle are moved when use guidelines are met, the negative, direct effects of grazing would be minimized, and riparian area and stream channel condition should improve. This mitigation measure should be effective for all of the key reaches except Big Canyon and Thompson Draw, which do not have enough available, palatable riparian vegetation to provide for statistically valid annual use monitoring as a management tool. The channels are unstable, elk use is also a factor and it is likely that recovery would be slow, but they do have potential for an increase in density of riparian vegetation. These reaches should be observed and use should be deferred after recruitment events. (Recruitment events usually occur in the winter/spring. They are moderately large flows (at least the five year return interval flow) that recede slowly enough that seedling roots can follow the receding water. If seedlings persist in the summer, even without surface water, they should be protected that summer and fall.) Once the riparian vegetation has increased (approximately 30-50 plants per 1000 feet), the riparian utilization guidelines could then be used.

Indirect Effects of Grazing. The soils within the allotment are mostly in satisfactory condition. Grazing of impaired and unsatisfactory condition uplands may slow the rates of upland recovery, indirectly slowing the rate of riparian area and stream channel recovery from the scouring effects of increased runoff and higher peak flows. If management prescriptions are followed and cattle are moved when use guidelines are met, the negative, indirect effects of grazing would be minimized.

Direct effects of higher utilization standards for Weeping Lovegrass in selected pastures. In an effort to reduce the frequency of Weeping lovegrass in some pastures currently dominated by this non-native species higher utilization standards would be used with the intent to increase the frequency of native grass species. In a study (Bernau, et. al. 2013) conducted on the Roberts Mesa North pasture, utilization levels of 60% resulted in small increases in percent bare ground. Percent bare ground was 12% in sites targeted for higher utilization and 7% in control sites with standard utilization levels. The small increase in bare ground in the control sites would have a negligible effect on runoff and erosion.

Indirect Effects of higher utilization standards for Weeping lovegrass in selected pastures Adherence to utilization standards for riparian areas in pastures selected for higher intensity grazing on lovegrass should not result in additional impacts to riparian areas and stream channel.

Direct effects of water developments. The proposal to develop existing wells, water storage, pipelines and troughs in the Houston Mesa Pasture would not adversely impact riparian areas or stream channels as the improvements are located away from any drainages. Trick tank systems would not adversely impact riparian areas or stream channels because they collect rain water only. Other water developments are not specified and cannot be analyzed (unless they refer to road tanks which would not impact riparian areas or stream channels as they are located along roads and collect road runoff). Troughs (or drinkers) would be located outside the riparian area which could have the positive effect of drawing cattle away from riparian vegetation and stream channels. It is proposed to re-locate an existing, non-functioning road tank, which would not impact any riparian areas.

Indirect Effects of water developments. Supplying water in new areas may cause new areas of heavy use.

Direct effects of holding pastures. New holding pastures should not be located in riparian areas. If they are located away from riparian areas there would be no direct effects.

Indirect effects of holding pastures. New holding pastures may create new areas of concentrated use, however, the size is typically small and would not likely have any indirect effects on riparian areas.

Direct effects of fencing. The only proposed fencing that would have a direct effect on riparian areas or stream channels is the division fence in Dick Williams pasture to prevent cattle from accessing Tonto Creek during peak recreation seasons. This fence would prevent cattle from accessing Tonto Creek during the hot season, which is when cattle are most likely to concentrate in riparian areas. This would be beneficial to water quality, the riparian area and stream channel, allowing it rest during the hot season.

Indirect effects of fencing. Improved conditions in Tonto Creek would benefit downstream reaches.

Direct and Indirect effects to water quality. Two stream reaches within the project area are rated Impaired by ADEQ (2011), the East Verde River from Ellison Creek to American Gulch (selenium) and Tonto Creek from the headwaters to an unnamed tributary north of Bear Flat (low dissolved oxygen).

The term Not attaining refers to water bodies that have had a TMDL study completed, or do not need one, but are still not meeting water quality standards. Because Tonto Creek has a TMDL completed and is still impaired for nitrogen and *E. coli* it is now rated Not attaining (ADEQ 2011). Regardless of the source of the original impairment, our management cannot cause further degradation of the impaired standards in these water bodies (A.A.C. R18-11-107).

Research done on Oak Creek, near Sedona, Arizona, to determine the source of *E. coli* impairment at the popular Slide Rock State Park has determined that there are two reservoirs of bacteria that can cause high levels of *E. coli*, direct input and bacteria caught in sediment (Crabill et al. 1999). One reach of Oak

Creek had high levels of *E. coli* that correlated to high recreation use and was not correlated to stream discharge. Therefore it was concluded that recreation was the source of high levels of *E. coli*. In the second reach that had high levels of *E. coli* (upstream from the recreation area) the impairment was directly correlated to high stream discharge. It was concluded that the bacteria were being washed off the watershed and caught in stream sediments which were then disturbed during storm events, releasing the bacteria. The source was likely wildlife and cattle.

Extrapolating to Tonto Creek, because the high levels of *E. coli* in Tonto Creek are not correlated with discharge (ADEQ 2004), the source for this creek is likely due to recreation rather than from the watershed. Cattle grazing or crossing streams can also introduce nitrogen and *E. coli* into the water (Davies-Colley 2004). Cattle grazing along Tonto Creek in the summer has the potential to contribute to the impairment of the nitrogen and *E. coli* standards.

Tonto Creek from an unnamed tributary north of Bear Flat to its confluence with Roosevelt Lake was rated Impaired by EPA for fish consumption (FC) due to exceedance of mercury in fish tissue (ADEQ 2013). The source of the mercury is unknown and a TMDL has not been completed. Any potential impacts to water quality would be reduced or eliminated with Best Management Practices (BMPs).

Consistency with Riparian Area Management Direction. This alternative should meet the intent of Forest Plan direction to protect, manage, and restore riparian areas if the described mitigation measures are successful. The mitigation measures have a high probability of success for all the key reaches with the exception of Big Canyon and Thompson Draw. If Big Canyon and Thompson Draw are observed and rested after recruitment events, they would also have a high probability of success.

Effects of Alternatives on Watershed Condition Assessment Ratings

Under each of the twelve indicators used to assess watershed condition, there are one or more attributes. Three attributes were considered for these environmental consequences: large woody debris, channel shape and function, and riparian vegetation condition.

Big Canyon-Tonto Creek is already rated Functioning, and should remain so under Alternative 1, or with successful resource protection measures under Alternative 2 (Loomis 2012).

Under Alternative 1, or with successful resource protection measures under Alternative 2, the riparian vegetation condition and large woody debris ratings could improve one condition class, which would improve the overall rating for Houston Creek from Impaired to Functioning at risk and for Dry Pocket Wash-Tonto Creek from Functioning at risk to Functioning (Loomis 2012).

Under Alternative 1, or with successful resource protection measures under Alternative 2, the riparian vegetation condition and large woody debris ratings could improve for the remaining watersheds, but would not improve the overall rating.

Channel shape and function is dependent on establishment of riparian vegetation and would take longer to achieve. The rating for this attribute may not improve within the time-frame of this project.

Cumulative Effects Common to All Alternatives

The existing condition of streams and riparian areas on these allotments is the result of the cumulative effects of historic and recent management, natural disturbances, and the interaction between these two agents of change. This discussion includes the 6th code watersheds listed in Table 13 (existing condition) and begins with the settlement of lands in the 1880s.

Historic over-grazing has had the most extensive effect on watersheds, stream channels and riparian areas. The range was considered over stocked with cattle by 1891 (Allen 1989). There have been many accounts of the overgrazing and subsequent drought and flood events that occurred throughout central and southeastern Arizona (Wagoner 1952). Tonto National Forest Range Management files (File Code 2210) document concentrated use at water sources including springs and riparian areas.

Existing patterns of elk use are currently slowing the recovery of riparian vegetation in some of the streams in these allotments. Levels of elk use would continue to impact stream channel and riparian area condition and trend.

There are several designated camping areas as well as dispersed camping within the project area. Recreation activities, such as camping, can impact stream terraces and riparian vegetation along the East Verde River, Tonto Creek and other creeks in the project area.

There are private subdivisions as well as summer homes located along the East Verde River, Tonto Creek and other creeks in the project area. Homes in these subdivisions depend primarily on septic systems for waste disposal. Septic systems could potentially contribute to water quality issues. A Total Maximum Daily Load (TMDL) study was done on Tonto Creek from the headwaters to Haigler Creek by ADEQ (2004) to determine the cause of impairment by *E. coli*. The study, done during the summer recreation season (third week of May through second week of September), found that *E. coli* levels increased downstream suggesting heavy summer recreation use (including summer homes) to be the cause (ADEQ 2004). Some steps taken to alleviate the problem are listed in existing conditions.

In 2011 a Decision Notice (USDA 2011) was signed to allow the town of Payson a utility corridor special use permit for a pipeline to deliver water from the C.C. Cragin Reservoir, located above the Mogollon Rim. The town has access for up to 3500 acre feet per year from the reservoir. Due to a water exchange with Salt River Project (SRP), the reservoir (originally Blue Ridge Reservoir) was built in 1965 by Phelps Dodge Morenci to store water from East Clear Creek and deliver it to the East Verde River (SWCA 2011). The water exchange agreement has since ceased, but SRP has continued water deliveries, sporadic in the past few years, to the East Verde River to provide water to the Phoenix area. Deliveries would continue and likely be during the summer months.The approximately 30 cubic feet per second that is delivered is less than the two year flow where it enters the creek, according to flood flow regression equations developed by the USGS (1994). This flow has little impact on the channel (Hjalmarson and Davidson 1966) as a whole, though there are local impacts at the out-flow discharge point in the form of bank cutting. The new pipeline would remove about 17 percent of the water that is currently released into the East Verde River (SWCA 2011). The Environmental Assessment for the pipeline determined that this reduction in deliveries would not likely impact overall flow or riparian habitat on the East Verde

River (SWCA 2011). Much of the pipeline would be constructed parallel to the Houston Mesa Road and the East Verde River. Short term increases in erosion and sediment would be expected during construction.

Several entities hold water right certificates or claims to divert water from springs and creeks within the project area for domestic or other uses. These diversions reduce the amount of water flowing in the creeks, but may only be noticeable during low flows. A dam on lower Mail Creek has diverted all the base flow to a pond on the terrace above the creek, leaving a dry channel below the dam. No water right filing was found for this diversion. The water rights in this area have not yet been adjudicated.

Recent wildfires in the project area include Dude (1990), National (2002), August (2002), Webber (2004), Zane (2005), February (2006), Rim (2009), Water Wheel (2009), Horton (2011) and Big Canyon (2012). Some smaller fires overlapped older, larger fires. Though the Dude Fire occurred in 1990, it was a large fire (about 25,000 acres) and impacts from the flows that followed are still visible in some channels. The flows following the Water Wheel Fire caused extreme sedimentation in tributaries of the East Verde River and pool filling on the river itself. Seeding and other restoration activities were completed following this fire. Much of the burned area was chaparral, which should recover in 3-5 years.

Unauthorized motorized cross country travel can impact streams and riparian areas through removal, destruction, or degradation of herbaceous and woody vegetation, aquatic emergent vegetation, and stream banks. The Tonto NF's Travel Management plan is intended to analyze alternate motorized routes for providing access and a recreation experience sufficient to discourage motorized vehicle operators from feeling compelled to travel off established roads or trails. Once routes are established, maps would be available to the public. Enforcement of the Travel Management decision is imperative to ensure compliance.

Other activities and management actions that have occurred within the watersheds include road development, lack of road maintenance, off-road vehicle use, mining, fire suppression, juniper treatments and prescribed fire. These activities can cause short and/or long-term sedimentation into stream channels.

Other grazing allotments within the 6th code watersheds listed that may have cumulative downstream effects on stream channels and riparian areas within the project area include: Pine, Christopher Mountain/Ellinwood, Gisela, Soldier Camp, and Diamond Butte. All of these allotments are grazed. However, all either have current NEPA or are on the schedule to be analyzed, so additional impacts should be minimal.

Climate change presents additional considerations. According to the Arizona Drought Monitor Report for October 2012 (ADWR 2012), the long-term drought status for Gila County is "moderate drought", which has likely had an effect on these allotments. According to NOAA National Climatic Data Center data, there has been a marked upward trend in the globally averaged annual mean surface temperature since the mid-1970s (Shein 2006). Models used by Seager et al. (2007) to predict how climate change would affect the southwestern United States indicate that this region has begun the transition to a dryer climate which would continue into the 21st century. However, the models are too broad-scale to predict

how climate change might affect the monsoons (Lenart 2005), which contribute 40% of the total annual precipitation received on the Tonto National Forest.

With continued drought and higher temperatures, small water sources may dry up leaving less water for cattle and wildlife. Piping water away from riparian areas for use by cattle may reduce water available for riparian vegetation, and in combination with a dryer climate may cause mortality of riparian vegetation (Serrat-Capdevila et al. 2007).

Alternative 1 – No Grazing

The direct and indirect effects of this alternative, when combined with other past, present or reasonably foreseeable actions (cumulative effects) as listed above, should result in reaching desired conditions at the fastest rate. As stated in the direct effects, potential for recovery and rate of recovery would vary by key reach. Where there is potential for recovery of riparian vegetation, eliminating the direct and indirect effects of livestock grazing should allow the most rapid rates of recovery. Where riparian vegetation is meeting desired conditions this alternative would provide the most protection for maintaining those conditions.

Alternative 2 – Proposed Action

Cumulative Effects. The direct and indirect effects of this alternative, when combined with other past, present or reasonably foreseeable actions (cumulative effects discussed above), are likely to result in attainment of desired conditions for riparian areas but at a slower rate than Alternative 1. In this alternative 21 key reaches may be grazed by livestock, all potentially during the summer.

BMPs would be implemented to protect water quality. If Tonto Creek is grazed during the summer (third week of May through second week of September), there is the potential of contributing to the impairment of the nitrogen and *E. coli* standards, in violation of the Clean Water Act.

If installed correctly, the structures proposed for habitat enhancement should contribute to or maintain desired conditions in the East Verde River.

Wildlife Resources

Overview

The Forest plan provides general wildlife resource goals, including 1) providing for species diversity in the ecosystem, 2) maintaining or improving wildlife and fish populations through improvement of habitat, 3) ensuring that fish and wildlife habitats are managed to maintain viable populations of existing species, 4) preventing adverse modification of critical habitat for threatened and endangered species, and 5) managing to improve threatened, endangered, and sensitive species with a goal of increasing population levels that would remove them from the lists.

This section discloses, in separate subsections, the existing conditions (Affected Environment) and the potential effects (Environmental Consequence) of the Diamond Rim Grazing Allotment Project on (1)

species and their habitats listed as endangered, threatened, candidate, or proposed (under the federal Endangered Species Act of 1973 as amended (ESA), 2) species designated as sensitive by the Regional Forester in Region 3 (Biological Evaluation), 3) habitats designated for management indicator species (MIS) and migratory birds with provisions under the Migratory Bird Treaty Act (MBTA) for the Tonto National Forest (MIS and MBTA report). Portions of this discussion are based on the Biological Assessment (BA)—a document that is prepared in compliance with the ESA and used in consultation with US Fish and Wildlife Service--which can be found in the project record.

The BA provides a process through which potential effects of the proposed action on federally listed species under the Endangered Species Act (ESA) are evaluated and considered during the planning and review process. The analysis in the BA and Forest Sensitive Species within this chapter is completed to determine whether the proposed action would result in a trend toward the sensitive species becoming federally listed.

Threatened and Endangered Wildlife, Plants, and Fish

Species occurrence records, District files, Arizona Game and Fish Department's (AGFD) Heritage Data Management System (HDMS), personnel knowledge, and the USFWS Information, Planning, and Conservation (IPaC) decision support system were used in identifying federally listed species and critical habitat which may occur or have suitable habitat within the action area (HDMS Project ID HGIS-04185).

Endangered, threatened, proposed or candidate species and their critical habitat found within the Diamond Rim Allotments include Narrow-headed gartersnakes and their proposed critical habitat, Chiricahua leopard frogs and their critical habitat, Mexican spotted owls and their critical habitat, Mexican gartersnake proposed critical habitat, and Gila trout. The Payson Ranger District completed a consultation with the USFWS for effects of the proposed action to these federally listed species and received a final biological opinion on November 17, 2017. The table below shows the federally listed species and critical habitat with effects determinations (Table 13)[12]. The Biological Opinion can be found in the project record.

Table 14: Federally Listed Species and Designated or Proposed Critical Habitat Evaluated in Detail within the Action Area.

Common Name	Species	Status	Determination
Chiricahua leopard frog and Designated Critical Habitat	(*Lithobates chiricahuensis*)	Threatened	May Affect, Likely to Adversely Affect
Narrow-headed gartersnake and Proposed Critical Habitat	*Thamnophis rufipunctatus*	Threatened with Proposed Critical Habitat	May Affect, Not Likely to Adversely Affect
Gila Trout	*Oncorhynchus*	Threatened	May Affect, Not Likely to Adversely

[12] Federally listed species included on the USFWS list, but excluded from further evaluation, is the Northern Mexican Gartersnake. It has been excluded from analysis because the species is not reasonably certain to occur. There are no historic or current records of occupancy within the action area.

	gilae		Affect
Mexican spotted owl and Designated Critical Habitat	*Strix occidentalis lucida*	Threatened	May Affect, Not Likely to Adversely Affect
Proposed critical habitat for the northern Mexican gartersnake	*Thamnophis eques*	Threatened with Proposed Critical Habitat	May Affect, Not Likely to Adversely Affect

Source, Arizona Game and Fish Department's Heritage Data Management System (HDMS)
http://ecos.fws.gov/ipac/ Status definitions: C=Candidate, ESA=Endangered Species Act, LE=Listed Endangered, LT=Listed Threatened

Affected Environment

Chiricahua Leopard Frog and Designated Critical Habitat[13]

ESA Status:	Threatened, June 13, 2002
Forest Occurrence:	Apache-Sitgreaves, Coconino, Coronado, Gila, and Tonto (possibly the Cibola)
Recovery Plan:	2007
Critical Habitat:	March 20, 2012
Effects Finding (species)	May Affect, Likely to Adversely Affect
Effects Finding (critical habitat)	May Affect, Likely to Adversely Affect

The proposed action area falls in the Upper Verde Management Area (UVMA) in Recovery Unit 5 outlined in the Chiricahua leopard frog (CLF) Recovery Plan. Suitable habitat includes all perennial waters within 1) elevational range of the frog (3,400 to 9,000 feet), 2) a mixture of aquatic and perimeter vegetation to provide oviposition sites, thermoregulation, and refuge from predators, 3) absence or low densities of nonnative aquatic species and 4) a variety in substrate and range of shallow to deeper water for potential hibernacula. (USFWS 2007).

Suitable habitat types within the Diamond Rim Allotments including stock tanks, springs, and streams, however, little data exists describing how many stock tanks or springs within the proposed area are 1) no longer functional, 2) inhabit nonnative aquatics like bullfrogs, crayfish, or barred salamanders, or 3) where chytrid fungus *(Batrachochytrium dendrobatidis (Bd))* is present; the fungus causes an infection disease in amphibians. Diamond Rim Allotments contain 95 stock tanks, 6 wells, 54 springs and 31 wildlife catchments/guzzlers. According to field surveys conducted in 2003 by FS hydrologists, 27 of 95 stock tanks were reported to be in good or excellent condition while 30 were reported in poor condition or dry during the time of survey which occurred in June-July. Further, 21 of 54 springs were reported to be in functional condition with water present. Provided these sites do not have high densities of

[13] For life history information on the Chiricahua leopard frog visit https://www.azgfd.gov/w_c/edits/documents/Lithchir.fi_002.pdf

nonnative aquatic species, they could be considered suitable sites for frogs. The approximate 46 miles of perennial or intermittent streams within the action area could also be considered suitable lotic sites for CLFs provided they lack high densities of nonnative sport fish, crayfish, or bullfrogs. Unfortunately, all of perennial stream miles within the action area contain some level nonnative aquatics with the exception of Big Canyon, located on the easternmost allotment, Indian Gardens. The presence of chytrid fungus has been known to occur within the project area. Although no strategized sample efforts have taken place within the action area, in 2013, AGFD opportunistically collected 20 tissue samples from CLFs at four localities within the action area, two of which came back positive for chytrid fungus.

Information presented below represents data from CLF protocol surveys up to July 30, 2016 by permitted biologists from Payson Ranger District, AGFD, and Phoenix Zoo; this data is housed in AGFD's Ranid Frogs Project's *Riparian Herpetofauna Access Database*. According to the data, three of five Diamond Rim Allotments are currently occupied by CLFs; Cross V, Green Valley, and Indian Gardens; suitable habitat can likely be found in the Star Valley and Payson allotments. Since 1995, CLFs have been observed one time or another at 19 sites across these three allotments, however, frogs were observed at only 10 sites in 2015 and 2 sites in 2016. Lack of surface water availability in occupied stock tanks and disease may be the cause for this recent local decline in addition to the presence of nonnatives like bullfrogs, barred tiger salamanders, and crayfish. Paragraphs below include CLF data for the three occupied allotments.

As described above, AGFD has partnered with Forest Service and Phoenix Zoo (PZ) to implement head-starting recovery actions throughout the species range, including sites within the proposed action area. Since 2009, AGFD has released over 2,197 tadpoles, 2,374 juvenile, and 56 adult CLFs to 14 sites across three of the five allotments; Green Valley, Cross V, and Indian Gardens. These recovery actions include, 1) releasing headstarted frogs to unoccupied or recently naturally colonized sites, 2) augmenting known CLF sites with headstarted frogs to increase genetic variability, and 3) translocating wild egg masses to new or existing sites.

In addition to head-starting recovery actions, the permittee has installed required improvements to mitigate impacts to the threatened CLF in coordination with the USFWS. These improvements include the following:

- Constructed livestock and elk exclosure in 2008 to protect frog habitat located on a tributary of Ellison Creek.
- Livestock exclusion fence to protect perennial frog habitat in Lewis Creek. The permittee shares maintenance responsibility of this exclosure with the Payson Ranger District prior to grazing the pasture per the existing Biological Opinion for Little Green Valley (USFWS 2008).
- Assisted AGFD when placing log jams in unfenced riparian areas to reduce livestock impact to frogs if/when colonization occurred throughout Ellison Proper or its tributaries.
- Several stock tanks created by the permittee have been naturally colonized or selected as release sites for CLFs.

Critical Habitat

In March, 2012 the USFWS designated critical habitat for the Chiricahua leopard frog on approximately 4,187 ha (10,346 acres) which includes areas on the Apache-Sitgreaves, Coconino, Coronado, Gila, and Tonto NFs in Eight Recovery Units. The proposed critical habitat is located in Apache, Cochise, Gila, Graham, Greenlee, Pima, Santa Cruz, and Yavapai Counties, Arizona; and Catron, Grant, Hidalgo, Sierra, and Socorro Counties, New Mexico.

The final rule (77 FR 16324; March 20, 2012) designated 39 critical habitat units across the range of the species in Arizona and New Mexico. Based on the above needs and our current knowledge of the life history, biology, and ecology of the species, and the habitat requirements for sustaining the essential life-history functions of the species, we have determined the physical or biological features (the general habitat features upon which a species depends), as described by the primary constituent elements (or PCEs the more specific habitat parameters defining the physical and biological features), essential to the conservation of the CLF are:

1. Aquatic breeding habitat and immediately adjacent uplands exhibiting the following characteristics:
    a. Standing bodies of fresh water (with salinities less than 5 parts per thousand, pH greater than or equal to 5.6, and pollutants absent or minimally present), including natural and manmade (e.g., stock) ponds, slow-moving streams or pools within streams, off-channel pools, and other ephemeral or permanent water bodies that typically hold water or rarely dry for more than a month. During periods of drought, or less than average rainfall, these breeding sites may not hold water long enough for individuals to complete metamorphosis, but they would still be considered essential breeding habitat in non-drought years.
    b. Emergent and or submerged vegetation, root masses, undercut banks, fractured rock substrates, or some combination thereof, but emergent vegetation does not completely cover the surface of water bodies.
    c. Nonnative predators (e.g., crayfish, bullfrogs, nonnative fish) absent or occurring at levels that do not preclude presence of the CLF.
    d. Absence of chytridiomycosis, or if present, then environmental, physiological, and genetic conditions are such that allow persistence of CLFs.
    e. Upland habitats that provide opportunities for foraging and basking that are immediately adjacent to or surrounding breeding aquatic and riparian habitat.
2. Dispersal and nonbreeding habitat, consisting of areas with ephemeral (present for only a short time), intermittent, or perennial water that are generally not suitable for breeding, and associated upland or riparian habitat that provides corridors (overland movement or along wetted drainages) for CLFs among breeding sites in a metapopulation with the following characteristics.
    a. Are not more than 1.0 mile (1.6 kilometers) overland, 3.0 miles (4.8 kilometers) along ephemeral or intermittent drainages, 5.0 miles (8.0 kilometers) along perennial drainages, or some combination thereof not to exceed 5.0 miles (8.0 kilometers).
    b. In overland and nonwetted corridors, provide some vegetation cover or structural features (e.g., boulders, rocks, organic debris such as downed trees or logs, small mammal burrows, or leaf litter) for shelter, forage, and protection from predators; in wetted corridors, provide some ephemeral, intermittent, or perennial aquatic habitat.
    c. Are free of barriers that block movement by CLFs, including, but not limited to, urban, industrial, or agricultural development; reservoirs that are 50 acres (20 hectares) or

more in size and contain nonnative predatory fish, bullfrogs, or crayfish; highways that do not include frog fencing and culverts; and walls, major dams, or other structures that physically block movement.

With the exception of impoundments, livestock tanks, and other constructed waters, critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries.

Two critical habitat units are within the action area; the Ellison and Lewis Creek Units are located within the Green Valley Allotment of the Diamond Rim Allotment complex. Designated critical habitat includes portions of Ellison and Lewis creeks and two neighboring stock tanks. One of the two tanks has variable water permanency and after drying in 2014, frogs have not been observed despite surveys in 2015 and 2016. Fourteen protocol surveys completed from May 2013 through October 2015 have shown no more than 3 metamorphosed frogs observed at the second tank during each visit.

Narrow-headed Gartersnake and Proposed Critical Habitat[14]

Endangered Species Act Status:	Threatened, July 08, 2014
Forest Occurrence:	Gila, Tonto, Apache-Sitgreaves, Coconino, Prescott
Recovery Plan:	No
Critical Habitat:	Proposed, July 10, 2013
Effects Finding (species)	May Affect, not Likely to Adversely Affect
Effects Finding (critical habitat)	May Affect, not Likely to Adversely Affect

Within the Action area: According to USFWS, suitable habitat for the narrow-headed gartersnake within the Diamond Rim Allotments is not abundant, mostly due to abundant nonnative predators in perennial reaches (J. Servoss personal communication 2016). Only two observations of narrow-headed gartersnakes are known within the Diamond Rim Allotments and they are located on the far western and southeastern boundaries of the action area. The most recent of which was reported in 1992 along the East Verde River boarding the western boundary of the Payson Allotment; the second observation was in 1990 on Tonto creek located on the southeastern boundary of the Star Valley Allotment and southwest of Hells Gate Wilderness.

Outside the Action area: There are several more recent observations of narrow-headed gartersnakes just outside the Diamond Rim Allotment action area. A single record reported in 2004 exists for Houston Creek, tributary of Tonto Creek, approximately one half mile outside the southernmost boundary of the action area. Further, a Tonto Creek record from 2005 near the Rye Creek and Tonto Creek confluence is located approximately seven miles away. The most recent and reliable extant populations of narrow-headed gartersnakes are located well outside the Diamond Rim Allotments in Haigler and Canyon creeks. Several snakes were reported in 2014 in Haigler Creek; these observations are approximately

[14] For life history information on the narrow-headed gartersnake, visit https://www.azgfd.gov/w_c/edits/documents/Thamrufi.di_007.pdf

five miles (direct line) from the eastern boundary of the action area. (Goode 2014). In 2015, AGFD surveyed Canyon Creek, located approximately 17 miles (direct line) east of the action area and found eight individual snakes with evidence of reproduction. Surveys in 2016 and 2017 continue to result is snake observations.

Despite rigorous and on-going efforts by AGFD and USFWS to recover the narrow-headed gartersnake and protect its habitat, there are no plans within the next five to ten years to release narrow-headed gartersnakes to the East Verde River, Houston Creek, or Tonto Creek that flows within the project area. The primary reason being high densities of nonnative fish communities and it is unclear if releasing headstarted snakes into the wild will be a viable option as a recovery tool. Although there are no recent observations of narrow-headed gartersnakes in upper Tonto Creek within the action area, there may be suitable habitat despite presence of nonnative fish (T. Jones personal communication 2016).

Proposed Critical Habitat

The USFWS proposed critical habitat for the narrow-headed gartersnake on July 10, 2013 (78 FR41550). There are 6 units proposed as critical habitat for the narrow-headed gartersnake. Critical habitat units occur in Greenlee, Graham, Apache, Yavapai, Navajo, Gila, and Coconino Counties in Arizona, as well as in Grant, Hidalgo, Sierra, and Catron Counties in New Mexico. Proposed critical habitat on the Forest occurs within the Verde River, Tonto Creek, and Upper Salt Subbasin Units and includes the portions of or full lengths of the East Verde River, Tonto Creek, Houston Creek, Canyon Creek, Verde River, Salt River, and Haigler Creek. The total amount of proposed critical habitat on the Tonto National Forest is approximately 46 square miles (29,440 acres). Three reaches totaling just over 11 square miles (7,040 acres) within the action area are considered proposed critical habitat for the narrow-headed gartersnake; Tonto Creek, (3.79 square miles or 2,425 acres) and Houston Creek (2.78 square miles or 1,179 acres) both of which are included in the Tonto Creek Subbasin Unit and East Verde River (4.6 square miles or 2,944 acres) within the Verde River Subbasin Unit. Critical habitat includes a 600ft lateral extent to either side of bankfull stage. The primary constituent elements (PCEs) for the Narrow-headed gartersnake are:

1) Stream habitat, which includes:

a) Perennial or spatially intermittent streams with sand, cobble, and boulder substrate and low or moderate amounts of fine sediment and substrate embeddedness, and that possess appropriate amounts of pool, riffle, and run habitat to sustain native fish populations;
b) A natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of processing sediment loads;
c) Shoreline habitat with adequate organic and inorganic structural complexity (e.g., boulders, cobble bars, vegetation, and organic debris such as downed trees or logs, debris jams), with appropriate amounts of shrub-and sapling-sized plants to allow for thermoregulation, gestation, shelter, protection from predators, and foraging opportunities; and
d) Aquatic habitat with no pollutants or, if pollutants are present, levels that do not affect survival of any age class of the narrow-headed gartersnake or the maintenance of prey populations.

2) Adequate terrestrial space (600 feet (182.9 meters) lateral extent to either side of bankfull stage) adjacent to designated stream systems with sufficient structural characteristics to support life-history functions such as gestation, immigration, emigration, and brumation.

3) A prey base consisting of viable populations of native fish species or soft-rayed, nonnative fish species.

4) An absence of nonnative fish species of the families Centrarchidae and Ictaluridae, bullfrogs (Lithobates catesbeianus), and/or crayfish (Orconectes virilis, Procambarus clarki, etc.), or occurrence of these nonnative species at low enough levels such that recruitment of Narrow-headed gartersnakes and maintenance of viable native fish or soft-rayed, nonnative fish populations (prey) is still occurring (USFWS 2013).

Proposed critical habitat on the Forest occurs within the Verde River, Tonto Creek, and Upper Salt Subbasin Units and includes the portions of or full lengths of the East Verde River, Tonto Creek, Houston Creek, Canyon Creek, Verde River, Salt River, and Haigler Creek. The total amount of proposed critical habitat on the Tonto National Forest is approximately 46 square miles. Three reaches totaling just over 11 square miles within the action area are considered proposed critical habitat for the narrow-headed gartersnake; Tonto Creek, (3.79 square miles) and Houston Creek (2.78 square miles) both of which are included in the Tonto Creek Subbasin Unit and East Verde River (4.6 square miles) within the Verde River Subbasin Unit. Critical habitat includes a 600ft lateral extent to either side of bankfull stage.

Proposed Critical Habitat for Northern Mexican Gartersnake[15]

Endangered Species Act Status:	Threatened, July 08, 2014
Forest Occurrence:	Apache-Sitgreaves, Coconino, Coronado, Gila, Prescott, Tonto
Recovery Plan:	No
Critical Habitat:	Proposed, July 10, 2013
Effects Finding (critical habitat)	May Affect, not Likely to Adversely Affect

There are no historic or extant records of northern Mexican gartersnakes within the action area. Observations of northern Mexican gartersnakes as recent as 2012 exist from Tonto Creek downstream of the Diamond Rim Allotments, the closest to the project area being a 2010 observation approximately four miles south. Observations from 1995, 2004-2005, 2010-2012 have been documented further south of Gisela. (Holycross et al. 2006, p. 40-44; Burger 2008).

There are 14 units proposed as critical habitat for the northern Mexican gartersnake. Primary Constituent Elements (PCEs) for the northern Mexican gartersnake proposed critical habitat are described below.

[15] For life history information on the northern Mexican gartersnake, visit https://www.azgfd.gov/w_c/edits/documents/Thameqme.fi_004.pdf

1. Aquatic or riparian habitat that includes:
   a) Perennial or spatially intermittent streams of low to moderate gradient that possess appropriate amounts of in channel pools, off-channel pools, or backwater habitat, and that possess a natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of processing sediment loads; or
   b) Lentic wetlands such as livestock tanks, springs, and cienegas;
   c) Shoreline habitat with adequate organic and inorganic structural complexity to allow for thermoregulation, gestation, shelter, protection from predators, and foraging opportunities (e.g., boulders, rocks, organic debris such as downed trees or logs, debris jams, small mammal burrows, or leaf litter); and
   d) Aquatic habitat with characteristics that support a native amphibian prey base, such as salinities less than 5 parts per thousand, pH greater than or equal to 5.6, and pollutants absent or minimally present at levels that do not affect survival of any age class of the northern Mexican gartersnake or the maintenance of prey populations.
2. PCE 2: Adequate terrestrial space (600 feet (182.9 meters) lateral extent to either side of bankfull stage) adjacent to designated stream systems with sufficient structural characteristics to support life-history functions such as gestation, immigration, emigration, and brumation.
3. PCE 3: A prey base consisting of viable populations of native amphibian and native fish species.
4. PCE 4: An absence of nonnative fish species of the families Centrarchidae and Ictaluridae, bullfrogs, and/or crayfish, or occurrence of these nonnative species at low enough levels such that recruitment of northern Mexican gartersnakes and maintenance of viable native fish or softrayed nonnative fish populations (prey) is still occurring.

Verde River and Tonto Creek Subbasin Units are both within the Tonto National Forest. The total amount of proposed critical habitat on the Forest is approximately 22 square miles (14,080 acres). Tonto Creek is the only stream located within the action area proposed for critical habitat for the northern Mexican gartersnake; approximately 3.9 square miles (or 2,496 acres) of critical habitat falls within the Diamond Rim Allotments. Critical habitat along Tonto Creek includes a 600ft lateral extent to either side of bankfull stage.

Mexican Spotted Owl and Designated Critical Habitat[16]

ESA Status:	Threatened, March 16, 1993
Forest Occurrence:	All
Recovery Plan:	2012, First Revision
Critical Habitat:	Redesignated August 31, 2004
Effects Finding (species)	May Affect, not Likely to Adversely Affect
Effects Finding (critical habitat)	May Affect, not Likely to Adversely Affect

[16] For life history information on the Mexican spotted owl, visit https://www.azgfd.gov/w_c/edits/documents/Strioclu.fi_002.pdf

The sum of the Diamond Rim Allotments fall within two Mexican spotted owl (MSO) recovery units. A total of 161,382 acres of the Upper Gila Mountain Recovery Unit makes up the majority of the Diamond Rim Allotments; the remaining southernmost 2,370 acres of the action area fall in the Basin and Range West Recovery Unit.

Protected Activity Centers (PACs)

A total of 12 MSO PACs occur across the Diamond Rim Allotments with the exception of Star Valley Allotment. One of the 12 PACS barely intersects the northeast boundary of the action area. Habitat identified as PACs within the allotments totals 7,300 acres or 4.46 % of the total area and includes both forested and canyon habitats. **Error! Reference source not found.** contains the PAC numbers, number of acres falling in the action area, and survey history for each PAC. Given the lack of consistent monitoring of PACs in this area, it is difficult to make assumptions on occupancy and reproductive success. According to the best available data from 2014, monitoring efforts by EcoPlan Associates, resulted in owl observations in only two PACs. Pair occupancy was inferred or confirmed with nesting status undetermined in the Chase Creek East PAC located in northeast corner of the Payson Allotment. A male was inferred or confirmed with nesting status unknown in the Lee Johnson PAC also in the Payson Allotment but to the northwest. Protected activity centers within the action area have not be formally monitored since 2014.

Table 15. MSO Survey Data for the last 10 years within the action area.

PAC No.	Allotment(s)	Total PAC Acres/ PAC Acres in Action area	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
120 402	Indian Gardens	585/15	NI	O-NU	NI	O-NU	O-NN	NI	NI	NI	NI	NR	NR	NI	NI	IM-NR
120 408	Payson	629/629	NI	NI	NI	M	NI	NR	NI	NI	NI	NR	NR	NI	NI	NI
120 411	Indian Gardens	631/631	NI	O	NI	M	M	NI	NI	NI	NI	NR	NR	NI	NI	NI
120 412	Payson	649/649	NI	NI	NI	F	NI	P	NI	NI	NI	O-NU	O-NU	NI	NI	NI
120 414	Payson	824/824	NI	NI	NI	NR	NI	NR	NI	NI	NI	NR	NR	NI	NI	NI
120 415	Payson	647/647	NI	NI	NI	NI	NI	O	NI	NI	NI	NR	NR	NI	NI	NI
120 419	Payson	727/727	NI	NI	NI	NI	NI	NR	NR	NR	NR	NR	NR	NI	NI	NI
120 420	Payson	534/534	NI	NI	NI	O-NU	NI	M	NI	NI	NI	NR	NR	NI	NI	NI
120 421	Payson	608/608	NI	NI	NI	M	NI	O	NI	NI	NI	M-NU	M-NU	NI	NI	NI
120 422	Green Valley Indian Gardens	671/671	NI	NR	NI	NI	NR	NR	NR	NR	NR	NR	NR	NI	NI	NI
120	Green	602/602	NI	NR	NI	NI	NR	NR	NR	NR	NR	NR	NR	NI	NI	NI

PAC No.	Allotment(s)	Total PAC Acres/ PAC Acres in Action area	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
423	Valley Cross V															
120 424	Payson	763/763	NI	NI	NI	NI	NI	P	NI	NI	NI	NR	NR	NI	NI	NI

LEGEND

O= Pair Occupancy inferred or confirmed
M= Male inferred or confirmed
F= Female inferred or confirmed
P= Presence of a single owl inferred or confirmed sex unknown
Y= Number of young fledged
YD= Number of young found dead
NI= No Information
NU= Nesting status undetermined
NY= Nesting status undetermined no young produced
NN= Non-nesting/Non-reproduction confirmed
NA= Nest Abandoned
NF= Nest Failed
A= Absence or Unoccupied
IM-NR= Informally monitored - no response or location
*= Could constitute a new PAC-1998 survey will try to confirm this

Protected activity centers, critical habitat and a majority of recovery habitat within the Diamond Rim Allotments will likely be monitored more constantly in the future given they fall within the Four Forest Restoration Initiative footprint.

Recovery Habitat

Forested and Riparian Recovery Habitat occurs in forests and rocky canyons used by owls for roosting, foraging, dispersal, and other life history needs, but outside of PACs and designated critical habitat. Recovery Habitat is intended to: 1) provide protection for areas that may be used by owls; 2) foster creation of roost/nest habitat; 3) simultaneously provide managers with greater management flexibility than is allowed in PACs; and, 4) facilitate development and testing of management strategies that could be applied in PACs (USFWS 2012).

Potential MSO recovery habitat may exist outside of PACs and critical habitat across the five allotments but is not well classified by the TNF. Recovery habitat important to MSOs for life history needs include ponderosa pine-Gambel oak, mixed conifer, and riparian forest communities (USFWS 2012). In order to estimate the amount of potential MSO recovery habitat within the action area, Mid-Scale Existing Vegetation Dominance Type Map Unit data created by USDA Southwest Region was used to identify areas that have potential for becoming foraging, nesting, roosting, or dispersal habitat. This area has experienced nine wildfires ranging from moderate to high severity burns or stand replacing fires (**Error! Reference source not found.**). With the exception of the Water Wheel Fire, all fires burned just below

the Mogollon Rim. In 1990, the Dude Fire burned ~24,000 acres across the northern portions of Indian Gardens and Green Valley allotments. High fire intensity and severity resulted in a stand replacing fire, triggering successional vegetative communities like chaparral scrub to replace areas previously occupied by ponderosa pine and mixed coniferous forest in the fire scar, thus greatly reducing or eliminating potential recovery habitat for owls within the action area. Similar high severity fire effects were seen in the February, Packrat, Water Wheel and Webber fires. Combined, these fires equate to 39,638 acres of altered or no longer suitable recovery habitat for the owl.

Table 16. Fire history on Diamond Rim Allotments

Allotment	Fire Name	Year	Acres within Action area
Green Valley/Indian Gardens	Dude	1990	24,174
Payson	Packrat	2002	~1950 (Fire was on both Tonto and Coconino NFs)
Payson	Webber	2004	~3,070 (Fire was on both Tonto and Coconino NFs)
Indian Gardens	Zane	2005	136
Payson	February	2006	4,057 ((Fire was on both Tonto and Coconino NFs)
Cross V	Rim	2009	2500
Payson	Water Wheel	2009	773
Indian Gardens	Horton	2011	390.03
Indian Gardens	Big Canyon	2012	107.8

Currently, recovery habitat for nesting or roosting can be found in the Diamond Rim Allotments within existing ponderosa pine communities not altered by stand replacing fires discussed above (~34,025 acres). Quality of this habitat for owls varies because many of these areas lack the diversity of plant species, large mature trees, and dense vegetative structure preferred by owls. On the southern portion of the allotments, or winter range, potential spotted owl wintering and dispersing habitat exists on all or portions of the ~147,000 acres of pinyon-juniper-oak habitat.

Critical Habitat

The USFWS designated critical habitat for the spotted owl in 2004 on approximately 8.6 million acres of Federal lands in Arizona, Colorado, New Mexico, and Utah (USFWS 2004). Within the designated boundaries, critical habitat includes only those areas defined as protected habitats (defined as PACs and unoccupied slopes greater than 40 percent in the mixed conifer and pine-oak forest types that have not had timber harvest in the last 20 years) and restricted (now called “recovery”) habitats (unoccupied owl foraging, dispersal, and future nest/roost habitat) as defined in the 1995 Recovery Plan (USFWS 1995a). The 1995 Recovery Plan was used as the basis for the 2004 critical habitat rule. The PCEs for spotted owl critical habitat were determined from studies of their habitat requirements and information provided in the Recovery Plan (USFWS 1995a). Since spotted owl habitat can include both canyon and forested areas, PCEs were identified in both areas. The PCEs identified for the spotted owl within mixed-conifer, pine-oak, and riparian forest types that provide for one or more of the spotted owl’s habitat needs for nesting, roosting, foraging, and dispersing are:

1. A range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30 to 45 percent of which are large trees with diameter at breast height (dbh) (4.5 feet above ground) of 12 inches or more;
2. A shade canopy created by the tree branches covering 40 percent or more of the ground;
3. Large, dead trees (snags) with a dbh of at least 12 inches.
4. High volumes of fallen trees and other woody debris;
5. A wide range of tree and plant species, including hardwoods; and
6. Adequate levels of residual plant cover to maintain fruits and seeds, and allow plant regeneration.

The PCEs listed above usually are present with increasing forest age, but their occurrence may vary by location, past forest management practices or natural disturbance events, forest-type productivity, and plant succession. These PCEs may also be observed in younger stands, especially when the stands contain remnant large trees or patches of large trees. Certain forest management practices may also enhance tree growth and mature stand characteristics where the older, larger trees are allowed to persist.

Steep-walled rocky canyonlands occur typically within the Colorado Plateau EMU, but also occur in other EMUs. Canyon habitat is used by owls for nesting, roosting, and foraging, and includes landscapes dominated by vertical-walled rocky cliffs within complex watersheds, including many tributary side canyons. These areas typically include parallel-walled canyons up to 1.2 miles (2 kilometers) in width (from rim to rim), with canyon reaches often 1.2 miles (2 kilometers) or greater, and with cool north-facing aspects. The PCEs related to canyon habitat include one or more of the following:

1. Presence of water (often providing cooler temperatures and higher humidity than the surrounding areas);
2. Clumps or stringers of mixed-conifer, pine-oak, pinyon-juniper, and/or riparian vegetation; and
3. Canyon walls containing crevices, ledges, or caves; and,
4. High percent of ground litter and woody debris.

The action area falls within critical habitat unit UGM-10. Approximately 22,669 acres or 13.8% of Mexican spotted owl critical habitat occur on the Diamond Rim Allotments, specifically in Payson, Indian Gardens and Cross V allotments. Critical habitat occurs along the Mogollon Rim in the northeastern and northwestern sections of the action area and encompasses 10 of the PACs, including the one PAC which intersects the action area by 15 acres; two PACs within the action area are located outside critical habitat. Only areas identified as protected and recovery habitat within these units are considered critical habitat (USFWS 2004). Further, 14,606 acres of critical habitat within the action area (66%) has experienced moderate to high severity wildfires discussed above (Dude, Horton, February, Webber, Rim and Packrat). Therefore, the actual amount of Mexican spotted owl habitat within these two units likely covers less area than is indicated by the unit acreage.

Gila Trout[17]

ESA Status:	Threatened, July 18, 2006
Forest Occurrence:	Apache-Sitgreaves, Coconino (proposed Reintroduction), Coronado, Gila, Prescott, and Tonto
Recovery Plan:	September 10, 2003
Critical Habitat:	No
Effects Finding (species)	May Affect, not Likely to Adversely Affect

In October 2015, a field review of Dude creek was conducted by USFWS, AGFD and Forest Service representatives. At that time, it was determined that Dude Creek had recovered enough from the Dude Fire and subsequent fires to potentially support Gila trout. On October 28, 2015 approximately 1000 Gila trout (Whisky Springs lineage) were re-introduced into the perennial portion of Dude Creek above a natural fish barrier. Visual surveys in April, 2016 conducted by Forest Service staff counted 32 fish greater than six inches in tail length. A second stocking (200 fish) was completed in December, 2016. Surveys and stockings are planned to continue through the cooperative efforts of AGFD, USFWS and the Forest Service over the next two years in Dude Creek to promote establishment. Recovery reintroduction efforts within the action area are also currently being planned for Webber Creek and Chase Creek (C. Gill, personal communication, July 2016). Both the Webber Creek and Chase Creek recovery locations are found within the Payson allotment of the Diamond Rim allotments. The Haigler Creek recovery site is found upstream of the allotments, feeding into Tonto Creek that comprises the south border of the Green Valley allotment. Gila trout that are planned for reintroduction into these watersheds are therefore considered in this assessment.

Gila trout currently occupy Dude Creek on the Cross V allotment, and, in the future, may occupy Webber and Chase Creeks on the Payson allotment due to planned reintroduction efforts for recovery. Additionally, planned reintroductions into upstream areas, such as Haigler Creek, could result in movement of fish into areas of Tonto Creek that border the Green Valley allotment.

Environmental Consequences

Effects to Threatened and Endangered Wildlife, Plants, and Fish from the Proposed Action

[17] For life history information on Gila trout, visit https://www.azgfd.gov/w_c/edits/documents/Oncogila.fo_002.pdf

Effects Analysis Common to all Aquatic Species and Proposed or Designated Critical Habitat (Chiricahua leopard frog and critical habitat, northern Mexican gartersnake proposed critical habitat, narrow-headed gartersnake and proposed critical habitat, and Gila trout).

Routine maintenance of existing fence and creation of new fence will have minimal impacts of semi-aquatic and aquatic species. Livestock fencing is not often placed near riparian habitat but on the uplands. Fence repair frequently consists of replacing or tightening barbed wire or replacing t-posts. This can involve the use of chainsaws to remove fallen debris or OHVs for hauling heavy materials. In most cases, it normally takes about 1-3 days to repair damaged fence line. There may be disturbance through human activity and mechanized equipment but the disturbance is expected to be in short duration. All fencing would be built to Forest Service standards to provide for wildlife passage through the fence. At a minimum, this would be a four-strand fence with smooth bottom wire 18 inches off the ground and a total height of 42 inches or less.

Chiricahua Leopard Frog and Designated Critical Habitat

The Chiricahua leopard frog is known to coexists with grazing activities at most sites where it is found (USFWS 2007: 32-34) however, livestock management activities include many elements that may affect the species and its aquatic habitats (Fleischner 1994, Belsky et al. 1999, Jones 2000).

Grazing effects on CLF habitat include both the creation of habitat and the loss and degradation of habitat (Sredl and Jennings 2005). Livestock grazing can cause a decline in diversity, abundance, and species composition of riparian herpetofauna communities from direct or indirect threats. These can include: (1) declines in the structural richness of the vegetative community; (2) losses or reductions of the prey base; (3) increased aridity of habitat; (4) loss of thermal cover and protection from predators; and (5) a rise in water temperatures to levels lethal to larval stages of amphibian and fish development (Belsky et al. 1999).

Grazing will occur in most of the habitats occupied by this frog. One large and healthy population of Chiricahua leopard frogs co-exists with cattle and horses on the Tularosa River in New Mexico (Randy Jennings, Western New Mexico University, personal communication, 1995) as well as many stock tanks across Arizona's national forests. Throughout their range, CLFs are often found living in dirt stock tanks (created by mounding dirt around a drainage site by bulldozer). These tanks are heavily used by livestock, especially cattle. When managed poorly, livestock grazing activities can negatively impact this species and its habitats.

Direct effects of livestock grazing to CLFs include direct mortality or injury. Eggs, tadpoles, and metamorphosing CLFs may suffer direct mortality or injury through trampling by cattle along the perimeter of stock tanks and in pools along streams (USFWS 2007); this has been documented in the

literature in other amphibians (see Bartelt 1998, Ross et al. 1999), but most likely occurs to amphibian egg masses rather than metamorphosed frogs. Trampling of CLFs by livestock has not been documented; however, it may occur, particularly in confined, simple habitats such as stock tanks. Metamorphosed frogs can probably avoid trampling when they are active; however, leopard frogs are known to hibernate on the bottom of ponds (Harding 1997) where they may be subject to trampling during the winter months. During a CLF telemetry study looking at winter hibernacula, AGFD biologists observed CLFs during winter months taking shelter in vegetation and rock crevices along banks of stock tanks and streams (H. McCall, personal communication August 2017; C. Akins, personal observation, 2015). We are reasonably certain there is an increased risk of trampling to 1) hibernating frogs, 2) overwintering tadpoles and 3) egg masses at sites that are occupied or may become occupied by frogs due to dispersal from nearby sites during the life of the project.

Indirect effects of grazing can include elevated levels of sedimentation, loss of wetland and riparian vegetation, and changes in water quality in stock tanks. We are reasonably certain that adverse effects to bankside and aquatic vegetation in occupied habitat, causing loss of cover for frogs, will occur at some level during the duration of this proposed action. We anticipate these indirect effects could occur on any of the current or future occupied habitat areas within the Diamond Rim Allotments.

Sedimentation of deep pools used by frogs decreases the quality of habitat and alters primary productivity. The proposed action includes conservative utilization levels (30-40%) in upland areas combined with no more than 619 head dispersed across 163,752 livestock acres; due to topography, some areas may be inaccessible to livestock, especially those areas just below the Mogollon Rim, potions of Tonto Creek and the East Verde River. The distribution of grazing across such a large area should provide adequate residual ground cover to mitigate some sedimentation into suitable frog habitats.

Perennial or intermittent streams (Webber Creek, East Verde River, Ellison Creek, American Gulch, Horton Creek, Tonto Creek, Houston Creek, Green Valley Creek, Bull Tank Canyon, Big Canyon, Gibson Creek, and Dry Pocket Wash) flow through portions of the Diamond Rim allotments and not all sedimentation can be mitigated. Loss of wetland and riparian vegetation has the potential to decrease hiding and shading cover; however, Tonto National Forest riparian utilization guidance will be followed which should lead to improved riparian areas over the long run by limiting riparian utilization of woody species to <50% of terminal leaders on top 1/3 of plants that are accessible to livestock (<6.0 ft. tall). Herbaceous species will be limited to 40% of plant species biomass for deergrass and maintain 6-8 inches of stubble height for emergent species such as rushes, sedges, cattails, and horsetails. Additionally, cattle would be moved when riparian utilization levels are met, therefore, minimizing any negative, indirect effects of grazing and providing time for riparian area and stream channel condition to improve. Degraded water quality and reduced vegetation in stock tanks will likely occur as no tanks are fenced or partially fenced at this time. Part of the season of use includes summer monsoons, which would increase stock tank water levels and improve water quality through dilution.

Improvements like construction of new water developments or cleaning of existing tanks described above in the proposed action can have beneficial effects to native aquatic species by creating new

suitable habitat and securing perennial water necessary for breeding. These improvements can also facilitate dispersal and support and strengthen metapopulation dynamics of frogs. Most times, tank maintenance (removal or sediment/dredging) occurs once a tank is completely dry and therefore not likely occupied by frogs, however, there are times when excavation of sediment within a tank is removed when soils are still moist. Despite lack of surface water in a drying tank, maintenance of tanks with moist sediment can result in mortality or injury of frogs seeking cover from desiccation. Arizona Game and Fish Department biologists have observed CLFs taking refuge in cracks formed by drying mud on numerous occasions; frogs were found between three to eight inches down in mud cracks [Recovery Unit 4 – Agate Mine Tank (2009), Recovery Unit 2- Greaterville Tank (2012), Recovery Unit 5 - Moore Tank 4 (2014)] (A. King, personal communication, April 8, 2009); C. Akins, personal observation, June 1, 2012; C. Akins, personal observation, May 28, 2014). Given tanks are generally cleaned when tanks are completely dry, we anticipate routine tank maintenance to have little negative impact to the frog. In 2016, only two tanks were occupied by frogs; Middle and Upper Moore Tanks. Both of these tanks are not currently in need of maintenance and have held water year round. Typically tanks are cleaned every 10-15 years if water permanency at the site is unstable. Construction of new tanks will benefit the frog by 1) increasing livestock distribution, 2) provide additional dispersal sites for frogs, and 3) strengthen metapopulations dynamics of frogs. New tank locations will likely be along existing roads to collect roadside run-off and will not be located in drainage bottoms. They will be constructed during winter or dry summer months like May and June when frogs are not likely to be dispersing.

Concern when creating new water sites is that they can sometimes create suitable habitat for nonnatives like bullfrogs and crayfish. Surveys within the project area have resulted in only one observation of a single bullfrog. New tank locations will be selected by Range and Wildlife staff in coordination with the permittee to ensure tanks will not be colonized by nonnative species and the Forest Service will continue to work with the CLF Local Recovery Group to remove nonnative threats when identified. Existing stock tanks provide habitat for CLF as well as bullfrogs should they become established. According to AGFD data, only one adult bullfrog has been observed on the Cross V Allotment and was immediately removed by a permitted FS biologist; no other bullfrog observations exist for the Diamond Rim Allotments. Therefore, bullfrogs are currently not of concern and ongoing surveys will aid in discovering bullfrog populations that may become established over the course of the project. The permittee is actively involved in all CLF RU5 Local Recovery Group meetings and will notify the group if nonnative species are detected during routing operations. Crayfish do exist in high numbers in the East Verde River, Tonto Creek and their tributaries as well as Houston Creek and Weber Creek, and although crayfish have not been found in any stock tank across the Diamond Rim Allotments, they could move into stock tanks over time. Besides potentially creating habitat for nonnatives, proposed livestock management activities could increase the likelihood of chytrid fungus. Several sites within the proposed action area have tested positive for chytrid fungus. Therefore, it is possible that livestock (along with humans and wildlife) could spread the fungus when moving between habitats.

Although these potential effects are not insignificant and there is a low occurrence of CLF in the Diamond Rim Allotments, a majority of the currently occupied areas completely or seasonally restrict livestock. This minimizes the potential for severe adverse effects to the species. Livestock grazing is

expected in suitable habitat or naturally colonized sites not currently fenced from livestock. These effects will be attenuated through consistent monitoring, utilization guidelines, mitigation measures (e.g., erosion control and sediment removal from the stock tanks), and adaptive management as proposed by the Tonto National Forest in the Diamond Rim Allotment AMP.

Critical Habitat

1. Aquatic breeding habitat and immediately adjacent uplands exhibiting the following characteristics:
PCE 1a: Standing bodies of fresh water, including natural and manmade (e.g., stock) ponds, slow-moving streams or pools within streams, off-channel pools, and other ephemeral or permanent water bodies that typically hold water or are rarely dry for more than a month. During periods of drought, or less than average rainfall, these breeding sites may not hold water long enough for individuals to complete metamorphosis, but they would still be considered essential breeding habitat in non-drought years.
Effect: Actions implemented under the proposed action are expected to retain and recover this PCE for frogs. There are standards and guidance with the Forest Service's *Wildlife, Fish, and Rare Plant Habitat Management -2600 Manual* that minimizes impacts to federally listed and sensitive species, in this case, that guidance ensures that areas (stock tanks) are not dewatered or impaired to the point that they cannot support frogs. Routine tank cleaning to remove sediment (i.e., draining and or removal of sediment) is likely to occur within the action area. There is an extremely low likelihood that this action will result in reduction of surface water. Typically, tanks are cleaned when the site is naturally drying or completely dry which normally occurs from May to June. Cleaning takes place prior to monsoon, allowing the tank to naturally re-fill through rainfall events after the work is completed. Once sediment is removed in stock tanks, surface water and permanency typically increases. Furthermore, occasional drying of stock tanks (natural or human caused) for periods not exceeding one month, may be beneficial for the following reasons: 1) while metamorphosed frogs can likely survive a short drying event, nonnative predators, particularly fish or fully aquatic forms of tiger salamanders will be eliminated (USFWS 2007), 2) drying of tanks may facilitate the removal of chytrid fungus zoospores that are free swimming in water that may occupy the water.

PCE 1b: Emergent and or submerged vegetation, root masses, undercut banks, fractured rock substrates, or some combination thereof, but emergent vegetation does not completely cover the surface of water bodies.
Effect: The proposed action is expected to result in adverse effects to components of this PCE. Livestock will eat and/or modify emergent and submerged vegetation resulting in loss of cover for frogs. Lower Moore Tank has steep banks and rocky substrate which limits perimeter and band side vegetation growth and livestock ability to access all portions of the tank. According to data housed AGFD's Riparian Herpetofauna Access Database, submergent and emergent aquatic vegetation (grasses, sedges, rushes, and potamogeton) is often present during protocol surveys at Lower Moore Tank despite a history of grazing and it is unlikely that livestock use will fully impact these features. Further, Lewis Creek and Lower Moore Tank have fencing around them to keep livestock out if the habitats become stressed. The spring head at Lewis Creek, were frogs have been known to occur has an elk fence which prohibits livestock access as well. Lower Moore Tank has a trap fence around it and in case of severe drought, and with coordination with the permittee, livestock could be excluded until water is pumped to the site or

refills during monsoon. To date, there has not been a need to utilize the trap fence at Lower Moore to exclude livestock. Despite removal of some perimeter and submergent vegetation, the critical habitat stock tanks and drainages can still provide habitat for the Chiricahua leopard frog even when livestock are present; especially open water and banks free of vegetation for basking.

PCE 1c: Nonnative predators absent or occurring at levels that do not preclude presence of the Chiricahua leopard frog.
Effect: We do not anticipate livestock grazing actions to directly increase the spread of nonnative predators like bullfrogs and crayfish. The Tonto National Forest and permittee are active members of the CLF Recovery Unit 5 Local Recovery Group. A priority of this group is to identify, monitor and remove nonnative predators within active CLF Management Areas. Efforts are also made to ensure that Forest Service employees are aware of what stock tanks containing CLFs and nonnative species so that the potential to inadvertently transfer nonnative species to occupied habitat is reduced. Maps displaying nonnative species are handed out at annual recovery meetings. The TNF will also continue to partner with the AGFD Regional Office to remove nonnative bullfrogs from surrounding landscapes where CLFs are present; currently, only one bullfrog was observed at one site within the Diamond Rim Allotments. Additionally, being that the permittee is an active member of the CLF RU5 Local Recovery Group he recognizes the harmful effects nonnative species can have on aquatic wildlife. In 2013, the permittee participated in the CLF Certification Training Workshop and has information on morphological characteristics of native versus nonnative amphibians in the Diamond Rim Allotments. For reasons described above, we believe that these actions associated with livestock grazing on the Diamond Rim Allotments will significantly reduce the probability of transferring nonnative species to occupied or suitable habitats and will not result in adverse modification of this PCE.

PCE 1d: Absence of chytridiomycosis (Bd), or, if present, then environmental, physiological, and genetic conditions are such that they allow persistence of Chiricahua leopard frogs.
Effect: Arizona Game and Fish Department records show that Bd has been detected in RU5 since at least 2004, therefore there is potential that actions authorized under the proposed action, such as the cleaning/sediment removal of stock tanks and moving machinery among stock tanks could result in the movement of Bd, or other diseases, to critical habitat. However, the Tonto National Forest has included preventative measures in the proposed action that require the livestock allotment permittee and Forest Service field personnel working in/near critical habitat to disinfect equipment used between sites located is different subwatersheds. Pathogens, such as Bd, can easily be transferred between habitats in mud or vegetation on equipment and footwear. It is unlikely that heavy equipment used to clean tanks will need to be disinfected given tank cleaning normally occurs when the site is dry. When applicable, disinfecting equipment between sites should significantly reduce the potential for Bd to be transmitted to critical habitat. These preventative measures should decrease the potential for Bd to be introduced to Chiricahua leopard frog habitat on the Diamond Rim Allotments and not result in adverse modification of this PCE. It is important to note that because stock tanks are important habitat to CLFs on the Diamond Rim Allotments, the USFWS, AGFD, and the Forest Service have cleaned out stock tanks as part of ongoing recovery actions. Therefore, this action would continue with or without the proposed action.

PCE 1e: Upland areas that provide opportunities for foraging and basking that are immediately adjacent to or surrounding breeding aquatic and riparian habitat.
Effect: Implementing the proposed action may result in reduced vegetative habitat immediately around and surrounding critical habitat. However, lentic critical habitat sites (Lower Moore and Moore 4 Tank) have steep banks with rocky soil, limiting the ability for vegetation to grow naturally. Livestock will be able to eat, trample, and/or otherwise modify vegetation across the perimeter of tanks. Though this will modify some habitat for frogs, it will also result in some beneficial effects to frog habitat by providing needed basking (e.g., open areas) and foraging habitat for frogs. Although there will be some adverse effects to this PCE, overall grazing and rotation strategy will ensure suitable habitat maintains some level of aquatic and riparian habitat for frogs and other wildlife.

2. Dispersal and non-breeding habitat, consisting of areas with ephemeral (present for only a short time), intermittent, or perennial water that are generally not suitable for breeding, and associated upland or riparian habitat that provide corridors (overland movement or along wetted drainages) for frogs to move among breeding sites in a metapopulation. The dispersal and non-breeding habitat need to have the following characteristics:
PCE 2a: Are not more than 1.0 mile overland, 3.0 miles along ephemeral or intermittent drainages, 5.0 miles along perennial drainages, or some combination thereof not to exceed 5.0 miles.
Effect: Actions implemented under the proposed action should not result in the loss of stock tanks within critical habitat that would change the movement distance (connectivity) between stock tanks. Any anticipated range management improvements to maintain or create water developments as perennial waters would also aid in protecting and strengthening this PCE.

PCE 2b: In overland and non-wetted corridors, provides some vegetation cover or structural features (e.g., boulders, rocks, organic debris such as downed trees or logs, small mammal burrows, or leaf litter) for shelter, forage, and protection from predators; in wetted corridors, provides some ephemeral, intermittent, or perennial aquatic habitat.
Effect: Actions implemented under the proposed action should not significantly reduce or modify this PCE within critical habitat. Though actions may result in small reductions in organic debris as a result of livestock grazing or trampling, these impacts are not likely to significantly modify components of this PCE like rocks, downed trees, logs, and boulders.

PCE 2c: Are free of barriers that block movement by Chiricahua leopard frogs, including, but not limited to, urban, industrial, or agricultural development; reservoirs that are 50 acres or more in size and contain predatory nonnative fishes, bullfrogs, or crayfish; highways that do not include frog fencing and culverts; and walls, major dams, or other structures that physically block movement.
Effect: Actions implemented under the proposed action would not result in the creation of barriers to movement within critical habitat.

Determination of Effects

Criteria used to determine the effects that the proposed livestock grazing and management activities will have on the Chiricahua leopard frog was taken directly from the 2015 *Framework for Streamlining Grazing Consultations* (USFS 2015).

It is determined that the proposed action on the Diamond Rim Allotments, **May affect, and is likely to adversely affect** Chiricahua leopard frog, based upon the following:

- Livestock grazing in or around occupied sites could result in direct mortality of egg mass, thus reducing recruitment of the site.
- Although there are existing exclosures in place in a tributary to Ellison Creek (Trib 4), and Lewis Creek and Lower Moore Tank, these exclosures only cover a portion of occupied reaches and/or critical habitat. Livestock will have access to grazing or known occupied sites.
- The adherence to the proposed conservative utilization guidelines (31 – 40%) will ensure residual vegetation remains in the uplands to reduce runoff, maintain or improve soil condition and watershed health, however, livestock will have access to graze occupied sites.
- Sites within the action area have tested positive for chytrid fungus. Livestock grazing in or near occupied sites known to have chytrid fungus, may contribute to the spread of disease in the area as livestock move from one water to another.
- Permittee will notify USFS Range and Wildlife staff 60 days prior to the maintenance cleaning of any stock tank occupied by or within dispersal distance of occupied sites.
- Water shall not be pumped or diverted from a site occupied by Chiricahua leopard frogs.
- Permittee will notify USFS Range and Wildlife staff of nonnative predators like bullfrogs or crayfish are discovered across the DRA.

Determination of Effects Chiricahua Leopard Frog Critical Habitat

Criteria used to determine the effects that the proposed livestock grazing and management activities will have on the PCEs of critical habitat described above was taken directly from the 2015 *Framework for Streamlining Grazing Consultations* (USFS 2015).

It is determined that the proposed action on the Diamond Rim Allotments, **May affect, and is likely to adversely affect**, Chiricahua leopard frog critical habitat based on the following:

- The proposed action allows for livestock grazing in designated critical habitat
- Sites within the action area have tested positive for chytrid fungus. Livestock grazing in or near occupied sites known to have chytrid fungus, may contribute to the spread of disease in the area as livestock move from one water to another.

Narrow-headed Gartersnake and Proposed Critical Habitat

Livestock grazing in occupied narrow-headed gartersnake habitat with a largely native aquatic community is generally compatible with conservation and recovery of gartersnakes provided 1) potential adverse effects to primary prey species (fish) are mostly insignificant; or 2) the effect of their

take on the overall prey base (non-listed species) is negligible. Adverse livestock grazing effects to riparian or aquatic habitat has typically occurred as a result of historical or unmanaged grazing. Effects include declines in the structural richness of the vegetative community; losses or reductions of the prey base; increased aridity of habitat; loss of thermal cover and protection from predators; a rise in water temperature; and desertification. Studies on Western gartersnakes (terrestrial) indicated abundance and biomass was significantly higher in areas that were excluded from grazing, where the streamside vegetation remained lush, than where unmanaged grazing was permitted (USFWS 2014). Managed grazing with limited utilization ranging from light use to moderate use (i.e., <30 % of key foraging species) of riparian vegetation could take place with no significant or measurable effects to the species, but should be less depending on current condition of the riparian zone (Holechek et al. 2004). Conversely, excessive grazing in the uplands of watersheds occupied by gartersnakes may result in elevated levels of sedimentation in occupied streams and cause a reduction in fish reproduction which negatively affects the gartersnakes primary prey base.

Narrow-headed gartersnakes are somewhat resilient to physical habitat disturbance where harmful nonnative species are absent (USFWS 2014). Unfortunately, perennial reaches within the action area inhabit a variety of nonnative aquatic species (AGFD unpublished data). Although there are no recent observations of narrow-headed gartersnakes in the action area, adequate surveys have not been completed to confirm absence. It is reasonable to believe that snakes may occupy upper Tonto Creek but presumed to be in extremely low densities (T. Jones, personal communication, December 2016). Upper Tonto Creek is known to be heavily occupied by bullfrogs, crayfish, green sunfish, brown trout, and yellow bullheads (Holycross *et al.* 2006, p. 59; Burger 2008, pp.1, 4; Wallace *et al.* 2008; pp. 243–244; USFWS 2011, p. 8-142;)

The most recent reported observation of a narrow-headed gartersnake within the Diamond Rim Allotments was in 1992. Under the proposed action, grazing will occur in riparian areas that have not been extensively surveyed for snakes using AGFD's unofficial protocol of five consecutive day trapping efforts (reaches of Tonto Creek, East Verde River and Houston Creek). Without these extensive surveys targeting gartersnake, we are unable to confirm whether narrow-headed gartersnakes in these perennial waters are absent or exist in extremely low densities not yet detected. Although detecting gartersnakes is low when fish or frogs are survey targets, incidental observations of narrow-headed gartersnakes during AGFD routine aquatic surveys have not been reported within the action area. Because grazing will occur in these riparian areas where prey and habitat are present, direct effects of grazing are possible but not likely to occur due to the presumed rarity of the species within the action area.

Even though the trampling of a black-necked gartersnake has been photo-documented on the Apache-Sitgreaves National Forest, there is no evidence to suggest that death or injury to gartersnakes by trampling is common or is reasonably certain to occur. If narrow-headed gartersnakes are present, effects on the species include the slight risk for gartersnakes to be trampled by livestock. Nonetheless, gartersnakes should easily be able to evade livestock even if they are basking or acquiring prey from areas they inhabit.

In the early season, the quality of forage and water availability in the upland adjacent to riparian corridors is high (Rosgen 1994). This reduces the concentration of livestock on streamside vegetation, therefore decreasing opportunities for livestock to encounter snakes if present. Rest following early grazing allows for plants and grasses time to recover from grazing for the rest of the growing season (Rosgen 1994). The relatively cool, damp, and shady aquatic habitats favored by primary fish species and preyed on by narrow-headed gartersnakes, are those favored by livestock over the surrounding drier uplands. Although it is unlikely for livestock to directly impact the snake's prey base, protection of riparian and aquatic habitat in allotment management planning, through rotation and monitoring, and existing stock tanks adjacent to riparian areas minimizes effects to both fish and snakes.

Poorly managed livestock grazing can indirectly impact the narrow-headed gartersnake by (1) reducing structural richness of the vegetative community by overgrazing; (2) increased sedimentation; (3) causing a reduction or loss of the snake's prey base; (4) increased aridity of habitat; and (5) loss of thermal cover and protection from predators.

Indirect effects may result from increased sedimentation to occupied and proposed critical habitat where poor watershed conditions exist. In 2010, the Tonto National Forest implemented a national survey to assess watershed condition on forest service land; American Gulch and Houston Creek watersheds were the only two watersheds within the Diamond Rim Allotments considered impaired during these surveys Increased sedimentation can reduce reproduction in native fish which are a critical component to the narrow-headed gartersnake prey base. An increase in sedimentation by livestock may be difficult to quantify due to existing levels seen within the East Verde and Tonto Creek subbasins. Natural levels of turbidity from large storm events, wildfires, inability for certain soil types to support vegetation, and suspended particles of clay, silt organic matter, and microscopic organisms contributes to higher baseline levels as well as unnatural sedimentation from recreation and off highway vehicle use. High levels of sedimentation can hinder the attachment of certain groups of macroinvertebrates to the stream substrate which may ultimately affect the prey base for numerous species of resident fish, ultimately effecting the primary prey base for narrow-headed gartersnakes. However, due to our utilization standards and adaptive management, we anticipate levels of sedimentation caused by livestock in proposed critical habitat reaches will be low, ameliorated in part by the armored nature of creeks and streams with sheets of bedrock and large cobble along their banks.

Narrow-headed gartersnakes are strictly piscivorous, meaning they feed exclusively on fish. Given that livestock will have access to areas where both native and nonnative fish are present, it is likely that livestock could increase sedimentation in those habitats not protected by bedrock and cobble, potentially lowering macroinvertebrate populations. However, we do not anticipate temporary decreases of invertebrate populations to impact existing fish populations in proposed critical habitat reaches because management practices like rest, rotation, temporary exclusions (Tonto Creek), salting practices, utilization limits and timing of grazing can help to reduce soil erosion. Conservative to moderate utilization guidelines described in the proposed action on key species follow utilization guidance recommended in *Range Management Principles and Practices (Sixth Edition)* for grazing range types (semiarid grassland and shrub, oak woodland-Juniper, pine forest) with the Diamond Rim Allotments. Maintaining forage production aids in soil stability and protects streamside banks from

increased erosion. According to AGFD biologists, fish abundance is high in the East Verde and Tonto Creek subbasins (B. Burger personal communication, November 2016). Given the abundance of fish within proposed critical habitat streams and armored nature of most reaches, we do not anticipate that grazing at the landscape level across these allotments will adversely affect the snake's prey base of native and nonnative fish.

If gartersnakes are present, they may be affected by the loss of protective vegetative cover which could result in higher predation rates by native and nonnative predators and the loss of thermoregulatory options within microhabitat. Certain plant species, like willows, may be more important than other riparian plants to narrow-headed gartersnakes. For example, bankside willows are often used by narrow-headed gartersnakes as convenient basking sites given their low branches and potential for large root masses. Laying across branches above the water surface allows snakes to bask, yet quickly escape into the water at the first sign of danger. Following guidance in the Tonto National Forest Plan and Tonto National Forest Riparian Area Management Utilization Guidelines, riparian utilization of woody species will be limited to <50% of terminal leaders on top 1/3 of plants that are accessible to livestock (<6.0 ft. tall). This size class of willow is likely too small to provide an ecological benefit to narrow-headed gartersnakes and therefore we expect any potential direct effect to willow trees to be insignificant for the narrow-headed gartersnake.

Herbaceous species will be limited to 40% of plant species biomass for deergrass and maintain 6-8 inches of stubble height for emergent species such as rushes, sedges, cattails, and horsetails. Additionally, riparian areas will not be used as holding facilities, for trailering livestock, or for drought relief. When possible, riparian areas will be used during the winter when regeneration is more successful. Limiting the utilization rate of woody species to 50% or below and herbaceous species to 40% or below will facilitate the growth of seedlings, and sapling tree species into larger size classes (USDA 2002) that will provide both thermal and escape habitat for narrow-headed gartersnakes. It is important to note, based upon observations made during visual encounter surveys and our current understanding of narrow-headed gartersnake ecology that narrow-headed gartersnakes depend very heavily upon streamside rock structure such as crevices, medium- to large-sized boulders, adjacent talus, etc. as critical cover types. These features are not expected to be affected by the proposed livestock grazing.

Construction or maintenance of water sites is not likely to impact narrow-headed gartersnakes because earthen livestock tanks are not considered optimal habitat; they primarily occupy lotic systems occupied by fish. New site locations will not be within 300 feet of perennial reaches or in narrow-headed gartersnake proposed critical habitat.

Allotment management has the potential to impact narrow-headed gartersnakes if present within the action area or suitable habitat. Livestock will have access to graze in and around proposed critical habitat, riparian areas containing suitable habitat for gartersnakes, and reaches where snakes could occur in extremely low densities (upper Tonto Creek or the east Verde River). If snakes are present, the proposed action may impact individuals through minor and temporary alterations to their terrestrial habitat where shedding, brumation, thermoregulation, gestation, and other needs are met. However,

we anticipate overall impacts to the narrow-headed gartersnake to be minimized because as described above, the prey base will not be adversely affected, important terrestrial cover types like rock crevices and boulder piles are unlikely to be damaged or destroyed by livestock, and grazing utilization guidelines allow for plant maintenance, growth, or recovery (Holechek 2011).

Proposed Critical Habitat

PCE No.1: Aquatic or riparian habitat that includes:

PCE No. 1a Perennial or spatially intermittent streams with sand, cobble, and boulder substrate and low or moderate amounts of fine sediment and substrate embeddedness, and that possess appropriate amounts of pool, riffle, and run habitat to sustain native fish populations;

Effect: It is likely for livestock to alter existing substrate or change stream dynamics such as riffle, pool and run habitat in areas accessible to cattle not protected by large cobble and bedrock. Cattle using riparian areas may walk into stream habitat and create hoof imprints in mud or fine sediment. In a flowing stream, this disturbance can cause uplift of sediment to be carried downstream in addition to sedimentation. In rugged terrain, livestock will tend to concentrate in flatter areas that are more convenient to access (Holechek 2011) and tend to avoid large gullies, stony or rocky terrain, and rock outcropping (USDA, 2005; Cooper et al. 2008). Additionally, we anticipate that that livestock will avoid walking in areas where larger cobble or boulder piles are present, therefore, we do not expect livestock use in these areas will significantly alter these features within the actual stream. Conversely, we anticipate more disturbance along the bank where flatter ground exists, creating a potential for fine sediment to be deposited into the stream. This should not impact fish population or habitat because Tonto National Forest operates grazing permits under monitored limits and provides resting periods. In this area, riparian vegetation grazing is limited to 40 % of plant biomass and stubble must be maintained at 6-8 inches for deer grass (provides stream-side cover and inhibits channelization and erosion), thus maintaining cover, reducing erosion, and providing shading for aquatic species. Further, changes in livestock distribution will be based on utilization monitoring and resources condition with standards and guidelines developed to protect sensitive riparian vegetation, soils, protected species, and reduce grazing impacts to perennial waters and water quality (Tonto National Forest, Forest plan 1985, FSH 2209.13).

PCE No. 1b: A natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of processing sediment loads;

Effect: It is not likely the livestock will alter the natural flow of the East Verde River, Tonto or Houston creeks. There will be no withdrawal of water from lotic drainages and there are adjacent stock tanks within the action area that can be used in severe drought conditions.

PCE No. 1c: Shoreline habitat with adequate organic and inorganic structural complexity (e.g., boulders, cobble bars, vegetation, and organic debris such as downed trees or logs, debris jams), with appropriate amounts of shrub-and sapling-sized plants to allow for thermoregulation, gestation, shelter, protection from predators, and foraging opportunities; and);

Effect: Shoreline habitat will be temporarily affected as livestock use, specifically vegetation, amounts of shrub-and sapling-sized plants and levels of organic debris. To prevent damage to vegetation that utilization in riparian areas will be limited to <50% of terminal leaders on top 1/3 of plants that are accessible to livestock (<6.0 ft. tall). Herbaceous species will be limited to 40% of plant species biomass for deergrass and maintain 6-8 inches of stubble height for emergent species such as rushes, sedges, cattails, and horsetails. Limiting the utilization rate of woody species to 50% or below and herbaceous species to 40% or below will facilitate the growth of seedlings, and sapling tree species into larger size classes (USDA, 2002) that will provide both thermal and escape habitat for narrow-headed gartersnakes and minimize impacts to riparian vegetation. Although vegetation is an important feature to narrow-headed gartersnakes, they depend very heavily upon streamside rock structure such as crevices, medium- to large-sized boulders, adjacent talus, etc. as critical cover types. There are areas on the East Verde River and its confluence with Ellison Creek that are inaccessible (large waterfalls, rolling bedrock sheets) to livestock. Similar features may exist in Upper Tonto Creek but are not as large in scale. It is unlikely for livestock to alter PCE features such as boulders, downed trees and debris jams.

PCE No. 1d: Aquatic habitat with no pollutants or, if pollutants are present, levels that do not affect survival of any age class of the narrow-headed gartersnake or the maintenance of prey populations.

Effect: Livestock in riparian areas can alter water quality through excessive excrement, resulting in elevated levels of nitrogenous compounds (ammonia). In addition, fecal contamination may cause eutrophication of water and an increase in planorbid snail numbers, number of nematode parasites, and the rate of some parasites. (Johnson *et al*. 1999). This will not have an effect on individual narrow-headed gartersnakes because there are no known extant populations within the action area; if snakes are present, the most likely location would be Upper Tonto Creek where livestock are excluded from a two mile stretch of the creek during summers. Critical habitat for narrow-headed gartersnakes within the action area makes up only lotic sites, thus, any pollutants by cattle will not be concentrated and only be temporary because the system has perennial flow at rates that fluctuate depending on the season... For these reasons, we do not anticipate any pollutants by livestock to Diamond Rim Allotments drastically alter the snakes prey base.

PCE No. 2: Adequate terrestrial space (600 feet (182.9 meters) lateral extent to either side of bankfull stage) adjacent to designated stream systems with sufficient structural characteristics to support life-history functions such as gestation, immigration, emigration, and brumation.

Effect: Livestock use in upland areas to the East Verde River, Tonto and Houston creeks will not remove structural characteristics like boulders where narrow-headed gartersnakes may seek cover. However, livestock may decrease vegetation cover on the floodplain used by snakes. Upland forage utilization would be managed at a level corresponding to light to conservative grazing intensity in order to provide for grazed plant recovery, increases in herbage production, and retention of herbaceous litter to protect soils. Conservative use equates to 30 to 40 percent on herbaceous species and up to 50 percent use on browse.

PCE No. 3: A prey base consisting of viable populations of native fish species or soft-rayed, nonnative fish species.

Effect: East Verde River, Tonto and Houston creek reaches within the action area are known to inhabit both native and nonnative fish species. The East Verde River is occupied by rainbow trout, green sunfish, yellow bullhead catfish, fathead minnow, roundtail chub, desert sucker, speckled dace, and longfin dace. (S. Lashway, personal communication, November 2016). Although no thorough fish assemblage surveys have been completed in Houston Creek, AGFD biologists have observed natives like longfin dace, but also nonnative green sunfish and fathead minnow. According to a 2013 AGFD Fish and Riparian Herpetofauna Survey report, the Tonto Creek reach, upstream of the Houston Creek confluence contained rainbow and brown trout, desert sucker, green sunfish, yellow bullhead, and Sonora sucker. Livestock use in these reaches could alter fish habitat in areas not protected by bedrock, rock outcroppings, large cobble, however it is not anticipated that livestock use will reduce native and nonnative fish populations because native and nonnative fish prey bases will not be indirectly adversely affected through loss of aquatic invertebrate populations caused by sedimentation. Sedimentation by livestock will be minimized by the following adaptive management actions: rest, rotation, temporary exclusions (Tonto Creek), salting practices, utilization limits and timing of grazing.

PCE No. 4: An absence of nonnative fish species of the families Centrarchidae and Ictaluridae, bullfrogs (Lithobates catesbeianus), and/or crayfish (Orconectes virilis, Procambarus clarki, etc.), or occurrence of these nonnative species at low enough levels such that recruitment of northern Mexican gartersnakes and maintenance of viable native fish or soft-rayed, nonnative fish populations (prey) is still occurring (USFWS 2013).

Effect: All perennial waters within the project area are occupied by numerous harmful nonnative species as described within this document including spiny-rayed fish, bullfrogs, and crayfish. The exception to this is Big Canyon. Livestock are not known to carry/transport nonnative predators from one site to another and therefore will not increase the spread of nonnative fish, crayfish or bullfrogs throughout the area. Although actions like building new water developments could create suitable habitat for harmful nonnatives like bullfrogs, only one adult bullfrog has been found within the project area and it was immediately removed; no other bullfrogs have been detected since. Based on low occurrences in the project area, it is unlikely for bullfrogs to colonize newly created habitat.

Determination of Effects – Narrow-headed Gartersnake

Criteria used to determine the effects that the proposed livestock grazing and management activities will have on the narrow-headed gartersnake was taken directly from the 2015 *Framework for Streamlining Grazing Consultations* (USFS 2015).

It is determined that the proposed action on the Diamond Rim Allotments, **May affect, not likely to adversely affect** narrow-headed gartersnake based on the following:

- Grazing will occur in riparian areas, however, there are no reported extant narrow-headed gartersnake populations in the action area. If snakes are present, they are presumed to be in

extremely low number given harmful nonnative aquatic predators occupying most perennial waters within the action area (T. Jones, personal communication, December 2016).

- Streamside rock structures, medium to large boulders and talus slopes important to narrow-headed gartersnakes are not expected to be affected by the proposed livestock grazing.
- Native and nonnative fish prey bases will not be indirectly adversely affected through loss of aquatic invertebrate populations caused by sedimentation. Sedimentation by livestock will be minimized by the following actions: rest, rotation, temporary exclusions (Tonto Creek), salting practices, utilization limits and timing of grazing.
- Improvements to increase water permanency will have little to no effect on narrow-headed gartersnakes because lentic sites are not considered suitable habitat; snakes do not currently occupy lentic sites within the project area.

Determination for Narrow-headed Gartersnake Proposed Critical Habitat

Criteria used to determine the effects that the proposed livestock grazing and management activities will have on the PCEs of critical habitat described above was taken directly from the 2015 *Framework for Streamlining Grazing Consultations* (USFS 2015).

It is determined that the proposed action on the Diamond Rim Allotments, **May affect, not likely to adversely affect** narrow-headed gartersnake critical habitat based on the following:

- Even though livestock will have some seasonal access to proposed critical habitat throughout the action area, a two mile stretch of Tonto Creek critical will be excluded from livestock use during summers.
- Much of proposed critical habitat along the East Verde River is in accessible to livestock given topography, large boulders and bedrock waterfalls. Further, the proposed action will not increase occupancy of harmful nonnative predators, or levels of sedimentation beyond natural occurring levels seen in the East Verde and Tonto Creek subbasins.
- Although some riparian vegetation will be removed, utilization limits will minimize impacts allowing for available cover for snakes; removal of vegetation will not impact narrow-headed gartersnakes ability to seek cover given their higher selection of rock crevices or entering the water channel when evading predators.
- Improvements to increase water permanency will not take place in proposed critical habitat.

Proposed Critical Habitat for Northern Mexican Gartersnake

There are no historic or recent observations of northern Mexican gartersnakes within the action area, therefore, the proposed action will not affect this species. Additionally, USFWS and AGFD have no desire to release or introduce northern Mexican gartersnakes to areas within the Diamond Rim Allotments.

The northern Mexican gartersnake proposed critical habitat would be affected by livestock grazing activities and factors discussed under that of the narrow-headed gartersnake. There are minor

differences in the proposed PCEs between the two gartersnake species. The northern Mexican gartersnake proposed critical habitat PCEs that differ include lentic wetlands (livestock stock tanks, springs, and cienegas) and aquatic habitats and water quality thresholds needed to support a native amphibian prey base (78 FR 41500). Therefore, some discussion below is similar to that described above for narrow-headed gartersnake critical habitat PCEs.

PCE No.1: Aquatic or riparian habitat that includes:

PCE No. 1a Perennial or spatially intermittent streams of low to moderate gradient that possess appropriate amounts of in channel pools, off-channel pools, or backwater habitat, and that possess a natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of processing sediment loads;

Effect: Seasonal livestock use of Tonto Creek will not alter or modify flow regimes or in channel pools. It is possible for livestock to trample areas near back water pools if accessible and free of debris jams but it is not anticipated that this would change the structure of the stream. Livestock will have access to these reaches for about 1-2 months or earlier if riparian utilization has been exceeded. At that time, the pastures within proposed critical habitat will be rested for one full growing season. Additionally, a two mile stretch of Upper Tonto Creek will be inaccessible to livestock during summers which will further minimize impacts.

PCE No. 1b: Lentic wetlands such as livestock tanks, springs, and cienegas;

Effect: Lentic wetlands will not be affected by the proposed action. Proposed critical habitat within in the action area only include lotic reaches. Improvements under the proposed will increase this PCE by the creation of new lentic sites.

PCE No. 1c: Shoreline habitat with adequate organic and inorganic structural complexity to allow for thermoregulation, gestation, shelter, protection from predators, and foraging opportunities (e.g., boulders, rocks, organic debris such as downed trees or logs, debris jams, small mammal burrows, or leaf litter);

Effect: Livestock grazing in Tonto Creek will alter shoreline vegetation that could be used for foraging, gestation, thermoregulation, shelter, and protection from predators. To mitigate loss of vegetation by grazing, utilization in riparian areas will be limited to 50% of terminal leaders on top 1/3 of plants that are accessible to livestock (<6.0 ft. tall). Herbaceous species will be limited to 40% of plant species biomass for deer grass and maintain 6-8 inches of stubble height for emergent species such as rushes, sedges, cattails, and horsetails. Limiting the utilization rate of woody species to 50% or below and herbaceous species to 40% or below will facilitate the growth of seedlings, and sapling tree species into larger size classes that will provide both thermal and escape habitat for northern Mexican gartersnakes and minimize impacts to riparian vegetation. Livestock may have access to these areas for about 1-2 months at a time or shorter if utilization guidelines are exceeded. This proposed action allows flexibility for land managers to restrict use in sensitive riparian areas to winter months. Winter use in riparian

areas is often favorable given that 1) soil compaction is minimized and bank trampling should be limited due to frozen ground and 2) utilization of herbaceous plants is not as detrimental because no growing parts are exposed at this time. Conversely there are draw backs, including damage to woody riparian communities that may provide protection to livestock in adverse winter conditions (Ehrhart and Hansen 1998). Similar to the East Verde River, large boulder and bedrock features exist in Upper Tonto Creek. It is unlikely for livestock to alter PCE features such as boulders, downed trees and debris jams. Small mammal burrows used by northern Mexican gartersnakes and smaller organic debris could be trampled by livestock but potential impact to this feature of the PCE is not anticipated to impact the snake since they are not present within the action area.

PCE No. 1d: Aquatic habitat with characteristics that support a native amphibian prey base, such as salinities less than 5 parts per thousand, pH greater than or equal to 5.6, and pollutants absent or minimally present at levels that do not affect survival of any age class of the northern Mexican gartersnake or the maintenance of prey populations.

Effect: Livestock use in aquatic systems may reduce amphibian prey base due to changes in water quality. Excessive excrement from livestock in occupied habitat may result in elevated levels of nitrogenous compounds (e.g., ammonia) that alter growth and development of various life stages of the frog, or even result in mortality of some individuals. In addition, fecal contamination may cause eutrophication of water and an increase in planorbid snail numbers, number of nematode parasites, and the rate of parasite infection that cause deformities in amphibians (Johnson et al. 1999). Conversely, a limited input of livestock excrement to aquatic habitats may promote algal and macrophyte growth that ultimately increases food resources for tadpoles and frogs (Maxell, 2000). Amphibians including barred tiger salamanders, toads, and spadefoots are known to occupy most of the perennial waters within the action area. Additionally, CLFs are known to have occupied 14 sites at one time or another. Although specific leopard frog water quality tolerances are not currently known, waters should not be anoxic, should not exhibit high sulfide levels, and should exhibit pH levels of no lower than 6.0 or higher than 9.0 (USFWS 2007). According to data from AGFD Riparian Herpetofuana Database, CLFs have persisted in stock tanks used by livestock with pH levels as low as 4.72 to high as 11.4 (pH data was collected using calibrated HANNA Combo Meter, #HI98129). Critical habitat for northern Mexican gartersnakes within the action area makes up only one lotic site, thus, any pollutants by cattle will not be concentrated, vary depending on natural flow and seasonal fluctuations. Further, because of timing and rest schedules, livestock excrement will only be temporary. The proposed action includes the creation of earthen livestock tanks which will create suitable habitat for amphibians and improve livestock concentrations and distribution, thus benefiting northern Mexican gartersnakes. New water developments will not be created within 300 feet from perennial reaches in near proposed critical habitat. For these reasons, we do not anticipate that livestock will alter the water quality in a way that would no longer support amphibian populations.

PCE No. 2: Adequate terrestrial space (600 feet (182.9 meters) lateral extent to either side of bankfull stage) adjacent to designated stream systems with sufficient structural characteristics to support life-history functions such as gestation, immigration, emigration, and brumation.

Effect: Livestock use in upland areas to Tonto Creek will not remove structural characteristics like boulders where narrow-headed gartersnakes may seek cover. However, livestock may decrease vegetation cover on the floodplain used by snakes. To mitigate loss of vegetation by grazing, utilization in riparian areas will be limited to 50% of terminal leaders on top 1/3 of plants that are accessible to livestock (<6.0 ft. tall). Herbaceous species will be limited to 40% of plant species biomass for deer grass and maintain 6-8 inches of stubble height for emergent species such as rushes, sedges, cattails, and horsetails. Upland forage utilization would be managed at a level corresponding to light to conservative grazing intensity in order to provide for grazed plant recovery, increases in herbage production, and retention of herbaceous litter to protect soils. Conservative use equates to 30 to 40 percent on herbaceous species and up to 50 percent use on browse.

PCE No. 3: A prey base consisting of viable populations of native fish species or soft-rayed, nonnative fish species.

Effect: PCE No. 3 is identical for narrow-headed and northern Mexican gartersnakes. Please see effects discussion under PCE No. 3 analysis for narrow-headed gartersnake proposed critical habitat. In addition to fish, northern Mexican gartersnakes also feed on amphibians. The maintenance or creation of new water developments will create suitable habitat for amphibians which will benefit the snake.

PCE No. 4: An absence of nonnative fish species of the families Centrarchidae and Ictaluridae, bullfrogs (Lithobates catesbeianus), and/or crayfish (Orconectes virilis, Procambarus clarki, etc.), or occurrence of these nonnative species at low enough levels such that recruitment of northern Mexican gartersnakes and maintenance of viable native fish or soft-rayed, nonnative fish populations (prey) is still occurring (USFWS 2013).

Effect: PCE No. 4 is identical for narrow-headed and northern Mexican gartersnakes. Please see effects discussion under PCE No. 4 analysis for narrow-headed gartersnake proposed critical habitat.

Determination of Effects – Northern Mexican Gartersnake

Criteria used to determine the effects that the proposed livestock grazing and management activities will have on the northern Mexican gartersnake was taken directly from the 2015 *Framework for Streamlining Grazing Consultations* (USFS 2015).

It is determined that the proposed action on the Diamond Rim Allotments, will have **no effect** on northern Mexican gartersnakes based on the following:

- Species is not present within the action area

Determination for Northern Mexican Gartersnake Proposed Critical Habitat

Criteria used to determine the effects that the proposed livestock grazing and management activities will have on the PCEs of critical habitat described above was taken directly from the 2015 *Framework for Streamlining Grazing Consultations* (USFS 2015).

It is determined that the proposed action on the Diamond Rim Allotments, **May affect, not likely to adversely affect** northern Mexican gartersnake proposed critical habitat based on the following:

- Even though livestock will have some seasonal access to proposed critical habitat throughout the action area, a two mile stretch of Tonto Creek critical will be excluded from livestock use during summers.
- The proposed action will not increase occupancy of harmful nonnative predators, or levels of sedimentation beyond natural occurring levels seen in the Tonto Creek subbasin.
- Livestock use is not anticipated to eliminate existing amphibian species (toads, leopard frogs, and salamanders) which are a prey base for northern Mexican gartersnakes.
- Although some riparian vegetation will be removed, riparian and upland utilization limits will minimize impacts allowing for available cover for snakes.
- Improvements to increase water permanency will not take place in proposed critical habitat and will create suitable habitat for the snake and its amphibian prey base.

Mexican Spotted Owl and Designated Critical Habitat

Under the proposed action, livestock grazing would occur in Mexican spotted owl PACs during the breeding season (March 1st – August 31st). Since the presence of humans and noise associated with livestock management activities could potentially result in effects to spotted owls such as temporary or permanent nest abandonment, the use of mechanized equipment such as chainsaws and ATV/UTVs other than on existing roads; spring branding and fall gathering; and maintenance of corrals or buildings would not be permitted inside of PACs during the breeding season (March 1st – August 31st); exceptions may be made if protocol surveys confirm non-nesting. This will be included in the AOI and AMPs. Impacts due to routine maintenance of fences will have little effect to owls because only 2 of the 12 PACs have pasture fences that intersect them and all routine maintenance of fences will be not be permitted in the breeding season. Even though 10 PACs butt against northern pasture boundaries where fences would likely exist, these pastures (and PACs) traverse the Mogollon Rim, thus a pasture fence is not needed given the natural cliff barrier. Approximately one half mile of fence in Oaks Springs PAC runs through the core with an additional one half mile through the PAC. Fence intersecting the Roberts Mesa PAC runs seven tenths of a mile and is less than 200 meters away from the core. Grazing-related activities in PACs during this sensitive period would be limited to routine herding in an effective manner that reduces time in PAC. This information along with the locations where mechanized equipment cannot be used during the breeding season will be provided to the permittee.

Impacts from tank cleaning or new water developments would be minimal because construction would not occur during the breeding season when noise from heavy equipment might disturb nesting owls (exceptions may be made if protocol surveys confirm non-nesting). Under the proposed action, new water developments would not occur in PACs or located in designated critical habitat. Heavy equipment would be restricted to existing roads when present. Tanks sites would be selected to avoid removal of large snags, downed logs, and large mature trees.

Potential effects from concentrations of livestock in suitable spotted owl foraging habitat including wet meadows and other forest openings could result in trampling of vegetation and compaction of soil, reducing foraging habitat quality by reducing hiding cover and food resources for prey. Water quality of streams, springs, wetlands, and stock tanks could potentially be impacted by grazing and result in effects to hiding cover and food resources for prey species. Potential effects to herbaceous cover under the proposed action would be managed through the length of the grazing period (how long plants are exposed to livestock grazing), frequency of grazing (how often plants are exposed to livestock grazing), grazing intensity (how much of a plants growth to date is removed during the grazing period; determined at the end of the grazing period), and forage utilization guidelines (how much of a plants annual growth is removed; determined at the end of the growing season). Timing of grazing and rotational grazing management descried throughout this document will minimize effects to herbaceous height and cover for prey species. These practices allow for herbaceous plant growth and recovery to occur under favorable climatic conditions as livestock are moved between pastures. Additionally, grazing intensity on summer or winter range browse species would be managed up to moderate levels (30-50% utilization). Herbaceous utilization would be managed at conservative levels (30-40%). Management at these levels would provide sufficient herbaceous forage and hiding cover for owl prey and to maintain soil conditions and, therefore, water quality.

Potential effects from livestock grazing to suitable foraging habitat in wetland areas near Tonto Creek, Horton Spring, a tributary to Ellison Creek, and Lewis Creek would be protected given portions have existing livestock exclosures. Congregation of livestock in these areas and near other water sources could also be mitigated through the placement of salt or mineral supplements in less sensitive areas such as uplands.

The Mexican Spotted Owl Recovery Plan encourages managing habitat for a diversity of prey species to help buffer against population fluctuations of individual prey species and provide a more constant food supply for the spotted owls (USFWS 2012). The amounts of remaining vegetative biomass resulting from different levels of grazing have shown varying levels of effects on small mammal populations important to Mexican spotted owls. Shifts among small mammal prey species on the Diamond Rim Allotments would be expected to occur in areas with livestock grazing (10 – 50% utilization) especially those close to water, salt, or mineral blocks. We anticipate there will be little to no shift in small mammal prey species in areas with decreased intensity to no grazing (0 – 10%) in areas farther from water or inaccessible to livestock (i.e. steep slopes and canyons) or the Round Valley Pasture which is closed to grazing until the range has recover. Managing grazing intensity and utilization of herbaceous vegetation at conservative levels (30 – 40%) would help meet this objective.

Routine maintenance of existing fence completed could also have a small effect on vegetative cover and soil conditions in suitable spotted owl foraging habitat when ATV/UTVs are used off-road along fence lines or when fencing material may be stock piled. This disturbance will be extremely localized and will be short in duration, therefore, we do not anticipate prey populations occurring around pasture fences to be affected.

Critical Habitat

Under this proposed action, locations selected for range improvements like construction of new waters will not result in the adverse effects to the PCEs of critical habitat.

Forest or Riparian Habitat PCEs

PCE No 1. A range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30 to 45 percent of which are large trees with diameter at breast height (dbh) (4.5 feet above ground) of 12 inches or more;
Effect: Livestock grazing will likely have little to no effect on diversity and size classes of mixed conifer and pine-oak because these species have low palatability to grazing livestock, especially cattle due to resin, turpentine, oleoresins commonly found in pines and conifers (Sampson and Jesperson 1963). Conversely, riparian forest types may be affected by livestock foraging on woody riparian species, however riparian utilization guidelines which limit to 50% of leaders browsed on upper 1/3 plants up to 6 feet tall should not change species richness or obstruct riparian woody species ability to develop in to large trees. If an area is heavily grazed, livestock can impact germination rates of riparian species directly and indirectly through foraging, soil compaction, trampling, limiting reproduction, and removing germination sites of riparian trees. However, some ground disturbance by livestock can increase microhabitat for germination and aid in stability of steep banks. Livestock can reduce or lower slopes of incised banks, making banks more suitable for vegetation to become established (Poff et. Al 2012). Although pine and conifer components of this PCE will likely not be affected by livestock, we anticipate come adverse impacts to the riparian tree germination and recruitment.

PCE No 2. A shade canopy created by the tree branches covering 40 percent or more of the ground;
Effect: Livestock will likely have no effect on shade canopy given they primarily feed on grasses and some palatable browse species.

PCE No 3. Large, dead trees (snags) with a dbh of at least 12 inches.
Effect: Livestock grazing will likely have no effect on the presence of large, dead trees (snags).

PCE No 4. High volumes of fallen trees and other woody debris;
Effect: Livestock will likely have little effect on volume of fallen trees and other woody debris (snags). Over time, livestock may trample or crush smaller diameter logs or woody debris but this disturbance would not result in substantial loss in volume.

PCE No 5. A wide range of tree and plant species, including hardwoods; and
Effect: Although livestock grazing can temporarily reduce plant biomass, grazing will likely have no effect on the range of plant species across critical habitat.

PCE No 6. Adequate levels of residual plant cover to maintain fruits and seeds, and allow plant regeneration
Effect: Livestock grazing following utilization guidelines (browse species up to moderate levels (30-50% utilization) and herbaceous utilization at conservative levels (30-40%)) should minimize any adverse

effect to plant cover and provide sufficient adequate levels of plant cover to trap fruit and seed as well as allow plant regeneration. Utilization levels described above allow for facilitation of growth and recovery of the plant (USDA 2002). As mentioned above, if an area is heavily grazed, livestock can impact germination rates of riparian species directly and indirectly through foraging, soil compaction, trampling, limiting reproduction, and removing germination sites of riparian trees. However, some ground disturbance by livestock can increase microhabitat for germination and aid in stability of steep banks. Livestock can reduce or lower slopes of incised banks, making banks more suitable for vegetation to become established (Poff et. Al 2012).

Canyon Habitat PCEs

Presence of water (often providing cooler temperatures and higher humidity than the surrounding areas);
Effect: Livestock grazing near canyon habitats will not eliminate presence of water because livestock tend to avoid rugged terrain, steep slopes, gullied canyons, rock outcroppings, and boulder piles (USDA 2002, Holechek 2011). Additionally, there are 31 wildlife waters across the Diamond Rim Allotments that exclude livestock. Under this proposed action, range improvements like construction of new water developments will increase permenant and seasonal water.

Clumps or stringers of mixed-conifer, pine-oak, pinyon-juniper, and/or riparian vegetation; and
Effect: Livestock will not change the structure of mixed conifer stringers, pine-oak, or pinyon-juniper habitats because they forage on grasses and palatable browse species. Grazing will likely reduce riparian vegetation when livestock have access. Riparian utilization guidelines that limit use up to 50% of 1/3 terminal leaders on top 1/3 of plants facilitate the growth of seedlings, and sapling tree species into larger size classes, thus minimize impacts to riparian vegetation. Further, allotment management plans include annual monitoring programs for riparian vegetation utilization to prevent overuse and adverse impacts to streams and riparian habitats.

Canyon walls containing crevices, ledges, or caves; and,
Effect: Livestock grazing will have no effect on canyon crevices, ledges or caves.

High percent of ground litter and woody debris.
Effect: Livestock grazing following utilization guidelines (browse species up to moderate levels (30-50% utilization) and herbaceous utilization at conservative levels (30-40%)) should minimize any affect negative effect to ground litter and woody debris. Presence of livestock will likely break down litter and woody debris into smaller pieces but not completely remove these features.

Determination of Effects – Mexican Spotted Owl

Criteria used to determine the effects that the proposed livestock grazing and management activities will have on the Mexican spotted owl was taken directly from the 2015 *Framework for Streamlining Grazing Consultations* (USFS 2015).

It is determined that the proposed action on the Diamond Rim Allotments, **May affect, but is not likely to adversely affect** Mexican spotted owls based on the following:

- Livestock grazing or livestock management activities will occur within PACs, but no human disturbance or construction actions associated with the livestock grazing will occur in PACs during the breeding season (exceptions may occur where recent surveys indicate non-breeding or infer absence).
- Tonto National Forest Riparian utilization guidance will be followed which limits riparian utilization of woody species to <50% of terminal leaders on top 1/3 of plants that are accessible to livestock (<6.0 ft. tall). Herbaceous species will be limited to 40% of plant species biomass for deergrass and maintain 6-8 inches of stubble height for emergent species such as rushes, sedges, cattails, and horsetails. Additionally, cattle would be moved when riparian and upland utilization levels are met, therefore, minimizing any negative, effects of grazing and providing time for range and stream channel condition to improve. This will ensure cover for prey species will not be adversely affected and the range would be maintained for potential for surface fire when desired.
- No livestock management activities/construction (such as fencing repair/creation or stock tank cleaning) will occur in Mexican spotted owl PACs (Protected Activity Centers) during the breeding season (unless non-nesting is confirmed) (March 1 to August 31) and no new water developments will be developed within PACs.

Determination for Mexican Spotted Owl Critical Habitat

Criteria used to determine the effects that the proposed livestock grazing and management activities will have on the PCEs of critical habitat described above was taken directly from the 2015 *Framework for Streamlining Grazing Consultations* (USFS 2015).

It is determined that the proposed action on the Diamond Rim Allotments, **May affect, but is not likely to adversely affect** Mexican spotted owl critical habitat based on the following:

- Tonto National Forest riparian utilization guidance will be followed which limits riparian utilization of woody species to <50% of terminal leaders on top 1/3 of plants that are accessible to livestock (<6.0 ft. tall). Herbaceous species will be limited to 40% of plant species biomass for deergrass and maintain 6-8 inches of stubble height for emergent species such as rushes, sedges, cattails, and horsetails. Additionally, cattle would be moved when riparian and upland utilization levels are met, therefore, minimizing any negative, effects of grazing and providing time for range and stream channel condition to improve. This will ensure cover for prey species will not be adversely affected and the range would be maintained for potential for surface fire when desired.
- Livestock grazing will have little to no effect on PCEs of forested or canyon MSO habitat pertaining to tree diameter, canopy closure, uneven-aged character, multi-layered canopy of overstory trees, snag basal area, and woody debris, or canyon ledges and crevices. Effects to

riparian woody species, plant cover and woody debris will be mitigated by Tonto National Forest upland and riparian utilization guidelines described above.

- Under this proposed action, locations selected for range improvements like construction of new waters not occur in critical habitat or result in the adverse effects to PCEs.

Gila Trout

Generally, where cattle are grazed, there are possible impacts to Gila trout habitat if adequate monitoring and utilization standards are not followed. Potential direct effects of cattle grazing to Gila trout include trampling of eggs, alevins (during spawning and incubation periods, from March to June), juvenile and adult fish. Potential indirect effects to Gila trout include elevated levels of sediment loading and reduction of stream channel stability and function. Increased sedimentation could impact spawning gravels, hyporheic flow, and stream production thus altering the macroinvertebrate prey base and impacting incubating eggs and alevins. These alterations could lead to lowered spawning success and recruitment of Gila trout.

Management actions under the proposed action are anticipated to provide protections for Gila trout and their habitats (both occupied and unoccupied). Cattle stocking rates are determined by annual utilization monitoring that is based on standards and guidelines developed to protect sensitive riparian vegetation, soils, protected species, and reduce grazing impacts to perennial waters and water quality (Tonto National Forest, Forest Plan 1985, FSH 2209.13). The proposed action includes monitoring of grazing vegetation utilization within riparian areas as well as soil, watershed, and water quality impacts (see details in Riparian Utilization Monitoring). The AMP is developed with the permittee and includes criteria for desired habitat conditions, range utilization standards, and monitoring plans. Annual monitoring ensures that these standards are not exceeded and annual operating instructions provide for appropriate rest-rotation schedules to adaptively manage and respond to changing climate and range conditions that may affect sensitive species and their habitats. Part of the proposed action includes addition of range improvements, such as off channel watering systems or fencing that reduces the need for access to sensitive riparian areas and watersheds, thus further protecting Gila trout and their habitats. Improvement actions like construction or maintenance of water developments is not likely to impact Gila trout because water sites will be 300 feet away from any perennial reach. Gila trout do not occupy any lentic site within the project area so they will not be impacted when existing tanks are cleaned. Heavy equipment will stay on existing roads where present and not cross perennial drainages occupied by Gila trout.

Dude Creek

Grazing may affect Gila trout that currently occupy the Dude Creek perennial reaches where they have been stocked because the area is not fully excluded by fencing. Impacts to fish in the creek less likely, because the creek is encompassed by steep slopes and contains forage species such as scrub oak, that are unpalatable or less palatable to cattle. Cattle use within the area is thus not highly likely or will be at low levels.

Webber and Chase Creeks

Webber Creek (Boy scout/Hells Half-acre pastures) and Chase Creek (Girl Scout pasture) within the Payson allotment are potential habitats for Gila trout reintroduction. Grazing may affect Gila trout that occupy this creek in the future as it is vulnerable to trampling and damage by both elk and cattle grazing because it is not fenced or excluded at this time. However, impacts to the area will be carefully monitored because Webber Creek is a key forest watershed, containing sensitive riparian vegetation and soils. Key watersheds provide additional protections for aquatic species habitats under the Tonto National Forest's Forest Plan in addition to the existing range utilization standards, including annual watershed condition monitoring.

Tonto Creek

Grazing may affect Gila trout that occupy Tonto Creek if they move downstream after future reintroductions in Haigler Creek. However, impacts from grazing will likely be low as the bordering pastures to the creek (Kings Ridge and Winter division of the Green Valley allotment) contain substantial off channel troughs and tanks that help move cattle away from sensitive riparian areas. Additionally, Tonto Creek access in most of these areas is seasonally excluded from grazing by fencing.

Determination of Effects – Gila Trout

Criteria used to determine the effects that the proposed livestock grazing and management activities will have on the Gila trout was taken directly from the 2015 *Framework for Streamlining Grazing Consultations* (USFS 2015).

It is determined that the proposed action on the Diamond Rim Allotments, **May affect, but is not likely to adversely affect** Gila trout based on the following:

- Access to the occupied perennial reaches of Dude Creek and the riparian areas is limited due to the steep slopes of the canyon;
- Available forage is considered fair to poor for cattle within the occupied Dude Creek watershed, consisting of woody deciduous shrubs and small forbes, likely reducing use by cattle;
- Allotment management plans include annual monitoring programs for riparian vegetation utilization to prevent overuse and adverse impacts to streams and riparian habitats for sensitive and protected aquatic species. Monitoring is used to develop each year's annual operating instructions that ensure adaptive management under changing environmental conditions. This strategy provides for annual review of grazing management and ensures appropriate use to maintain watershed function and condition.
- Improvements to increase water permanency will not be within 300 feet of a perennial reach.

Effects to Threatened and Endangered Wildlife, Plants, and Fish from the No Grazing Alternative

The 'No Grazing' alternative would result in a "No Effect" determination for 1) designated critical habitat for the Chiricahua leopard frog, 2) Mexican spotted owl and its designated critical habitat, 3) narrow-headed gartersnake and its proposed critical habitat, 4) Gila trout, and 5) proposed critical habitat for

the northern Mexican gartersnake given no livestock grazing or livestock management activities would occur within or near known TES populations or suitable habitat and primary constituent elements associated with Mexican spotted and gartersnake critical habitat. This alternative would promote improved riparian habitat (in areas not currently restricted or excluded), water quality, aquatic habitat, and upland conditions. Although other factors such as flooding regime, drought, and recreational impacts play a role in the quality of the habitat for species on the Diamond Rim Allotments, it is anticipated that non-use would result in greater improvement of upland and riparian areas to that of the grazing alternative. General habitat conditions for sensitive species would also improve with discontinuation of livestock grazing. Implementation of the No Grazing Alternative may begin to reverse some of the impacts resulting from past overgrazing practices on allotment.

Conversely, the "No Grazing" alternative could negatively impact individual Chiricahua leopard frogs (CLFs). Given that the frog's life cycle consists of eggs and larvae, the Chiricahua leopard frog requires permanent or semi-permanent water sources. Within the Payson Ranger District, habitats historically and currently used by CLFs include both natural and manmade structures, including dirt livestock tanks (USFWS 2007). Under the "No Grazing" alternative, dirt stock tanks would no longer be developed or maintained by the livestock permitee which overtime, may result in some less stable but permanent livestock tanks to shift to more ephemeral waters. Recovery actions by the FWS, AGFD, and FS will still continue and can include creation of new waters, but with a lack of waters being maintained by permittees there may be a shift which could potentially affect the frog's ability to establish a stable and secure metapopulation. A metapopulation can become established when local frog populations disperse to and become established at nearby waters (permanent or ephemeral). Although CLFs are known to use ephemeral waters during dispersal events, permanent water sites are critical for a functioning metapopulation and allows for successfully reproducing populations (USFWS 2007).

Implementation of the 'No Grazing' alternative would begin to reverse some of the impacts resulting from past overgrazing practices on the allotment and move the area toward the stated desired conditions. This alternative would provide the greatest benefit to threatened and endangered species, Tonto National Forest Management Indicator Species, and general wildlife species. Wildlife populations in the area, including endangered and sensitive species dependent on riparian habitat would benefit from improved habitat conditions.

Forest Service Sensitive Wildlife, Plants, and Fish

Sensitive species are defined as "those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by: (a) significant current or predicted downward trends in population numbers or density, or (b) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution. "

The most recent Region 3, Regional Forester's Sensitive Species List (2013) and the Tonto National Forest Sensitive species list, dated February 2015, were used in determining which, if any, sensitive species may be affected by the proposed action. Forest Service sensitive species known to occur or have suitable habitat within the action area are listed below in Table 17. All Forest sensitive species were

considered, however, only sensitive species that are known to occur or have suitable habitat on the Diamond Rim allotments will be included in greater detail in this evaluation.

The most current and available data on species, available habitat, survey history, biologists knowledge and experience, and a review of the Arizona Game and Fish Departments (AGFD) Heritage Data Management System (HDMS) and HabiMap were used to determine if any listed species, or their habitats may be affected by the proposed action.

Table 17: Sensitive Species and Bald/Golden Eagles Evaluated in Detail within the Action Area

Common Name	Scientific Name	Determination
American Peregrine Falcon	*Falco peregrinus anatum*	May affect individual American peregrine falcons, but is not likely to result in a trend toward federal listing or loss of viability.
Northern Goshawk	*Accipter gentiles*	May affect individual Northern goshawk, but is not likely to result in a trend toward federal listing or loss of viability.
Bald Eagle / Golden Eagle	*Haliaeetus leucocephalus* *Aquila chrysaetos*	May affect individual bald or golden eagles, but is not likely to result in a trend toward federal listing or loss of viability.
Desert Sucker	*Catostomus clarki*	May affect individual desert sucker, but is not likely to result in a trend toward federal listing or loss of viability.
Roundtail chub	*Gila robusta*	May affect individual roundtail chub, but is not likely to result in a trend toward federal listing or loss of viability.
Sonora sucker	*Catostomus insignis*	May affect individual Sonora sucker, but is not likely to result in a trend toward federal listing or loss of viability.
Mogollon Fleabane	*Erigeron anchana*	No effect on individual Mogollon fleabane or population viability of this species.
Senator Mine Alumroot	*Heuchera eastwoodiae*	May affect individual Senator Mine Alumroot, but is not likely to result in a trend toward federal listing or loss of viability.
Blumer's dock	*Rumex orthoneurus*	May affect individual Blumer's dock, but is not likely to result in a trend toward federal listing or loss of viability.
Broadleaf Lupine	*Lupinus latifolius ssp. Leucanthus*	No effect on individual broadleaf lupine or population viability of this species.
Metcalfe's Tick-trefoil	*Desmodium metcalfei*	May affect individual Metcalfe's tick-trefoil, but is not likely to result in a trend toward federal listing or loss of viability.

Common Name	Scientific Name	Determination
Arizona Bugbane	*Cimicifuga arizonica*	May affect individual Arizona bugbane but is not likely to result in a trend toward federal listing or loss of viability.
Arizona Phlox	*Phlox amabilis*	May affect individual Arizona phlox but is not likely to result in a trend toward federal listing or loss of viability.
Mayfly A	*Fallceon eatoni*	May affect individual Mayfly A but is not likely to result in a trend toward federal listing or loss of viability.
Parker's Cylloepus Riffle Beetle	*Cylloepus parkeri*	May affect individual Parker's Cylloepus Riffle Beetle, but is not likely to result in a trend toward federal listing or loss of viability.
Caddisfly A	*Wormaldia planae*	May affect individual Caddisfly A, but is not likely to result in a trend toward federal listing or loss of viability.
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	May affect individual Pale Townsend's big-eared bat, but is not likely to result in a trend toward federal listing or loss of viability
Western Red Bat	*Lasiurus blossevillii*	May affect individual western red bat, but is not likely to result in a trend toward federal listing or loss of viability
Spotted Bat	*Euderma maculatum*	May affect individual spotted bat, but is not likely to result in a trend toward federal listing or loss of viability
Allen's Lappet-Browed Bat	*Idionycteris phyllotis*	May affect individual Allen's lappet-browed, but is not likely to result in a trend toward federal listing or loss of viability

American Peregrine Falcon

Affected Environment

American peregrine falcons are known within the project area just below the Mogollon Rim near Webber Creek and east of Dude Creek. Multiple site visits to Webber Creek were made in 2005 when an American peregrine was observed briefly in the drainage. Subsequent surveys in 2005 resulted in no additional birds seen or evidence of breeding (AGFD, 2017). In 2005, biologists heard vocalizations and observed two sub-adults east of upper Dude Creek. The site was visited again in 2015 and resulted in the detection of one bird (AGFD, 2017, S. Tonn personal communication 1/09/2017).

Analysis of Effects

Direct and Indirect Effects: Nesting habitats are not likely to be impacted by activities under the proposed action as they prefer high cliffs that are inaccessible to cattle. There could be indirect impacts through modification of foraging habitat and disturbance to prey species. The allotments have foraging habitat (ponderosa pine, mixed conifer, pinyon-juniper, and grasslands) that contain commonly taken prey species such as jays, woodpeckers, mourning doves, band-tailed pigeons, flickers and various songbirds. Peregrine falcons feed almost exclusively on other birds but do not depend entirely on one small group of birds. There may be human disturbance during livestock operations. Prey species habitat will be improved or maintained based on utilization guidelines of conservative use (31-40%), and a deferred rotation grazing system to provide growing season rest. It is reasonable to expect that the proposed action will provide and maintain satisfactory vegetation, watershed (riparian), and soil condition. Activities under the proposed action such as maintenance or development of waters and fences will have minimal impacts on nesting American peregrine falcons given they nest on cliff faces where these improvements are not located. There may be disturbances to foraging birds however, impacts are expected to be short in duration. Tank cleaning or creation usually takes no more than two days and depending on distance and terrain, fence maintenance and creation can take up to two weeks (Kelly Bedson, personal communication, September 2017)

Determination of Effects

It is determined that the proposed action ***may affect individual American peregrine falcons, but is not likely to result in a trend toward federal listing or loss of viability***.

Northern Goshawk

Affected Environment

There are four known northern goshawk Post Fledgling Areas (PFAs) within the Diamond Rim Allotments near Robert's Draw, Broad Draw and Horton Creek, and between Bray and Sycamore creeks; all of which were last monitored in 2009. Monitoring in 2009 resulted in no responses in both Robert's Draw and Bray/Sycamore PFAs. A foot search in Broad Draw PFA resulted in one goshawk seen of unknown age and sex inside the PFA and another bird of unknown age and sex seen 1.2 miles west of the PFA. Over the last decade, protocol inventory surveys have taken place prior to implementation of fuel reduction treatments under the Myrtle and Christopher Hunter analysis areas (totaling over 60,000 acres) within the Diamond Rim Allotments. Inventory surveys within suitable habitat, conducted in 2007, 2008, and 2009 resulted in only four northern goshawk observations in 2008; all within the Robert's Draw PFA.

Analysis of Effects

Direct and Indirect Effects: Indirect effects can result from livestock grazing, causing a loss of habitat or habitat quality for northern goshawk prey (ground dwelling small mammals and birds). When rodent prey decrease in response to reduced vegetative cover, their avian predators decrease as well (Bock et al. 1993). Livestock grazing can directly impact rodents by trampling and collapsing burrows, compacting soils which hinders burrow construction, and by removing rodent food sources such as seed heads (Heske and Campbell 1991; Hayward et al. 1997; Adler and Lauenroth 2000). Avian prey species are also indirectly affected by the impacts grazing has on vegetation (Bock et. al. 1993). Livestock can reduce

forage production, which reduces litter production, increases soil compaction, and reduces infiltration. These changes to the soil, and consequently the vegetation, may affect breeding birds negatively, especially those that depend on dense herbaceous ground cover (Saab et al. 1995). A reduction in herbaceous vegetation can lead to an increased chance for nest predation, nest parasitism, exposure to elements, and ultimately nest failure. The use of rotational grazing system, utilization guidelines and biomass based stocking rates should keep a level of use that will not result in any long-term effects to the potential habitat for this species. Activities under the proposed action such as maintenance or development of waters and fences will have minimal impacts on nesting northern goshawks. Of the four known goshawk areas, no existing pasture fences run through the PFAs, further any existing fence is more than one quarter mile away from any PFA boundary. Under the proposed action, new construction of waters will not occur inside of PFAs. There are four existing waters within two PFAs that may receive routine maintenance over the next 10 years but will not be cleaned during the breeding season unless non nesting is determined. There may be disturbance to foraging birds however, impacts are expected to be short in duration. Tank cleaning or creation usually takes no more than two days and depending on distance and terrain, fence maintenance and creation can take up to two weeks (Kelly Bedson, personal communication, September 2017)

Determination of Effects

It is determined that the proposed action ***may impact individual northern goshawks, but is not likely to result in a trend toward federal listing or loss of viability***.

Sensitive Fish: Desert Sucker, Sonora Sucker, and Roundtail Chub

Affected Environment

Desert Sucker

There are known populations of desert sucker within the action area, along the East Verde River, within the Payson and Cross V allotments and upper Tonto Creek on the Indian Gardens allotment. Additionally, the project area contains known populations in lower Tonto Creek, along the northeastern boundary of Hells Gate Wilderness Area, east of Green Valley Allotment and along the southwestern boundary of the wilderness area, south of the Star Valley Allotment (AGFD, 2017).

Sonora Sucker

There is one drainage within the action area inhabited by Sonora suckers. Surveys conducted by AGFD in 2011 resulted in observations of Sonora sucker in the East Verde River near Flowing Springs.

Roundtail Chub

On April 6, 2017 the U.S. Fish and Wildlife (FWS) withdrew the proposed listing for headwater chub (Gila nigra) and roundtail chub (Gila robusta) in the Lower Colorado River Basin due to the findings of the Joint Committee on the Names of Fishes. These findings concluded that the two formerly proposed species as well as the currently listed Gila chub (Gila intermedia) are no longer valid species and should be all considered roundtail chub. The FWS is still working internally to clarify the process that will be taken for this species complex. Roundtail and headwater chub have no current federal listing status but

are still on the Regional Forester's sensitive species list as separate entities and therefore will be analyze as sensitive species but group into a single analysis.

Current population trend and status information indicates numbers may be low for roundtail chub within the action area. Arizona Game and Fish Department staff attempted collection of roundtail chub in the East Verde River in conjunction with the East Verde River/Payson pipeline project during July, 2016 and collected just six adult chub (S. Lashway, personal communication). Lower Tonto Creek surveys near and around Tontozona found no chub in 2016 (S. Williams, personal communication 2016). This species has previously been found in the East Verde River, lower Ellison, and Webber Creek in the Payson and Cross V allotments, and Houston Creek and Tonto Creek in the Star Valley allotment. Green Valley is adjacent to the Cross V allotment and includes waters (i.e. Ellison and Webber creeks) that feed the East Verde River. Indian Gardens includes unoccupied headwaters of Tonto Creek, but these areas feed into potentially occupied reaches downstream.

Analysis of Effects to Sensitive Fish

Desert and Sonora suckers and roundtail chub are known to occur within deeper, perennial sections of East Verde River and desert suckers in portions of Tonto Creek. Desert suckers have persisted within this riparian habitat with past grazing pressure. The proposed action will impose seasonal restriction on grazing in portions of upper Tonto Creek where desert suckers are known to occur. Potential threats related to the action include direct harm through trampling within spawning or rearing stream habitats to eggs, larvae, and juvenile fish; damage to riparian vegetation resulting in increased water temperatures, sedimentation, and reduced channel stability; and flow diversion or withdrawals for watering within the occupied watersheds. Management approaches under the proposed action are anticipated to provide additional protections for desert suckers and roundtail chub and their habitats (both occupied and unoccupied). Cattle stocking rates are determined by annual utilization monitoring that is based on standards and guidelines developed to protect sensitive riparian vegetation, soils, protected species, and reduce grazing impacts to perennial waters and water quality (Tonto National Forest, Forest plan 1985, FSH 2209.13). The proposed action includes monitoring of grazing vegetation utilization within riparian areas as well as soil, watershed, and water quality impacts. Annual monitoring ensures that these standards are not exceeded and annual operating instructions provide for appropriate rest-rotation schedules to adaptively manage and respond to changing climate and range conditions that may affect sensitive species and their habitats. Part of the proposed action includes addition of range improvements, such as off channel watering systems (troughs) or fencing that reduces the need for cattle to access sensitive riparian areas and watersheds, thus further protecting aquatic species habitats. Activities under the proposed action such as maintenance or development of waters and fences will have minimal impacts on native fishes. Water developments would not be built within 300 feet of perennial streams. New spring developments would be constructed with the spring box designed so that residual flow is left at spring head to prevent dewatering. It is unlikely that heavy equipment would cross perennial waters unless traveling on an existing road bed.

Determination of Effects to Sensitive Fish

It is determined the proposed action will have ***may affect individual desert suckers, Sonora suckers, and roundtail chub but is not likely to result in a trend toward federal listing or loss of viability.***

Mogollon Fleabane

Affected Environment

This species occurs at granite cliff faces in chaparral and pine forest. There is one historic observation in the action area on the Star Valley Allotment. This locality was last surveyed in 1990. There is also a historic population from 1973 approximately one half mile east of the action area in Tonto Creek and another five miles west of the action area reported in 1937 from Pine Creek within the Tonto National Bridge State Park. Suitable habitat does exist within the action area.

Analysis of Effects

Direct and Indirect Effects: It is unlikely that range activities will have any direct or indirect impacts on Mogollon fleabane or potential habitat because it occupies rock and cliff faces inaccessible to livestock. (R. Madera, personal communication, April 17, 2017). Activities under the proposed action such as maintenance or development of waters and fences will have minimal impacts on Mogollon fleabane. Heavy equipment used to repair or create waters or fences are likely to stick to existing roads or two-tracks and not over steep and rocky terrain.

Determination of Effects

Given suitable habitat for the species is inaccessible to livestock, it is determined that the proposed action will have ***no effect on individuals or population viability of this species***.

Metcalfe's Tick-trefoil

Affected Environment

There are no known populations of Metcalfe's tick-trefoil within the action area, however, suitable habitat within the action area has not been routinely survey over the last decade. Suitable habitat may exist along rocky slopes and canyons in shaded riparian areas in Ponderosa pine forest, mixed conifer, Pinyon-juniper grass and semi-desert grasslands (R. Madera, personal communication April 17, 2017). The closest known population inhabits Fossil Creek, almost 10 miles from the action area and last reported in 2005.

Analysis of Effects

Impacts may potentially occur to any individuals of this species growing in the analysis area. Although the species can be found in rocky canyons less accessible to livestock, suitable habitat also exists in forested riparian and upland areas where livestock grazing is expected. Direct effects include trampling of plants if present. Livestock grazing may indirectly impact this species if present by degrading or altering potential habitat as a result of soil compaction, erosion, increased water runoff and decreased water infiltration. Additionally, disturbed areas may precipitate the introduction and spread of invasive species which could compete with the alumroot for resources. The proposed action includes adaptive management and rest rotation of pastures which will help mitigate adverse impacts to this species if present within the action area. Best management practices for range will decrease the likelihood of long term impacts to this species. Activities under the proposed action such as maintenance or development of waters and fences will have minimal impacts on Metcalfe's tick-trefoil. Heavy equipment used to

repair or create waters or fences are likely to stick to existing roads or two-tracks. Location selection of new waters will be made by the District Wildlife Biologist and Range staff in coordination with the permitte and sites will be surveyed for sensitive plants prior to implementation.

Direct and Indirect Effects:

Determination of Effects
Although the species has not been reported within the analysis area, there may be suitable habitat. Therefore, it is determined that the proposed action ***may impact individual Metcalfe's tick-trefoil but not likely to result in a trend toward listing or a loss of viability.***

Senator Mine Alumroot

Affected Environment
Endemic to central Arizona, the Eastwood Alum Root occurs on Mogollon Rim, on Christopher Creek, Hunter Creek, and Barnhardt Pass. Found on moist shaded slopes in ponderosa pine forests and canyons, mostly in inaccessible terrain, the alum root is known to occur within the proposed project boundary. There is only one historic observation of Senator Mine alumroot within the project area downstream of the See Canyon proposed stream corridor from 1966.

Analysis of Effects
Direct and Indirect Affects: Similar to Metcalfe's tick-trefoil, livestock grazing may indirectly impact this species if present by degrading or altering potential habitat as a result of soil compaction, erosion, increased water runoff and decreased water infiltration. However, these impacts are less likely for Senator Mine Alumroot given its found on steeper slopes and canyons often inaccessible to livestock. Disturbed areas may precipitate the introduction and spread of invasive species which could compete with the alumroot for resources. The proposed action includes adaptive management and rest rotation of pastures which will help mitigate adverse impacts to this species. Best management practices for range will decrease the likelihood of long term impacts to this species. Activities under the proposed action such as maintenance or development of waters and fences will have minimal impacts on Senator Mine alumroot. New waters would not be built within 300 feet of perennial streams. New spring developments would be constructed with the spring box designed so that residual flow is left at spring head to prevent dewatering. It is unlikely that heavy equipment would cross perennial waters unless traveling on an existing road bed. Location selection of new waters will be made by the District Wildlife Biologist and Range staff in coordination with the permitte and sites will be surveyed for sensitive plants prior to implementation.

Determination of Effects
Although the species has not been reported within the analysis area, the area has not been throughouly surveyed and there there may be suitable habitat. Therefore, it is determined that the proposed action ***may impact individual Senator Mine alumroot but not likely to result in a trend toward listing or a loss of viability.***

Blumer's Dock

Affected Environment

In the 1980s, Blumer's dock was transplanted to 17 localities within the Tonto National Forest, largely from seed or seedlings taken from native populations in the Sierra Ancha Mountains on the Pleasant Valley Ranger District (Harris and Gobar 1993). Occurrences pulled from AGFD's HDMS within the action area include nine transplanted populations scattered along drainages below the Mogollon Rim. Translocations occurred in the late 1980s with more consistent monitoring up the early 1990s. Currently, status of transplanted populations in six of the nine drainages is unknown; Webber Creek, Ellison Creek, Dude Creek, Horton Spring and two populations on Tonto Creek. However botanists suspected a number of plants were extirpated by wildfires since the 1990's along with post fire impacts like flooding and erosion. Populations in Bray Creek, Chase Creek and the East Verde River were recently monitored in 2017. All populations appear to be declining or potentially extirpated. However, additional monitoring is needed to confirm. (Madera 2017, unpublished raw data).

Analysis of Effects

Grazing by both livestock and wildlife was identified as a primary threat to Blumer's dock Impacts of grazing by direct grazing and trampling have been documented at two sites on the Coronado National Forest and to a lesser degree on the Tonto National Forests (Harris and Gobar 1993). Chase Creek has an existing fence to keep livestock out of the transplanted area. Surveys in 2017 reported portions of the fence are in need of repair. Plans to repair the fence are underway and when completed, this area will be excluded from livestock grazing and not directly impacted by presence of livestock. The proposed action includes the creation of a livestock exclosure around Horton Springs, approximately five acres in size. Within this exclosure, the spring itself would be double fenced to keep both livestock and elk out of the spring which is where the Blumer's dock was transplanted. If plants are still present at Horton Springs, they would not be directly impacted by livestock grazing.

All other transplanted populations that still exist in the action area may be accessible to livestock grazing. If plants are present where livestock graze, Blumer's dock could be directly affected by grazing or trampling. When grazed, Blumer's dock has been shown to exhibit reduced vigor and abundance as well as inhibited seed production (Brooks 1999). Under the proposed action, utilization guidelines and livestock stocking rates are determined by annual utilization monitoring that is based on standards and guidelines developed to protect sensitive riparian vegetation, which will minimize impacts to this species (Tonto National Forest, Forest plan 1985, FSH 2209.13). Activities under the proposed action such as maintenance or development of waters and fences will have minimal impacts on Blumer's dock. New waters would not be built within 300 feet of perennial streams. New spring developments would be constructed with the spring box designed so that residual flow is left at spring head to prevent dewatering. It is unlikely that heavy equipment would cross perennial waters unless traveling on an existing road bed. Location selection of new waters will be made by the District Wildlife Biologist and Range staff in coordination with the permitte and sites will be surveyed for sensitive plants prior to implementation.

Determination of Effects
It is determined that the proposed action ***may impact individual Blumer's dock but not likely to result in a trend toward listing or a loss of viability.***

Broadleaf Lupine

Affected Environment
There is one known population of broadleaf lupine within the action area in upper reaches of the East Verde River. Broadleaf lupine occurs near permanent sources of water, along streams, springs, riparian areas in ponderosa pine forest, chaparral, and mixed conifer forests. Suitable habitat for the species exists within the action area.

Analysis of Effects
There are no known negative impacts from grazing. Main threats are habitat loss through wetland degradation (R. Madera, personal communication April 17, 2017). Research suggests that broadleaf lupine is toxic to livestock because of specific alkaloids they contain that may permanently affect spine shape of the fetus when a gestating cow consumes the plant. (Hall 1974, Ralphs 2002). It is likely this species will not be grazing given its potential toxicity and poor forage quality. Activities under the proposed action such as maintenance or development of waters and fences will have minimal impacts on broadleaf lupine. New waters would not be built within 300 feet of perennial streams. New spring developments would be constructed with the spring box designed so that residual flow is left at spring head to prevent dewatering. It is unlikely that heavy equipment would cross perennial waters unless traveling on an existing road bed. Location selection of new waters will be made by the District Wildlife Biologist and Range staff in coordination with the permitte and sites will be surveyed for sensitive plants prior to implementation.

Determination of Effects
It is determined that the proposed action will have ***no effect on individuals or population viability of this species***.

Arizona Bugbane

Affected Environment
Not known to occur in the project area or the Payson Ranger District however, there is a small portion of the project area that may contain suitable habitat. The species is known only from four disjunct populations in Coconino and Gila counties in central and northern Arizona (AGFD 1999; DeWald & Phillips 1996) including Bill Williams Mountain, Oak Creek Watershed, West Clear Creek Watershed, and Workman Creek Watershed in the Sierra Ancha Wilderness.

Analysis of Effects
Similar to Metcalfe's tick-trefoil, and Senator Mine Alumroot, impacts may potentially occur to any individuals of this species growing in the analysis area. Although the species can be found in rocky canyons less accessible to livestock, suitable habitat also exists in forested riparian and upland areas where livestock grazing is expected. Direct effects include trampling of plants if present. Livestock

grazing may indirectly impact this species if present by degrading or altering potential habitat as a result of soil compaction, erosion, increased water runoff and decreased water infiltration. Additionally, disturbed areas may precipitate the introduction and spread of invasive species which could compete with the alumroot for resources. The proposed action includes adaptive management and rest rotation of pastures which will help mitigate adverse impacts to this species if present within the action area. Best management practices for range will decrease the likelihood of long term impacts to this species. Activities under the proposed action such as maintenance or development of waters and fences will have minimal impacts on Arizona bugbane. Heavy equipment used to repair or create waters or fences are likely to stick to existing roads or two-tracks. Further, new water developments will not be within 300 feet of perennial waters. Location selection of new waters will be made by the District Wildlife Biologist and Range staff in coordination with the permitte and sites will be surveyed for sensitive plants prior to implementation.

Determination of Effects

Although the species has not been reported within the analysis area, the area has not been throughouly surveyed and there may be suitable habitat. Therefore, it is determined that the proposed action *may impact individual Arizona bugbane if present but not likely to result in a trend toward listing or a loss of viability.*

Arizona Phlox

Affected Environment

Not known to occur within project area. The closest observation is located in Camp Verde Arizona, approximetly 30 miles from the western boundary of the project area.

Analysis of Effects

Similar to Metcalfe's tick-trefoil, Senator Mine Alumroot, and Arizona bugbane, impacts may potentially occur to any individual Arizona phlox that may be present within the analysis area. Although the species can be found in rocky slopes less accessible to livestock, suitable habitat also exists in both pinyon-juniper woodlands and ponderosa pine-gambel oak communites where livestock grazing is expected. Direct effects include trampling of plants if present. Livestock grazing may indirectly impact this species if present by degrading or altering potential habitat as a result of soil compaction, erosion, increased water runoff and decreased water infiltration. Additionally, disturbed areas may precipitate the introduction and spread of invasive species which could compete with the alumroot for resources. The proposed action includes adaptive management and rest rotation of pastures which will help mitigate adverse impacts to this species if present within the action area. Best management practices for range will decrease the likelihood of long term impacts to this species. Activities under the proposed action such as maintenance or development of waters and fences will have minimal impacts on Metcalfe's tick-trefoil. Heavy equipment used to repair or create waters or fences are likely to stick to existing roads or two-tracks. Location selection of new waters will be made by the District Wildlife Biologist and Range staff in coordination with the permitte and sites will be surveyed for sensitive plants prior to implementation.

Determination of Effects

Although the species has not been reported within the analysis area, the area has not been throughouly surveyed and there may be suitable habitat. Therefore, it is determined that the proposed action *may impact individual Arizona phlox but not likely to result in a trend toward listing or a loss of viability.*

Mayfly A

Affected Environment

There are no known popualtions or detections of Mayfly A within the action area, howerver, the area has not been thoroughly surveyed and suitable habitat may exist.

Analysis of Effects

Livestock grazing may indirectly impact aquatic inverterbrates by altering water quality or sedimentation rates in areas they inhabit. Cattle stocking rates are determined by annual utilization monitoring that is based on standards and guidelines developed to protect sensitive riparian vegetation, soils, protected species, and reduce grazing impacts to perennial waters and water quality (Tonto National Forest, Forest plan 1985, FSH 2209.13). The proposed action includes monitoring of grazing vegetation utilization within riparian areas as well as soil, watershed, and water quality impacts. Annual monitoring ensures that these standards are not exceeded and annual operating instructions provide for appropriate rest-rotation schedules to adaptively manage and respond to changing climate and range conditions that may affect sensitive aquatic invertebrates and their habitats. Part of the proposed action includes addition of range improvements, such as off channel watering systems (troughs) or fencing that reduces the need for cattle to access sensitive riparian areas and watersheds, thus further protecting aquatic species habitats. Activities under the proposed action such as maintenance or development of waters and fences will have minimal impacts on Mayfly A if present. New waters would not be built within 300 feet of perennial streams. New spring developments would be constructed with the spring box designed so that residual flow is left at spring head to prevent dewatering. It is unlikely that heavy equipment would cross perennial waters unless traveling on an existing road bed.

Determination of Effects

Although the species has not been reported within the analysis area, the area has not been thoroughly surveyed and there may be suitable habitat. Therefore, it is determined that the proposed action *may impact individual mayfly A but not likely to result in a trend toward listing or a loss of viability.*

Parker's Cylloepus Riffle Beetle

Affected Environment

There are no known popualtions or detections of Parker's Cylloepus riffle beetle within the action area, howerver, the area has not been thoroughly surveyed and suitable habitat may exist.

Analysis of Effects

Livestock grazing may indirectly impact aquatic inverterbrates by altering water quality or sedimentation rates in areas they inhabit. Cattle stocking rates are determined by annual utilization monitoring that is based on standards and guidelines developed to protect sensitive riparian vegetation, soils, protected species, and reduce grazing impacts to perennial waters and water quality (Tonto National Forest, Forest plan 1985, FSH 2209.13). The proposed action includes monitoring of grazing vegetation utilization within riparian areas as well as soil, watershed, and water quality impacts. Annual monitoring ensures that these standards are not exceeded and annual operating instructions provide for appropriate rest-rotation schedules to adaptively manage and respond to changing climate and range conditions that may affect sensitive aquatic invertebrates and their habitats. Part of the proposed action includes addition of range improvements, such as off channel watering systems (troughs) or fencing that reduces the need for cattle to access sensitive riparian areas and watersheds, thus further protecting aquatic species habitats. Althought the species is not known to occur in the action area, suitable habitat may exist and they area has not been surveyed. Activities under the proposed action such as maintenance or development of waters and fences will have minimal impacts on Parker's Cylloepus Riffle Beetle if present. New waters would not be built within 300 feet of perennial streams. New spring developments would be constructed with the spring box designed so that residual flow is left at spring head to prevent dewatering. It is unlikely that heavy equipment would cross perennial waters unless traveling on an existing road bed.

Determination of Effects

Although the species has not been reported within the analysis area, the area has not been throughouly surveyed and there may be suitable habitat. Therefore, it is determined that the proposed action *may impact individual Parker's Cylleopus Riffle Beetle but not likely to result in a trend toward listing or a loss of viability.*

Caddisfly A

Affected Environment

There are no known popualtions or detections of Caddisfly A within the action area, howerver, the area has not been throuourly surveyed and suitable habitat may exist. The closest observations are from the early to mid 1980's 30 miles north of the project area along the Verde River and its tributaries.

Analysis of Effects

Livestock grazing may indirectly impact aquatic inverterbrates by altering water quality or sedimentation rates in areas they inhabit. Cattle stocking rates are determined by annual utilization monitoring that is based on standards and guidelines developed to protect sensitive riparian vegetation, soils, protected species, and reduce grazing impacts to perennial waters and water quality (Tonto National Forest, Forest plan 1985, FSH 2209.13). The proposed action includes monitoring of grazing vegetation utilization within riparian areas as well as soil, watershed, and water quality impacts. Annual monitoring ensures that these standards are not exceeded and annual operating instructions provide for appropriate rest-rotation schedules to adaptively manage and respond to changing climate and range conditions that may affect sensitive aquatic invertebrates and their habitats. Part of the proposed action includes

addition of range improvements, such as off channel watering systems (troughs) or fencing that reduces the need for cattle to access sensitive riparian areas and watersheds, thus further protecting aquatic species habitats. Althought the species is not known to occur in the action area, suitable habitat may exist and they area has not been surveyed. Activities under the proposed action such as maintenance or development of waters and fences will have minimal impacts on Caddisfly A if present. New waters would not be built within 300 feet of perennial streams. New spring developments would be constructed with the spring box designed so that residual flow is left at spring head to prevent dewatering. It is unlikely that heavy equipment would cross perennial waters unless traveling on an existing road bed

Determination of Effects

Although the species has not been reported within the analysis area, the area has not been thoroughly surveyed and there may be suitable habitat. Therefore, it is determined that the proposed action *may impact individual Caddisfly A but not likely to result in a trend toward listing or a loss of viability.*

Pale Townsend's Big-eared Bat, Western Red Bat, Spotted Bat, and Allen's Lappet-Browed Bat (Allen's big-eared bat).

Affected Environment

Pale Townsend's Big-eared Bat

There are no known populations of Pale Townsend's big-eared bats located within the action area, however, there is a population approximately one mile west of the Star Valley Allotment. Survey and monitoring information for the area is limit and suitable habitat may occur. Townsend's big-eared bats prefer abandoned mines or caves (A. McIntire, personal communication, December 2016; Adams, 2003). Suitable habitat exists given there are many rock outcrops within the action area and 14 known caves. According to AGFD HDMS occurrence data, nearest roost is located just over one mile west of the Star Valley Allotment. This roost, located in an abandoned mine was first reported in 1995 and surveyed annually through 1998 by Forest Service and again in 2003 by AGFD. In August of 2003, AGFD biologists reported up to 10 Pale Townsend's Big-eared Bat, two of which were lactating females.

Western Red Bat

There are no observations of this species within the action area, however survey and monitoring information is limited and suitable habitat may occur. The nearest observation is from 2011 when biologists captured red bats along Fossil Creek, approximately 15 miles from the western project border. There is also a record from 1962 at Spring Creek, in the Sierra Ancha Mountains (approximately 6 miles from the southern project border). Red bat habitat is associated with broad-leaf deciduous riparian areas and other wooded areas at elevations of 1900-7200 ft. This species roosts among dense foliage and resembles a dead leaf when hanging. Red bats depends on riparian habitats for roosting and probably foraging as well (A. McIntire, personal communication, 11/09/2017).

Allen's Lappet-browed Bat

There are no observations of this species within the action area, however survey and monitoring information is limited and suitable habitat may occur. The nearest detection was in 2011 approximetly

10 miles west of project border; also from 2009, 12 miles north of project border. Biologists netted this species in the Sierra Ancha Mountains in 1993 (approximately 6 miles from the southern project border). Allen's lappet-browed bat habitat is mostly known from the southern Colorado Plateau, the Mogollon Rim and adjacent mountain ranges and is most often associated with ponderosa pine, pinyon-juniper, and Mexican woodland and riparian areas of sycamores, cottonwoods, and willows. On the Coconino and Apache-Sitgreaves national forests, the species is known to roosts in caves and abandoned mine shafts, but also common in tree roosts (A. McIntire, personal communication, 11/09/2017).

Spotted Bat

There are no observations of this species within the action area, however survey and monitoring information is limited and suitable habitat may occur. Habitat associations vary over this species' range but has mostly been captured in dry desertscrub and sometimes in ponderosa pine forest; Roost sites are poorly known, but they seem to prefer roosting in crevices and cracks in cliff faces (A. McIntire, personal communication, 11/09/2017).

Analysis of Effects

Disturbance to Pale Townsend's big-eared, western red bats, Allen's lappet-browed bats, and spotted bats (if present in the action area) may occur when noise from range activities such as personnel, vehicles, and dogs are present within close enough proximity to roost locations. Noise disturbance at certain intensities can disturb bats in their roosts and result in premature exiting or unnecessary arousal from hibernation. Since hibernating bats often have only enough fat reserve to bring them out of hibernation once, disturbance during the winter can trigger bats to arouse from hibernation, only to go resume hibernation without enough fat reserves to come back out in the spring. Noise disturbance of long duration can cause temporary or permanent roost abandonment. We expect these types of disturbance to be reduced for Pale Townsend's big-eared, Allen's lappet-brown bats, Allen's lappet-brown bats, and spotted bats given they primarily roost in abandoned mines, cliff crevices or caves which livestock cannot readily access and improvemtns are not likely to occur. Activities under the proposed action such as maintenance or development of waters and fences would occur during the day when bats are likely to be in day time roosts and often times are not constructed in rugged and steep, cliffed areas. Tank cleaning or creation usually takes no more than two days and depending on distance and terrain, fence maintenance and creation can take up to two weeks (Kelly Bedson, personal communication, September 2017). New waters will benefit this species for both foraging and providing more sources for drinking.

Further, only 4 of 14 known caves providing suitable habitat for thesespecies are within a quarter mile of a pasture fence, thus, any noise disturbance to potential roosting bats by routine fence maintenance would likely be limited to these four caves. Western red bats are more likely to be disturbed by range activities, however, potential effects will be minimized because proposed improvements will not occur within 300 feet of perennial draianges where the species is likely to roost.

Negative impacts to water quality in stock tanks could potentially occur reducing habitat quality for macro-invertebrates that the bats prey on. These potential effects to vegetation and water quality

would be managed by limiting the length of grazing of a pasture in a given year, using a rotational grazing management system, managing grazing intensity at conservative levels and forage utilization at conservative levels (30-40%).

Livestock grazing and the subsequent reduction in host plants can negatively affect insects that insectivorous bats eat. Aboveground macroarthropods (insects and arachnids) experienced large decreases with moderate or heavy grazing, but conversely with light grazing showed slight increases (Milchunas et al. 1998). On the other hand, beneficial impacts would be expected through maintenance of existing structural improvements like stock tanks and drinkers with wildlife ramps. This maintenance would improve or maintain available waters on the allotment, which provides drinking water and forage areas for bats.

Determination of Effects

Although we do not anticipate any direct effects to individual Pale Townsend's big-eared bats, western red bats, Allen's lappet-brown bats, and spotted bats, given there may be some noise disturbance throughout the length of the project and indirect impacts to bat's prey species through reduction in grazed vegetation and water quality, it is determined that the proposed action ***may impact individual bat species but not likely to result in a trend toward listing or a loss of viability.***

Bald and Golden Eagle Protection Act

Affected Environment

Bald Eagle

The Bald Eagle was delisted on August 8, 2007 and is currently in monitoring status by the USFWS. There are no known breeding populations of bald eagles within the action area. The lack of breeding observations is likely due to unsuitable habitat throughout the Diamond Rim Allotments with the exception of lower Tonto Creek north of Gisela (K. License, personal communication, August 28, 2017). Conversely, eagles have recently been reported at the Buckhead Mesa Landfill (Hallock, 2017) which is located inside the action area. Buckhead Mesa Landfill operates under a Special Use Authorization to use or occupy Forest Service lands. The permit covers 57.77 acres within the action area and observed roost habitat may include both the landfill and adjacent Forest Service land. Despite these sightings, there have been no reports of nesting bald eagles at the landfill and biologists suspect this is a winter roost site where eagles opportunistically forage (K. Jacobson, personal communication, August 16, 2017). The Arizona Game and Fish Department (AGFD) has plans to thoroughly monitor this roost location to determine if suitable nesting habitat exists.

There is one known breeding population outside the action area, just south of the Star Valley Allotment, east of Gisela along lower Tonto Creek (AGFD, 2017). In 2017, surveys within this breeding area confirmed successful nesting with two fledged eagles after early June (K. License, personal communication 08/28/2017).

Golden Eagle

There is one known breeding population of golden eagles within the action area located on the Star Valley Allotment in a tributary to Tonto Creek. According to AGFD, the nest was discovered in 2013 during routine nest searches. In 2014, a breeding attempt was documented but failed by April 11, presumably during incubation. In 2015, the eagles were not observed in the area during two occupancy flight checks early in the nesting season (K. Jacobson, personal communication, August 2017). The nearest known population of golden eagles outside the action area was reported in 2013 which is located over five miles west in Pine Creek.

Analysis of Effects to Bald and Golden Eagles

Noise from livestock management operations may impact nesting golden eagles present within the action area. This disturbance can lead to nest abandonment depending on noise level and duration, the tolerance of the nesting pair, or what phase of nesting the disturbance takes place (USFWS 2007b). Given there have been no reported breeding populations or nest sites of bald eagles within the action area, livestock management operations is less likely to impact any nest productivity, however, if a breeding pair of bald eagles is discovered, we anticipate similar affect to those of nesting golden eagles. Any disturbance by livestock will be minimized because a majority of these activities will not occur within 1000 feet of any active golden eagle nest. Depending on the activity and location of the nest, these restrictions may be lifted by the wildlife biologist after consulting with the USFWS and AGFD.

There is limited bald eagle nest habitat available on the Diamond Rim Allotments due to lack of suitable foraging areas close to large bodies of water with adequate food supply. Routine management operations (fence maintenance, pasture movement, etc.) taking place in potential roost or foraging areas may cause a disturbance or disruption to eagles if present. This disruption can interfere with feeding and sheltering, thus reduce chances of survival and productivity (USFWS, 2007b). Livestock grazing and operations will not occur within the 55.77 acre Buckhead Mesa Landfill where a winter roost site exists, however, bald or golden eagles roosting or foraging on adjacent to the landfill on Forest Service land may be impacted by noise or human disturbance through livestock management activities.

Activities under the proposed action such as maintenance or development of waters and fences will have minimal impacts on nesting bald or golden eagles if present. Currently, there is only one nesting golden eagle pair along a tributary to Tonto Creek adjacent to an existing pasture fence; fence maintenance would not occur within 1,000 feet of an active eagle nest during the breeding season. Depending on the specific activity and location of the active nest, these restrictions may be lifted on a case by case basis by the wildlife biologist after consulting with the USFWS and AGFD. New water developments will not be created during sensitive breeding seasons or within 300 feet of perennial streams. There may be disturbance to foraging birds however, impacts are expected to be short in duration. Tank cleaning or creation usually takes no more than two days and depending on distance and terrain, fence maintenance and creation can take up to two weeks (Kelly Bedson, personal communication, September 2017).

Determination of Effects to Bald and Golden Eagles

It is determined the proposed action ***may impact individual bald and golden eagles, but is not likely to result in a trend toward federal listing or loss of viability***.

General Wildlife, Management Indicator Species, and Migratory Birds

Affected Environment

General Wildlife

The various vegetation types in the project area support a variety of game and nongame species. The project is within Game Management Unit 22. Big game in the area include black bear, elk, mule deer, whitetail deer, javelina, turkey and mountain lion. Stable black bear populations and high densities of elk can be found at higher elevations below the Mogollon Rim from Pine, AZ to upper Tonto Creek. Whitetail deer can be found along the face of the Mogollon Rim and in lower densities in lower elevations where steep topography exists. Transient black bears can also be found in these lower elevations. Mule deer tend to inhabit isolated areas below the rim and in higher densities where habitat transitions into desert scrubland. Merriam's turkey populations in the project area are recovering from recent harsh winters and stabilizing at higher elevations. Lower elevations of the project area exhibit highest populations of javelina and some stable elk herds. Mountain lion show no preference for location within the project area and can be found throughout (J. Sayer, personal communications January 23rd, 2017).

Game birds and small game found in the project area include; Gambel's quail, mourning dove, white-winged dove, cottontail rabbits, black tailed jackrabbits and Abert's and grey squirrel. Most small game populations rely heavily on rainfall and populations can fluctuate annually. Populations of small game are currently stable with no concerns. Predators such as coyotes and grey fox are common in the project area and bobcats are less frequently observed (J. Sayer, personal communications January 23rd, 2017). Non-game species include a large variety of birds, mammals, reptiles and amphibians.

Rare Plants

Although there haven't been any formal surveys for rare plants completed within the action area, there may be a number of rare local or regionally endemic plants found within the action area. The grazing strategy and management, authorized utilization levels, and proposed range improvements were developed in order to provide for maintaining or improving upland and riparian conditions as well as soil conditions; all of which would benefit rare plant species. Prior to the installation of any of the proposed range developments (i.e. fencing, water developments), a site specific survey would be conducted to determine if any rare plants are within the immediate area. If discovered, a biologist would determine if the species would be directly impacted by the project, or indirectly through increased livestock use within an area. If determined that the effect would negatively affect a species, the proposed improvement location or design may be modified to mitigate deleterious effects.

Management Indicator Species and Migratory Birds

Management indicator species (MIS) were selected during the Tonto National Forest planning process to adequately monitor implementation of project actions on wildlife habitat and species diversity. These indicator species reflect general habitat conditions or habitat components that are of value to these and other species with similar habitat needs. Habitats for a large number of the Forest MIS occur on the Diamond Rim Allotments. Because most MIS are not rare species and the allotments contains a variety of vegetation types, it is assumed that at least some individuals of each MIS are present on the allotment. The ten MIS species selected for this allotment (Table 16) were done so based on the premise that livestock grazing and management can have an effect on habitat components (ground cover, species diversity, riparian components, etc.) that can impact Forest-wide habitat and population trends. Those indicator species listed in Table 16 have been fully analyzed and are available in the Management Indicator Species Report in the project record. In summary, the proposed grazing strategy, utilization levels and improvements will not alter Forest-wide habitat or population trends for any of the species analyzed. Additionally, this report details species not selected for analysis and the reason for their exclusion.

Table 18: Tonto National Forest MIS Selected for the Diamond Rim Grazing Analysis Area

Habitat Type	Reason for Selection
Pinyon/Juniper Woodland	
Ash-throated flycatcher	Ground cover
Chaparral	
Spotted towhee	Shrub density
Black-chinned sparrow	Shrub density
Riparian (high and low)	
Bald eagle	General riparian
Bell's vireo	Well-developed understory
Black hawk	Riparian streamside
Arizona gray squirrel	General riparian
Aquatic	
Macro-invertebrates	Water quality and fisheries habitat
Desert Grassland	
Horned lark	Vegetation aspect
Savannah sparrow	Grass species diversity

Migratory Birds and Important Birding Areas

Executive Order 13186, January 10, 2001, directs federal agencies to support migratory bird conservation and to "ensure environmental review processes evaluate the effects of actions and agency

plans on migratory birds, with emphasis on species of concern". Important Bird Areas (IBA) are sites that provide essential habitat for one or more species of bird, including sites for breeding, wintering, and/or migrating birds. No designated IBA's occur within the action area, however, the Mogollon Rim Snow Melt Draws state ranked IBA is located within the project area, just north of the action area on top of the Mogollon Rim. The IBA encompasses drainages in close proximity to the edge of the Rim where an increase of precipitation is expected due to the air currents along the cliffs. This IBA includes Ponderosa pine, white fir, Douglas fir, southwestern white pine, quaking aspen, and Gambel oak.

Special Status Species are those given status by agencies responsible for managing plants, wildlife, and their associated habitat because of declines in the species' population or habitat. Birds are given provisions under the *Migratory Bird Treaty Act* (MBTA). A Migratory Bird Treaty Act Report was completed and is available in the project record. Of the 40 migratory birds that may occur on Tonto National Forest, 28 were analyzed based on vegetation communities present on the Diamond Rim Allotments. Conservative upland and riparian utilization standards, partial or seasonal riparian exclosure fencing (along portion of Tonto Creek, tributary to Ellison Creek, Lewis Creek, Horton and Chase Springs, etc.) and permitted numbers balanced with production, rotational grazing, and adaptive management should allow for an improvement in watershed and overall habitat condition over time. Therefore, we believe there will be no measureable negative effect on migratory bird populations or trends.

Environmental Consequences

The alternatives are contrasted based on the likelihood of riparian vegetation and stream channels in the key reaches, attaining the short and long-term desired conditions described in the Hydrology/Riparian sections of the EA. Endangered, sensitive, management indicator species, and migratory birds that require riparian and aquatic environments would respond to changes in riparian and aquatic habitats. Similarly, each alternative, and its effects on wildlife and plant species, will be evaluated based on the attainment of short and long-term goals, described in the Soils/Range desired conditions section of the EA. Watershed affects from upland and riparian areas will have either positive or negative impacts to aquatic and terrestrial wildlife species. Short-term desired conditions limit the annual impacts of livestock grazing. Long-term desired condition is measured through effectiveness monitoring. Although upland livestock use levels, and associated wildlife habitat are important to wildlife; riparian and aquatic habitat condition is of higher value due to limited habitat availability and the importance of that habitat to threatened, endangered, and sensitive wildlife and management indicator species and migratory birds.

Direct and Indirect Effects of Alternative 1 (No Grazing)

The most rapid rates of riparian recovery, from past grazing impacts, normally occur with complete protection from grazing (Clary and Kruse 2003). Riparian areas are generally regarded as having high inherent potential for recovery from disturbance. The potential for recovery is highly variable, dependent on biotic and abiotic factors, including flow regime, channel gradient, dominant channel substrate, past disturbance history, watershed area, and cover and diversity of riparian vegetation (Milchunas 2006; Kindschy 1987).

General Wildlife

With discontinuation of grazing, wildlife habitat conditions would likely improve. Riparian habitat not currently seasonally restricted or excluded from livestock use would likely occur more rapidly, as compared to the action alternative. Riparian areas would continue to recover from past grazing. Riparian canopy cover, vegetative cover, recruitment of woody and herbaceous riparian species, including deergrass, would likely increase. It is expected that, over time, structural and age class diversity in riparian areas would improve, resulting in increased potential for riparian dependent wildlife species to occur on the Diamond Rim allotments.

With the exclusion of livestock grazing, it is expected that, herbaceous plant vigor and diversity in upland key areas, overall watershed, and soil conditions across the allotment would continue to improve. Upland habitat for game species such as deer, elk, bear, and javelina would generally increase in vigor and density. Small game and non-game species would generally increase over time with an increase in herbaceous cover and probable increase in grass species diversity. Improvements in these resource conditions would be expected to occur more quickly than they would under implementation of the grazing alternative.

One effect of the 'No Grazing' alternative to wildlife would be the removal or lack of maintenance of water developments. Developments such as dirt stock tanks, developed springs, and troughs that provide water to livestock also provide water to wildlife; more importantly, dirt tanks provide habitat for several amphibian species. Livestock permittees are responsible for developing and maintaining water improvements. Under the no grazing alternative, these improvements would not be maintained. Wildlife may rely on these developed waters for survival in areas without alternate water sources (i.e. seeps, springs). Further, metapopulation dynamics of amphibian populations may be disrupted or become less stable if once permanent water sources become ephemeral due to lack of maintenance.

Management Indicator Species and Migratory Birds

Habitat conditions for these species would be expected to improve with the end of livestock grazing on the Diamond Rim allotments. Improvement in soil and vegetation conditions would benefit wildlife habitat in all vegetation types. Improvements to terrestrial habitat are as described under the general wildlife discussion above. The elimination of livestock from stream courses should result in overall improvements in water quality. As compared to the grazing alternative, an improvement in water quality and aquatic conditions is anticipated with the elimination of bank trampling and trailing from livestock in riparian areas not currently restricted or excluded.

Direct and Indirect Effects of Alternative 2 (Proposed Action)

The proposed action for the Diamond Rim Allotments is to authorize livestock grazing in a manner that is consistent with Forest Plan standards, guidelines, and objectives and maintains or improves natural resource conditions. Livestock would be grazed using a flexible livestock rotational system with a selective rest-rotation strategy. Proposed permitted use numbers including yearlings total 10,050 Animal Unit Months (AUMs), year-long (March 1-February 28).

General Wildlife

Riparian and upland areas provide important terrestrial and aquatic habitat to wildlife species. Excessive grazing and trampling can destabilize and break down stream banks, which can result in negative effects to aquatic wildlife if poorly managed. These effects may cause modification of stream morphology and function, increased siltation, and reduction of woody and herbaceous vegetation.

Congregation of livestock (herding, stock tank areas, trailering, loading/unloading, maintenance of livestock facilities, branding) may contribute to effects to wildlife or associated habitat. Effects may include removal of vegetation, dust accumulation, noise, avoidance areas, soil compaction, and watershed effects. Impacts may vary depending upon circumstances. For the most part, effects associated with congregation of livestock are primarily within the uplands.

Implementation of the riparian utilization guidelines are intended to reduce these effects and maintain or increase existing riparian vegetation. If riparian area utilization guidelines are followed and cattle are moved when use guidelines are met, the negative, direct effects of grazing will be minimized, and riparian area and stream channel condition should be maintained or improved. This mitigation measure should be effective for all of the key reaches in grazed pastures. Recruitment of woody and herbaceous riparian species, including deergrass, is expected. Over time, structural and age class diversity in these riparian areas would continue to improve under this alternative, although to a lesser degree than under the “No Grazing”. Other selected key riparian reaches are also expected to improve through adherence to the stated utilization guidelines.

Overall, it is expected that watershed and soil conditions across the allotment would continue to improve under this alternative, although improvement would be slower than the ‘No Grazing’ alternative. Over time, upland habitat capability for game species such as deer and quail may slowly improve due to an increase in herbaceous vigor and density in the openings as a result of conservative use under this alternative. Small game and non-game species numbers would generally increase over time with an increase in herbaceous cover and probable increase in grass species diversity, although at slower rates than the “No Grazing” alternative.

Management Indicator Species and Migratory Birds

Under the proposed action, partial or seasonal exclusion of riparian habitat within Lewis, Ellison and Tonto creeks, water developments, and adherence to riparian utilization guidelines are expected to improve habitat conditions for riparian (Bell’s vireo, black hawk, Arizona gray squirrel) and aquatic species (macroinvertebrates). As described, the utilization levels on the key forage species in all key areas and adjacent areas on the allotments would be considered light to moderate grazing intensity, including wildlife use, throughout all areas. This would be accomplished through adaptive management practices. Based on these use prescriptions it is predicted that the physiological growth requirements of the forage plants would be favored in all key areas and adjacent areas on the allotments

With an improvement in soils and vegetation, upland wildlife habitat is expected to improve over time, although at a slower rate and to a lesser degree than the No Grazing alternative.

Species that are indicators of chaparral vegetation type (rufous-sided towhee/black-chinned sparrow), would likely experience a smaller habitat gain under this alternative than under the 'No Grazing' alternative.

Cumulative Effects to Endangered, Threatened, and Sensitive Wildlife, Plants and Fish Common to Both Alternatives.

Overview

Cumulative effects include the direct and indirect effects of each alternative when added to all past, present, and reasonably foreseeable future actions. Reasonably foreseeable future actions are those for which there are existing decisions, funding, formal proposals, or which are highly probable, based on known opportunities or trends.

Analysis Area and Time Frame

Within the project area, special status species discussed above are limited in extant to the project area due to fragmented or available suitable habitat or reliance on semi-aquatic or permanent aquatic habitats for natural history needs. Cumulative effects are limited to those populations as described above or at the 6th code watershed (12-digit Hydrologic Unit Code sub-watershed).

The timeframe for analysis of cumulative impacts is the past 10 years and the coming 10 years because that is the length of time the grazing permit would authorize grazing. After 10 years, the area would be evaluated again to determine if it is appropriate to renew the permit and what management changes may be necessary.

Potential Cumulative Impacts to the Wildlife, Fish and Plants

Past, present and reasonably foreseeable actions ongoing in the cumulative impact area for wildlife include the activities and actions of livestock grazing, planned and unplanned fire, road development and use, habitat restoration treatments, construction, and recreation use.

The cumulative effects to wildlife from these past, present, and reasonably foreseeable actions may include: vegetative alternation, habitat fragmentation, increased human disturbances and the anthropogenic effects on the landscape that alters and impacts the quality, quantity and use of habitat associated with local wildlife species that utilize the analysis area for breeding, nesting, foraging, year-round use and dispersal or migration.

Grazing

The Diamond Rim Allotments are adjacent to eleven other livestock grazing allotments, three of which are located on the Coconino National Forest and one on the Apache-Sitgreaves National Forest. The eleven allotments include Pine, American Gulch, Gisela, and Hog allotments on the Payson Ranger District; Christopher/Ellinwood, Soldier Camp, and Diamond Butte allotments on the Pleasant Valley Ranger District; Baker Lake/Calf Pen, Hackberry/Pivot Rock, and Buck Springs allotments on the Coconino National Forest; and Limestone Allotment on the Apache-Sitgreaves National Forest. All of these allotments are grazed and vary from year-long grazing to primarily only winter or summer grazing.

Based on 6th code watershed overlap of adjacent allotments, only two of the eleven grazing allotments may have cumulative downstream effects on stream channels and riparian area within Diamond Rim; Pine and Christopher Ellenwood allotments on the Tonto National Forest. The Pine Allotment is seasonally grazed in the summer and Christopher/Ellinwood has year-long grazing. Drainages within the two allotments that feed into portions of Diamond Rim are minimal and include Sycamore Canyon, American Gulch, and Tonto Creek. Cumulative watershed effects for these allotments are anticipated to be minimal in contrast to the size and complexity of the watersheds themselves. Both Pine and Christopher Mountain/Ellinwood allotments are being implemented based on environmental analysis, so additional impacts should be minimal given utilization standards and BMPs in place to minimize impacts to the land and therefore would not contribute to cumulative effects.

Road Development, Motorized Use and Recreation

Motorized and non-motorized recreation, and illegal cross country travel, negatively impact wildlife resources and or habitat through removal, destruction or degradation of herbaceous/woody vegetation and aquatic emergent vegetation and associated stream habitats. Traffic impacts to wildlife may cause avoidance of the area due to dust, noise, and/or presence of vehicles and people, wildlife/vehicle collisions, and poaching from vehicles. Secondary roads may have similar impacts to wildlife, although traffic volume and speed will generally be lower, impacts to wildlife will still exist, but at reduced levels. Illegal cross country travel also has negative effects to wildlife and habitat through proliferation of wildcat trails, use of motor vehicles through washes, riparian corridors, and uplands. Wildlife habitat becomes fragmented and often damaged for the long term as a result of illegal, cross country, motorized travel.

Maintenance of roads and trails may also have a temporary negative effect on wildlife. Workers, heavy equipment, and noise may lead to wildlife avoidance during maintenance activities. On the Diamond Rim Allotments, road maintenance affects to wildlife are expected to be minimal due to the infrequent maintenance cycle (annual) of Forest Service Roads 32, 64, 199, 289, 1155, 1156, and Arizona State Route 260 which are the only maintained roads across the entire Diamond Rim Allotments. Well maintained roads prevent erosion, help to keep human traffic on established roads, and prevent vegetative growth on roadbeds. None of these actions would measurably influence the effects described in this assessment for livestock grazing alternatives.

There are four developed campgrounds, eight picnic areas, and one interpretive site within the analysis area. In general, the presence of people and associated noise and disturbance of habitat in dispersed areas and on non-motorized trails has negative effects on wildlife. Impacts to wildlife may include total avoidance of areas that regularly receive high recreational use, habitat destruction or modification, and avoidance of critical riparian areas where yearlong recreation use occurs. Recreational shooting also has negative impacts on wildlife as a result of noise and the presence of people. Trash and debris shooters often leave behind may pose hazards to wildlife and actually attract other shooters, due to available target material. Hunting may have negative impacts on wildlife including: high concentrations of hunters, illegal off-road travel, littering, increased presence of people/vehicles, and poaching. Recreation impacts, combined with effects of the proposed action may cause an increase in human and noise disturbance to wildlife, especially terrestrial species. To minimize impacts described above, the

Tonto National Forest manages several programs and designated recreation areas within the proposed action area. Day use sites along the East Verde River and several designated group sites aim to concentrate users and provide trash and bathroom facilities. Further, programs like Leave No Trace, Pack it In – Pack It Out are in place to encourage users to remove their litter from the land and provide education on how recreational activities can impact nature. Given these resource protection measures and BPMs, impacts from recreation would not measurably influence the effects described in this assessment for livestock grazing alternatives.

Construction

As described in the Hydrology, Riparian Vegetation, and Water Quality effects analysis, the Town of Payson is in the construction phase of a treatment plant and pipeline to deliver water from the C.C. Cragin Reservoir, located above the Mogollon Rim into the Town of Payson. According to the analysis, changes in flow because of the pipeline project has little impact on the channel as a whole, though there are local impacts at the out-flow discharge point in the form of bank cutting. The Environmental Assessment for the pipeline determined that a 17% reduction in deliveries would not likely impact overall flow or riparian habitat on the East Verde River (SWCA 2011), thus we anticipate minimal impacts to native aquatic species occupying the East Verde River and its tributaries. Much of the pipeline has been constructed parallel to the Houston Mesa Road and the East Verde River. Short term increases in erosion and sedimentation occurred when the pipeline crossed the East Verde River three times. River crossing disturbance was short in duration and effects to aquatic species were minimized due to conservation measures in place during project implementation. Construction of the pipeline is scheduled to be completed September 2017 and the treatment plant for July 2018. Conservation measures minimizing impacts to wildlife and their habitats were built into the proposed action.

Habitat Restoration Project

The Walnut Flat Mastication Project is an ongoing habitat restoration project in piñon-juniper habitat within the action area. The purpose of the project is to create an open juniper grassland, dominated by large diameter juniper and native grasses. Once the project is completed, the unit will resemble the historic structure of juniper grasslands and be a “low” fire hazard, with conditions conducive to the reintroduction of low severity fire. Measures within the proposed action are designed to retain large diameter juniper, all pinyon pine, and all riparian species that may occur along the stream courses if present, thus benefiting wildlife that depend on pine nuts as a food source and pinon-juniper grassland obligates. We anticipate an increase in productivity of native grasses and a less dense canopy cover, thus no cumulative effects are anticipated.

Payson Ranger District on the Tonto National Forest is in the process of developing a Proposed Action for recreational OHV management. The “Payson OHV Recreation Project” is designed to address specific needs on the Payson Ranger District associated with recreational OHV use trends and local resource conditions. The purpose and need for this project is to organize and manage recreational OHV use while protecting sensitive riparian areas on the Payson Ranger District. The Proposed Action would (1) prohibit off-highway motorized vehicle travel within 200 feet on each stream bank of identified stream corridors, (2) designate three OHV staging areas, and (3) identify a location for a new recreational OHV campground. When this proposed future action is implemented, we anticipate beneficial impacts to

proposed stream corridors over time which will create more suitable habitat for semi-aquatic or aquatic special status species analyzed in this document.

Planned and Unplanned Fire

Wildfire suppression activities can affect wildlife and associated habitat by direct loss of habitat to fire or suppression activities (brush removal, line construction, black-line construction, aerial application of retardant, drafting from streams), and indirect effects such as fire support aircraft noise, sedimentation in aquatic systems, and avoidance of areas with fire suppression activities. Wildfires, prescribed fires, and fire suppression activities within the watersheds are expected to continue at recent or historical levels. Fires, particularly on a large scale, alter wildlife habitat use patterns. Depending on fire severity and intensity, initial loss of habitat may drive animals into adjacent areas straining available resources. As the burned area recovers, it often becomes a magnet for wildlife as it offers early seral species not available elsewhere in the habitat. Meaningful movement of wildlife into or out of the allotments could intensify or negate anticipated changes in habitat conditions.

Climate Change

Climate change has the potential for additional impacts. According to NOAA National Climatic Data Center data, there has been a marked upward trend in the globally averaged annual mean surface temperature since the mid-1970s (Shein 2006). The Federal Advisory Committee Draft Climate Assessment Report is projecting higher temperatures and lower precipitation for the southwestern U.S. (Garfin et al. 2013). New modeling efforts for the North American monsoons indicate that the amount of monsoon moisture will change little, however, the monsoons will be delayed and most of the precipitation will come late in the season (September-October) (Cook and Seager 2013).

Summary

Past, present and foreseeable future actions within the Diamond Rim Allotments, for the most part, are one-time events that are short in duration with a small geographical extant relative to the action area with built in conservation measures to minimize impacts to special status species, migratory birds, and management indicator species. Management practices and mitigation measures have been included in the Proposed Action to minimize any negative effects of reauthorizing grazing on the Diamond Rim Allotments to wildlife, aquatic species, and rare plants. Based on the discussion above and by following these practices, no significant effects from either alternative are expected when added to the effects discussed in this section.

Recreation, Wilderness, Visual Quality

Desired Condition

Recreation Opportunity Spectrum

The Forest Plan identifies and describes a recreation opportunity spectrum (ROS) class system to be used on forest lands, including the analysis area, to help guide development and management in order

to provide a variety of recreation experiences desired by the public and range from essentially natural, low use areas to highly developed intensive use areas. The table below shows the number and percentage of acres of each classification in the project area.

Table 19: ROS Classification Acres in Project Area

Classification	Acres	Percentage
Rural	10,567.8	1.9
Roaded Natural	266,498.1	48.2
Semi Primitive Motorized	151,885.6	27.5
Semi Primitive Nonmotorized	113,996.4	20.6
Urban	9,931.7	1.8
ROS Total	552,879.6	100

Existing Condition

Developed Recreation

There are four developed campgrounds, eight picnic areas, and one interpretive site within the analysis area.

Houston Mesa Campground is located just north of Payson along the Houston Mesa Road and is comprised of a family campground, a horse campground, and two large group units. The family campground is located on the north side of the Houston Mesa Road on 60 acres with 75 sites, while the horse camp with 30 sites and two group sites is located on the south side of Houston Mesa Road on 30 acres.

Ponderosa Campground is located 12 miles east of Payson on the south side of Highway 260. The campground is comprised of a family campground with 61 sites and two group sites located on 48 acres of land. The well and water system for this campground is located on the north side of the highway and is approximately 0.1 acres.

Upper Tonto Creek Campground is located one mile north of Highway 260 along Forest Road 289. The campground consists of nine sites on seven acres of land and is located within the Tonto Creek Recreation Area.

Tonto Creek Walk-in Campground is located just north of Highway 260 along Forest Road 289. The campground consists of nine walk-in sites on seven acres of land and is located within the Tonto Creek Recreation Area.

East Verde Picnic Area is located five miles north of Payson off of Highway 87 along the East Verde River. The site consists of a small dirt parking area, one toilet, and four picnic sites.

First Crossing Picnic Area is located seven miles northeast of Payson off of the Houston Mesa Road. This site was improved in 2010 and consists of a parking area with a capacity for 19 passenger vehicles, a toilet, and multiple picnic tables.

Second Crossing Picnic Area is located 8 miles northeast of Payson off of the Houston Mesa Road. This site was improved in 2010 and consists of a parking area with a capacity for 29 passenger vehicles, a toilet, and multiple picnic tables.

Third Crossing Picnic Area is located 8.5 miles northeast of Payson off of the Houston Mesa Road. This site was improved in 2010 and consists of a parking area with a capacity for 21 passenger vehicles, a toilet, and multiple picnic tables.

Water Wheel Picnic Area is located 7.5 miles northeast of Payson off of the Houston Mesa Road. This site was improved in 2010 and consists of a paved parking area with a capacity for 40 passenger vehicles, a toilet, and multiple picnic tables. This site has a historic water wheel and the foundations of several homestead buildings within the site.

Horton Picnic Area is located one mile north of Highway 260 along Forest Road 289. The site consists of a paved parking area, one toilet, and five picnic sites. This site provides access to the picnic area and also serves as parking for the Horton Creek Trail and the Derrick Trail.

Mid-way Picnic Area is located halfway between the Upper and Lower Tonto Creek Campgrounds within the Tonto Creek Recreation Area. It consists of a paved parking area with capacity for 20 vehicles, one toilet, and four picnic sites with tables.

Shoofly Village Interpretive Site and Picnic Area is located five miles northeast of Payson on the east side of Houston Mesa Road. Facilities provided at the site include a large parking area, six ramadas with picnic tables and grills, a vault toilet, and a handicap-accessible self-guided interpretive trail. The site interprets a prehistoric Native American village that was occupied between A.D 1000 and 1250.

Dispersed Recreation

The following recreational activities are common in dispersed areas across the Payson Ranger District (Payson RD).

Dispersed Camping: group and family camping in undeveloped areas along roads and creeks, within forested portions of the project area, is very popular. Dispersed camping takes place across the entire project area with areas along waterways including the East Verde River, and Tonto Creek seeing the heaviest use within the project area.

Designated Dispersed Group Areas: Three designated group use areas exist within the project area and include Diamond Point, Preacher Canyon, and Bear Hide. Scout groups and church groups from the Phoenix Metropolitan Area seek the cool, shady pines of the Payson RD throughout the year. Any group over 75 people is required to obtain a special use permit and is directed to utilize one of the above dispersed areas.

Off Highway Vehicle Riding: Besides camping, OHV riding is very likely the most frequent recreational activity on the Payson RD. Currently, OHV use is allowed across the ranger district unless posted closed. Use of dirt bikes, jeeps, and other four wheel drive vehicles is also common across the project area.

Hunting: The project area is located within the Arizona Game and Fish Management Unit 22. This game unit provides small and big game hunting opportunities such as elk, deer, bear, mountain lion, and javelina, etc., that is very popular with in and out of state hunters as well as permitted outfitting and guiding companies. A year around activity across the district, hunting is heaviest during the fall.

Hiking, Mountain Biking, and Horse Back Riding: All three activities are very popular across the district and primarily take place in the forested upper elevations of the project area.

Fishing: Portions of the East Verde River and Tonto Creek are found within the project area. Both rivers are popular fishing destinations and are stocked regularly by Arizona Game and Fish.

Rock Collecting: Two designated rock collecting areas exist on Payson RD including the Diamond Point crystal collection area and the Paleo site. The Diamond Point Site is located along Forest Road 65 and well known for its clear quartz crystals, many of them doubly terminated and resembling New York Herkimer diamonds. The Paleo site is located approximately 15.5 miles east of Payson along the south side of Highway 260 outside of the ADOT right of way and is a popular place to collect fossils of the Naco Formation, a Pennsylvanian shale/limestone deposited 300 million years ago. Rock collecting is not limited to these two sites.

Wilderness and other Special Areas

There is one designated wilderness area, one Inventoried Roadless Area, and two administrative sites within the project area.

Wilderness: The Hellsgate Wilderness was established by Congress with passage of the *Arizona Wilderness Act* on August 28, 1984. There are approximately 9,283 acres of wilderness within the project area.

Inventoried Roadless Area: The entire 6,165 acres of the Hellsgate Wilderness Contiguous Inventoried Roadless Area is located within the project area. The 2001 Roadless Rule established prohibitions on road construction, road reconstruction, and timber harvesting within the boundaries of inventoried roadless areas on National Forest System lands. The intent of the 2001 Roadless Rule was to provide lasting protection for inventoried roadless areas within the National Forest System in the context of multiple-use management.

Administrative Sites: Two administrative sites are located within the project area including the Indian Gardens Guard Station and the Diamond Point Lookout Tower. These sites have been dedicated for National Forest administrative use from the original reserved public domain.

Roads and Trails

There are approximately 482 miles of officially recognized roads within the project area. An unknown number of user created roads and trails exists. Portions of State Highway 260 and 87 make up the major transportation corridors on the ranger district. The Control Road and the Houston Mesa Road (FR 199) serve as major secondary transportation corridors. Numerous two-track roads make up the majority of the mileage.

There are 56 miles of designated trails within the project. Approximately 30 miles of the Highline Trail (#31), which is a designated National Recreation Trail is located within the project area. A portion of the Arizona Trail, which is a designated national scenic trail is also located within the project area.

Lands and Special Uses

The project area contains approximately 27 tracts of private lands otherwise known as inholdings. Several of these inholdings have right-of-way access across National Forest land and/or special use permits for pipelines or water containment. Gila County holds easement over multiple roads within the project area. The state of Arizona holds a right of way easement for the portions of State Highway 87 and State Highway 260, which are found within the project area. There are multiple mining claims located within the project area, but no active mines.

Special uses within the project area include multiple utility corridors under permit to Arizona Public Service (APS) and Salt River Project (SRP). Multiple special use permits for hunting outfitting and guiding and one permit for horse rides. The Diamond Point Communications Site is comprised of four separate permits for communication towers at the top of Diamond Point Ridge.

The town of Payson was recently issued a permit to begin construction on a 12-mile pipeline, which would follow the Houston Mesa Road. The entire length of the new pipeline would be located within the project area.

Effects Analysis

Alternative 1: No Grazing

Direct and Indirect Effects: (Common to all ecosystems unless otherwise noted.)

This alternative would have no direct or indirect effects on recreational activities available within the complex boundaries. Current developed and dispersed recreational uses along with existing lands and mineral uses would be expected to continue without livestock activity.

Cumulative Effects: General recreational, land, and mineral uses may change slightly over time due to natural and social trends resulting from discontinued livestock grazing; no direct or indirect effects are anticipated therefore there would be no cumulative effects.

Alternative 2: Proposed Action

Direct and Indirect Effects: (Common to all ecosystems unless otherwise noted.)

Livestock: Under this alternative the number of permitted animal unit months is more than the current authorized number. Increased numbers could result in more frequent human/cow encounters. These encounters could result in a positive or negative experience depending on the individual recreational user's attitude towards livestock and their desired recreational experience.

Grazing Schedule: Recreational users tend to utilize cooler upper elevations in summer months to escape the summer heat and lower elevations in winter months to enjoy slightly warmer temperatures. The proposed rotation may result in more frequent human/cow encounters. These encounters could result in a positive or negative experience depending on the individual recreational user's attitude towards livestock and their desired recreational experience.

Water Developments: Range developments, such as stock tanks and watering troughs, that are maintained by the grazing permittee can be beneficial to user groups such as equestrians and hunters and improve recreational experiences. Over time proposed water related improvements could add to the recreational experience of Forest users.

Pastures and Fencing: Under this proposal several pastures which are currently closed to grazing would be included in the grazing rotation. In these areas recreationalist/cow encounters would occur when presently there were none. These encounters could result in a positive or negative experience depending on the individual recreational user's attitude towards livestock and their desired recreational experience. Proposed fencing and cattle guards would have no direct or indirect effects on recreation.

Wilderness: The Forest Plan states that Hellsgate Wilderness is to be managed for wilderness values, while providing livestock grazing and recreation opportunities that are compatible with maintaining wilderness values and processes.

Cumulative Effects

Recreation Opportunity Spectrum: The proposed action would not change the current recreation opportunity spectrum classifications and the ROS would remain in standard with the Forest Plan and a plan amendment would not be needed.

Developed Recreation: Under this alternative, recreational users at developed sites may experience increased encounters with cows. This could be mitigated by installing or maintaining fence lines around developed sites and coordinating cow movement through these areas with the recreation department.

Dispersed Recreation: Presence of livestock grazing within dispersed recreation sites does not preclude or prevent other recreational opportunities. However, due to the increased number of proposed cattle and opening of several currently closed pastures, it would be expected that there would be an increase in recreationalist/cow encounters. These encounters could result in a positive or negative experience depending on the individual recreational user's attitude towards, livestock and their desired recreational experience. Fencing of popular dispersed recreation corridors or scheduling cows to avoid popular dispersed areas during the busiest recreation months could help mitigate these encounters.

Lands and Minerals: Under this alternative there would be no direct or indirect effects to lands or minerals. Use of these resources would continue with little to no change. No cumulative effects are anticipated.

Roads and Trails: Under this alternative there would be no direct or indirect effect to roads or trails. No new roads, trails, or mileage is proposed and use would continue with no anticipated cumulative effects.

Heritage Resources

Desired Condition

Mitigation of impacts to heritage resources for all alternatives is best accomplished by avoidance of these properties through placement and construction of all range improvements. It can also be achieved by minimizing opportunities for localized concentration of animals, improving distribution across allotments and across each pasture, and by reducing the intensity of grazing for the allotment as a whole. In instances where a proposed range improvement would involve any potential for ground disturbance, such as stock tanks and the use of heavy equipment to achieve project goals, a 100 percent archaeological survey would be conducted for areas which have no previous survey coverage, or have outdated surveys which do not conform to current standards. Other, more specific, mitigation requirements may be identified as each of these improvements is developed and a heritage inventory is made of their areas of potential effect. Such protective measures are developed in accordance with the goals of the project taking into account site vulnerability as well as the methods of project implementation.

All inventoried heritage sites are treated as eligible for the National Register of Historic Places with the exception only of those that have been formally determined to be not eligible in consultation with the State Historic Preservation Officer (SHPO). Archeological clearance must be approved with all necessary consultation with SHPO and the potentially interested Tribes prior to issuing any decision regarding the construction, modification, or removal of all range improvements, fuels treatments including prescribed burns and any actions proposed by an outside agency on National Forest Lands. This approach, based on long-term consultation with SHPO and on Region 3 policy as embodied in the *First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities* between the USDA Forest Service Region 3, the State Historic Preservation Officers of Arizona, New Mexico, Texas, and Oklahoma, and the Advisory Council on Historic Preservation, signed December 24, 2003. Specifically, Appendix B, the *Standard Consultation Protocol for Rangeland Management* (*Range Protocol*) developed pursuant to Stipulation IV.A of the *Programmatic* Agreement. Mitigation measures as set forth in the *Programmatic Agreement* itself are considered to be the "standard operating procedure" for treating potential impacts to heritage resources on the Tonto National Forest.

Protection measures identified under the *Range Protocol* include:

- Archaeological survey would be conducted for all areas proposed for surface disturbance which have no previous survey coverage, or have outdated surveys, which do not conform to current standards.

- Relocation or redesign of proposed range improvements and ground-disturbing management practices to avoid direct and indirect impacts to historic properties.
- Relocation of existing range improvements and salting locations sufficient to ensure the protection of historic properties being impacted by concentrated grazing use.
- Fencing or exclosure of livestock from individual sensitive historic properties or areas containing multiple sensitive historic properties being impacted by grazing.
- Periodic monitoring to assess site condition and to ensure that protection measures are effective

Other mitigation measures involving data recovery, for example, may be developed and implemented in consultation with the SHPO as the need arises. The appropriate tribes would be consulted if the mitigation is invasive or if it affects a traditional cultural property (TCP) or other property of concern for them.

Future improvements and other ground-disturbing management practices that are scheduled beyond the first two years and were not included in the Section 106 cultural resource report will be contingent upon the completion of the identification and protection of historic properties and compliance with all applicable provisions of Section 106 of NHPA.

These protection measures apply equally to action alternatives. For the no action/no grazing alternative, only the first two measures apply

Monitoring

In accordance with the *Range Protocol*, monitoring would be conducted as part of the day-to-day activities of the professional cultural resource specialists and certified para-archaeologists working in the area. Grazing allotments cover most of any given forest and when archaeologists are in the field conducting surveys, they are most likely surveying within a grazing allotment. Archaeologists would use these opportunities to observe and report on grazing activities, effectiveness of grazing strategies, and potential impacts to heritage resources. Any incidents of damage to historic properties from grazing would be reported, and the archaeologists would draw upon the protection measured outlined in the *Range Protocol* to ensure that the effects are avoided or minimized.

Existing Condition

The allotments, which comprise the Diamond Rim allotment complex, contain more than 700 known and hundreds, if not thousands, of undocumented prehistoric and historic archaeological sites. These sites represent the occupation and agricultural modification and use of this area by people related to the Hohokam, Salado, and Central Arizona Tradition (Northern Salado), as well as Western Apache archaeological traditions over a period of 8,000 to 10,000 years. They also contain several historic sites reflecting use and occupation by Anglo ranchers, stockmen, miners and prospectors, the Civilian Conservation Corps, and the Forest Service.

Numerous survey blocks have been conducted in the allotments, primarily associated with timber, fuel wood, fuels thinning and grassland restoration actions, along with ADOT activities associated with the

widening and realignment of State Route 260. The density of prehistoric sites within the surveyed areas has ranged from moderate to high. However, much of the area remains unsurveyed. The previous archaeological surveys have revealed a large number of prehistoric and historic sites. Known heritage properties include a variety of features, ranging from historic cabin sites, a Civilian Conservation Corp (CCC) camp, a CCC-era cabin listed on the National Register of Historic Places, communication and transportation systems, to simple artifact scatters to large prehistoric habitation sites, including Shoofly Village, which is listed on the National Register of Historic Places. The great majority of these features, however, is prehistoric and consists of collapsed stone masonry structures, various water control devices such as check dams and terraces, and roasting pits for the processing of agave. There are also a large number of features associated with a long history of cattle ranching and a few reflecting sporadic attempts at small scale mining and ore processing. A few homestead sites have been identified and recorded within the allotments. Many other prehistoric and historic archaeological sites are represented by nothing more than a scatter of artifacts on the ground surface.

No TCPs, native plant gathering areas or tribal sacred sites are currently known to be located within the allotment; however, no specific efforts to identify and inventory such areas have been made. Nevertheless, it should be stressed that acorns produced by Emory oaks represent an important traditional plant resource as identified by Western Apaches, who still use acorns as a traditional food source and for ceremonial purposes. Gathering activities are conducted by family groups throughout the sub-Mogollon Rim area and individual groups may vary their annual gathering activities to a wide area and not rely solely on a single preferred grove. The importance of this resource to Western Apaches cannot be underestimated and efforts to protect and preserve Emory oak groves are essential.

From the 1870s to the early 1920s grazing of what would become the Diamond Rim allotment complex was heavy and unregulated. This resulted in an initial reduction of vegetative cover, which may have affected heritage resources by soil loss, erosion, and trampling. Since the establishment of the allotments and implementation of grazing management, known heritage resources inventoried within have stabilized and in many cases improved in condition as vegetative cover have returned.

Effects Analysis

Impacts to heritage resources, especially archaeological sites, can be generally defined as anything that results in removal of, displacement of, or damage to artifacts, features, and/or stratigraphic deposits of cultural material. In the case of heritage resources that are considered eligible for inclusion in the National Register of Historic Places, this can also include alterations of a property's setting or context. In the case of traditional cultural properties and sacred places, additional considerations may include alterations in the presence or availability of particular plant species. Heritage resources, depending on their nature and composition, are subject to several different types of impact from activities associated with grazing. Direct impacts from grazing are generally considered to be those resulting from concentrated livestock trampling or construction related activities. Indirect impacts could include erosion and changes in vegetative composition and density that alter the setting and geographic context of sites.

Since site condition assessments for heritage resources are not available for any time prior to introduction of European livestock species to the Southwest, some level of effect is assumed to have contributed to the current condition of all sites on the allotments. Given the nonrenewable nature of heritage resources – particularly archaeological and historic sites – any portion of them that has been damaged or removed diminishes their cultural and scientific value permanently.

Legal and Regulatory Compliance

While numerous federal laws and executive orders are in place that address historic preservation and tribal consultation on federal lands, the National Historic Preservation Act (Preservation Act) of 1966, as amended, provides the legal framework for heritage resource management on this project. Preservation Act Section 106 directs all Federal agencies to take into account the effects of their undertakings (actions, financial support, and authorizations) on properties included in or eligible for the Preservation Act. Advisory Council on Historic Preservation regulations at 36 CFR 800 implement Preservation Act Section 106, and these regulations contain the definitions utilized to determine the potential effect, if any, any given undertaking will have on cultural resources. The Area of Potential Effect for a given project is defined as "… the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties… The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking." (*36 CFR 800.16(d)*). An Effect to a cultural resource is defined as "…alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register." (*36 CFR 800.16(i)*). An Adverse Effect is found "when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association."[36 CFR 800.5(a)(1); see subsection (a)(2)]. Effects to cultural resources may be either direct or indirect.

Forest Service Manual 2360 and Forest Service Handbooks 1509 and 2309 are the documents through which the Washington Office outlines implementation of *36 CFR 800*, providing the foundation for agency policy and procedures. Owing to the complexity and diversity of heritage or cultural resources on the National Forests, the Forest Service Manual does not specify one overarching desired future condition. However, Forest Service Manual 2364.02 lists as the first three objectives for the protection and stewardship of Heritage resources:

1. Protect cultural resources in a manner consistent with their National Register qualities and management allocations.
2. Avoid or minimize the effects of Forest Service or Forest Service authorized land use decisions and management activities on cultural resources.
3. Safeguard cultural resources on National Forest System lands from unauthorized or improper uses and environmental degradation.

In tandem with the guidance from the Washington Office, the Forest Service Southwest Region (Region 3) has generated regional amendments Region 3 Forest Service Manual 2360 and Region 3 Forest

Service Handbook 2309. Region 3 Forest Service Manual 2360 addresses the infrastructure, policies, and procedures used for cultural resource management in this region. Region 3 Forest Service Handbook 2309 contains the standards and guidelines for cultural resource management in the region.

In accordance with *36 CFR 800.14(b)(2)*, federal agencies have the option to pursue "Program Programmatic Agreements", which allow the agency to create a Section 106 process that differs from the standard review process and that will apply to all undertakings under a particular program. These agreements are typically used by agencies with programs that have undertakings with similar or repetitive effects on historic properties, such as grazing authorizations, in order to avoid the need for a separate Section 106 review for each project. Long-term consultation with the State Historic Preservation Officer and Region 3 policy has resulted in the *First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities between the USDA Forest Service Region 3, the State Historic Preservation Officers of Arizona, New Mexico, Texas, and Oklahoma, and the Advisory Council on Historic Preservation*, signed 12/24/03 (R3PA). This agreement, specifically, Appendix H, *Standard Consultation Protocol for Rangeland Management* developed pursuant to Stipulation IV.A of the Programmatic Agreement, is considered to be the "standard operating procedure" for treating potential grazing impacts to heritage resources on the Tonto National Forest.

In accordance with Appendix H, standard Section 106 process will be implemented on all range improvement and ground-disturbing management practices that are planned and have been identified at the time of the *National Environmental Policy Act* analysis. In addition to the acreage identified for improvements, analysis of impacts to Heritage resources from cattle grazing will also be undertaken. Field surveys should be conducted in areas where there are known or potential impacts to heritage resources or specific areas of concern in order to identify and assess site conditions.

"In making the decision on the level of survey to be conducted, the Forest Archaeologist will consider the following and document the decision in the heritage resource report:

A. grazing history
B. proposed changes in grazing management practices
C. known incidents of or high potential for damage to sites
D. presence of grazing-sensitive sites
E. presence of areas where cattle congregate
F. amount of the allotment previously surveyed for cultural resources
G. site density
H. information provided by employees, permittees, or other users

Once inventory has been completed, and archaeological sites have been identified, the Forest may draw from, but is not limited to, the following mitigation measures to ensure that effects to cultural resources are avoided or minimized:

1. Archaeological survey will be conducted for areas proposed for surface disturbance which have no previous survey coverage, or have outdated surveys which do not conform to current standards;
2. Relocation or redesign of proposed range improvements and ground-disturbing management practices to avoid direct and indirect impacts to historic properties;
3. Relocation of existing range improvements and salting locations sufficient to ensure the protection of historic properties being impacted by concentrated grazing;
4. Fencing or exclosure of livestock from individual sensitive historic properties or areas containing multiple sensitive historic properties being impacted by grazing;
5. Periodic monitoring to assess site condition and to ensure that protection measures are effective;
6. Other mitigation measures involving data recovery, for example, may be developed and implemented in consultation with the SHPO as the need arises; and
7. The appropriate Tribes will be consulted if the mitigation is invasive or it affects a TCP or other property of concern for them.

Also in accordance with Appendix H, monitoring will be conducted as part of the day-to-day activities of the professional cultural resource specialists working in the area. Grazing allotments cover most of any given forest, and when archaeologists are in the field conducting surveys they are most likely surveying within a grazing allotment. The archaeologists will use these opportunities to observe and report on grazing activities, the effectiveness of the grazing strategy, and potential impacts to heritage resources. Any incidents of damage to historic properties from grazing will be reported, and the archaeologists will draw upon the protection measures outlined in the *Protocol* to ensure that the effects are avoided or minimized. (Appendix H, II, D)

The 1985 Forest Plan and its Amendment 21 (May 3, 1995) establishes the following standards and guidelines (under Decision Unit (DU) 3) that is applicable throughout the Forest regarding the management and protection of prehistoric and historic archaeological sites and other historic properties:

> The Forest will comply with *National Historic Preservation Act (NHPA)* and with *Executive Order (EO) 11593,* and will undertake active management which recognizes Heritage (cultural) resources as equal in importance to other multiple uses. Heritage resources will be managed in coordination with the State Historic Preservation Officer (SHPO) in accordance with the R3PA regarding cultural property protection and responsibilities….
>
> During the conduct of undertakings, the preferred management of sites listed in, nominated to, eligible for, or potentially eligible for the National Register of Historic Places is avoidance and protection. Exceptions may occur in specific cases where consultation with the SHPO indicates that the best use of the resource is data recovery and interpretation…

In general, this requires that any surface disturbing project can be subject to the evaluation, consultation, and clearance approval process required by the Region 3 Programmatic Agreement, which typically requires archaeological survey of proposed construction and disturbance activities, e.g. for range improvements. Specifically for the Diamond Rim area, this would include the evaluation of potential impacts from grazing systems, as well as the construction and maintenance of range improvements. The Amendment goes on to add that interpretive opportunities for Heritage (archaeological and historic) resources should be pursued as a high priority when opportunities arise. Other management direction, specifically applied toward the protection of archaeological and historic resources from looting or vandalism is found in the *Archaeological Resources Protection Act*.

Management of this aspect of the Heritage resource was not expressly addressed in the 1985 Forest Plan. Until revision of the Plan is completed, direction in this area is provided by the Region 3 Programmatic Agreement, the *Native American Graves Protection and Repatriation Act*, and a variety of laws, Executive Orders, Memorandums, and case law, including *Archaeological Resources Protection Act*, the *American Indian Religious Freedom Act*, *National Environmental Policy Act*, and *National Forest Management Act*. Executive Orders and Memorandum include *1994 Government-to-Government Relations with Native American Tribal Governments*, *EO 13007 Accommodations of Sacred Sites*, and *EO 12898 Environmental Justice* as directed by the Forest Service Manual and Handbook.

The proposed action (Alternative 2) proposes various activities in the five allotments located in the Diamond Rim Allotments. The proposed action would also authorize the construction and maintenance of future as yet unidentified range improvements that may become necessary for allotment management. This alternative no longer requires a project-specific amendment related to standards and guidelines for cultural resources. Amendment #29, signed on July 31, 2017, amended the 1985 Tonto National Forest Land and Resource Management Plan to permanently remove forestwide standard and guideline $4 from page 38-1. The No Grazing Alternative (Alternative 1) proposes that no grazing management activities take place within the project area. The Determination of Effect presented in this report takes into consideration the effect of the activities proposed in Alternative A on the archaeological sites, since not grazing within the allotment will not affect historic properties. The spatial boundary used to evaluate direct and indirect effects of the project was the allotment boundary, since no cultural resources outside of this area will be affected by proposed project activities.

Assumptions and Methodology (data limitations and data inaccuracies)

Physical accessibility to archaeological records of the Forest is inconsistent; most archaeological sites and surveys recorded prior to 2012 have been digitized into GIS. Hard-copy site and survey records appear to have been kept up to date through approximately 2015. Both hard-copy records and digital records were compared in order to determine data gaps; however, anything not captured in either format will be absent from the literature review. The methodology used for literature review followed current professional standards.

Cultural resource surveys conducted for this project will follow methodology identified in the Region 3 Programmatic Agreement. Range improvements that are proposed to be installed within the first two

years of the project were evaluated[18]. Improvements proposed to be installed after the first two years of this project, or improvements that may become necessary in the future but have not yet been identified may require additional surveys and evaluation by the Forest Archeologist before they can be installed.

Direct and Indirect Effects for the Proposed Action

Direct effects are those that will occur during project implementation. The potential for adverse impacts of grazing activities on significant cultural resources relates directly to the level of range developments (i.e. water tanks, pipelines, etc.), number and density of livestock within an allotment, length of grazing periods, and other ground disturbing activities existing and proposed within the project area, including access to range developments. While there is no common agreement among archaeologists as to how extensive the effects are, there is no disagreement that livestock grazing has the potential to adversely impact significant cultural resources through trampling, obliteration, and displacement (Horne and McFarland 1993, Osborn and Hartley n.d., Osborn et. al 1987, Shea and Klench 1993, Todd et. al 2000, and Willingham 1994). Sites located within the vicinity of livestock congregation areas, such as near water tanks, salt licks, gates, along fence lines or other livestock trials, suffer the most damage. The severity of grazing impacts on cultural resources increases proportionally with the number and duration of livestock congregation. Livestock grazing requires the construction and maintenance of range improvements, including water tanks, pipelines, fences, and access roads. The installation and maintenance of range improvements typically require new ground disturbance. Projects requiring new ground disturbance, by definition, have the potential to adversely affect significant cultural resources.

In general, the direct effects on the cultural resources of the various activities that are proposed for this project are expected to be as follows:

1. In those project areas where no historic properties (archaeological sites meeting National Register criteria) are present, proposed project activities have **No Potential to Affect** cultural resources.
2. In those project areas in which ground disturbing activities would be carried out as listed above, where historic and/or unevaluated properties are present, and where Site Avoidance is feasible and is implemented, the proposed project activities are expected to have **No Effect** on cultural resources.
3. Where archaeological sites occur where site avoidance is not feasible, the Forest may use any of the mitigation measures described above and develop a mitigation plan that will result in a finding of **No Adverse Effect** on historic properties.
4. Where archaeological sites that are located within the identified boundaries of the Perry Mesa Archeological District, where proposed activities would have an adverse effect, the Forest will use any of the mitigation measures described above and develop a mitigation plan that will result in a finding of **No Adverse Effect** on historic properties.

[18] More detailed information on the type and location of these improvements can be found in Chapter 2.

Increased site vulnerability is expected to be the principal indirect effect to historic properties resulting from proposed activities. With application of appropriate mitigation, it is not expected that the proposed project activities will increase visitor use in those areas in which archaeological sites are located. Therefore, it is not expected that implementation of the proposed activities will have indirect effects on the historic properties.

Archeological sites located within the project area will continue to be affected by natural processes (i.e. erosion). Since recreation activities would continue to take place within the project area, the extent and scope of adverse effects of these activities to archaeological sites will remain unknown. However, opportunities for interpretative development and/or stabilization may be identified.

Effects Common to Action Alternatives

Based on a history of observation and consultation with SHPO, managed grazing is not considered in and of itself to constitute an effect on heritage resources when the grazing strategy is designed to match herd size with capacity and distribute livestock as evenly as possible across the allotment in order to avoid localized concentrations of animals and the resultant impacts to soils and vegetation associated with intense trampling. Changes in grazing strategy are likewise not considered to have an effect provided that whatever new strategy is implemented does not alter these conditions.

Adverse effects could be foreseen, if a proposed grazing strategy were to introduce livestock into an area not known to have been grazed historically. They may also be expected when a grazing strategy proposes shifting to a more intensive system where higher permitted numbers or high intensity/short duration schedules would concentrate livestock into confined areas where either the absolute or relative stock density would cause a significant increase in surface disturbances due to trampling that would be above previous or existing levels. This could result in either direct or indirect adverse effects depending on the degree of trampling resulting from localized concentration and on the presence or absence of heritage resources in the concentration area, the nature of the resource and its resistance to such impacts, and the distance to other heritage sites. For the most part, these conditions tend to be associated with the construction of range improvements designed to provide water or to concentrate and hold stock for roundup or shipping. Thus, the greatest potential for direct adverse effects to heritage resources is associate with the construction of range improvements and the access roads needed to build and maintain them.

Air Quality

Desired Condition

Projects related to action alternatives are subject to NAAQS and should strive to keep particulate matter within those standards during normal operations or special projects.

Existing Condition

Air quality for the analysis area is monitored by Arizona Department of Environmental Quality under direction from the *Clean Air Act* and Environmental Protection Agency, who provide National Ambient Air Quality Standards (NAAQS). The analysis area is not in a nonattainment area or maintenance area for regulated air pollution. Action alternatives are expected to have a minimal effect on air quality (ADEQ 2012).

Effects Analysis

Particulate matter (10 microns and smaller) dispersed during activities associated with livestock grazing management can penetrate human and animal lungs. Inhaling particulate matter 2.5 microns and smaller has been linked to increases in death rates, heart attacks, plaque and clotting, respiratory infections, asthma attacks, and cardiopulmonary obstructive disease (ADEQ 2012). Effects can be mitigated through proper site preparation and construction techniques and through site restoration following ground-disturbing activities. These effects could occur during livestock gathering (heavy trailing or increased vehicle movement) and during construction of range improvements. Effects would be minimized under a no grazing alternative without livestock gathering and trailing; however, use of roads in the area would still occur and construction of improvements for wildlife or recreational benefit could still occur on the allotment. Air quality would still be affected by activities on other active grazing allotments in the analysis area and by continued recreation and mining operations in the project area and just outside the project area.

Climate

Desired Condition

U.S.D.A. Strategic Plan for 2010 to 2015 sets a departmental goal to "ensure our national forests and private working lands are conserved, restored, and made more resilient to climate change, while enhancing our water resources." As a measure of this goal, all National Forests are to come into compliance with a climate change adaptation and mitigation strategy. The Plan and A Roadmap for Responding to Climate Change has been developed and is available on the agency's website at http://www.fs.fed.us/climatechange/.

The Roadmap integrates land management, outreach, and sustainable operations accounting. It focuses on three kinds of activities: assessing current risks, vulnerabilities, policies, and gaps in knowledge; engaging partners in seeking solutions and learning from as well as educating the public and employees on climate change issues; and managing for resilience, in ecosystems as well as in human communities, through adaptation, mitigation, and sustainable consumption strategies. To measure agency progress in moving toward this goal, a performance scorecard has been implemented.

Effects Analysis

Research indicates livestock grazing may affect climate through emissions of methane gas produced by cattle (Gill et al. 2010). This effect is anticipated to be minor in the analysis area as total livestock numbers are low and distributed broadly across the landscape for all grazing allotments in the project

area. It would be difficult to separate effects of livestock emissions from those produced by other human activities, such as passenger vehicles and off-road vehicles traveling on roads in the analysis area, industrial activities such as mining, and outflow from major metropolitan areas such as Phoenix, Arizona, which lies approximately 80 miles south of the analysis area.

In addition to such human and industrial activities not related to the proposed action, forests are managed to maintain a vigorous condition that supports trees and sequesters carbon long-term. The Forest Service acknowledges the trade-off between its management activities and greenhouse gas (GHG) emissions. Management activities (such as thinning, prescribed burning) may result in a short term release of emissions, but they will lead to increased forest resilience and resistance to wildfire, drought and insects/disease that decreases the potential for and magnitude of releases in the long-tern.

Livestock grazing may or may not affect climate by altering the abundance or type of carbon-sequestering vegetation available on the landscape (Brown, et al.1997; Asner et al. 2004; Archer and Predick 2008). Implementation of best management practices and utilization guidelines is anticipated to mitigate this effect across the analysis area.

Climatic fluctuations, on the other hand, have a profound effect on livestock grazing. Implementing an adaptive management strategy would be critical for responding to these fluctuations by adjusting stocking levels as needed in periods of below average or above average precipitation to meet desired conditions for all resources.

Removal of livestock from the allotments through selection of a no grazing alternative would reduce emissions slightly; however, it would be difficult to measure this change. Emissions would continue to be generated from neighboring allotments in the analysis area. Eliminating grazing pressure on vegetation may also have a slight benefit for carbon sequestration; again, this would be difficult to measure on such a small scale.

No adverse direct, indirect or cumulative effects to the climate and GHG emissions are anticipated.

Additional effects of climate are discussed under the vegetation and hydrology sections of this chapter.

Socioeconomics

Affected Environment

All of the allotments within the project are located in Gila County, Arizona, on the Payson ranger district. Gila County encompasses approximately 4,758 square miles. In 2010 Gila County had a population of 53,597, an increase of 4.4 percent over 2000. Major employment in Gila County includes mining, recreation, ranching, and tourism (http://co.gila.az.us/).

Within the county, ownership or administrative control occurs as follows: U.S. Forest Service - 56 percent of the land; Apache Tribe - 38 percent; individuals and corporations - 2 percent; U.S. Bureau of Land Management - 2 percent; State of Arizona and other public lands the remaining 2 percent (Arizona Department of Commerce 2008). With little private land to assess property taxes, the county is

dependent upon funding from the federal government. The U.S. Government makes payments to Gila County under various programs, the two most important being:

- Payments in Lieu of Taxes (PILT). These payments are made to the local governments based upon the acreage of federal land within the county, population, consumer price index and previous year payments. In 2012, Gila County received approximately $3,271,245 from this program (USDoI 2011).

- *Secure Rural Schools and Community Self Determination Act of 2000* (*PL 106-393*). Traditionally, the federal government had returned 25 percent of the revenues collected on Forest Service lands from grazing permits and timber sales to the counties on which these revenues were generated. With decreased timber sales and fees generated from grazing permits, the above Act was designed to "...restore stability and predictability to the annual payments made to States and counties containing National Forest System lands and public domain lands managed by the Bureau of Land Management for use by the counties for the benefit of public schools, roads and other purposes." In 2011 Gila County received $1,693,792 from this program (Gila County 2011).

Social Environment

The social environment is perhaps the most diverse and emotionally charged arena in ecosystem management. The social environment for this analysis comprises the people living in and adjacent to the Tonto National Forest. Forest resources play an important social role for the people of the Southwest. The goods, services, and uses available from the National Forests represent major components in the lives of many residents within the area of the Tonto NF, especially those in rural areas.

Geographically this region has two types of very distinct population centers. There are several small rural communities scattered along and within the boundaries of the Forest. In addition, the Phoenix metropolitan area abuts the Forest along its western boundary. The smaller communities tend to rely at least partially on forest resources (mining, ranching, and timber) for their economic development. This is evidenced by the Gila County Land Use and Resource Policy Plan for public lands, which states, "Federal and state agencies need to recognize and take into account the critical role that public lands in Gila County play in the overall functioning of the County, and in the County's economy and tax base" (Gila County 1997, revised 2010). The Phoenix metropolitan area and Payson area have experienced great population growths in recent years. The influx of people in recent decades has also brought about more diverse views and public opinion regarding appropriate uses of the public lands. The demand for recreational type activities on public lands is greatly increasing.

Few generalizations can be made about the communities across the Southwest. They are as diverse as the people who live there and due to the increasing desirability of the Southwest as a living location. The diversity is ever increasing. It should not be expected that all residents have the same or even similar points of view on various issues.

Lifestyles

Ranching and the grazing of domestic livestock have been a part of the Southwest culture for 400 years. Grazing sheep and cattle in the Southwest was introduced by the Spanish in the late 16th century. The tradition of an open range endured for several hundred years before Anglo-Americans arrived in the Southwest, and when they came, the new arrivals expanded the traditional pastoral practices into modern range-cattle and sheep industries. In the Southwest, the National Forests were of equal or greater importance to the people for their range resources as they were significant for timber, watershed, or mineral resources (Baker et al. 1988).

Economic Impacts

Other than reported actual livestock numbers (from bills for collection) that have been placed on the five allotments within the project area, data has not been provided to the Forest Service in regards to the economic returns from ranching operations or expenses incurred for maintenance of range improvements. Stocking levels have been quite variable throughout recent history on the allotments due to fluctuating resource conditions, recurrent drought, and economic considerations.

Research is available that discusses the influence stocking levels can have on economic returns. Generally, heavier stocking levels result in the greatest gross economic returns, while moderate stocking levels maximize net economic returns (Holechek et al. 2004). Over time, heavy stocking tends to result in higher death loss, a greater need for supplemental feeding, especially in years of below average precipitation, and lower weaning weight percentages.

Under heavy stocking levels, livestock tend to make high gains for a few years, especially when precipitation remains at average or above average levels. However, during drier periods, livestock productivity tends to reduce per animal unit and per unit area. The severity of reduction is related to the stocking density, i.e., heavier stocking levels result in more severe reductions in economic returns than moderate stocking levels, especially in drought years. Under the adaptive management proposal, desirable stocking levels would be moderate over the long term to achieve desired resource conditions.

Social and Economic Effects

There are many opportunities and benefits with the proposed action. There would be actively managed livestock grazing operations and ecological monitoring.

Further, there would be land management and water developments that also benefit wildlife and recreationists implemented by livestock grazing permittees. There would be land stewardship and opportunities to raise livestock for human consumption and other uses (medical, industrial, household, and other by- products) in a unique, safe, health-giving and sustainable environment.

For example, with the proposed action, up to 600 livestock per year could be placed into the market creating up to 330,000 lbs of edible beef. This is based on a 600 head herd, yielding 510 head of calves to market each fall assuming an 85% calf crop. In addition to market age yearling and weanling calves the operation could produce approximately 90 head of culls and aged males and females to market as well. The gross income off of this operation could be in the range of $610,000 annually assuming a price

of at least $2.20/pound on 550 weight yearlings. This money would be returned to the local economy in the form of wages, payments to suppliers, interest and capital investments in the ranching infrastructure.

From this same 600 head of animals there would be ~50% of beef by-products. This includes from each of those 600 animals: 1) insulin for some diabetics from a cows pancreas, 2) epinephrine (adrenaline) to treat allergic shock and allergies from a cows adrenal glands, 3) ACTH (adrenocorticotropic hormone) to treat allergic diseases from the cows pituitary gland, 4) blood factors that can be used for treatment of hemophilia, 5) leather goods for furniture, automobiles, luggage, shoes, clothing, saddles, and bridles, 6) paint brushes, 7) felt for weather stripping, 8) sports equipment – the hide from one beef animal can be made into 20 footballs, 18 soccer or volleyballs, 12 basketballs or baseball gloves, or 144 baseballs. The sports industry uses over 100,000 cattle hides each year. 9) Horns and hooves provide imitation tortoise shell, combs, pet chews, imitation ivory, piano keys, 10) Fats and fatty acids from a cow provide crayons, candles, floor wax, detergent, bar soaps, shaving cream, cosmetics such as lipstick, deodorants, lubricant fluids, plastics, tires, perfumes, pet foods, livestock feeds, 11) Gelatin from bones of a cow provide photographic film, paper and cardboard glues, emery boards, 12) A cows intestines provides tennis racquet strings and musical instrument strings, 13) Gelatin from bones also provides candy, marshmallows, gel coatings for vitamin and medication capsules, yogurt, and gelatin, 14) Fatty acid-base from fats provides chewing gum, oleo margarine and shortening, 15) Plasma protein from blood of a cow provides cake mixes, deep-fry batters, pasta, imitation seafood, 16) Some inks in printing contain animal fats, 17) industrial cleaners, 18) Nail polish, soap, lotions, makeup, deodorants, eye contact cleaner, 19) antifreeze, hydraulic brake fluid, car wax, and asphalt binding agents 20) blood meal and bone meal provide fertilizer and soil amendments.

Further, widely available research and monitoring demonstrates a variety of grazing management strategies can be beneficial in the management of plants, soils and wildlife within riparian areas and uplands.

Congressional recognition of the value and contributions of public lands livestock grazing to our Nation's social and economic stability and as a critical function in our Nation's food security and by-products security would be acknowledged or complied through implementation of the proposed action.

The Proposed Action has the potential to provide a near term solution to the ongoing problem of managing Weeping lovegrass on these allotments in a way that benefits both the ecosystem as well as the local economy.

Effects Analysis

Environmental Consequences - Alternative 1 (No Action)

A no grazing alternative would not affect future payments received through PILT or *PL 106-393*. Payson and Gila County could be affected by a no grazing alternative due to the amount of money made by the permittee and how much is spent in the local economy. This is related to a multiplier effect, or that monies made in a community are often re-spent in that community. Multipliers in rural communities are

generally lower than for large municipal areas as expenditures for large ticket items are usually made outside the local area. Multipliers of 1.25 to 1.75 are common in rural areas associated with adjacent public lands (Loomis 2002).

Removal of livestock could result in the loss of some culture and lifestyle tied to ranching. This could intensify feelings of mistrust and loss of personal control, and threaten lifestyles, resulting in negative attitudes towards the Forest Service, and other federal agencies in general.

Conversely, those individuals who perceive grazing to be an unsuitable use of federal lands may feel increased trust and increased positive attitude towards the Forest Service, and other federal agencies in general. These individuals may perceive an increased social benefit from livestock removal.

All permittees in the project area have had or currently have contracts with government, state or local agencies for livestock management plans and range improvements. Removal of livestock and range improvements would affect stipulations of their contracts, potentially requiring financial burden on permittees.

Environmental Consequences - Alternative 2 (Proposed Action)

Personal characteristics such as self-sufficiency, independence, hard work, and other traits associated with the ranching lifestyle would most likely be protected under these alternatives.

Continuation of ranching operations in a sustainable manner would provide for continuation of the culture and lifestyle tied to ranching in this area.

Conversely, those individuals who perceive grazing to be an unsuitable use of federal lands may feel decreased trust and increased negative attitude towards the Forest Service, and other federal agencies in general. These individuals may perceive a decreased social benefit from continuing grazing or expanded grazing.

Federal, state, and local contracts would be maintained, providing improved management possibilities for livestock operators.

No adverse direct, indirect or cumulative effects to social or economic systems are anticipated.

Chapter 4: Consultation and Coordination

Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

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White Mountain Apache
Ft. McDowell Yavapai Nation
Tonto Apache Tribe
Yavapai Apache Tribe
Pueblo of Zuni
Hopi Tribe
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Audubon Society
Western Watersheds Project
Center for Biological Diversity
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T.W. Land & Cattle Co.
Livestock grazing permittees on Payson RD
Private land owners within or adjacent to the project area
Sierra Club
Friends of Anderson Mesa
The Nature Conservancy
Payson Chamber of Commerce
Small business owners within or adjacent to the project area

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