

**This is a working document that is being modified and changed as new information comes forward.*

Salt River Six Environmental Impact Statement: Draft Range and Vegetation Report

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Desired Conditions:

Tonto NF Land Management Plan

- Provide for grazing of domestic livestock (p19).
- Bring permitted grazing use in balance with forage allocated for use by domestic livestock (p 24).
- Improve watershed condition, range forage improvement, wildlife habitat improvement and visual quality enhancement (p 22).
- Maintain a minimum of 30% effective ground cover for watershed protection and forage production, especially in primary wildlife forage producing areas. Where less than 30% exists, it will be the management goal to obtain a minimum of 30% effective ground cover (p 40-1).
- Identify key ungulate forage monitoring areas. These key areas will normally be ¼ mile from water, located on productive soils on level to intermediate slopes and be readily accessible to grazing. Size of the key forage monitoring areas should be 20 to 500 acres. Within key forage monitoring areas, select appropriate key species to monitor average allowable use (p 43).
- Achieve utilization in the riparian areas that will not exceed 20% of the current annual growth by volume of woody species, at least 80% of the potential riparian overstory crown coverage and at least 50% of the cottonwood willow and mixed broadleaf acres in Structural Type I by 2030 (p 41).
- Rehabilitate at least 80% of the potential shrub cover in riparian areas through the use of appropriate grazing systems and methods (p 41)
- Rehabilitate and maintain, through improved management practices, mixed broadleaf riparian to achieve 80% of the potential overstory crown coverage. Natural regeneration is anticipated to achieve most of this goal. Artificial regeneration may be necessary in some areas.
- Reestablish riparian vegetation in severely degraded but potentially productive riparian areas. Natural regeneration is anticipated to achieve this goal, but artificial regeneration may be necessary in some areas (p 41)

- Provide wildlife access and escape on all livestock and wildlife water developments (p 42)
- Forage use by grazing ungulates will be maintained at or above a condition which assures recovery and continued existence of threatened and endangered species (p 42)

Management Levels in project area given by Tonto NF Land Management Plan (p 243)

| Level Identifier | Description of Range Management Levels |
|-------------------------|---|
| B | Management controls livestock numbers so that livestock use is within present grazing capacity. Improvements are minimal and constructed only to the extent needed to protect and maintain the range resource in the presence of grazing. |
| C | Management seeks full utilization of forage allocated to livestock. Cost effective management systems and techniques, including fencing and water development, are designed and applied to obtain relatively uniform livestock distribution and use of forage, and to maintain plant vigor. |
| D | Management seeks to optimize production and utilization of forage allocated for livestock use consistent with maintaining the environment and providing the multiple use of the range. From all existing range and livestock management technology, practices may be selected and used to develop cost effective methods for achieving improved forage supplies and uniform livestock distribution and forage use. Cultural practices such as brush control, type conversion, fertilization, site preparation and seeding of improved forage species may be used to improve quality and quantity of forage. Cultural practices may be combined with fencing and water developments to implement complex grazing systems and management methods. |

Management Level B Locations

5A – Sierra Ancha Wilderness

- Manage for wilderness values, wildlife habitats and natural ecological processes while allowing livestock grazing and recreation opportunities that are compatible with maintaining these values and processes.
- Manage suitable rangelands at Level B to maintain permitted use within forage capacity. Rangeland in less than satisfactory condition will be treated with improved grazing management.
- Minimal range improvements for protection of forage and soil resources commensurate with wilderness values. Maintain utilization at acceptable levels within key forage producing and Wilderness use areas.
- Minimal range improvements, i.e., boundary fences and interior division fences deemed essential for Level B management.

2B – Salt River Canyon Wilderness – (p 76)

- The primary emphasis for this area is the preservation of naturally occurring flora, fauna, aesthetics and ecological processes while providing a very high quality white water river running experience.
- Minimal range improvements necessary for Level B management and protection of the forage and soil resources commensurate with wilderness values. Maintain utilization at acceptable levels within key forage producing and wilderness use areas.
- Minimal range improvements, i.e., boundary and essential interior division fences deemed necessary for Level B management. Rangeland in less than satisfactory condition will be treated with improved grazing management.

2C – Upper Salt River Canyon – (p 80)

- The primary emphasis for this area is the preservation of naturally occurring flora, fauna, aesthetics and ecological processes while providing a very high quality white water river running experience.
- Minimal range improvements developed (i.e., boundary fences and interior division fences essential for Level B management). Maintain utilization at acceptable levels within key areas.

6G – Salt River Canyon Wilderness - (p 185)

- Minimal range improvements necessary for Level B management and protection of the forage and soil resources commensurate with wilderness values. Maintain utilization at acceptable levels within key forage producing and wilderness use areas.
- Minimal range improvements, i.e., boundary and essential interior division fences deemed necessary for Level B management.
- Watershed protection is an important emphasis, and the stream shall be maintained in a free-flowing condition with water quality maintained or improved. Other activities that are authorized by the Wilderness Act will be conducted as so to minimize their impact on wilderness character (p 184)

Management Level C Locations

6F – Roosevelt Lake - Management Level C

- Minimal range improvements necessary for Level C management and protection of the forage and soil resources. Maintain utilization at acceptable levels within key forage producing areas.
- Minimal range improvements, i.e., boundary and essential interior division fences deemed necessary for Level C management.

Management Level D Locations

2F Globe General Management area – (p 87)

- In the pinyon-juniper type manage toward a goal of 25-50% cover of browse shrubs in key deer wintering areas, planting may be necessary in some areas to restore a seed source.
- Manage the pinyon-juniper type to emphasize the production of mule deer.
- Manage the chaparral type to emphasize the production of whitetail deer.
- Manage suitable rangelands at Level D. Rangeland in less than satisfactory condition will be treated with improved grazing management along with the installation of structural and non-structural improvements.
- Continue monitoring of existing range study plots, and revegetation and brush treatment projects.
- Manage the chaparral type on a 30 year prescribed fire rotation on those sites managed for forage production and water yield.
- Use of approved herbicides on a selective basis where brush encroachment is clearly inhibiting forage production for wildlife and domestic livestock. Possible treatment areas will be identified in Allotment Management Plans (AMP) and will involve areas of limited size and extent where other management practices (i.e. prescribed burning) cannot be effectively or economically utilized to achieve management objectives. Projects of this nature will be subject to environmental assessment and public involvement to insure project objectivity and public safety.
- Maintenance performed on revegetation acres as determined in Allotment Management Plans to retain optimum forage production. Methods will be appropriate to vegetation and terrain of treatment areas and could include prescribed fire, chemical and/or mechanical means.
- Develop structural improvements in association with AMP to maintain utilization at levels appropriate with management intensity and AMP objectives.
- Study and assess the effects of grazing on the endangered Arizona hedgehog cactus by fencing plots. Correct management conflicts within the range of Arizona hedgehog cactus.

6J Tonto Basin General Management Area – (p 193)

- Continue inspections of existing range study plots and revegetation and brush treatment projects.
- Rangeland in less than satisfactory condition will be treated with improved grazing management along with the installation of structural and non-structural improvements.
- Manage the chaparral type on a 30 year prescribed fire rotation on those sites managed intensively for increased forage production and water yield.
- Use of approved herbicides on a selective basis where brush encroachment is clearly inhibiting forage production for wildlife and domestic livestock. Possible treatment areas will be identified in allotment management plans and will involve areas of limited size and extent where other management practices (i.e., prescribed burning) cannot be effectively or economically utilized to achieve management objectives

- Maintenance performed on revegetation acres as determined in Allotment Management Plans to retain optimum forage production. Methods will be appropriate to the vegetation and terrain of treatment areas and could include prescribed fire, chemical and/or mechanical means.
- Manage suitable rangelands at Level D, except manage South Thompson Mesa at Level A until the areas returns to satisfactory productivity. Rangeland in less than satisfactory condition will be treated with improved grazing management along with the installation of structural and non-structural improvements (p 195)
- Develop structural improvements in association with AMP's to maintain utilization at levels appropriate with management intensity and AMP objectives.
- Manage the pinyon-juniper type in a sustained yield even-flow basis. Horizontal diversity will be provided by a mix of successional stages within 5,000 acre wildlife management units. Ten percent of the type will be maintained as permanent openings with suitable ground cover for specific site conditions

Best Management Practices and Other management objectives

Desired conditions for vegetation communities are to:

- Increase cover of native herbaceous species with an ultimate goal of achieving ecosystem potential.
- Increase plant basal area and litter.
- In Sonoran desert communities, increase cover of biological soil crusts to reduce soil erosion, increase infiltration, and limit spread of exotic annuals (Elzinga et al 1988).
- In Sonoran desert communities, allow for increased production of jojoba.
- In semi-desert grassland communities, increase foliar canopy coverage, basal cover, and vigor of native grass species that decrease under grazing pressure.
- In juniper savannahs and woodlands, increase foliar canopy coverage, basal cover, and vigor of native grass species which decrease under grazing pressure.
- In chaparral, increase foliar canopy cover and vigor of shrub species preferred by grazing animals (Forest Service Handbook, FSH, 2209.21).
- In ponderosa pine and mixed conifer, provide for diversity in age classes of trees and healthy spacing of trees.

Range Improvements/ Management: Guidelines and standards for most existing range improvements are as follows:

- Any maintenance or reconstruction of improvements must be confined within original site disturbance and construction. No new soil disturbance.
- Access to the site must be via existing roads. If road improvement is needed to access site prior approval by the District Office is required.

- Do not disturb any riparian obligate vegetation, specifically willow, cottonwood and sycamores
- Troughs: An overflow pipe, automatic shut off valve and approved wildlife entry/escape ramp must be installed. Troughs must be placed on rocks or concrete to prevent mud or sink holes. Must be painted a color that best matches surrounding landscapes. Generally water must be transported outside riparian areas.
- Storage Tanks: Must be painted a color that best matches surrounding landscape. Overflow is not permitted. Open top storage tanks must have approved wildlife escape ramps.
- Pipelines: Must use existing pipeline routes for replacement. Placement of above or below ground pipelines will be determined on a site specific basis.
- Fences: A fence comprises of 4 strands; bottom smooth wire at 16 inches, and a maximum top wire of 42 inches. If using live Juniper as a post, then must be protected from girdling by wire.
- Wells: If using liquid or air drilling mediums, all drilled solids and fluids must be water misted at exhaust to reduce air particulates and moved off forest. If well is redrilled, registration of water rights will be made through Arizona Department of Water Resources to USA-USDA-Forest Service-Tonto National Forest.
- Additional guidelines for range improvements can be found in the Forest Service Structural Range Improvement Handbook (FSH 2209.22, R-3). Some projects may also require site specific modifications to those standards and guidelines listed above.

Future management considerations:

Proper livestock distribution continues to be a challenge in this analysis area as well as most grazing allotments throughout the Tonto National Forest. Recent technological advances in global positioning satellite systems, solar enhanced battery storage, and animal behavior research promises electronic devices that significantly improve rangeland manager's tools in animal distribution. Electronic devices that are attached to livestock may be coming on market in future that may significantly replace need for costly conventional wire fencing.

Uses of these systems and other yet unknown technologies that enable operators and managers to better manage resources should be incorporated where appropriate and most efficient.

Existing Conditions

VEGETATION TYPES

Riparian (streams and springs)

- **Dominant vegetation:** cottonwood (*Populus fremontii*), sycamore (*Platanus wrightii*), Goodding's willow (*Salix gooddingii*), Arizona grape (*Vitus arizonica*) deergrass (*Muhlenbergia rigens*), sedge (*Carex spp*), hackberry (*Celtis reticulata*), desert willow (*Chilopsis linearis*)
- **Rangeland management tools that may be used:** seeding or planting native vegetation on recovering streambanks; deferred grazing or exclusion of grazing in impaired or recovering riparian areas; mechanical, biological or chemical treatment to reduce or remove noxious weeds; fencing; water development
- **Pastures containing Riparian: Sedow-** Hess, 4Y, Big Horse, Bronson, Brushy, Indian Gardens, Monument Trap, New Corral, Rock Springs Riparian, Sevenmile Riparian, Steer, Storm Canyon ; **Hicks Pikes Peak-** Hicks, Holly, Horseshoe Bend, Kenny, Ortega, Rip, West; **Chrysolite-72,** Ash Creek Riparian, Boundary, Carol, Gleason Riparian, Home, Jackson, Poverty, Regal, Timber, Tony; **Haystack Butte-** Upper Ask Creek, Ash Creek, Bronson, East Steer; **Poison Springs-** Blevens, Klondike; **Dagger-** Lower Dry Creek, Upper Coon Creek, Oak Creek Mesa, West Devore, Dagger.
- **Water developments:** live water in creeks, seasonal water in “potholes”, spring boxes or horizontal wells on active springs, submersible pumps and pipelines to storage tanks and troughs away from streams, storage tanks at spring developments with associated pipelines and troughs.

Sonoran desert:

- **Dominant vegetation:** little leaf palo verde (*Parkinsonia microphyllum*), cholla (*Cylindropuntia spp.*), saguaro (*Carnegiea gigantea*), brittlebush (*Encelia farinosa*), bursage (*Ambrosia spp.*), crucifixion thorn (*Canotia holocantha*), creosote (*Larrea tridentata*), Mormon tea (*Ephedra spp.*), jojoba (*Simmondsia chinensis*), catclaw acacia (*Acacia greggii*), mesquite (*Prosopis velutina*), shrubby buckwheat (*Eriogonum wrightii*), false mesquite (*Calliandra eriophylla*), turpentine bush (*Ericameria laricifolia*), range ratany (*Krameria spp.*), red brome (*Bromus rubens*), three awn (*Aristida spp.*)
- **Rangeland management tools that may be used:** seeding or planting native vegetation in recovering soils; concentrating grazing on nonnative annual grasses when green to reduce fire effects and reduce seed propagation; mechanical, biological or chemical treatment to reduce or remove noxious weeds and reduce fire effects; mechanical treatment to reduce cholla encroachment and improve native vegetation diversity; fencing, water development, salt and or low moisture blocks to distribute livestock across landscape.
- **Pastures containing Sonoran desert scrub: Sedow-** 4Y,; **Hicks Pikes Peak-** North Steer, Ortega, Rip, Schute Springs, South Steer, West, Windmill, Yellow, F.S., Hicks, Holly, Hope, Horseshoe Bend, Lower Devore; **Chrysolite-**Boundary; **Haystack Butte-** Cottonwood, River, Upper River; **Poison Springs-** Basset Lake, Intake, Upper Blevens, Blevens, East Highway, Chalk Creek, Baker, Braddock, South Willow, North Willow, Zig Zag, Summit, North Black Mesa, South Black Mesa, Klondike, Summit, Hackberry, West Highway; **Dagger-** Oak Creek Mesa (sparse), Upper Dry Creek, Lower Dry Creek, Upper Coon Creek, Lower Coon Creek, West Devore, Dagger, Rock.

- **Water developments:** wells with windmills or pumps, spring boxes or horizontal wells on active springs, live water in creeks, seasonal water in drainage “potholes”, dirt stock tanks, storage tanks at wells and spring developments with associated pipelines and troughs

Semi-desert grassland:

- **Dominant vegetation:** mesquite, catclaw acacia, cholla, prickly pear (*Opuntia*), mimosa (*Mimosa biuncifera*), shrubby buckwheat, range ratany, false mesquite, snakeweed (*Gutierrezia sarothrae*), black grama (*Bouteloua eriopoda*), side-oats grama (*Bouteloua curtipendula*), hairy grama (*Bouteloua hirsuta*), three awn, curly mesquite (*Hilaria belangeri*), globe mallow (*Sphaeralcea* spp.)
- **Rangeland management tools that may be used:** light to moderate grazing to maintain or improve diversity of native species and reduce nonnative annual grasses; grazing to reduce seed propagation of nonnative plants; mechanical, biological or chemical treatment to reduce or remove noxious weeds; mechanical or fire treatment to reduce cholla encroachment and improve native vegetation diversity; fencing and water development, salt and or low moisture blocks to distribute livestock across landscape; seeding or planting native vegetation in recovering soils.
- **Pastures containing semi-desert grassland: Sedow-** Bronson, Horse; **Hicks Pikes Peak-** West, Kenny, Big, Lower Devore, Upper Big, South Steer, Holly, Windmill, North Steer, Ortega, Hope, Horseshoe Bend, Lower Shute Springs, Upper Shute Springs; **Chrysotile-** Tony, Boundary, Jackson, Ash Creek, Regal, 72, Poverty; **Haystack Butte-** River, Steer, Cottonwood, Upper River, Bronson; **Poison Springs-** Upper Blevens, Chalk Creek, Baker, South Willow, North Willow, Klondike, South Black Mesa, North Black Mesa, Hackberry; **Dagger-** Oak Creek Mesa, Upper Dry Creek, Lower Dry Creek, Upper Coon Creek, Lower Coon Creek, West Devore, Dagger, Rock, Ellison, North Sheep, Little Sheep.
- **Water developments:** wells with windmills or pumps, spring boxes or horizontal wells on active springs, live water in creeks, seasonal water in drainage “potholes”, dirt stock tanks, storage tanks at wells and spring developments with associated pipelines and troughs

Juniper savannahs:

- **Dominant vegetation:** alligator juniper (*Juniperus deppeana*), redberry juniper (*Juniperus coahuilensis*), sotol (*Dasylirion wheeleri*), skunkbush sumac (*Rhus trilobata*), beargrass (*Nolina microcarpa*), hairy grama, curly mesquite, squirreltail (*Elymus elymoides*), side-oats grama
- **Rangeland management tools that may be used:** light to moderate grazing to maintain or improve diversity of native species and reduce nonnative annual grasses; grazing to reduce seed propagation of nonnative plants; mechanical, biological or chemical treatment to reduce or remove noxious weeds; mechanical or fire treatment to reduce cholla encroachment and improve native vegetation diversity; fencing and water development, salt and or low moisture blocks to distribute livestock across landscape;

seeding or planting native vegetation in recovering soils, use of managed or wildland fire to move vegetation towards desired conditions.

- **Pastures containing juniper savannahs:** **Sedow-** 4Y, Bronson, New Corral, Hess, Brushy, Monument, Steer, Rock Springs, Reveg, Storm Canyon, Walnut, Sevenmile, Indian Gardens, Home Horse, Hudson ; **Hicks Pikes Peak-** Hope, Horseshoe Bend, Upper Shute Spring, Windmill, South Steer, Lower Devore, Holly, Hicks, Murphy, West, Kenny ; **Chrysofile-** Boundary, Ash Creek, 72, Tony, Timber, Home, Poverty, Syrvey, Jackson, Horse #1, #2, #3; **Haystack Butte-** River, Cottonwood, Upper River, Steer, Bronson, Breeding; **Poison Springs-** Upper Blevens, Baker, South Willow, North Willow, Klondike, Hackberry; **Dagger-** Oak Creek Mesa, Upper Coon Creek.
- **Water developments:** wells with windmills or pumps, spring boxes or horizontal wells on active springs, live water in creeks, seasonal water in drainage “potholes”, dirt stock tanks, storage tanks at wells and spring developments with associated pipelines and troughs

Juniper woodlands:

- **Dominant vegetation:** alligator juniper, redberry juniper, Emory oak (*Quercus emoryi*), sotol, skunkbush sumac, turbinella oak (*Quercus turbinella*), agave (*Agave spp*), Manzanita (*Arctostaphylos spp.*), buckbrush (*Ceanothus spp.*), mountain mahogany (*Cercocarpus montanus*), holly leaf buckthorn (*Rhamnus crocea*), bull or mountain muhly (*Muhlenbergia spp.*)
- **Rangeland management tools that may be used:** light to moderate grazing to maintain or improve diversity of native species and reduce nonnative annual grasses; grazing to reduce seed propagation of nonnative plants; mechanical, biological or chemical treatment to reduce or remove noxious weeds; chemical or timber/fuel wood treatment to achieve desired juniper density; fencing, water development, salt and or low moisture blocks to distribute livestock across landscape; seeding or planting native vegetation in recovering soils; use of managed or wildland fire to move vegetation towards desired conditions
- **Pastures containing juniper woodlands:** **Sedow-** 4Y, Indian gardens, Reveg, Storm canyon, Bronson, New Corral, Hess, Brushy, Monument, Rock Springs, Walnut, Sevenmile, Home Horse, Hudson; **Hicks Pikes Peak-** Horseshoe bend, Lower Shute Springs, Windmill, North Steer, Lower Devore, Holly, Rip, Murphy, Kenny; **Chrysofile-** Ash Creek, Tony, Horse #1, #2, #3, North Ash Creek, Regal, 72, Timber, Home, carol, Jackson, Survey, Poverty; **Haystack Butte-** Cottonwood, Steer, Bronson, Breeding; **Poison Springs-** Klondike; **Dagger-** Oak Creek Mesa.
- **Water developments:** wells with windmills or pumps, spring boxes or horizontal wells on active springs, live water in creeks, seasonal water in drainage “potholes”, dirt stock tanks, storage tanks at wells and spring developments with associated pipelines and troughs

Turbinella oak chaparral:

- **Dominant vegetation:** turbinella oak, juniper, skunbush sumac, agave, buckbrush, mountain mahogany, holly leaf buckthorn, manzanita

- **Rangeland management tools that may be used:** light to moderate grazing to maintain or improve diversity of native species and reduce nonnative annual grasses; grazing to reduce seed propagation of nonnative plants; mechanical, biological or chemical treatment to reduce or remove noxious weeds; chemical or timber/fuel wood treatment to achieve desired juniper density; fencing, water development, salt and or low moisture blocks to distribute livestock across landscape; seeding or planting native vegetation in recovering soils; use of managed or wildland fire to move vegetation towards desired conditions.
- **Pastures containing turbinella oak chaparral:** Sedow- 4Y, Indian Gardens, Reveg, Storm canyon, Walnut, Bronson, Hess, Brushy, Monument, Rock Springs; **Hicks Pikes Peak-** Hope, Rip, Kenny, Murphy, Horseshoe Bend, Windmill, South Steer, Lower devore, Holly, Hicks, West; **Chrysotile-** Survey, Carol, Ash Creek, Tony, North Ash Creek, Regal, Timber, Jackson, Poverty; **Haystack Butte-** Cottonwood, Upper River, Bronson, Breeding; **Poison Springs-** Upper Blevens, Blevens, Summit, Klondike; **Dagger-** Oak Creek Mesa, Upper Coon Creek, North Sheep.
- **Water developments:** wells with windmills or pumps, spring boxes or horizontal wells on active springs, live water in creeks, seasonal water in drainage “potholes”, dirt stock tanks, storage tanks at wells and spring developments with associated pipelines and troughs.

Ponderosa Pine/ Mixed Conifer:

- **Dominant vegetation:** Ponderosa pine (*Pinus ponderosa*), Gambel oak (*Quercus gambelii*), Douglas fir (*Pseudotsuga menziesii*), buckbrush, mountain mahogany, bull or mountain muhly, Arizona fescue (*Festuca arizonica*), bluegrass (*Poa spp.*)
- **Rangeland management tools that may be used:** light to moderate grazing to maintain or improve diversity of native species and reduce nonnative annual grasses; grazing to reduce seed propagation of nonnative plants; biological treatment to reduce or remove noxious weeds; mechanical, biological, chemical and or timber/fuel wood treatment to achieve desired tree density; fencing, water development, salt and or low moisture blocks to distribute livestock across landscape; use of managed or wildland fire to move vegetation towards desired conditions.
- **Pastures containing ponderosa pine/ mixed conifer:** **Chrysotile-** Tony, Timber, Home, Carol, Horse #1, #2, #3; **Haystack Butte-** Bronson; **Dagger-** Oak Creek Mesa.
- **Water developments:** wells with windmills or pumps, spring boxes or horizontal wells on active springs, live water in creeks, seasonal water in drainage “potholes”, dirt stock tanks, storage tanks at wells and spring developments with associated pipelines and troughs.

CHRYSOTILE ALLOTMENT

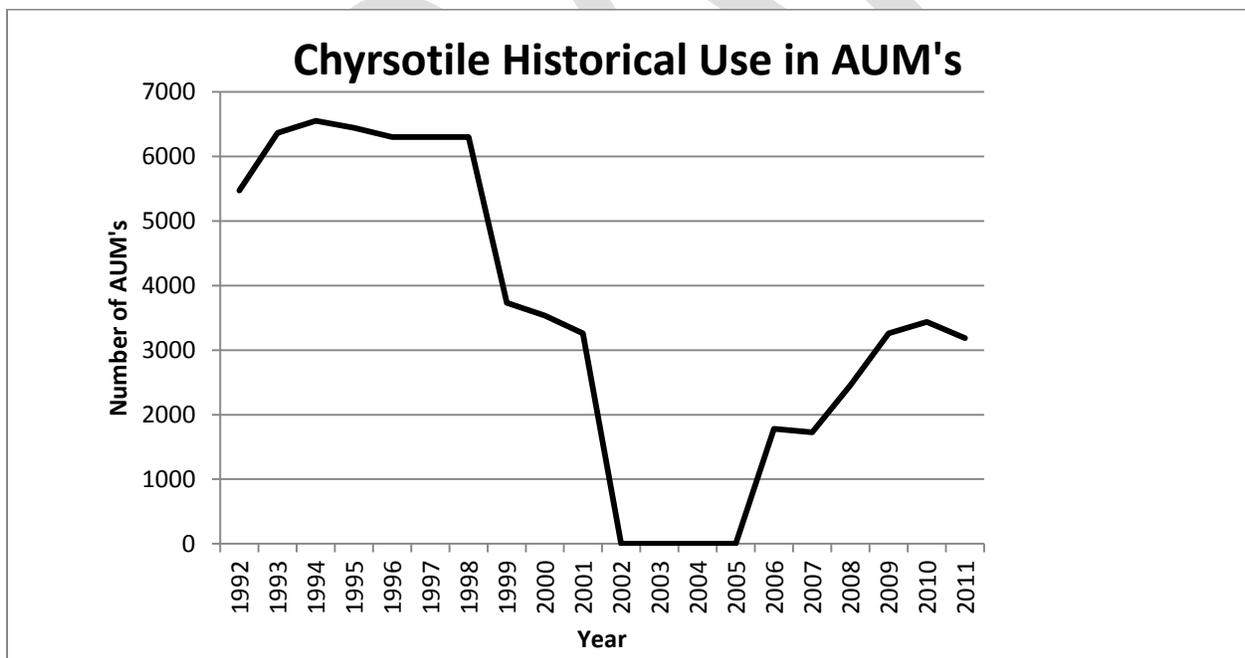
History

Chrysotile Allotment is located in northeast corner of Globe Ranger District and comprises 53,760 grazed acres. Allotment is bounded on east by San Carlos Apache Reservation, southwest by Winters Allotment, south by Haystack Butte Allotment, and north by Salt River. Elevation varies from 2,825 feet at Gleason Flat to 6,629 feet at Carol Spring Mountain.

Topography is extremely variable with a wide array of slopes and aspects. There is high diversity and variation in vegetation due to variable elevation, soils, aspect, and precipitation. Some areas of allotment are predominated by browse species while others are predominantly grassland. Most of vegetation types within Chrysotile Allotment are adapted to periodic grazing and to periodic fire.

Howard “Pinky” Norris purchased base property from Leroy Tucker in 1972. During 1980s and 1990s allotment was separated into four management units with two pastures each, providing for one year’s rest between uses. Units were Gleason Flat/Ash Boundary Unit, 72/Regal Unit, Tony/Timer Unit, and Carol/Poverty Unit. Use was to be limited to 50-60% on key browse and perennial grass species. Gleason Flat/Ash Boundary Pasture was closed to livestock from 1998-2000, and cattle were rotated in other units. In 2001, grazing permit was reduced by 50% from 456 to 228 and from 300 yearlings to 150 yearlings. From 2001 to 2005 permit was in transition and no authorized cattle were permitted. In 2005, Pinky sold base property to Michael and Kimberly Oddenetto. In the past livestock trespass from neighboring tribal land has been a problem that continues to a lesser degree at present. Trespass livestock generally remain in or near Salt River.

Michael and Kimberly Oddenetto’ current Term Grazing Permit is 228 adult cattle yearlong and 150 yearling cattle seasonally. Current management uses livestock to maintain or improve forage plant health, vigor, and reproduction. A rest rotation grazing strategy controls intensity, timing, frequency, and duration of grazing effects in pastures. Generally pastures receive a full year of rest for each consecutive warm or cool growing season in a three year cycle. Management goal is to utilize 40-50% of herbaceous forage and 50% of browse species production by weight.



PASTURES

Boundary Pasture (Juniper Savanna, Riparian Vegetation, Semi-Desert Grassland, Sonoran Desert Scrub vegetation types): Boundary Pasture is approximately 4,566 acres. It is located on northern end of allotment and extends to western boundary. In 2010, light levels of grazing had occurred on dominant perennial grass, purple threeawn. Red brome and six weeks fescue also dominated throughout site. Heavy grazing heavily impacted nearly all palatable vegetation. Most cattle evidence occurs on flat ridge tops and saddles. Forage production is limited except in areas of steep or rocky ground.

Salt River borders western boundary while Butte Creek flows through middle of pasture. In past year livestock have accessed Gleason flat. Two dirt stock tanks are distributed on either end of pasture. Butte stock tank may only hold water seasonally and Little Colorado has not been reported to hold water in years. Picacho and Butte spring are not productive or have not been maintained in many years. A pipeline system was installed including four troughs. Other than pipeline, only reliable water source is available in pasture, Salt River. Livestock distribution remains uneven with most use occurring near pipeline.

Ash Creek Pasture (Juniper Savanna, Woodlands, Turbinella Oak Chaparral, Semi-Desert grassland, Riparian vegetation types): Ash Creek Pasture is approximately 2,749 acres. It is located north of Boundary Pasture, on west boundary of allotment.

Ash Creek splits northern and southern halves of pasture and meets Salt River at northwestern border. In this area, creek is cut down to bedrock. Ash Creek riparian community is diverse and vigorous to approximately 0.15 miles upstream from confluence with Salt River.

Trail Spring is near eastern border of pasture, no indication of spring maintenance in years. Fence line between Ash Creek pasture and Ash Creek riparian pasture has been down for years, Cattle trailing have been documented through this area.

ATV tracks have been seen going through Ash Creek pasture and Riparian pasture. Gate along roadway has been left open numerous times.

A nonfunctional corral is located on the northern flat of pasture. Cattle access this area because drainage fence line between pastures is down.

North Ash Creek Pasture (Riparian Vegetation, Semi-Desert grassland, Turbinella Oak Chaparral, Woodlands vegetation types): North Ash Creek pasture is 1316 acres located between Regal and Ash Creek pastures in northern portion of allotment.

Regal Pasture (Riparian vegetation, Semi-Desert grasslands, Turbinella Oak Chaparral, Woodlands vegetation types): Regal Pasture is approximately 6,967 acres. It is located in north end of allotment, east of Ash Creek and west of 72 Pasture. Dominant plant species throughout pasture is juniper, manzanita, scrub oak, pinyon pine, snakeweed and cliffrose. Inspections indicate pasture is primarily trees and shrubs with bare ground open spaces. When canopy is open, grasses are sparse. Dominant species is curly mesquite. Use on cliffrose has been moderate to high, based on utilization measurements.

Salt River runs along northern border of pasture, meeting Regal Canyon, which runs through middle of pasture. Cattle do not have access to many points along Salt River. Throughout pasture, developed stock water includes dirt stock tanks, spring boxes, storage tanks and

pipelines. No information has been gathered on Unnamed Spring. Trail Stock pond, has not been observed and uncertain if tank catches water. Seventy-Two well has a pipeline and storage tank in 72 water lot, but system is not charged with water. Ash spring stock tank and ash stock tank have not held water for years and would possibly hold water if cleaned out and lined. 72 stock tank located in 72 water lot does not hold water. Water lot has high amounts of erosion and active gullies.

Long Road Pipeline project is located along Forest Road 897, which crosses a few different pastures. Project source is hauled water, it is not charged and no water occurs along pipeline.

Both holding and riparian pastures approximately have 188 acres. Fence line separating these pastures from Regal is not functional and cattle can easily access these areas. Fourth of July spring may be functional but pipeline and trough are not charged with water.

72 Pasture (Riparian vegetation, Juniper Savanna, Woodlands, Turbinella Oak Chaparral, Semi-Desert grasslands vegetation types): 72 Pasture is approximately 8,157 acres. It is located in northeast corner of allotment.

Salt River runs along northern border of pasture. Canadian spring, Canadian Stockpond, Mormon spring, Phillips spring, Reservation tank, and Top of Mountain tank are distributed throughout pasture. Canadian Spring, stock pond, Mormon spring, Phillips spring and Reservation tank have not been observed in years and improvement is likely non functional. Unauthorized stock tanks, Road 897 tank 2 and 3 are located in pasture. Both unauthorized tanks also have Long Road pipeline troughs and storage tanks located on improvement. Top of the Mountain stock tank was dry upon inspection in June 2011, Long Road Pipeline has a trough at this location.

Long Road Pipeline project is located along Forest Road 897, which crosses a few different pastures. Project source is hauled water, it is not charged and no water occurs along pipeline.

Tony Pasture (Turbinella Oak Chaparral, Woodlands, Juniper Savanna, Conifer Forests, Semi-Desert grasslands vegetation types): Tony pasture in allotment at approximately 8,157 acres. It is located in the middle and stretches from west to east boundaries of allotment. Most common throughout pasture is juniper, scrub oak, buckwheat, squirreltail, comb bur, and cryptantha. Some ungrazed portions of this pasture show great recruitment of sideoats grama and curly mesquite.

Ash Creek cuts through middle of pasture. Toney tank #2, Tony spring, Toney tank, Upper Bear spring, Cibecue stockpond, White tank, Ripley Canyon tank, Highway tank 1 and 2, road 897 tank, and Buck Place spring are distributed throughout pasture. An improvement was made in 2008, adding a 6,500 gallon tank with two metal troughs. No recent data on Toney tank #2, Tony spring, Toney tank, Upper Bear spring, Cibecue stockpond, and Ripley Canyon tank to know if improvements are functional. White Tank was dry upon inspection in June 2011. Buck Place spring has water but it does not feed trough.

Long Road Pipeline project is located along Forest Road 897, which crosses a few different pastures. Project source is hauled water, it is not charged and no water occurs along pipeline. A storage tank and a couple troughs are located in pasture. Haul water location is near Highway tank 1.

Timber Pasture (Conifer Forests, Juniper Savanna, Woodlands, Turbinella Oak vegetation types): Timber pasture is approximately 4,806 acres. It is located south of Tony Pasture and west of Carol Pasture. Vegetation in pasture is alligator juniper woodlands and savanna, juniper savanna, and ponderosa pine. Plant species in juniper woodlands are similar to those in alligator juniper savanna, but with a higher density of alligator junipers and greater canopy cover. Dominant plant species in vegetation types are similar to those of the same type in other pastures.

Pasture is primarily dominated by snakeweed and juniper. Primary grass present is junegrass and curly mesquite. Although use is often low on curly mesquite, browse is the dominate forage throughout pasture. In 2010 photos indicating fence line contrast was taken 1.5 miles from Timber Camp stock tank. More bare ground and less grass density is present on Timber pasture. On other portions of pasture, utilization on curly mesquite is low but water patterns are starting to appear. Average ungrazed curly mesquite is only 2.5 inches in Timber pasture.

Ash Creek runs north and south through pasture. Timber Camp tank, Timber Camp well, Pine tank, Blue stockpond, and an unnamed spring are distributed throughout pasture. All improvements except Pine stock tank may not be functional. Pine stock tank has a good functional fence and was holding water in June 2011.

Home Pasture (Juniper Savanna, Woodland, Turbinella Oak Chaparral, Conifer Forests vegetation types): Home Pasture is approximately 1,969 acres. It is located west of Carol Pasture. Vegetation in this pasture is similar to vegetation in 72 Pasture.

Bassett Spring is in southern portion of pasture. This improvement is not known to be functional. An improvement was made in 2008, adding a 10,000 gallon storage tank, supplying water to six troughs in Home, Jackson, and Survey Pastures.

Carol Pasture (Turbinella Oak Chaparral, Woodlands, Conifer Forest vegetation types): Carol Pasture is approximately 7,073 acres. It is located west of Timber Pasture. Vegetation in pasture is mostly chaparral and ponderosa pine, with some juniper savanna and alligator juniper savanna.

Pine Tree tank, Reservation Line tank, Bee spring, Hicks tank, Woodpecker spring, Barrowpit stock tank, Bear Canyon spring, Carol Spring, Turkey tank, Barrowpit spring, and Barrowpit corral storage are distributed throughout pasture. Walnut Spring is listed as part of Carol pasture, but fence line puts it in Poverty pasture. Barrowpit stock tank does not exist, soils are erosive and tank does not hold water. Barrowpit spring is located near Barrowpit stock tank but is not functional. Storage tank and trough at Barrowpit corral is used to haul water for corral.

Pine Tree stock tank holds water year round, according to photos taken in June 2011. In summer 2011, Hicks tank was dry.

Poverty Pasture (Riparian vegetation, Semi-Desert grassland, Woodland, Turbinella Oak Chaparral, Juniper Savanna vegetation types): Poverty Pasture is approximately 6,464 acres. It is located in southern tip of allotment.

Marano spring, Ray spring, John spring, Jim spring, Pigeon tank, Poverty spring pipeline, Redrock spring, Crow spring, Quail spring, Cottonwood spring, Remoan spring, Unnamed stock tank, Wood spring, Lower Sevenmile spring, Pick spring, Sixmile spring, Sevenmile tank, and Hackberry spring are distributed throughout pasture. Poverty pipeline, stemming from Poverty spring, installed in 2008, adding

a 10,000 gallon tank providing water to Poverty Pipeline in central-southern portion of pasture to supply numerous troughs.

In 2006, a range inventory was completed in Poverty pasture. In turbinella oak chaparral vigor measurements indicated key species averaged low vigor and no recruitment. Hydrologic and biotic integrity had moderately departed from what is expected for site.

In semi-desert grasslands, vigor of key grasses showed high vigor but mixed recruitment. Although grass vigor was good, biotic integrity had moderately departed from what would be expected due to an increase of undesirable shrub species.

Jackson Pasture (Woodland, Semi-Desert grassland, Riparian Vegetation, Juniper Savanna, Turbinella Oak Chaparral vegetation types): Jackson Pasture is approximately 638 acres. It is located in southern portion of pasture, west of Poverty Pasture. Vegetation is made up of alligator juniper woodland, pinyon-alligator juniper-Arizona oak, and semi-desert grassland types. At southern end of pasture, there is a small portion of streamside vegetation. Dominant species in these vegetation types are similar to those of same types in other pastures.

Granite tank, Granite well, unnamed spring and a pipeline installed in 2008 is in southern portion of pasture.

Horse #1, #2, #3 Pastures (Juniper Savanna, Conifer Forest, Woodland vegetation types): Horse Pasture is approximately 780 acres. It is located on western boundary of pasture, north of Carol Pasture. It is made up of mostly juniper savanna vegetation type, but has some pinyon-alligator juniper-Arizona oak and ponderosa pine vegetation types as well. Dominant species in these vegetation types are similar to those of same types in other pastures.

Carol tank, Carol tank 1 and 2 are located in Horse Pasture.

Utilization is high, exceeding 60% on grasses approximately ¼ mile from Carol Tank #1 in 2011.

In 2011, Carol stock tank #1 had cattle get stuck in the muck, trying to access the water. Tank was holding water, but muck was forming around which entrapped cattle. Carol Water Lot stock tank also had similar issues in 2011, cattle getting stuck. Tank was almost dry. Permittee was informed and cattle were removed from pastures.

Survey Pasture (Woodland, Juniper Savanna, Turbinella Oak Chaparral vegetation types): Survey Pasture is smallest pasture at approximately 638 acres. It is located south of Home Pasture. Vegetation is mostly chaparral vegetation type. Dominant species in these vegetation types are similar to those of same types in other pastures.

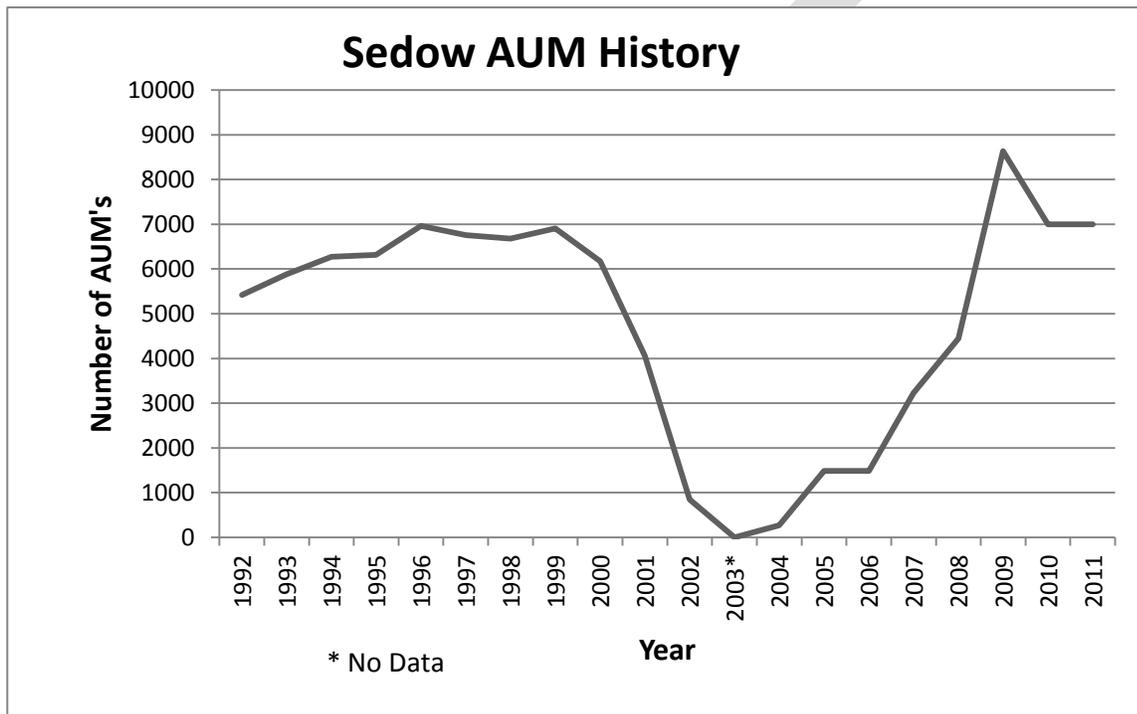
Jackson tank and a pipeline installed in 2008, are only waters in pasture.

SEDOW ALLOTMENT

History: Sedow Allotment has been under management by Griffin family since 1923. It was open range grazing until 1968 when a rotational grazing six pasture system began. It was improved upon with installation of pipelines, cross fencing, wells, and spring developments to a

current eleven pasture system. In addition, it has three smaller pastures utilized for weaning and for bulls, three pastures for horses, and seven traps used for round-ups.

Northwest boundary of Sedow Allotment is Salt River. Allotment is comprised of a total 40,723 acres; of which 5,910 acres are unsuitable for use. Soils in this allotment vary. Eastern half is made up of heavy clay to clay loam soils. Central portion is mostly decomposed granite, and northeastern portion is mostly schist and limestone. Loss by sheet and rill erosion is common. Vegetation varies from sonoran desert scrub to pinyon-juniper woodlands, with a few riparian areas along Salt River and in creeks. In the spring of 2002 drought conditions necessitated removal of livestock. Griffins filed an appeal to this decision, however, their appeal was denied.



4Y Pasture (Juniper Savanna, Sonoran Desert Scrub, Turbinella Oak Chaparral, Woodlands vegetation type): 4Y Pasture is largest pasture at approximately 9,166 acres and located in northwestern corner of allotment. Forage production is limited except in areas of steep or rocky ground. High diversity of grasses in turbinella oak chaparral can be attributed to the steep rocky terrain.

Potential water is spread through pasture: Sedow canyon seep 1 and 2, Blackjack tank, Yankee tank, Clay spring, Yankee Joe seep, Granite spring, Yankee Joe spring, a couple unnamed springs, and Lower Yankee Joe spring. Clay spring was maintained in 2010. None of the springs, tanks or seeps in pasture have been checked for current conditions.

Bronson Pasture (Juniper Savannas, Riparian vegetation, Semi-desert grassland, Turbinella Oak Chaparral, Woodland vegetation types): Bronson Pasture is approximately 3,743 acres and located at the northern boundary of the allotment. In Juniper Savanna the canopy cover often does not exceed 10 percent. Dominant grasses are curly mesquite, sideoats grama, and squirrel tail. Forage production ranges from 50-100 lbs/acre depending on the topography.

Water developments are spread out throughout pasture; Bronson tank, Blackie spring, Nesbitt spring, and Bushy horizontal well.

New Corral Pasture (Juniper Savanna and Woodland vegetation types): New Corral Pasture is approximately 2,402 acres and located in the northeast corner of the allotment. Woodlands vegetation type shows a denser overstory and a sparse understory of grasses than juniper savannas.

Water developments are spread throughout pastures: Timber tank, Timber spring, New Corral spring, Adobe horizontal well and Bear Cub horizontal well. In 2009, New Corral spring was functional and cattle were able to access trough.

In 2010, a rangeland health assessment indicated a slight to moderate departure from expected with some evidence of water flow patterns and an increased shrub component.

Hess Pasture (Juniper Savanna, Woodland, Turbinella Oak Chaparral vegetation types): Hess Pasture is 1,811 acres and located south of Bronson Pasture.

JU tank, JU spring, Noname horizontal well and Pancho spring are available waters in pasture. Pancho spring functions, but trough is in drainage and cattle trail up and down drainage to water. JU spring trough is located in JU corral and is functioning.

In 2010, a rangeland health assessment was completed that indicated a slight to moderate departure from expected with moderate evidence of a disruption in water flow patterns. Snakeweed is more abundant than desired throughout pasture.

Horse Pastures (Sonoran desert, semi-desert grassland vegetation types): Horse Pastures, consisting of Big and Little Horse pastures, is 893 acres and located south of New Corral Pasture on the eastern boundary of the allotment.

Only water source, if functioning, is Adobe spring, located in Big horse pasture. Pastures are often used for bulls.

Brushy Pasture (Juniper Savanna, Woodland and Turbinella Oak Chaparral vegetation types): Brushy Pasture is 485 acres and located east of Storm Canyon and north of Reveg Pasture. Forest Service Road 303 bisects the pasture from north to south.

Brushy spring is located in southwest portion of pasture, available to Brushy and Storm Canyon pastures. In 2008 spring was maintained. In summer 2011, trough was dry. Cattle use is often concentrated in Sedal Canyon where Brushy spring trough is located.

Monument Pasture (Juniper Savanna, Woodland and Turbinella Oak Chaparral vegetation types): Monument Pasture is the smallest pasture at 134 acres and is located nearly in the middle of the allotment.

Monument spring is located in a small trap. In 2011, no water was seen in trough.

Steer Pasture (Juniper Savanna vegetation type): Steer Pasture is 836 acres and located in the middle of the allotment on the eastern boundary.

Water improvements are located mostly in southern end of pasture, Steer well, Willow spring and steer stock tank.

In 2010, a rangeland health evaluation indicated a moderate to extreme departure from what is expected and desired. Water flow patterns indicate water is moving off site and not infiltrating. Dominate species are sub shrubs, forbs and shrubs, leaving short rooted grasses coming in last.

Rock Springs Pasture (Juniper Savanna, Woodlands, Riparian Vegetation and Turbinella Oak Chaparral vegetation type): Rock Springs Pasture is 1,615 acres and located on the eastern boundary, south of Steer Pasture.

Jackson Butte tank and Rock tank are seasonal stock tanks in middle and southern portions of pasture. Rock Springs Pasture is watered on east side.

In 2010, a rangeland health evaluation was conducted in juniper savanna. Although all attributes indicated a slight to moderate departure from expected, it was evident shrubs dominated the pasture. Perennial grasses were sparse and short rooter grasses were prominent.

Reveg Pasture (Woodland, Juniper Savanna and Turbinella Oak Chaparral vegetation types): Reveg Pasture is 2,125 acres and located in the middle of the allotment. FS 303 road bisects the pasture from the north to the south.

Access is possible to Double Corral spring in south of pasture near Home Horse pasture. At northern boundary, access is possible at Brushy spring. At the eastern boundary, East X4 well (maintained in 2007) is available for cattle use.

In 2010, a rangeland health assessment was completed that indicated a large water flow patterns, pedestaling, litter movement, portion of soil profile lost, and increased amount of shallow rooted perennial grasses.

Storm Canyon Pasture (Juniper Savanna, Turbinella Oak Chaparral, Woodland vegetation types): Storm Canyons is 7,426 acres and located in the southern quarter of the allotment. Dominant species, in chaparral, are turbinella oak, juniper, mountain mahogany, catclaw mimosa (*Mimosa biuncifera*), acacia, and desert ceanothus. Common grasses are curly mesquite, threeawns, sideoats grama, hairy grama, and squirrel tail.

In 2008 Storm Canyon spring was maintained. In 2011, trough at spring was not charged with water. Pasture contains 5 miles of waterline that supplies water to Middle Trough, Yankee Joe Trough, and Granite Springs Trough.

In 2010, a rangeland health assessment was completed that indicated a none to slight departure from expected with only minor evidence of water flow disturbance.

Walnut Pasture (Juniper Savanna, Woodland, Turbinella Oak Chaparral vegetation types): Walnut Pasture is located in the southern quarter of the allotment at approximately 2,099 acres.

Several springs provide water for cattle in traps along the perimeter of pasture fence. Walnut spring is located in northwest corner in Walnut Trap. Double corral spring located east, is shared with Home Horse pasture. Little pipe spring is located in a trap directly south and Cavey horizontal well near southwest corner.

Seven mile Pasture (Juniper Savanna, Woodland, Riparian vegetation types): 7 Miles Pasture is 1,380 acres and located in the southeast corner of the allotment. The streamside vegetation dominant plant species here are extremely variable, as the water source in this area may be perennial, intermittent or ephemeral.

In 2007, East X4 well was maintained and provides water to its northwest corner. Rock springs and tank are along the northern border of pasture.

Indian Gardens Pasture (Juniper Savanna, Woodland, Riparian vegetation, Tubinella Oak Chaparral vegetation types): Indian Garden is 833 acres and located in the southeast corner of the allotment. This pasture is located on the east side of highway 60.

One stock tank, Indian gardens tank, lies about center of pasture. An unnamed spring is south of tank. Two, potentially dry, stock tanks are located in the southern portion.

Shrub component, specifically acacia, is increasing and affecting pasture potential.

Home Horse Pasture (Juniper Savanna, Woodland, Riparian vegetation types): Home Horse Pasture is 224 acres and located in the southern quarter of the allotment. The base property for permit is located within this pasture.

Water is supplied from permittees base property in the center of pasture. Double Corral spring is located in the upper portion of pasture.

Hudson Pasture (Juniper Savanna, Woodland, Riparian vegetation types): Hudson Pasture is 2,964 acres and located in the southern portion of the allotment. Vegetation is mostly shrubs,

with little grass. Grasses found growing here are mostly curly mesquite, threeawns, and sideoats grama.

Several springs and wells are spread out about the pasture. Little wood camp, Cavey, Cottonwood, Little pipe, and Hudson springs are scattered throughout pasture. Hudson spring was maintained in 2008 to standard. Cavey and Cottonwood horizontal well are located near pasture boundaries.

In 2010, a rangeland health assessment indicated an increased shrub component that is disrupting the natural site stability and hydrologic function.

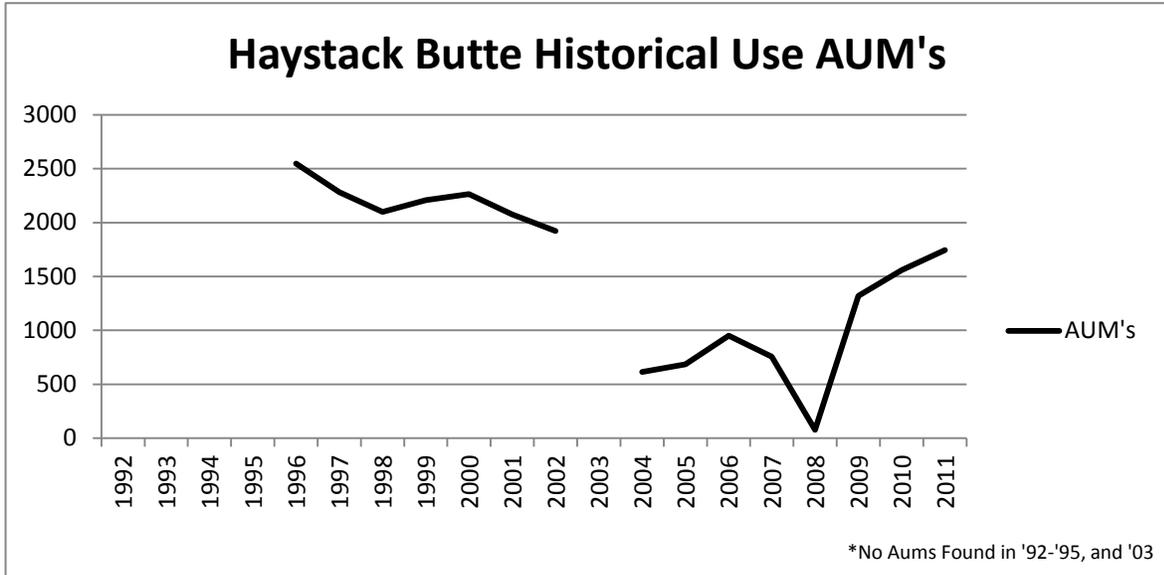
HAYSTACK BUTTE ALLOTMENT

History

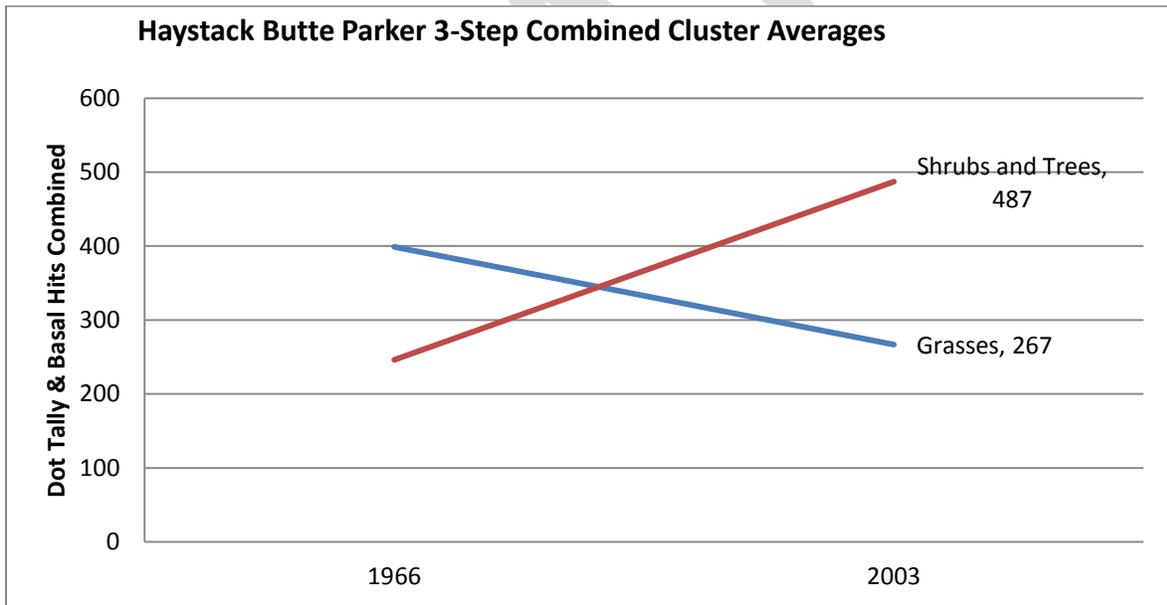
Haystack Butte allotment, located approximately 25 miles northeast of Globe, is bordered on the south by Sedow allotment; on the east and north by Chrysotile allotment; and west by the Salt River. It encompasses approximately 15,022 acres of rangeland. Elevations vary from 2,800 feet along the Salt River to 6,300 feet on the eastern edge of the allotment. Topography in the west is characterized by ridges which are not too steep on top, but which drop off steeply into the Salt River and its tributaries. To the east and north, terrain is increasingly steep with some gentle benches and slopes. Salt River Canyon Wilderness includes a strip of Haystack Butte allotment one to two miles wide east of the river.

During 1970's, Kerby Furniture, Inc. obtained Haystack Butte term grazing permit and began using a rest rotational grazing strategy. In 1982, an Allotment Management Plan (AMP) was approved and subsequently the permit was reduced by 29% and an additional 30 head of livestock were put under a Nonuse Agreement (NU-MOU) for range protection. This agreement, which was to expire at the end of 1988, allowed for 180 head of cattle yearlong or any combination of cattle and yearlings equaling 2,160 animal unit months (AUM's). During an extended drought in the late 1980s, cattle were often scattered across the entire allotment. In 1993, Rex Kerby sold livestock and transferred his term grazing permit to Gary Porter. In 1995, Porter sold livestock and transferred permit to James and Janet Barton. They held onto this permit until 2000 when they sold livestock and transferred their permit to Joseph and Kathy Youngblood. Joshua and Misty Smart became permit holders in 2008, and the current permittee, Peter Oddonetto, acquired the permit in May of 2011.

Six pastures are grazed in a deferred system of management where each pasture is generally grazed every year at a different use period each year. Each pasture receives growing season deferment two years during a three year grazing cycle. Although following a deferred system has been somewhat unattainable due to frequent transferring of this permit. Haystack Butte Allotment contains critical habitat for Chiricahua leopard frog and Razorback sucker. A prescription of 30-40% relative (seasonal) forage utilization in areas where utilization is a concern for listed species and their critical habitats.



The following graph is a depiction of a sample of Parker 3-Step cluster points on Haystack Butte Allotment. Numerous Parker 3-Step samples were taken in all allotments for this analysis and this trend in Haystack Butte appears to be to be an overall trend across entire analysis area (see Appendix I for detailed analysis data used in this assessment)



PASTURES

River Pasture (Juniper Savanna, Semi-Desert grassland, Sonoran desert scrub, Riparian vegetation types): River Pasture is located on far west end of allotment and is approximately 2,372 acres. The western boundary runs alongside Salt River. In areas of heavy utilization, catclaw acacia, catclaw mimosa, or prickly pear may dominate vegetation. Heavy grazing has greatly impacted nearly all semi desert grassland vegetation type. In Sonoran desert types, livestock forage production is limited except in areas of steep or rocky ground.

In 2011, a photo point was established along Salt River. An observed ungrazed portion, directly across from boundary fence, showed perennial grass plants with substantially more vigor. Green sprangle top, mountain muhly, red brome, side oats grama, blue grama and purple threeawn were observed in ungrazed portion. At site, located a distance from fence line, blue grama, purple threeawn and sideoats were perennial grasses observed. Higher amounts of snakeweed and red brome were present. Utilization levels were observed at 60%. Distance between plant species was higher at site compared to ungrazed portion.

Boundary fence with Sedow's No Grazing pasture, is non functional and is visible from Salt River. Salt River boundary fence line is nonexistent through White Ledges drainage and does not appear to continue up on western side of drainage. An old nonfunctional fenceline is located on a flat just west of White Ledges drainage.

White Ledges and Deer spring are both located in White Ledges drainage. Cattle can access these waters, as well as the Salt River, through White Ledges drainage. White Ledges spring is not a very reliable water source. Black Mesa stock tank is located near the boundary with Upper River pasture and provides seasonal water.

Cottonwood Pasture (Juniper Savanna, Semi-Desert grassland, Sonoran desert scrub, riparian, turbinella oak chaparral, woodlands vegetation types): Cottonwood Pasture is located east of River Pasture, and is approximately 2,500 acres.

Saddle horizontal well, canyon spring, cottonwood spring, and quail spring do not have current data on the reliability of water. Rock horizontal well, and willow spring 1 and 2 are not reliable sources of water. Cottonwood box spring, headquarters, freezeout and yellow jacket spring are reliable sources of water. Cottonwood tank is not functional and needs repairs.

Cattle do not access the Salt River from this pasture, especially since no developed water is available within the wilderness.

According to a 2009 rangeland health assessment water flow patterns are increasing and creating rills. Little movement is building up around junipers and cactus. Wood species have increased

throughout site and has displaced many desirable grass species. Soil stability and hydrologic function are stressed in this pasture.

Upper River Pasture (Turbinella oak chaparral, Semi-Desert grassland, Sonoran desert scrub, Juniper savanna vegetation types): Upper River Pasture is located on southern boundary of allotment and is approximately 1,069 acres.

During an inspection in 2009, Corner and Hog tank were both non functional and repairs would be needed. Hog holds water but only briefly and area gets mucky. Yellow jacket spring located in northwestern corner was maintained in 2007. Spring is also accessible by Cottonwood pasture. Black mesa corral near River pasture is not functional and repairs are needed. Little Butte spring south of yellowjacket spring was maintained in 2009. Hidden, division, white and barrel springs are water sources but current condition is unknown.

Pasture has not received regular use in several years related to poor condition of boundary fence between Haystack Butte and Sedow allotments. Loading Chutes corral is located off Little Butte trap and has been rebuilt in 2011.

In 2009 a rangeland health assessment was completed in conjunction with Natural Resource Conservation Service and permittee. There was visible soil erosion on slopes less than 10 percent. Vegetation composed of primarily snakeweed, threeawn, rabbitbrush, filaree and Indian wheat. Desirable species are growing in discreet locations, especially within cactus plants.

Steer Pasture (Juniper savanna, semi desert grasslands and woodland vegetation types): Steer Pasture is split in half with a west and east portion of pasture. Pasture is located east of Upper River Pasture and is smallest pasture in allotment at 804 acres.

Little butte and yellow jacket spring were maintained in 2009. Bronson spring pipeline was installed in 2008-2009 and has a couple storage tanks and troughs. East and West steer tanks hold small amounts of water, but are mostly non functional. Loading chutes corral was rebuilt in 2011.

Bronson Pasture (Juniper savanna, turbinella oak chaparral, semi-desert grassland, woodland, conifer vegetation types): Bronson Pasture is located in southeast corner of allotment. It is largest pasture at approximately 4,000 acres.

In 2007 and 2008 eagle bluff spring and Bronson spring were maintained and are currently functioning. Bronson trick tank and pipeline is not functional and needs an entire rebuild to maintain. Hoofprint tank was dry upon inspection in 2011. Haystack, Sanders, hoofprint, springs have not been inspected and current condition is unknown. Basin, Bronson, haystack butte and blackjack tanks have not been inspected and current condition is unknown.

Upper Ash Creek Pasture (vegetation types): Upper Ash Creek Pasture is located north of Bronson Pasture on the eastern boundary of the allotment. It is approximately 3,589 acres. Vegetation is mostly chaparral and juniper savanna, with a small portion of semi-desert grassland. The dominant species in these vegetation types are similar to those of the same type in Bronson Pasture. Water is available on the perimeter of the pasture in the form of tanks, wells, and springs.

In 2009, a rangeland health assessment indicated increased annuals and snakeweed.

Lower Ash Creek pasture (vegetation types):

Middle Ash Creek pasture (vegetation types):

Breeding Pasture (Juniper savanna, woodland, semi-desert grassland, turbinella oak chaparral vegetation types): At 284 acres, this is the smallest pasture. As its name indicates, pasture is mostly used for breeding. Horses have accessed the northern portion and water at the headquarters. Threeway tank is located in the southern end but it is a season tank that needs repair. Water is scarce in this pasture.

HICKS PIKES PEAK ALLOTMENT

History

Hicks-Pikes Peak allotment is located on Globe Ranger District, eight miles north and northwest of Globe, Arizona in Gila County Arizona. It encompasses a total area of 67,223 acres spread out over 18 pastures. Pastures range from over 10,000 to less than 500 acres. Salt River forms part of allotment's northern boundary, and Pinal Creek flows through allotment from south to north. In total, there are 56 miles of creeks and washes flowing through Hicks-Pikes Peak. A large part of this range is composed of decomposed granite soil, which is extremely susceptible to erosion. Allotment primarily consists of Sonoran desert scrub in lower elevations (as low as 2200 ft), semi-desert grasslands and chaparral in middle elevations, and pinyon-juniper-oak woodlands in high elevations (as high as 5385 ft).

H & E Ranch, Inc. was permittee from 1982 until 2006 when Rockin Four Ranch LLC bought base property. H & E Ranch, Inc split livestock into three groups which were rotated between a set of pastures, spending approximately one to three months in each pasture. In 2003, an extreme drought necessitated the removal of all livestock from allotment.

Rockin Four Ranch LLC incorporates a rotational grazing strategy, chosen based on grazing intensity, which is evaluated by estimating residual vegetation, vigor of plants, precipitation, and phenological stage of key species. There is a utilization limit of 40% for upland grasses, 50% for desirable browse species, 50% for woody riparian species, and 40% for herbaceous riparian species.

Allotment is currently degraded condition with downward trends still occurring in some areas. Most degradation is historical. Desirable forage species are much less prevalent than what would be expected and have been largely extirpated in some areas. Non-desirable species provide majority of forage on allotment with the result that desirable species, where accessible to

livestock, are over-used and increasingly scarce. Brushy and other invasive species have encroached making re-establishment of desirable plants difficult.

PASTURES

Ortega Pasture (Semi-desert grassland, Sonoran desert scrub, vegetation types): This pasture is located at northern boundary of allotment. At 9,319 acres, this pasture is among the largest in allotment. Sixty-nine percent of pasture has a slope of less than 45 degrees.

Storm Canyon and grapevine wash provides little in terms of potential water. Both washes meet Salt River. Turnout spring offers ephemeral water. Rockinstraw stock tanks may only provide seasonal water, but current condition is unknown. Storm canyon well and grapevine spring was maintained through EQIP (Environmental Quality Incentives Program). Jumoff spring has water present in small quantities. Little mud well is functional and provides water in corral.

Private land is situated at the end of Horseshoe bend road on boundary with wilderness. Land is not clearly fenced and cattle held on private move freely onto forest.

Hope Pasture (Juniper Savanna, Semi desert grassland, Sonoran desert scrub, Turbinella oak chaparral and Riparian vegetation types): This pasture is located on north-eastern boundary of allotment. This pasture is 3,643 acres.. Eight-nine percent of pasture has a slope of less than 45 °.

Available waters in pasture are Grapevine spring which border Ortega pasture and has been recently maintained. Trap Mesa, granite and willow spring have not been accounted for in recent years on water availability.

Horseshoe Bend Pasture (Juniper savanna, Semi desert grassland, Turbinella oak chaparral, Woodlands, Riparian vegetation types): At 10,135 acres, this is largest pasture in allotment. This pasture is located in northern portion of allotment, south of Hope Pasture. Eighty-three percent of pasture has a slope of less than 45 degrees.

Ephemeral Sycamore Canyon runs north and south through pasture but has limited livestock access. Near sycamore spring, cattle utilize seep willow and deergrass. Livestock often spend a majority of time here due to access of water and shade. Trailing near spring was heavy, up to a half mile, primarily in wash and roadway.. Near northern border, Mud Springs Wash provides an ephemeral water source. . Summit and horse spring tank may provide water, but only seasonally. Apache tank 1 and 2 may hold water seasonally, but upon last inspection in 2010, no water was available and road to tanks had washed out. Lower mud well produces water for both Horseshoe bend and Ortega pastures. Brush, hope, horse, lower cox canyon and upper cox canyon springs may produce water but current condition is unknown. Procopio spring provides water at a corral in southern portion of pasture. Little Brewster, new water, and upper well do not have current conditions and uncertain if water is produced. Little mud well produces water and cattle use regularly.

Livestock utilization is not evenly distributed throughout pasture, occurring mostly along trails and in washes. Moderate to heavy utilization has been documented in washes throughout pasture.

Lower Shute Springs Pasture (Semi desert grassland, sonoran desert scrub, woodlands, and riparian vegetation types): This pasture is located in northeast corner of allotment. It is north of Upper Shute Springs Pasture and located in a wilderness area. Pasture is 9,202 acres and bisected by Salt River. Eighty five percent of pasture has slopes less than 45 degrees.

This pasture is composed entirely of wilderness area with Salt River being primary water source. Shute spring well is a developed water source, which borders Upper and lower shute pastures. If gates left open, cattle may access Shute spring wash and travel to river. Redmond Well may be accessed by cattle, but this area has not received much use in many years.

Upper Shute Spring Pasture (Semi desert grassland, juniper savanna vegetation types): This pasture is south of Lower Shute Springs Pasture, and separated by wilderness boundary to the north. Pasture is 6,822 acres in size. Vegetation is mostly chaparral and semi-desert scrub. Perennial grasses found here are curly mesquite (*Hilaria berlanderi*), side oats grama, and squirrel tail (*Elymus elmoides*). Herbaceous forage is made up significantly by Wrights buckwheat. Topography is similar to Lower Shute Springs Pasture.

Shute spring improvement was scheduled to be maintained in 2010, but no work was completed later in that same year. In April, the fence needed maintenance to keep cattle from accessing this area. Trough was overflowing creating a hydric area. A pipeline came from windmill and traveled downhill to possibly the corral below.

Redmond stock tank was last visited in 2010, and was full of water. No cattle appear to access site and forage availability around tank was high. Redmond well is functional, corral and trough have not been used in many years.

Two temporary troughs and one storage tank, from a pipeline originating from Shute Road well, have been placed along forest road 223, and are not always full of water. Jumpoff, price, granite and cold water spring have not been identified in recent years on their water availability. Shute stock tank one and two have not been observed in recent years on water holding capacity.

Redmond Well provides water, as described above for Lower Shute spring, but does not receive cattle use.

Cattle congregate along forest road 223 from direct observation and indirect, through springs and other water sources that do not receive cattle use.

Windmill Pasture (Juniper Savanna, Semi desert grassland, turbinella oak chaparral, woodlands and riparian vegetation types): Located in middle of allotment, it is 5,648 acres. Dominant vegetation is juniper woodland. Juniper is dominate canopy vegetation, with understory comprised mostly of sideoats grama, curly mesquite, and Wrights buckwheat. Desert ceonothus (*Ceanothus greggii*) and mountain mahogany are dominant browse. Ninety-one percent of pasture has a slope of less than 45°.

Procopio spring is producing water, located on boundary between Windmill and Horseshoe Bend pastures. In 2011, trough was leaking and contained no wildlife ramp. Lower well was developed through an Natural Resource Conservation Service EQIP contract. Two storage tanks are located at site, neither of which are functional. Both troughs did not have a wildlife ramp, but held water. Summit well was also repaired with EQIP funding. Improvement provides water

but does not meet standard, with trough having no wildlife ramp. A temporary wheeled storage tank was placed at location in 2009 and is included for analysis in this document. Jackson stock tank had no water in 2011. Roys stock tank holds minimal water and also has two unfunctional improvements nearby, a storage tank and trough. Big Pond corral and stock tank and not functional and would need major repairs to meet standards. Upper well provides water, but trough does not have a wildlife ramp. Cottonwood well, big boulder and rocky stock tank condition is unknown.

Cattle congregate around Lower, summit and upper and procopio water developments.

North Steer Pasture (Semi desert grasslands, woodlands, sonoran desert scrub and riparian vegetation types): This pasture is located in middle of allotment on eastern edge and is 1,585 acres. In semi desert shrub areas, dominant plant species are similar to that of Lower Shutes Pasture. Seventy four percent of pasture has a slope of less than 45 degrees.

Pinal well near South steer pasture has accessible water.

South Steer Pasture (Juniper savanna, sonoran desert scrub, semi desert grassland, turbinella oak chaparral, and riparian vegetation types): Located south of Windmill Pasture, and north of Pinal Creek, it is 2,291 acres. Ninety-five percent of pasture has a slope of less 45°.

Horseshoe Bend wash flows through west end of pasture. It is an ephemeral water supply fed by Sycamore Canyon and Mud Springs Wash. Kyles stock tank is a potential source of water, but uncertain if it holds any. Pinal well and wood spring pipeline have water and are on either end of pasture.

Upper Big Pasture (Semi desert grassland and riparian vegetation types): This pasture is in southern half of allotment and borders western boundary. It is second smallest pasture at 831 acres. Upper Big Pasture is almost entirely semi-desert grassland. In areas of slopes less than 30 degrees, forage production ranges from 50-300lbs/acre. Entire pasture has slopes less than 45 degrees.

Cement Springs is located near eastern border of pasture, and Big Pasture Well is shared with Big Pasture.

Big Pasture (Semi desert grassland and riparian vegetation types): This pasture is located south of Upper Big Pasture and is 1,261 acres. It is similar in vegetative composition and topography to that of Upper Big Pasture.

Wood Spring and Big Pasture Well are located on northern and eastern borders, respectively, of the pastures. Private land water is also accessible.

Yellow Pasture (Sonoran desert scrub and riparian vegetation types): This pasture is located southwest of South Steer Pasture and is 1,327 acres. Eighty-nine percent of pasture has slopes less than 45 degrees.

Hick's Wash cuts through southeastern corner of pasture while Hick's Well sits on eastern border.

Lower Devore Pasture (Semi desert grasslands, sonoran desert scrub, turbinella oak chaparral, Juniper savannas, woodlands and riparian vegetation types): This pasture is in south eastern portion of allotment and is 1,830 acres. A perennial grass and form mix was seeded onto old highway. Topography is almost entirely less than 45° slopes.

Thirty-nine spring has not been visited in many years and current condition of improvement is unknown. Gate at Devore wash well may be left open to allow cattle to access water at this site. An old improvement, Devore Wash pipeline, is not functional, but lies in floodplain of Devore wash.

Holly Pasture (Juniper Savanna, Semi desert grassland, Sonoran desert scrub, turbinella oak chaparral, woodland vegetation types): This pasture lies in southeastern portion of allotment and is 1,413 acres. Topography is mostly made of slopes less than 45 degrees.

Laurel and Bluff Spring is located in south-central region of pasture.

West Pasture (Sonoran desert scrub, semi desert grassland, juniper savanna, woodlands, turbinella oak chaparral vegetation types): This pasture is located in center of bottom portion of allotment. Majority of topography is less than 45 degree slopes.

Devore Wash runs through middle of pasture. There is low recovery potential for much of this wash due to a lack of water and road running along the wash. Cattle access portions of pasture by trailing throughout wash. Where road leaves the wash, water is intermittent.

Devore Wash Well is near northern border of pasture and readily provides water in corral/trap.

Hicks Pasture (Juniper savanna, sonoran desert scrub, turbinella oak chaparral, riparian vegetation types): This pasture is located east of West Pasture and is 1,815 acres. Western boundary of pasture borders Horseshoe Bend Wash. A perennial grass and forb mix was seeded on portion of old highway.

Dagger spring was observed in 2010 and had not been functional in many years. Improvement maintenance of project would provide water, outside of Hicks wash and pull cattle onto the hillsides. Rockhouse well has one trough outside of corral providing water to livestock in Hicks pasture.

Concerns in this pasture relate to Rockhouse well as the only reliable water source and steepness of hillsides. Cattle trailing occur throughout drainage and use is highly noticeable on grasses seeded on old highway.

Rip Pasture (Sonoran desert scrub, turbinella oak, woodlands and riparian vegetation types): This pasture is located in southeastern corner of allotment. It is 1,854 acres and contains mostly chaparral and pinyon-juniper-oak woodlands. Dominant perennial grasses in understory are black grama (*Bouteloua eriopoda*), hairy grama and curly mesquite. Three awn grasses and squirrel tail are also common. Topography is mostly less than 45 degree slopes.

Only two water sources, Rockhouse well and Dago spring, are currently available to cattle, although the former is most frequently used. Rockhouse trail spring has no spring box, and cement trough is completely filled in. Water was not present when last observed in 2005.

When cattle utilize pasture, often they are seen trailing in drainages and at Rockhouse well and corral. Salt has been found within the approved distance of one quarter mile of Rockhouse well.

Kenny Pasture (Turbinella oak chaparral, semi desert grasslands, juniper savanna, riparian vegetation types): This pasture is located south of Holly and West Pastures. It is 1,468 acres and is comprised mostly of chaparral and semi desert grasslands. Average topography is less than 45 degrees.

Murphy Spring, located in Murphy Pasture near border of Kenny Pasture, supplies water to a trough in Kenny Pasture. It also supplies surface water to Devore Wash for at least a quarter mile. This upper reach is dominated by pole sized Goodding willow (*Salix goodingii*) and Fremont cottonwood (*Populus fremontii*). Saplings are also present as well as a few seedlings. Fremont cottonwood is more common than Goodding willow downstream along with Seep willow (*Baccharis salicifolia*). Dominant herbaceous plants in this upper reach are sedges (*Carex spp.*) and rushes (*Juncus spp.*). This reach has high potential for recovery. With perennial water, fine sediments, and emergent vegetation, it could rebuild a floodplain and stream banks relatively quickly.

Water sources are limited in pasture. Indian spring has mature cottonwoods, goodings willow and ash. About 500 yards of riparian vegetation occur at seep. Trough and pipeline line right at seep and was fully functional upon inspection. Mexican camp spring has one trough and was full on last inspection of 2005.

Murphy Pasture (Juniper savanna, turbinella oak chaparral, woodlands vegetation types): This pasture is located in southern most end of allotment. It is 2,374 acres and made up of chaparral and pinyon- juniper-oak woodlands. Average slopes are less than 45 degrees.

Murphy Spring lies upstream in pasture. It supplies water to a trough as well as surface water to Devore Wash for at least a quarter of a mile. Rip, Moonshine, and Pinyon Springs are all in northern portion of pasture. Rip spring has slow moving water, often stagnating in pools. Spring feeds dirt tank below.

POISON SPRINGS ALLOTMENT

History

Poison Springs and Sierra Ancha allotments were grazed together from the late 1940s through early 2000s. Historic permits authorized separate numbers for each allotment, generally around 500-600 head of adult cattle total with yearling carryover, through the 1990s. Recommendations were made for closing the allotment in the 1950s due to poor soil and forage conditions; this suggestion was not implemented.

The permit was held by the same permittee from the 1970s through the early 1990s. During that time, numerous range inspection reports indicated consistently poor range condition across the allotment. Cattle were grazed yearlong in small groups of 30-60 in most pastures simultaneously. An allotment management plan crafted in 1987 implemented a modified Santa Rita grazing system with six “systems” or clusters of pastures arranged based on vegetative and geographic similarity. This AMP also provided guidelines for grazing utilization to move

existing conditions toward forest desired conditions. Yearling carryover was limited to years with sufficient annual production.

The permittee who acquired grazing privileges for the allotments in the 1990s experienced a series of noncompliance issues (cattle grazing the wrong pastures, excess cattle on allotment) culminating in a reduction of permitted numbers by 80%, to 102 adult cattle on both allotments. This was followed by removal of all livestock in 2000 as a result of persistent drought conditions across the forest. Base property for the Poison Springs/ Sierra Ancha allotment was sold in 2009 and a new permit was issued to the purchaser for 102 adult cattle year long. The new permit reflected a removal of three pastures on the Sierra Ancha allotment which were transferred to the Dagger allotment. The current permittee is working to implement a herd of high-quality grass fed beef for local marketing. He began with 22 head in 2010 and removed them in mid-2011 to experiment with a different breed. The allotment is currently unstocked. During the time the allotment was stocked, utilization levels were light and soils and vegetation received little impact except around water developments.

PASTURES

Bassett Lake Pasture (Sonoran desert type): This pasture is located south of Lake Roosevelt on the western boundary of the allotment adjacent to Roosevelt Lake Estates. Dominant vegetation in this unit is creosote and little leaf palo verde. Few other shrubs or sub-shrubs are found here. Annual vegetation was predominantly grass in 2011, including red brome. Few perennial grasses exist and are mainly limited to steeper slopes. Little recruitment of new plants was observed in 2011.

Water for this pasture has traditionally been pumped from a source on private property at the Roosevelt resort to a storage tank on the western end of the pasture southwest of Pinto Mesa tank and then gravity fed to three troughs in this pasture. It is uncertain at this time as to the availability of this water system to the current permittee. There are also two dirt tanks in this pasture, Pinto Mesa Tank and Road Junction Tank, both of which only provide temporary water for a short time after a rain event.

Intake Pasture (Sonoran desert type): This pasture is located south of Lake Roosevelt and adjacent to Bassett Lake Pasture to the east. It is a large unit with varying topography and soils, which directly affects the vegetation in this unit. The western portion is broken by many drainages of varying size. Soils are loose and erosive. Vegetation is diverse and vigorous. Dominant shrubs in this portion of the unit include little leaf palo verde, jojoba, catclaw acacia, Mormon tea, and mesquite. Smaller sub-shrubs include shrubby buckwheat, false mesquite, and ratany. Perennial grasses are sparse and include black grama and three-awn. Old Highway 188 runs through a portion of this pasture as a dirt road; many perennial grasses and forbs occur along its corridor from past seeding activities however this strip of vegetation is very narrow and does not contribute significantly to capacity for grazing in this unit. Annual vegetation in 2011 was predominantly forbs with non-native grasses in the western portion of the unit. Recruitment of most species was observed although in low amounts in 2011.

The eastern portion of Intake Pasture lies along Highway 288. East of Eads Wash, the unit is flatter with clayey soils. Vegetation returns to being dominated by palo verde and creosote, with catclaw acacia, saguaro, and cholla in lesser amounts. Red brome returns in the understory and

few sub-shrubs, perennial grasses or forbs were evident. Little recruitment of new plants of any species other than cholla was observed in 2011.

Water in this pasture is very limited with the only known source being a trough filled by a horizontal well drilled near Poison Spring. Significant recreational use at the confluence of Eads Wash and the Salt River is expected to lead to cattle possibly accessing the Salt River in spite of boundary fencing.

Upper Blevens Pasture (Sonoran desert, semi-desert grassland, juniper savannah, turbinella oak chaparral types): This pasture is located south of Lake Roosevelt and Highway 188 along the district boundary. Dominant vegetation in this unit is a mix of upper Sonoran desert and semi-desert grassland vegetation. Major tree/ shrub species include: little leaf palo verde, mesquite, saguaro, crucifixion thorn, mimosa, catclaw acacia, jojoba, prickly pear (*Opuntia spp.*), cholla, and juniper at higher elevations. Sub-shrubs include snakeweed and false mesquite. Slopes along Blevens Wash have few perennial grasses. Higher in elevation on steep upper slopes, perennial grasses become more common and include side-oats grama, three-awn, curly mesquite, squirreltail, and Arizona cottontop (*Digitaria californica*). Perennial forbs are infrequent and include globe mallow. Red brome and annual sprangletop (*Leptochloa spp.*) dominated much of the upper portion of this unit in 2011.

Water in Upper Blevens pasture is only available at High Blevens Spring, which is a small development with limited production.

Blevens Pasture (Sonoran desert scrub, turbinella oak chaparral types): This pasture is located south of Lake Roosevelt and Highway 188. Dominant vegetation is similar to Upper Blevens pasture. Blevens Wash contains several springs with a strong riparian vegetation component including cottonwood (*Populus fremontii*), sycamore (*Platanus wrightii*), Goodding's willow (*Salix gooddingii*), Arizona grape (*Vitis arizonica*) deergrass (*Muhlenbergia rigens*), and sedge (*Carex spp.*). Away from springs there is hackberry (*Celtis reticulata*), desert willow (*Chilopsis linearis*), and other shrubs found in upland portions of the unit. The upper portions of Pinto Creek in this pasture are showing signs of recruitment of cottonwood (*Populus fremontii*), Goodding's willow (*Salix gooddingii*), and desert willow (*Chilopsis linearis*).

Water for this unit is found at Lower Blevens Spring, Summit Spring, Pinto Creek, and Pinto Creek Well. Possible water sources that are currently not functional include Blevens Wash Well, Haven Trail Tank and Blevens Tank.

East Highway Pasture (Sonoran desert type): East Highway Pasture lies north of Lake Roosevelt and east of Highway 288. Broad drainages between long ridges dominate this unit. Primary vegetation in washes includes mesquite, little leaf palo verde, creosote, Mormon tea, and occasionally ratany. Slopes and ridges are dominated by Sonoran desert vegetation including saguaro, jojoba, crucifixion thorn, banana yucca (*Yucca baccata*), wolfberry (*Lycium spp.*), goldeneye (*Viguiera spp.*), yucca, and cholla. Red brome was common in 2011. Creosote dominates much of the flatter ground in this unit.

Water in this pasture is accessible to cattle from the private property at Bar Eleven Ranch (private land) on the west side of the pasture and from the corral on the east side of the pasture

that is fed by Willow Spring. The other possible water source in this pasture is at Roadrunner Tank.

Chalk Creek Pasture (Sonoran desert, semi-desert grassland types): Chalk Creek Pasture lies east of Highway 288 along Forest Road 203 (Cherry Creek Road). Vegetation ranges from upper Sonoran desert to semi-desert grassland. Dominant tree/ shrub species include saguaro, creosote, crucifixion thorn, mesquite, little leaf palo verde, jojoba, brittlebush, blue palo verde (*Parkinsonia florida*), mimosa, sotol, cholla, prickly pear, algarita (*Berberis hamatocarpa*), juniper, soap tree yucca (*Yucca elata*) and turbinella oak at higher elevations in the unit. Perennial forbs and subshrubs include globe mallow, ratany, shrubby buckwheat, and false mesquite. At higher elevations and on steeper side slopes, perennial grasses including curly mesquite, three-awn, and side-oats grama occur. Red brome was common throughout the unit in 2011.

Chalk Creek has some hackberry, mesquite, and desert willow but little other riparian-associated vegetation in this unit. Cattle can access water in Chalk creek when seasonally available and with some maintenance and repair would be able to use Chalk Tank and the trough and storage tank supplied by a windmill at Jose Well.

Baker Pasture (Sonoran desert, semi-desert grassland, juniper savannah types): Baker Pasture lies east of Chalk Creek Pasture and contains similar vegetation.

Water in this pasture would be provided from a windmill located at the end of FS Road 15 at the Chalk Creek horizontal well site. This windmill supplies a storage tank and trough with the overflow entering a nearby dirt tank. Other water sources that may be available in this pasture are Cottonwood horizontal well, No Salt Tank and Hackberry Tank.

Braddock Pasture (Sonoran desert type): Braddock Pasture lies directly east of Highway 288 along Forest Road 203. Topography is characterized by long ridges with steep slopes, broad drainages, and occasional wide, gently sloped flats. These flats are dominated by little leaf palo verde, bursage, creosote, jojoba, brittlebush, false mesquite, saguaro, cholla, and prickly pear. Few perennial forbs or grasses are evident. Red brome was the dominant annual species in 2011. Ridges and slopes have more diverse vegetation. In addition to species found on flatter areas, there is also shrubby buckwheat, Mormon tea, three-awn, curly mesquite, snakeweed, banana yucca, and globe mallow.

Water for this pasture would be supplied from the Hackberry Wash Well and Jackson Well, both of which are in disrepair at this time but believed to be capable of producing sufficient water. Three C Tank may provide seasonal access to water.

Zig Zag Pasture (Sonoran desert type): Zig Zag Pasture lies north of Lake Roosevelt and west of Highway 288. It is a gently sloping unit broken by occasional steep drainages closer to the lake. Dominant vegetation includes little leaf palo verde, mesquite, catclaw acacia, wolfberry, and whitethorn acacia (*Acacia acanthocarpa*). Few sub-shrubs, perennial grasses or forbs occur. Annual production was dominated by red brome in 2011.

Water in this pasture is limited to Spring Creek Flat Tank that temporarily holds water however it is proposed by the permittee to haul water to a storage tank that supply two troughs.

South Willow Pasture (Sonoran desert, semi-desert grassland, juniper savannah types):

South Willow Pasture lies east of Highway 288. It is a large unit with long broad ridges separated by wide drainages with steep slopes. Dominant vegetation includes bursage, creosote, little leaf palo verde, cholla, and mesquite. Other trees, shrubs and sub-shrubs include saguaro, crucifixion thorn, ratany, blue palo verde, mimosa, ratany, prickly pear, jojoba, wolfberry, and graythorn (*Zizyphus obtusifolia*). Desert senna (*Senna covisii*) and globe mallow occur in small amounts. An area of high saguaro recruitment occurs on slopes adjacent to Forest Road 1079. Drainages contain low amounts of desert willow and hackberry. Red brome was a dominant annual in 2011.

Water in this pasture is made available by a windmill at Willow Ridge Well and seasonally available at Cholla Ridge Tank and Byrns Tank.

North Willow Pasture (Sonoran desert, semi-desert grassland, juniper savannah types):

Vegetation is similar to that in South Willow Pasture.

Water in this pasture is provided by a pipeline off of Willow Spring located on the A-Cross Allotment, to two troughs at the southwestern corner of the pasture. Water is also available at the northwestern end of the pasture from developments made associated with the mine at that location and at Colcord Tank.

Summit Pasture (Sonoran desert, turbinella oak chaparral types):

Summit Pasture lies east of Highway 288 and consists largely of steep slopes with limited grazing accessibility. Dominant vegetation includes palo verde, desert hackberry (*Celtis pallida*), cholla, banana yucca, jojoba, and annual grasses.

Water in Summit Pasture is provided by a windmill at Summit Well along Forest Service Road 1488 and the pasture boundary between Summit and Klondike Pastures. This windmill is currently in disrepair and not functional. There are also two dirt tanks in this pasture, the condition of these dirt tanks is not known. Our maps indicate that Poison Spring Windmill is in this pasture however this windmill does not appear to be present as indicated on the map.

Klondike Pasture (Sonoran desert scrub, semi-desert grassland, juniper savannah, turbinella oak chaparral types):

Klondike Pasture is dominated by very steep, rocky slopes around its perimeter with level, rocky ground in the west-central portion. Dominant vegetation includes juniper, prickly pear, sotol, turbinella oak, turpentine bush, and catclaw acacia. Perennial grasses are common and include side oats grama, hairy grama, three awn, and curly mesquite.

Water in the Klondike Pasture is provided by a windmill at Summit Well along Forest Service Road 1488 and the pasture boundary between Summit and Klondike Pastures. This windmill is currently in disrepair and not functional. There are also several dirt tanks in this pasture. Ground Tank has water year round and Salt Peak Tank hold water only temporarily. The condition of Tucker Tank and Barley Patch Tank is not known at this time.

North Black Mesa Pasture (Sonoran desert, semi-desert grassland types):

Steep, rocky side slopes comprise the perimeter of this pasture with a gently sloping interior. Side slopes have a more varied perennial grass component, including side oats grama, hairy grama, curly mesquite, three awn, and squirreltail. Interior soils are of heavy clay and largely dominated by annual

vegetation. Curly mesquite occurs where soils are rockier. Other dominant vegetation includes juniper and catclaw acacia.

Water in this pasture is limited to three dirt tanks named Black Mesa Dirt tank #1, #2, and #3. Only two of these tanks have recently been visited, and they are believed to only hold water for short periods of time after a rain.

South Black Mesa Pasture (Sonoran desert, semi-desert grassland types): vegetation in this pasture is similar to North Black Mesa Pasture.

Water in this pasture is provided by Black Mesa Spring and Burnt Canyon Tank, the condition of these improvements is not known at this time.

Hackberry Pasture (Sonoran desert, semi-desert grassland, juniper savannah types): Southern Hackberry Pasture is dominated by Sonoran desert vegetation with components of semi-desert grassland vegetation on north facing slopes. Shrubs and trees include mesquite, saguaro, palo verde, jojoba, catclaw acacia, teddy-bear cholla, ocotillo, barrel cactus, turpentine bush, crucifixion thorn, buckhorn cholla, shrubby buckwheat, prickly pear, Mormon tea, banana yucca, snakeweed, and hophush (*Dodonaea angustifolia*). Juniper trees were observed in the area but were almost all dead in 2011. Forbs and grasses are common on north-facing slopes, less common on other slopes and on flat ground. These include desert marigold (*Baileya spp.*), sparse Arizona cottontop, curly mesquite, three awn, sparse side-oats grama, desert trumpet (*Eriogonum inflatum*), globe mallow, wire lettuce (*Stephanomeria spp.*) and sparse bush muhly. North slopes also held large amounts of clubmoss (*Selaginella spp.*) in 2011.

Water in Hackberry Pasture is limited to Hackberry Spring which has not yet been visited. Other possible sources of water are found at Meddlers Wash Windmill, which is non-functional in its current state and at Meddlers Wash Horizontal Well which is no longer functional.

West Highway Pasture (Sonoran desert): West Highway Pasture lies north of Lake Roosevelt and west of Highway 288, bordering Roosevelt Lake. It is composed of gently sloping mesas, similar in vegetation to Zig Zag Pasture, broken by steep drainages leading to the lake. Dominant vegetation includes little leaf palo verde, mesquite, catclaw acacia, wolfberry, and whitethorn acacia. Three-awn occurs in sparse areas while Bermuda grass is present at water's edge. Annual production was dominated by red brome in 2011.

The only water source in this pasture is Roosevelt Lake.

DAGGER ALLOTMENT

History

Grazing on Dagger Allotment has been documented as far back as the 1930s. Range inspection reports from that time indicate distribution of cattle was uneven, favoring flat areas around Cherry Creek and other water sources. A range inspection from the 1940s recommended this allotment be limited to sheep grazing, as erosion and herbaceous vegetation loss was already high. The pattern of concentrated use on flat areas by cattle around Cherry Creek continued through the 1970s until the allotment was acquired by a permittee who grazed livestock concurrently on Dagger Allotment and A Cross Allotment. This permittee was noted to have

made many improvements to water developments on Dagger Allotment and had significantly improved livestock distribution and range conditions. Average numbers from the 1960s through 1990s were consistently around 450 cattle with yearling carryover, first on Dagger Allotment alone then on the combined Dagger/ A Cross allotments. Range inspection reports from the 1990s recommended an increase in AUMs due to improved range condition.

The Dagger and A Cross allotments changed hands again in the 1990s. This new permittee had difficulty keeping livestock distributed, resulting in revocation of the term grazing permit. The allotment returned to forest control and remained in nonuse from 2000 to 2009. In 2009, the current permittees were issued a restricted permit which allowed for conservative use of pastures without access to Cherry Creek, Coon Creek, or the Salt River. The permit was issued for Dagger Allotment without A Cross Allotment, which had been combined with Armer Mountain Allotment to accommodate the needs of an existing permittee. To compensate for this change, the district moved three pastures from the adjacent Sierra Ancha Allotment to Dagger Allotment (Lower Dry Creek pasture, Upper Dry Creek Pasture, Oak Creek Mesa Pasture). Current management provides for up to 125 cow/ calf pairs and up to 10 horses year long.

Current monitoring data from 2009-2011 indicates good livestock distribution and a diverse plant community. Long term trend monitoring completed with Arizona Cooperative Extension indicates the allotment is in “high seral state with respect to plant species composition” (Sprinkle, 2011). Utilization levels are low and impacts to soil and vegetation are low except around water developments.

PASTURES

Oak Creek Mesa Pasture (all vegetation types occur in this pasture; very little Sonoran desert): Vegetation in this pasture ranges from semi-desert grassland to juniper woodlands and chaparral. Cattle distribute unevenly in this pasture, favoring the higher elevations with gentler terrain and avoiding steep slopes dropping into Coon Creek and Cherry Creek. The far northern reaches of the unit contain mixed conifer and pine and is used only occasionally by stray animals due to a lack of water developments. This portion of Oak Creek Mesa Pasture has been in nonuse for many years due to conflicts with resources at highest elevations, including Mexican spotted owl habitat and difficulty keeping improvements maintained and cattle on the allotment.

Dominant shrubs include juniper, mesquite, snakeweed, turbinella oak, skunkbush sumac, buckbrush, catclaw acacia, beargrass, crucifixion thorn, shrubby buckwheat, banana yucca, manzanita (*Arctostaphylos spp.*), mountain mahogany, prickly pear, agave, sugar sumac (*Rhus ovata*), and hollyleaf buckthorn. Perennial grasses and forbs are abundant and include globe mallow, curly mesquite, squirreltail, three-awn, side-oats grama, bull muhly, hairy grama, sand dropseed (*Sporobolus cryptandrus*), and cane beardgrass (*Bothriochloa spp.*). Annual forbs and grasses were abundant in 2011 and included red brome, aster, and Indian wheat (*Plantago spp.*).

Water in this pasture is mostly provided by dirt tanks, sixteen of which are indicated on the map and many have not been visited by district range personnel. The dirt tanks in this pasture that have been observed are generally silted in and likely hold water only temporarily after large rain events. The permittee is looking into mechanically cleaning several of these dirt tanks including three in the Sierra Ancha Wilderness. Other water sources in this pasture are available at: Tin House spring, which has one drinker that is currently not functional; Oak Creek Spring, which

has three troughs within a quarter mile of the spring; and Coon Spring. There are several other springs in this pasture that may possibly be used as water sources however further information is needed in those areas.

Upper Dry Creek Pasture (Sonoran desert, semi-desert grassland types): This pasture is comprised of gentle to moderately steep slopes dominated by Sonoran desert scrub and semi-desert grasslands. Dominant shrubs/ trees include saguaro, palo verde, crucifixion thorn, jojoba, prickly pear, cholla, sotol, mormon tea, banana yucca, creosote, snakeweed, mesquite, shrubby buckwheat, false mesquite, catclaw acacia, turpentine bush, beargrass, juniper, and ocotillo. Perennial grasses and forbs are sparse at lower elevations and include three awn, red brome, and globe mallow. Upper elevations and steeper slopes also have limited curly mesquite and side-oats grama.

Water in this pasture is available at Coon Creek and Dry Creek Windmill. The condition of Upper Dry Tank is not known but is expected to provide seasonal water at best.

Lower Dry Creek Pasture (Sonoran desert, semi-desert grassland types): Vegetation in this unit is similar to Upper Dry Creek Pasture.

Water in this pasture is located at the spring near Bruce Horizontal Well, the lower section of Coon Creek and at the Salt River.

Upper Coon Creek Pasture (Sonoran desert, semi-desert grassland, juniper savannah, Turbinella oak chaparral): Vegetation in this pasture ranges from low elevation Sonoran desert scrub adjacent to Cherry Creek up to semi-desert grasslands and juniper grasslands above Coon Creek. The upper portion is similar in composition to the Oak Creek Mesa pasture described above, without the mixed conifer and pine component and with a minimum of chaparral. The lower portion includes saguaro, ocotillo, crucifixion thorn, jojoba, prickly pear, cholla, palo verde, sotol, mormon tea, banana yucca, creosote, snakeweed, mesquite, shrubby buckwheat, false mesquite, catclaw acacia, turpentine bush, beargrass, three awn, and red brome.

A large part of this unit lies on steep, erosive slopes dominated by shrubs and unlikely to receive any significant livestock use. Livestock concentrate at the extreme northern end of the unit on juniper grasslands or along gentler slopes above Cherry Creek, dominated by Sonoran desert scrub, depending on herding practices. The steep slopes of this unit are sufficient to provide a natural barrier between the two locations and could be used to create two distinct grazing opportunities during a grazing year.

Water in this pasture is accessible at Banning Windmill in the far north eastern portion of the pasture, east of Cherry Creek, Rock Spring, possibly Cherry Creek Well, and five dirt tanks that, if repaired, provides seasonal water. The main water source is Coon Creek, traditionally used near the lower Coon Creek Spring and Bill Lee Spring. This area would provide yearlong water.

A variety of palatable, cool season perennial grasses can be found at higher elevations (*Poa*, *Elymus*, *Festuca*, etc.), often in less-used portions of these vegetation types where grazing pressure is reduced or precipitation amounts are higher. Cool season perennial grasses can be bimodal where precipitation and temperature are favorable, flowering in late fall and spring and remaining palatable throughout the year. They occur in limited quantities on the Dagger

Allotment in juniper savannahs and woodlands as these vegetation types have understories dominated by shrub species.

Lower Coon Creek Pasture (Sonoran desert, semi-desert grassland): This pasture is similar in composition to Upper and Lower Dry Creek pastures. There is more palo verde and saguaro and sparser cover from other shrubs, sub-shrubs, and grasses.

Coon Creek is the only available water in this pasture.

West Devore Pasture (Sonoran desert, semi-desert grassland): This pasture is characterized by steep, erosive slopes and limited gentler terrain adjacent to Cherry Creek. Vegetation is Sonoran desert scrub. Dominant shrubs/ trees include saguaro, catclaw acacia, jojoba, cholla, juniper, mesquite, banana yucca, crucifixion thorn, sotol, mimosa, snakeweed, turpentine bush, and palo verde. Grasses and forbs are limited.

Water in this pasture is available along the Salt River, Cherry Creek, Devore Spring and Liquor Spring, which is developed but currently not functional.

Dagger Pasture (Sonoran desert, semi-desert grassland): This pasture is comprised of long ridges broken by steep slopes leading to sandy washes in the northern portion, a broad basin with vertic soils in its center, and steepening slopes leading down to the Salt River in its southern portion. Vegetation is primarily semi-desert grassland as described for Rock and Ellison pastures below. Suitable forage is most readily available in the northern portion, sparse in the basin with vertic soils, and available in limited quantities on slopes leading to the Salt River.

Water in the northern part of Dagger Pasture is provided by Devore Well. The windmill at this location supplies a storage tank and trough near the windmill and then is pumped to another storage tank and trough at the corner of the Ellison, Rock and Dagger pastures that allows access from all three pastures. From this storage tank the permittee is currently proposing a pipeline that extends down the fence line to another storage tank and trough at the corner of the Dagger, Rock and West Devore Pasture. Other water available in this pasture is provided by: Dagger Spring, which is developed and provides seasonal water to a trough; Natural Corral Tank, which is functioning but silted in; Natural Well, which appears functional but is not being used; Jump-Off Spring. Cattle can access the Salt River at a few locations in the southern end of the pasture.

Rock Pasture (Sonoran desert, semi-desert grassland): This unit is comprised of gentle to moderately steep slopes with Sonoran desert scrub and semi-desert grassland vegetation. Dominant shrubs/ trees include catclaw acacia, banana yucca, prickly pear, mesquite, cholla, mormon tea, soap tree yucca, snakeweed, mimosa, ratany, saguaro, palo verde, whitethorn acacia, and turpentine bush. Forbs and grasses are limited on lower slopes.

As the unit transitions to semi-desert grassland in the eastern half, ridges and slopes are dominated by black grama, three awn, curly mesquite, side-oats grama, snakeweed, mimosa, catclaw acacia, blue palo verde, mormon tea, soap tree yucca, sotol, prickly pear, cholla, false mesquite, ratany, slim tridens, and New Mexico feathergrass (*Hesperostipa neomexicana*). Livestock distribution currently favors lower slopes close to the Cherry Creek road while upper slopes closer to the eastern boundary are lightly used even though forage is of higher quality. Water development may be a limiting factor at this time.

Cattle have traditionally accessed water from Cherry Creek while in this pasture. However, to reduce impacts by cattle to Cherry Creek, a fence has been approved to be built on the east side of FS Road 203. This removes access to Cherry Creek while cattle are in the Rock Pasture. In order to provide water to cattle while in this pasture, projects are proposed by the permittee that would include a pipeline extension from Pringle Wash Well to troughs on the boundary of Ellison and Rock Pastures and another pipeline extension off the Devore Well Water System that supply troughs at the corner of Rock, Dagger and West Devore Pastures. There is also currently a trough off Montague Well that provides water to both Ellison and Rock Pastures.

Ellison Pasture (semi-desert grassland type): This pasture is dominated by semi-desert grassland with long ridges and steep slopes leading to broad, sandy washes. Vegetation is similar to eastern Rock Pasture as described above.

Water in Ellison Pasture is provided by a windmill at Montague Well that supplies a trough located between Ellison and Rock Pastures. Another windmill is located at Pringle Wash Well, which fills a storage tank and trough at the well site. Water may be available seasonally at an unnamed dirt tank. The permittee is currently proposing a pipeline to extend down Pringle Wash to troughs that would be located at the boundary between Ellison and Rock Pastures.

North Sheep Pasture (semi-desert grassland, turbinella oak chaparral types): Vegetation in this pasture is defined by long ridges and broad, sandy drainages. Soils are granitic and favor shrubs in most areas. Common shrubs found in the pasture include turbinella oak, juniper, shrubby buckwheat, catclaw acacia, mimosa, algerita, prickly pear, ratany, snakeweed, cholla, dalea (*Dalea spp.*) sotol, false mesquite, banana yucca, and velvet mesquite. Less common in the drainages is desert willow and Texas mulberry (*Morus microphylla*). Forbs and grasses are less common on flatter areas, more abundant on side slopes and ridge tops and include globe mallow, lotus (*Lotus spp.*), three awn, side oats grama, squirreltail, and black grama. Annual forbs and grasses were sparse in 2011 and included red brome and ragweed (*Ambrosia spp.*).

Current use of this pasture is well distributed away from available water, higher on flat areas and light on slopes and some ridge tops. Elk sign was observed during field visits in 2011.

Water in North Sheep Pasture is located at Bladder Windmill and Banning Windmill. Both of these windmills fill storage tanks and troughs at the well sites. The permittee has proposed a second trough off both of these windmill water systems but is not actively pursuing developments at this time. The permittee doesn't think that cattle water much at Granite Basin Spring or Bladder Spring, stating they are seasonal at best. A visit to these springs is planned for the near future, along with Hefner Tank and Dripping Spring.

Little Sheep Pasture (semi-desert grassland): Vegetation in this pasture differs from North Sheep due to more limestone and less granite. Shrubs are less prevalent, grasses and forbs are dominant. Common shrubs include snakeweed, soap tree yucca, mesquite, prickly pear, catclaw acacia, sotol, and false mesquite. Grasses and forbs are more abundant and include three awn, curly mesquite, black grama, side oats grama, slim tridens, and globe mallow. Current livestock distribution favors slopes and ridges close to water and FR 203. Use observed in 2011 was very light closer to the forest and allotment boundary in this pasture.

Water in Little Sheep Pasture is currently located at Upper Sheep Well. At this location, a windmill fills a storage tank and trough. From the storage tank, a pipeline extends down Sheep Wash to help fill another storage tank and trough located at and also being filled by, the windmill at Sheep Well. The permittee is currently proposing to extend a pipeline from this lower storage tank to another trough further down Sheep Wash. Cattle do not have access to Cherry Creek while in this pasture.

ADAPTIVE MANAGEMENT

Adaptive management uses monitoring results to continually modify management in order to achieve specific objectives. The proposed action and grazing alternatives provide sufficient flexibility to adapt management to changing circumstances. If monitoring indicates that desired resource conditions are not being achieved, adaptive management decisions would be used to modify management. Such changes may include annual administrative decisions to adjust the specific number of livestock, specific dates for grazing, class of animal or pasture rotations. These changes would not exceed the limits for timing, intensity, duration and frequency as defined in the term grazing permit. Adaptive management would be implemented through annual operating instructions, which would adjust livestock numbers and the timing of grazing so that use is consistent with current productivity and capacity and is meeting management objectives.

Adaptive management also includes monitoring to determine whether identified structural improvements are necessary or need to be modified. In the case that changing circumstances require physical improvements or management actions not disclosed or analyzed herein, further interdisciplinary review would occur. The review would consider the changed circumstances and site-specific environmental effects of the improvements in the context of the overall project. Based on the results of the interdisciplinary review, the District Ranger would determine whether correction, supplementation or revision of the EA is necessary in accordance with Forest Service policy or whether further analysis under NEPA is required.

MONITORING

Upland Mitigation and Monitoring

Forage utilization would be managed at a level corresponding to light to moderate intensity (30-40% on herbaceous key forage species). Use of browse species and annuals would be limited to not more than 50% of current annual growth in order to provide for grazed plant recovery, increases in herbage production and retention of herbaceous litter to protect soils (implementation monitoring).

As livestock use each specific unit (pasture), district range personnel monitor effects of grazing activities in the uplands such as use on herbaceous and woody vegetation, trampling, and effects on soils and wildlife habitat. This information would be used to help determine when cattle should rotate out of the scheduled unit during the grazing season. If livestock are reaching use limits for current annual production or causing other undesirable effects they would be moved from the pasture to the next scheduled unit. Post grazing monitoring would then document effects and,

when combined with actual livestock use information over time, would help determine the carrying capacity of each unit for livestock to refine future allotment management. If livestock consistently reach forage use limits before their scheduled move dates, annual authorized numbers would be adjusted in the next year's annual operating instructions. Over time, this information could be used to adjust permitted numbers on the term grazing permit.

If proper use in management units is reached before the end of the grazing year or season, livestock may have to be removed from the allotment to avoid exceeding utilization guidelines identified in this decision. Better distribution of livestock avoids concentrating effects and provides the best opportunity for livestock to remain on the allotment for the entire grazing season.

E.J. Dyksterhuis, in 1951 said “applicable information from pure science must be translated into terms of action and repackaged for a specific consumer with a specific need.” Dyksterhuis posed this question at 1950 annual meeting of Ecological Society of America “How can we best translate into helpful terms, suited to action on the range, the indispensable knowledge we obtain from pure sciences, particularly ecology?” This question is as relevant today as it was in 1950 (Ruyle and Dyess 2010). Now we have large amounts of ecological data, unprecedented analytical technology, and more people than ever interested in how rangelands are managed. How to appropriately interpret and apply historical data sets in light of current ecological concepts for a variety of ecological services is a critical consideration for resource managers (Ruyle and Dyess 2010).

For purposes of determining vegetative and soil trends over time this report uses data collected since 1950's at various intervals to determine changes over time. Data collected since 1950's to this day was collected using Parker 3-step protocols. In my report I have omitted score cards since such range condition scores, based on a climax model of plant succession, are now known to be limited predictors of most ecological (functional) processes in support of ecosystem services across rangelands (National Research Council 1994 and Society for Range Management Task Group on Unity in Concepts and terminology 1995). Additionally, various assumptions and weightings associated with Range Condition ratings from Parker data alter basic metrics collected and arguably limit their usefulness for interpreting resource trends (Ruyle and Dyess 2010). There are a number of weaknesses in Parker's method (Stohlgren et al 1998) and some are inherent in the model, such as sample size (Cook and Box 1961).

However, in some cases, seemingly fatal flaws, Parker data offer unparalleled historical and ecological value, especially for trend determinations with this caveat: interpretations should only be made bases on 'preponderance of evidence' from comparisons of data gathered in Steps 1 and 3 and other information pertinent to the particular location (Ruyle and Dyess 2010). As Parker himself said in 1954, “all possible clues must be considered before the final appraisal is made.” This is what I have done in this analysis and all others I have done on Globe District. Although there are significant data gaps (sometimes 20 years or more) in monitoring at specific sites using Parker 3-Step data, preponderance of numeral data as well as photograph comparison clearly shows a significant vegetative composition change across most of analysis. This shift is a reduction of perennial grasses and an increase in shrubs, half shrubs, and trees. This is consistent with findings across most of Southwest US (Throop and Archer 2007). Data collected in the

Reading the Range Program since 2007 is useful information when correlated with annual precipitation measurements for a yearly tool for improvement management, however any trend determinations requires more years of data collection.

For proper analysis associated with this NEPA requirement a clear distinction must be made between the concepts of inventory and monitoring.

The emphasis of this Range Report is long term monitoring as opposed to rangeland inventory. Rangeland monitoring repeats measurements and observations over time in order to document change in vegetation or other rangeland resources.

Long term planning requires knowledge of both meaningful, long term historical changes (if any) and short term inventory methods that eventually translate into improved long term trend indications. VGS data collected in past 4-8 years in analysis area provide this important component of long term trend now that we have in most cases a baseline to work from.

Precipitation data is vital in this analysis and was used in this analysis as well.

Riparian Mitigation and Monitoring

Riparian use guidelines for implementation monitoring are applied where specialists have identified “key reaches” or “key areas”. Key reaches, similar to upland key areas, are those stream channels, springs, or riparian areas that are representative, responsive to changes in management, accessible to livestock, and contain key vegetative species. In early seral or degraded riparian areas, appropriate monitoring cannot take place until riparian vegetation re-establishes. Use of riparian areas identified as degraded or in early seral condition should be deferred until sufficient riparian vegetation is re-established and can be monitored.

Once riparian vegetation has become re-established in key reaches and is available for monitoring, riparian utilization measurements (implementation monitoring) follow the Bureau of Land Management’s (1999), Sampling Vegetation Attributes and Utilization Studies and Residual Measurements and Burton et al (2011) or the most current acceptable method. Use guidelines are as follows: *obligate riparian tree species* – limit use to < 50% of terminal leaders (top 1/3 of plant) on palatable riparian tree species accessible to livestock (usually \leq 6 feet tall); *deergrass* – limit use to < 40% of plant species biomass; *emergent species* (rushes, sedges, cat-tails, horse-tails) – maintain six to eight inches of stubble height during the grazing period. Once riparian utilization guidelines are met cattle are usually moved to the next scheduled pasture regardless of available forage in the uplands.

Additionally, changes in riparian vegetation and stream channel geomorphology condition and trend are measured in 5 to 10 year intervals (effectiveness monitoring) using protocols described in the Bureau of Land Management’s (1999) Sampling Vegetation Attributes and Utilization Studies and Residual Measurements, Burton et al (2011), and Harrelson et al (1994), or the most current acceptable method.

Recreation Mitigation and Monitoring

The permittees continue to access their allotments on existing roads and trails as designated by Tonto National Forest maps to avoid the creation of illegal ATV trails. Access by permittees to

roads closed on the Forest Service system may be authorized by the agency in writing. Compliance with the Wilderness Act in the Salt River and Sierra Ancha Wilderness areas is important and expected of all users on the allotments. Permittees 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.

Wilderness Mitigation and Monitoring

The 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".

Heritage Mitigation and Monitoring

New rangeland improvements not currently analyzed in this decision would be assessed for need on a case by case basis. Any range improvement which would disturb soil would require an archaeological clearance by the Forest Archaeologist or a certified para-archaeologist. New improvements not anticipated by this decision would also require a separate analysis to comply with NEPA regulations. Salting, watering, or supplemental feeding would not be permitted where cultural sites or resources exist.

Mitigation of impacts to heritage resources for all alternatives are accomplished by avoiding these properties through the placement and construction of all range improvements. Minimizing localized concentration of animals, improving livestock distribution across the allotment, and reducing the intensity of grazing minimize surface disturbance to heritage resources. Where proposed improvements involve ground disturbance, 100% archaeological survey will be conducted. 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 SHPO.

Archaeological 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 improvements. This approach is based on long-term consultation with SHPO and 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 12/24/03, and specifically, Appendix H, the *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.

Protection measures identified under the Protocol include:

1. Archaeological surveys will be conducted for areas proposed for surface disturbance which have no previous survey coverage, or have out-dated 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 enclosure 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. The appropriate tribes will be consulted if the mitigation is invasive or it affects a TCP or other property of concern for them.

These protection measures apply equally to all proposals for these allotments. Specific protection measures are developed on a case by case basis.

Monitoring- In accordance with the Protocol, monitoring will 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. 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 measured outlined in the Protocol to ensure that the effects are avoided or minimized.

Effects Analysis

Alternative 1- No Grazing-

Under this alternative the term grazing permits on all six allotments within the project area would be cancelled following the guidance in 36 CFR 222.4 and FSM 2231.62. Twenty percent of the permitted numbers on the face of the permit would be removed from the allotment each year until no more grazing is permitted. In the event that all cattle are removed from the

allotments within one year of this decision, due to drought or other circumstances, the permit would be cancelled in whole. Existing improvements that are no longer functional or needed for other purposes, including interior fences, cattle guards, and water developments would be removed over time as allowed by funding and management priorities.

Riparian

Direct and Indirect Effects

Under this alternative livestock impacts to riparian vegetation is eliminated, except for the potential trespass into project area by unauthorized livestock from nearby grazed areas. This alternative provides for the most rapid recovery of riparian vegetation towards our desired future conditions.

Most rapid recovery is expected in channels with small watersheds, perennial flow or sub-surface flow, an existing source of riparian vegetation and availability of fine sediments. Amount of time required for riparian recovery after severe degradation can vary from several years to decades (Clary and Kruse 2003). Generally, riparian areas have high inherent potential for recovery from disturbance (Milchunas 2006). Recovery depends on watershed size, existing condition, stream channel and riparian area (flow regime, channel gradient, dominant channel substrate, type and extent of riparian vegetation), future management, climate and natural disturbances (Kindschy 1987, 1994).

Stream channel and riparian area recovery are considered optimal when effects of livestock grazing are eliminated (Clary and Kruse 2003). Eliminating livestock grazing replaces water to springs and streams from storage tanks or associated troughs. Riparian areas benefit by increasing availability of above and below ground water. Removing livestock eliminates approximately 12 gallons of water per head of livestock per day (USDA 2006). This facilitates an increase in the density, cover and area of riparian vegetation, especially at springs and streams with low flows. Local livestock operators have noticed an increase of vegetation from removal of livestock reduces the available surface water at some springs, which may limit wildlife access to these locations.

No grazing provides most rapid increase of upland vegetative cover, species diversity, and improvement of impaired and unsatisfactory soils condition. 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 should maintain or improve existing condition of upper watersheds.

Cumulative Effects

Heavy historic grazing in riparian areas removed vegetation, increased soil loss and destabilized streambanks. No grazing positively affect recovery of highly disturbed areas, including streambank stabilization. Increase in water availability for vegetation may remove water for wildlife that would have otherwise been available and contained in livestock troughs.

Current mining near Pinto Creek headwaters created leach mounds that ruptured causing flooding of leached materials down creek. Increased vegetation may decrease containments from spillage, acting as a natural filtration process.

Historic mining removed water from seeps, springs and wells, for the extraction of minerals. Water availability for wildlife and vegetation would increase with the removal of past mining and grazing activities.

Raising level of Roosevelt Lake decreased grazable lands, removing riparian and Sonoran desert vegetation. No livestock grazing may increase riparian vegetation along the lake shore, as a result of this it would also be harder for recreationalists to access the lake.

Trespass cattle access Forest Service lands through the Salt River corridor and from nearby allotments. Without livestock operator presence and decrease in permit administration and monitoring, trespass cattle populations may increase becoming wild and potentially harmful to forest visitors.

Salt cedar invasion displaces many native riparian species (Brotherson and Winkel 1986) a general purpose gene heightens opportunity of invasion. The extent to which tamarisk assumes dominance in these various habitats is a function of climate, and current and historical disturbance regimes. Active vegetative regeneration produces edible seedlings, allowing livestock to occasionally graze. As native vegetation actively grows, livestock start utilizing green up. Livestock removal eliminates one type of utilization on salt cedar. Without livestock grazing and native species are present, cottonwoods, willows and seepwillows grow faster, potentially shading out salt cedar (Horton 1977).

Unauthorized off road vehicle activities and user created roads increase over time, affecting soil compaction and erosion. Removal of livestock reduces one vector of soil compaction and erosion. Removal of livestock, subsequently permittees, and forest service personnel for purposes of range administration results in reduction in unauthorized off road enforcement, increasing soil erosion and compaction.

Eliminating livestock use and rangeland improvements can create a visually pleasing recreation experience for authorized users. Removal of fences and gates allows uninhibited flow of traffic throughout the project area however the lack of maintained range improvements may also limit water available to recreational users and for recreational livestock.

Livestock operators in the project area have had or currently have contracts with government, state or local agencies. Removal of livestock and range improvements affect stipulations of their contracts, potentially requiring financial burdens on permittees.

Haystack Butte headquarters special use permit may be in jeopardy since a headquarters may no longer be necessary to manage allotment. Headquarters spring, water source for special use permit, may be affected due to removal of rangeland improvement projects.

Climate change and drought affects vegetation response and growth with or without presence of livestock. Quicker recovery is possible in areas where a seed source or diverse species are present. Without grazing pressure plants show higher vigor, increased root and seed production.

An increase of tree, shrub, grass, subshrub and forb cover would increase carbon sequestration. Research indicates livestock grazing may affect climate through emissions of methane gas produced by cattle (Gill, et al 2010). Removal of livestock would decrease methane emissions to the overall rangeland livestock contribution; however other studies in croplands show that through consumption of plants, herbivores cycle carbon and nutrients that can lead to carbon sequestration (Follett 2001).

Effects of rangeland grazing systems are geographically widespread and are thus likely a larger contributor to changes in the global carbon cycle. Decreased vegetative cover can lead to desertification in response to grazing, removing these carbon stocks increases wind and water erosion accelerating the loss of potential carbon sequestration (Asner and Archer 2010).

In riparian areas, an increase of ground water often occurs with upland recovery and water that is infiltrated into system as runoff decreases.

Salt River wilderness contains range improvements scattered throughout project area. Range improvement removal will enhance wilderness visual quality. With proper clearances, permittees within project area may enter wilderness in vehicles to maintain improvements. Without livestock, roads accessing improvements should be closed, reducing unauthorized use.

Removal of improvements and livestock in wilderness and along salt river corridor positively increases wild and scenic river designation.

Surrounding allotments scheduled for future allotment analysis where grazing and associated actions will be analyzed. Vegetation in the project area would continue to receive use by wildlife, insects, unauthorized livestock, and be influenced by human activities such as harvesting, pruning under power lines, mining and mineral exploration, noxious weed introduction and spread, and off-road travel.

Removal of livestock eliminates damage or disturbance to campsites and recreational areas in the project area. Recreational use causes additional vegetation and soil disturbance, however removal of livestock reduces competition with recreational users.

Sonoran desert

Direct and Indirect Effects

Livestock impacts to Sonoran desert vegetation would be eliminated on Sedow, Hicks-Pikes Peak, Chrysofile, and Haystack Butte, Dagger and Poison Springs allotments.

No grazing provides most rapid increase of upland vegetative cover, species diversity, and improvement of impaired and unsatisfactory soils condition. As referenced by Allington and Valone (2011), van de Koppel, Reiterkerk (2004) and Castellano, Valone (2007), water supply strongly limits plant growth, an increase in soil water availability, positively creates an environment conducive to perennial plant recovery.

However after fifty years of livestock removal in Sonoran Desert vegetation outside of Tucson Arizona studies have also shown no significant composition change (Blydenstein et. al. 1957). Increases were observed in plant density especially in Range Ratany and perennial grasses on the protected site, while density in ragweed decreased under protection from grazing.

Exclusion of grazing, in south America, can cause a change of species composition and plant communities, usually resulting in the displacement of invasive species by native grasses (Sala et al 1986). Conversely on western rangelands, areas of high non-native plant invasions livestock can be used as an effective weed control tool through grazing (Frost and Launchbaugh 2003).

Recovery in desert systems can take twenty years or more with only minor improvement in vegetative composition where soil erosion is serious (Holechek et al 2010). Areas which cross ecological thresholds and are dominated by a single species may require intensive management, in addition to livestock removal to achieve any noticeable change.

Livestock removal eliminates grazing pressure on palatable vegetation, except where trespass use occurs. Palatable vegetation increases in diversity, vigor, root growth and distribution over time. Allington and Valone (2011) conducted grazed and non grazed studies on Appleton-Whittell Research Ranch in Southern Arizona, under which higher basal cover and species richness increased on nongrazed sites, as compared to grazed sites. Uncommon species on ungrazed sites increased.

Conversely, other research suggests improvements in forage production often may not necessarily follow exclusion of livestock grazing in sagebrush semi-desert in Southern Utah (West et al 1984). This may have similar effects on ecological sites analyzed in this analysis. In addition, cattle grazing of mixed bermudagrass and tall fescue pastures in southern piedmont regions can be considered a viable strategy to rehabilitate degraded cropland in a viable strategy to rehabilitate cropland in the southwestern United States. Studies have negated the perspective that only non-utilization of land is be the best strategy for rehabilitating degraded land (Frazluebbers and Stuedemann 2010).

It is projected that annual forb and cool season grass production increases rapidly with significant winter precipitation. Climatic carbon dioxide levels, temperature and precipitation are leading factors on rangeland species production (Izaurrealde et al 2011). Woody species, annual grasses and forbs increase with rising carbon dioxide levels, conversely, warm season bunchgrasses may decrease.

High rate of rapid recovery, in concentrated livestock use areas (i.e. around stock tanks, corrals, trailing corridors), may not occur. Rate of recovery depends on climate, fire, recreational impacts, and wildlife use.

Removal of livestock might reduce spread of acacia and mesquite because cattle are highly effective agents of dispersal (Browning and Archer 1988). If a population occurs in uplands, spread continues naturally. Livestock have already established a seed bank, where, without livestock, germination and growth is uninhibited (Browning and Archer 2011). In absence of livestock, drought may reduce grass species, especially bunchgrasses due to water levels

dropping below their infiltration threshold (Castellano and Valone 2007), which results in potential shift to a shrub dominated state.

Jojoba shrubs show higher rates of vigor and seed production. Seedlings in sheltered areas have higher survival rates than those greatly exposed to climatic extremes and rodent predation (Sherbrooke, 1977). Results of a study, conducted on National Park Service, indicate high presence of jojoba seedlings under existing mature vegetation with high surface litter presence. An appropriate level of seedling recruitment for viable population sustainability is unknown.

Noxious weed seed spread by domestic animal coats and consumption are eliminated. However, seeds continue transport by wildlife, natural forces, and recreational activities.

Without disturbance, biological crusts form, reducing ability of noxious and invasive weed seeds to germinate and increase water infiltration. Studies in the Great Basin found presence of biological crusts inhibited growth of cheatgrass, an annual exotic grass, but did not affect germination of native grasses (Sheley 1995). Type of moss forming biological crusts are important on the level of inhibited growth on species.

Removal of fences and gates allows uninhibited flow of traffic throughout the project area, however the lack of maintained range improvements may also limit water available to recreational users and for recreational livestock

Saguaro seedling establishment increase with reduced use and trampling of nurse plants by livestock (Martin and Turner 1977). Protection highly encourages seedling establishment and growth. In protected areas, studies show an increase of establishment up to 200 percent (Turner and Bowers 1988)

Cumulative Effects

Heavy historic grazing, especially around late 1800's and early 1900's left a lasting impression. Stocking rates have declined markedly since early 1900's with adoption of basic tenets of rangeland management. Livestock numbers declined with adjusted carrying capacity from noticeable shifts in vegetation composition. Secondary results include loss of soil fertility and water holding capacity (Asner and Archer 2010). Without livestock grazing, recovery is mixed especially with changes in climatic carbon dioxide, temperatures and precipitation fluctuations, which affects soil and vegetation response. Some site specific studies do show that light to conservative grazing benefit grass plants during times of drought as compared to no grazing (Holechek et al 2006).

Trespass cattle access Forest Service lands through the Salt River corridor and from nearby allotments. Without a livestock operator presence and decrease in forest service employee's monitoring, trespass cattle populations may increase becoming wild and potentially harmful to forest visitors.

Unauthorized off road vehicle activities and user created roads continue to increase, affecting soil compaction and erosion. Removal of livestock reduces one vector of soil compaction and erosion. A reduction in permittees and forest service personnel for purposes of range

administration results in equal reduction in unauthorized off road notifications, increasing soil erosion and compaction.

Livestock operators in project area have had or currently have contracts with government, state or local agencies. Removal of livestock and range improvements affect stipulations of their contracts, potentially requiring financial burden on permittees.

Haystack Butte special use permit for headquarters to maintain allotment may be in jeopardy since a headquarters for allotment would no longer be necessary with removal of grazing. Headquarters spring may be affected as part of rangeland improvement projects, which would affect water supply for special use ranch headquarters.

Prescribed fire would not be used in Sonoran desert. Increases in invasive and noxious weeds increase fine fuels, potentially increasing threat of wildfire and destruction of native vegetation.

Climate change and drought affects vegetation response and growth with or without presence of livestock. Quicker recovery is possible in areas where a seed source or diverse species are present. Without grazing pressure, plants show higher vigor, increased root and seed production. An increase of tree, shrub, grass, subshrub and forb cover would increase carbon sequestration.

Research indicates livestock grazing may affect climate through emissions of methane gas produced by cattle (Gill et al 2010). Removal of livestock would decrease methane emissions to the overall rangeland livestock contribution; however other studies also show that through consumption of plants, herbivores cycle carbon and nutrients that can lead to carbon sequestration (Follett 2001).

Effects of rangeland grazing systems are geographically widespread and are thus likely a larger contributor to changes in the global carbon cycle. Decreased vegetative cover can lead to desertification in response to grazing, removing these carbon stocks increases wind and water erosion accelerating the loss of potential carbon sequestration (Asner and Archer 2010).

Salt River wilderness contains range improvements scattered throughout project area. Range improvement removal may enhance wilderness visual quality while others may appreciate the rustic look of wilderness range improvements. Currently, with proper clearances, permittees within project area may enter wilderness in vehicles to maintain improvements. Without livestock, roads accessing improvements should be closed, reducing unauthorized use.

Surrounding allotments are scheduled for future allotment analysis where grazing and associated actions will be analyzed. Vegetation in the project area would continue to receive use by wildlife, insects, unauthorized livestock, and be influenced by human activities such as harvesting, pruning under power lines, mining and mineral exploration, introduction and spread, and off-road travel. Climatic conditions ultimately determine rates of growth and reproduction for all Sonoran Desert species, influencing the degree to which this vegetation type move toward desired conditions. In 2012, a decision approved installation of a new pipeline and fence in Sedow allotment, which slightly increases water distribution and creates a new pasture.

Removal of domestic livestock grazing subtracts one vector of transportation for weed propagules from a list of natural and human-related vectors. Without a vector of transport, reductions of new weed infestations and spread of existing infestations are reduced.

Intermediate levels of grazing may maintain greater levels of native plant diversity as compared to the removal of grazing as shown in a study in cheat grass dominated sites which has some similarities to red brome in Arizona (Loeser et al 2006).

Past heavy off road vehicle use, especially in Sedow allotment, has increased soil disturbance and changed vegetation type. Past mechanical work in this area has tried to restore area with little effect. Removing livestock may slightly improve conditions at this specific location.

Semi-desert grasslands

Direct and Indirect Effects

Many of the effects described under Sonoran Desert in this alternative would also apply in the Semi-desert grasslands, except where the effects are specific to Sonoran desert vegetation such as the effect to saguaro seedling establishment.

Cumulative Effects

Same as Sonoran Desert, except for prescribed fire.

Juniper Savanna

Direct and Indirect Effects

Effects of this action may also be described under the above vegetation types.

Livestock impacts to juniper savannas and woodlands would be eliminated on Sedow, Hicks-Pikes Peak, Chrysothile, and Sedow allotments. Without livestock, an increase of grasses occur allowing fire to easily move through landscape, reducing establishment of juniper stands. Under no grazing alternative, recovery is dependent on climatic carbon dioxide, temperature and precipitation fluctuations.

Cumulative Effects

Vegetation in watersheds outside the project area would continue to experience livestock grazing pressure. Vegetation in the project area would continue to receive use by wildlife, insects, unauthorized livestock, and be influenced by human activities such as harvesting, pruning under power lines, mining and mineral exploration, noxious weed introduction and spread, and off-road travel. Additionally, fuels treatments in this vegetation type are a cumulative effect to vegetation. An increase in fine fuels from the removal of grazing pressure could shorten the fire return interval.

Removal of livestock would increase fine fuels, allowing prescribed fires to maintain juniper savannas from becoming juniper woodlands.

Heavy historic grazing, especially around late 1800's and early 1900's left a lasting impression. Stocking rates have declined markedly since early 1900's with adoption of basic tenets of rangeland management. Livestock numbers declined with adjusted carrying capacity from noticeable shifts in vegetation composition. Secondary results include loss of soil fertility and water holding capacity (Asner and Archer 2010). Without livestock grazing, recovery is mixed especially with changes in climatic carbon dioxide, temperatures and precipitation fluctuations, which affects soil and vegetation response.

Trespass cattle access Forest Service lands through the Salt River corridor and from nearby allotments. Without livestock operator presence and decrease in permit administration monitoring, trespass cattle populations may increase becoming wild and potentially harmful to forest visitors.

Removal of domestic livestock grazing subtracts one vector of transportation for weed propagules from a list of natural and human-related vectors. Without a vector of transport, reductions of new weed infestations and spread of existing infestations significantly reduce.

Past heavy off road vehicle use, especially in Sedow allotment, has increased soil disturbance and changed vegetation type. Past mechanical work in this area has tried to restore area with little effect. Removing livestock may slightly improve conditions at this specific location.

Eliminating livestock use and many rangeland improvements could create a visually pleasing recreation experience for authorized off road users. Many fences and gates may be removed where they are not necessary and would eliminate needs to open and close gates.

All permittees in project area have had or currently have contracts with government, state or local agencies. Removal of livestock and range improvements affect stipulations of their contracts, potentially requiring financial burden on permittees.

Haystack Butte special use permit for headquarters to maintain allotment may be in jeopardy since a headquarters for allotment would no longer be necessary with removal of grazing. Headquarters spring may be affected as part of rangeland improvement projects, which would affect water supply for special use ranch headquarters.

Recreation use, especially desirability to camp, would increase with reduced conflict between recreational use and livestock. This causes new areas of disturbance that are unrelated to livestock use.

Removal of livestock would eliminate any potential damage to campsites and recreational areas along Salt River.

Climate change and drought affects vegetation response and growth with or without presence of livestock. Quicker recovery is possible in areas where a seed source or diverse species are present. Without grazing pressure plants show higher vigor, increased root and seed production. An increase of tree, shrub, grass, subshrub and forb cover would increase carbon sequestration. Research indicates livestock grazing may affect climate through emissions of methane gas produced by cattle (Gill et al 2010). Removal of livestock would decrease methane emissions to the overall rangeland livestock contribution.

Effects of rangeland grazing systems are geographically widespread and are thus likely a larger contributor to changes in the global carbon cycle. Decreased vegetative cover can lead to desertification in response to grazing, removing these carbon stocks increases wind and water erosion accelerating the loss of potential carbon sequestration (Asner and Archer 2010).

Salt River wilderness has many range improvements scattered throughout project area. Range improvement removal would enhance visual quality in the wilderness. Currently, with proper clearances, permittees within the project area may enter wilderness in vehicles to maintain improvements. If livestock grazing were removed, along with improvements in the wilderness, roads accessing these areas can be closed, reducing unauthorized use.

Juniper Woodlands

Direct and Indirect Effects

Effects are similar to those described for Juniper Savannas.

Cumulative Effects

Vegetation in watersheds outside the project area would continue to experience livestock grazing pressure. Vegetation in the project area would continue to receive use by wildlife, insects, unauthorized livestock, and be influenced by human activities such as harvesting, pruning under power lines, mining, mineral exploration, noxious weed introduction and spread, and off-road travel. Additionally, fuels treatments in this vegetation type are a cumulative effect to vegetation.

Heavy historic grazing, especially around late 1800's and early 1900's left a lasting impression. Stocking rates have declined markedly since early 1900's with adoption of basic tenets of rangeland management. Livestock numbers declined with adjusted carrying capacity from noticeable shifts in vegetation composition. Secondary results include loss of soil fertility and water holding capacity (Asner and Archer 2010). Without livestock grazing, recovery is mixed especially with changes in climatic carbon dioxide, temperatures and precipitation fluctuations, which affects soil and vegetation response.

Trespass cattle access Forest Service lands through the Salt River corridor and from nearby allotments. Without livestock operator presence and decrease in permit administration monitoring, trespass cattle populations may increase becoming wild and potentially harmful to forest visitors.

Recreation use, especially desirability to camp, would increase causing areas of disturbance that are unrelated to livestock use. Reduction of livestock and recreation conflicts provide more enjoyable recreational opportunities.

Heavy off road vehicle use has increased soil disturbance and changed vegetation type. Past mechanical work was tried to restore areas with little effect. Removing livestock may slightly improve conditions at this specific location if given enough time for soils to rebuild.

All permittees in project area have had or currently have contracts with government, state or local agencies. Removal of livestock and range improvements affect stipulations of their contracts, potentially requiring financial burden on permittees.

Climate change and drought affects vegetation response and growth with or without presence of livestock. Quicker recovery is possible in areas where a seed source or diverse species are present. Without grazing pressure plants show higher vigor, increased root and seed production. An increase of tree, shrub, grass, subshrub and forb cover would increase carbon sequestration. Research indicates livestock grazing may affect climate through emissions of methane gas produced by cattle (Gill et al 2010). Removal of livestock would decrease methane emissions to the overall rangeland livestock contribution.

Effects of rangeland grazing systems are geographically widespread and are thus likely a larger contributor to changes in the global carbon cycle. Decreased vegetative cover can lead to desertification in response to grazing, removing these carbon stocks increases wind and water erosion accelerating the loss of potential carbon sequestration (Asner and Archer 2010).

Salt River wilderness has many range improvements scattered throughout project area. Range improvement removal would enhance visual quality in the wilderness. Currently, with proper clearances, permittees within project area may enter wilderness in vehicles to maintain improvements. If livestock grazing were removed and improvements in wilderness, roads accessing these areas can be closed, reducing unauthorized use.

Turbinella Oak Chaparral

Direct and Indirect Effects

Livestock impacts to Sonoran desert vegetation would be eliminated on Sedow, Hicks-Pikes Peak, Chrysotile, and Haystack Butte, Dagger and Poison Springs allotments.

Studies show recovery in desert systems can take twenty years or more with only minor improvement in vegetative composition where soil erosion is serious (Holechek et al 2010). Areas which cross ecological thresholds and dominated by a single species may require intensive management, in addition to livestock removal.

Livestock removal eliminates grazing pressure on palatable vegetation, except trespass use. Palatable vegetation increases in diversity, vigor, root growth and distribution over time. Allington and Valone (2011) conducted grazed and non grazed studies on Appleton-Whittell Research Ranch in Southern Arizona. Higher basal cover and species richness increased on nongrazed sites, as compared to grazed sites. Uncommon species on grazed sites increased.

It is projected that annual forb and cool season grass production increases rapidly with significant winter precipitation. Climatic carbon dioxide levels, temperature and precipitation are leading factors on rangeland species production (Izaurre et al 2011). Woody species, annual grasses and forbs increase with rising carbon dioxide levels, conversely, warm season bunchgrasses may decrease.

High rate of rapid recovery should occur in concentrated livestock use areas (i.e. around stock tanks, corrals, trailing corridors). Rate of recovery depends on climate, fire, recreational impacts, and wildlife use.

Noxious weed seed spread by domestic animal coats and consumption is eliminated. However, seeds continue transport by wildlife, natural forces, and recreational activities.

Removal of improvements and livestock in wilderness and along salt river corridor positively increases wild and scenic river designation.

Eliminating livestock use and rangeland improvements creates a visually pleasing recreation experience for authorized users. Removal of fences and gates allows uninhibited flow of traffic throughout project area.

Areas with currently open canopies (shrub-free or dominated by herbaceous plants) due to livestock trailing or concentrated use could become denser.

Browsing of palatable shrubs by deer and elk would continue.

Cumulative Effects

Vegetation in watersheds outside the project area would continue to experience livestock grazing pressure. Vegetation in the project area would continue to receive use by wildlife, insects, unauthorized livestock, and be influenced by human activities such as harvesting, pruning under power lines, mining and mineral exploration, noxious weed introduction and spread, and off-road travel. Additionally, fuels treatments in this vegetation type are a cumulative effect to vegetation.

Trespass cattle access Forest Service lands through the Salt River corridor and from nearby allotments. Without livestock operator presence and decrease in permit administration monitoring, trespass cattle populations may increase becoming wild and potentially harmful to forest visitors.

Historic fires in this vegetation type increased shrub diversity and forage for livestock. Without grazing, these activities would not be necessary to change composition type. Prescribed fires would be used to remove dense pockets of chaparral to increase species diversity.

Heavy historic grazing, especially around late 1800's and early 1900's left a lasting impression. Stocking rates have declined markedly since early 1900's with adoption of basic tenets of rangeland management. Livestock numbers declined with adjusted carrying capacity from noticeable shifts in vegetation composition. Secondary results include loss of soil fertility and water holding capacity (Asner and Archer 2010). Without livestock grazing, recovery is mixed especially with changes in climatic carbon dioxide, temperatures and precipitation fluctuations, which affects soil and vegetation response.

All permittees in project area have had or currently have contracts with government, state or local agencies. Removal of livestock and range improvements affect stipulations of their contracts, potentially requiring financial burden on permittees.

Climate change and drought affects vegetation response and growth with or without presence of livestock. Quicker recovery is possible in areas where a seed source or diverse species are present. Without grazing pressure plants show higher vigor, increased root and seed production. An increase of tree, shrub, grass, subshrub and forb cover would increase carbon sequestration. Research indicates livestock grazing may affect climate through emissions of methane gas produced by cattle (Gill et al 2010). Removal of livestock would decrease methane emissions to the overall rangeland livestock contribution.

Effects of rangeland grazing systems are geographically widespread and are thus likely a larger contributor to changes in the global carbon cycle. Decreased vegetative cover can lead to desertification in response to grazing, removing these carbon stocks increases wind and water erosion accelerating the loss of potential carbon sequestration (Asner and Archer 2010).

Salt River wilderness has many range improvements scattered throughout project area. Range improvement removal would enhance visual quality in the wilderness. Currently, with proper clearances, permittees within project area may enter wilderness in vehicles to maintain improvements. If livestock grazing were removed and improvements in wilderness, roads accessing these areas can be closed, reducing unauthorized use.

Removal of domestic livestock grazing subtracts one vector of transportation for weed propagules from a list of natural and human-related vectors. Without a vector of transport, reductions of new weed infestations and spread of existing infestations significantly reduce.

Eliminating livestock use and rangeland improvements creates a visually pleasing recreation experience for authorized users.

Range improvement removal would enhance visual quality in the wilderness. Removal of fences and gates allows uninhibited flow of traffic throughout project area.

Removal of improvements and livestock in wilderness and along the Salt River corridor positively increases wild and scenic river designation.

Surrounding allotments are scheduled for future allotment analysis where grazing and associated actions will be analyzed.

Unauthorized off road vehicle activities and user created roads continue to increase, affecting soil compaction and erosion.

Removal of livestock reduces one vector of soil compaction and erosion.

Ponderosa Pine

Direct and Indirect Effects

Effects are similar to those described for Turbinella Oak Chaparral.

Limited access and available palatable forage in ponderosa pine and mixed conifer forests on Dagger, Chrysotile and Haystack Butte Allotments naturally limits impacts of livestock grazing on shrubs and grasses.

Careful management of grazing has been shown to promote establishment and growth of forest trees by controlling competitive vegetation in conifer plantations (Doescher et al 1987).

Cumulative Effects

Similar to those described for Turbinella Oak Chaparral.

Removal of livestock would decrease disturbance in Mexican Spotted Owl habitat.

Historic fires in this vegetation type increased shrub diversity and forage for livestock. Without grazing, these activities would not be necessary to change composition type. Livestock numbers declined with adjusted carrying capacity from noticeable shifts in vegetation composition. Secondary results include loss of soil fertility and water holding capacity (Asner and Archer 2010). Without livestock grazing, recovery is mixed especially with changes in climatic carbon dioxide, temperatures and precipitation fluctuations, which affects soil and vegetation response. Climate change and drought affects vegetation response and growth with or without presence of livestock. Quicker recovery is possible in areas where a seed source or diverse species are present. Research indicates livestock grazing may affect climate through emissions of methane gas produced by cattle (Gill et al 2010). Removal of livestock would decrease methane emissions to the overall rangeland livestock contribution. Trespass cattle access Forest Service lands through the Salt River corridor and from nearby allotments. Without livestock operator presence and decrease in permit administration monitoring, trespass cattle populations may increase becoming wild and potentially harmful to forest visitors. Removal of domestic livestock grazing subtracts one vector of transportation for weed propagules from a list of natural and human-related vectors. Without a vector of transport, reductions of new weed infestations and spread of existing infestations significantly reduce. All permittees in project area have had or currently have contracts with government, state or local agencies. Removal of livestock and range improvements affect stipulations of their contracts, potentially requiring financial burden on permittees. Eliminating livestock use and rangeland improvements creates a visually pleasing recreation experience for authorized users. Range improvement removal would enhance visual quality in the wilderness. Removal of fences and gates allows uninhibited flow of traffic throughout project area. Removal of improvements and livestock in wilderness and along the Salt River corridor positively increases wild and scenic river designation. Surrounding allotments are scheduled for future allotment analysis where grazing and associated actions will be analyzed. Unauthorized off road vehicle activities and user created roads continue to increase, affecting soil compaction and erosion. Removal of livestock reduces one vector of soil compaction and erosion. Removal of livestock would increase fine fuels, allowing prescribed fires to maintain juniper savannas from becoming juniper woodlands. Removal of livestock would decrease disturbance in Mexican Spotted Owl habitat.

Mixed Conifer

Direct and Indirect Effects

Grazing can be used as a tool to maintain specie richness in mixed conifer vegetation zones as shown by a study done in Britain by Humphrey et al (2000) which showed species richness was maintained in a grazed study plot where as it decreased when grazing was removed.

Effects are similar to those described for Ponderosa Pine.

Cumulative Effects

Similar to those described for Ponderosa Pine.

Alternative 2- Current Management

Riparian

Direct and Indirect Effects

Potential riparian fencing may allow full use pastures containing Cherry Creek, Coon Creek, and Salt River or if livestock continually meet riparian utilization levels, requiring significant cost to permittees. All other riparian areas and key reaches on remaining portions of project area continue to receive some level of livestock grazing. Fall or winter grazing is best although any species grazed must have following year to regrow. An active growth season receives most utilization and protection from harsh temperatures.

Livestock trail through riparian zones, where they forage, water and bed down. Especially during hot seasons, livestock seek riparian areas to bed down, increasing disturbance to vegetation and streambank alteration.

Trailing, especially in flood plain, increase occurrences of compaction and erosion. Foraging on riparian or riparian obligate species affect bank stabilization. Water sources located in drainages and riparian areas, cause increased livestock traffic and trailing. Loss of riparian vegetation weakens streambanks and disrupts substrates (Poff 2011), which is caused by livestock grazing, drought and periodic flooding.

Riparian water developments draw water from springs and seeps, impacting water levels. Approximately 12 gallons of water per head/day is required for livestock (USDA 2006), often from small springs and seeps. Many springs and seeps have pipelines and troughs, often lying within riparian areas ornages, requiring a minimum of yearly maintenance. Level of impacts to these systems depends on time of year and type of maintenance. Water developments are often sacrifice areas because of high trampling and forage utilization nearby. Cattle often ruminate at these areas, where high concentrations of nutrients from feces and urine collect (Milchunas 2006). Natural or live watering areas, where water is at surface level, receive much use because of shade and cooler temperatures. Water developments provide water for wildlife, depending on location and accessibility.

Spreading noxious or invasive weeds continue with current management as livestock are vectors of seed transport via animal coats and consumption.

Grazing in uplands causes erosion and sedimentation into watersheds and subsequent riparian areas. Obedsinzki et al (2001) state health in riparian areas are measured by overall watershed function.

Livestock graze and browse many plants in riparian corridors. Those monitored for use include deergrass, sedges, rushes, willows, cottonwood, and ash. Livestock utilize new leaders of palatable riparian species. Salt cedar new growth may be grazed, potentially reducing regeneration.

Salt River corridor presents a challenge to monitor since riparian vegetation occurs on small, sandy benches. Once in the corridor, cattle tend to congregate on these benches since there is nowhere else to go. As a result, benches can become highly impacted quickly.

Cumulative Effects

Long term grazing impacts vegetation through bedding and foraging; this may affect riparian cover and increase water temperatures. As livestock graze riparian obligate species, a reduction in overall canopy may occur. When trampling and disturbance is caused to streambanks, changes in morphology may affect water flow.

Historic grazing concentrated around riparian areas, causing bank destabilization, erosion and loss of vegetation. Current management removes concentrated pressure around riparian areas, allowing only incidental use. Riparian recovery is slow, since cattle access these areas. Many historic adits hit underground water sources, which have been used by livestock operators for additional water sources. Current management would continue to utilize these sources and potentially develop more breached underground water sources, possibly depleting ground water and affecting riparian surface flow.

Trespass cattle utilize riparian areas and owners will be notified by Forest Service personnel.

Livestock provides a vector of seed dispersal across riparian areas and throughout allotments. Noxious weeds have increased throughout project area. Although seed dispersal is still occurring, livestock reduce salt cedar seedling encroachment. Other dispersal vectors such as campers, off road users and hikers transport noxious weeds, but to a lesser extent than livestock.

Salt river is not grazed by livestock as a result of a consciences with USFWS and USFS until site specific analysis is complete and a determination is made. Cooperative contracts are maintained and improve management possibilities for livestock operators.

Depletion of ground water for cattle operations continues to affect plant recovery in riparian areas after drought. As referenced by Allington and Valone (2011), van de Koppel, Reitkerk (2004) and Castellano, Valone (2007), water supply strongly limits plant growth. Increase in shrub species changes water infiltration dynamics. This process may favor shrubs since grass roots are not deep enough to access water.

During active growth, grazing in riparian areas prevents seedling establishment of willows which are required for willow fly catcher habitat.

Improvements located within the wild and scenic designation corridor may restrict designation.

Climate change and drought affects vegetation response and growth with or without presence of livestock. A recent summary of scientific information provided in Rangelands (Archer and Predick, 2008) projects a likely effect on vegetation composition, diversity, and rate of growth in desert ecosystems, reduce water availability, and trigger soil erosion losses through a reduction in stability as soil moisture content decreases and the intensity of rainfall events increases. Current management continues to remove some vegetative cover through grazing that protects soil and stabilize stream channels from extreme weather events. Predicted climatic changes over the next several years indicate warmer and drier conditions develop in the southwest. Inspections and discussion with long time land owners have shown that some springs in the region have gone dry in recent years for the first time in several decades. It is not know if this is an effect of the climate change and the recent drought conditions or due to the water developments associated with some of these springs, or other unknown causes.

Research indicates livestock grazing affect climate through emissions of methane gas produced by cattle (Gill et al 2010). Continued grazing contributes to methane gas produced worldwide. It is difficult to pinpoint methane produced by livestock, since it depends on amount and type of feed intake (McGinn et al 2011). Studies conducted in the last ten years suggest higher greenhouse gas emissions from cow-calf operations rather than feedlots. For the United States beef herd, Johnson et al (2003), as phrased by McGinn (2011) found cow-calf operations accounted for 75 percent of greenhouse gas emissions, totaled from all beef production. In Canada in 2010, 84 percent of the nation's beef production greenhouse gas emissions were from cow-calf operations (Beauchemin et al 2010). Most studies focus on grazing animals on irrigated pasture rather than rangelands, which would present differing vegetative choices. Studies also may not highlight the indirect effects of forage production for feedlot systems.

Effects of rangeland grazing systems are geographically widespread and are thus likely a larger contributor to changes in the global carbon cycle. Decreased vegetative cover can lead to desertification in response to grazing, removing these carbon stocks increases wind and water erosion accelerating the loss of potential carbon sequestration (Asner and Archer 2010).

Sonoran desert

Direct and Indirect Effects

Heavy browsing greatly reduces shrub size and forage yield, but moderate browsing results in yields similar to ungrazed plants (Roundy et al, 1989). Browsing of jojoba by deer and cattle could be severe enough to prevent fruit development and leaders may be consumed faster than they grow (Matthews 1994). A study conducted on Tonto Basin Ranger Districts' Campaign Allotment demonstrated jojoba's tolerance of browsing by cattle. Jojoba initiated new twigs from lateral buds to compensate for the loss of apical buds and twigs. Plants at lowest elevations on Dagger, Poison Springs and Hicks Pikes Peak are hedged from high historical use and often occur in areas of compacted soils. Studies considering woody perennial Sonoran Desert species demonstrate that climate and elevation are more responsible for diversity and density than livestock grazing (The World Conservation Union et al 2005). Perennial grass survival are also more dependent upon climatic factors for survival however some studies indicated that grasses

were more vigorous when grazing pressure occurred during dormancy (The World Conservation Union et al 2005).

Livestock affect saguaro seedling establishment by trampling under nurse plants (particularly mesquite and paloverde) and through herbivory (Martin and Turner 1977). Saguaro seedling establishment is slow and highly dependent upon temperature, rainfall (soil moisture), and herbivory by insects. Microsites (nurse plants) are important for regulating temperature and providing shade essential for saguaro establishment. A reduction of multi-storied canopy layers reduces litter, understory cover, and nurse plant cover (The World Conservation Union et al 2005).

Livestock grazing tramples soil crusts reduces crust cover, frequency biomass, species richness and diversity, and ecological function (The World Conservation Union et al 2005). Biological soil crusts in the Sonoran Desert influence nutrient cycling, nitrogen fixation, and nutrient availability to plants; seedling germination and vascular plant growth; water infiltration and runoff; and soil stabilization and erosion. Biological crusts, depending on type of moss, inhibit germination of cheatgrass (Sheley 1995), a close cousin to red brome. As trampling continues, biological crusts may no longer inhibit growth of red brome.

Rangeland management research indicates conservative or moderate livestock use may result in plant vigor and landscape similar to an absence of livestock grazing (Holochek et al. 1999, Navarro et al. 2002, Loeser et al. 2007). These studies do not specify whether soils and vegetation being influenced by livestock grazing pressure were in satisfactory condition or some form of impaired condition (i.e. compaction, limited diversity) when the studies began. Climatic carbon dioxide levels, temperature and precipitation are leading factors on rangeland species production (Izaurrealde et al 2011). Stocking rates, timing and frequency must be assessed, due to bimodal, localized precipitation patterns and frequent regional drought events.

False Mesquite displays grazing effects quickly. Changes in growth form from vertical to prostrate is common when species receives moderate or higher grazing pressure. False mesquite (*Calliandra*) produces good quality browse in early spring following adequate winter precipitation and is often available before the onset of perennial grasses. It has a tendency to become dormant in early summer when precipitation is scarce but becomes productive again following adequate moisture from summer monsoon rains. False mesquite can withstand aggressive grazing pressure and often becomes the dominant forage plant on the landscape when perennial grasses have been removed.

Range Ratany is grazed, affecting vigor and future species recruitment. Range Ratany produces high quality browse in spring and summer months. According to FEIS database, Griffith (1991), species has a high tolerance for hedging and fair to good palatability for livestock, with grazing tolerance at 50% or less. Studies show conflicting information about species recruitment; it may be a locally genetic manipulation.

Shrubby buckwheat is intolerant of hedging and often decreases. It used by livestock with a medium palatability, slow growth rate and ability to resprout.

Various species of spring annuals are preferred by livestock when adequate winter moisture, soil warmth occur, usually during March through April. Tonto Basin ranger district pasture inspections indicate grazing pressure on accompanying shrubs is reduced while annuals are actively growing. Once they begin to cure, use of palatable shrubs in those areas begins to increase, as the shrubs are typically experiencing new growth and flower production resulting from winter moisture. Selection by livestock of more palatable annual forbs and grasses over those less palatable could lead to a reduction in species richness and diversity, although to what degree is unknown.

Grazing annual forbs and grasses led to changes in composition of annual plant communities, documented in a two-year study on grazed versus ungrazed desert sites (Waser and Price, 1981). Sites became dominated by a few annual species while those considered relatively rare on the sites tended to drop out of grazed sites.

Lack of water developments, terrain, time of year and large pastures create uneven livestock distribution. Installation of new rangeland developments awaits NEPA analysis. Livestock trailing occur, especially to and from water developments, salt and bedding areas. Heavier trailing occurs in areas where distribution is uneven.

Maintenance and installation of new water developments utilize above ground pipelines, potentially increasing temperature of water in troughs. Above ground pipelines exposed to high temperatures and direct sunlight, which are not charged with water, may speed breakdown. Some water developments provide water to wildlife.

Livestock grazing spreads noxious and invasive weeds. Red Brome and Stork's Bill are opportunistic exotic species, early spring germinators, that are spread through cattle grazing and attachment to coats. Temperature, precipitation and elevation are primary drivers of germination. Red Brome has a short window of grazing before seedheads form and attach to animals or blow in wind. Stork's Bill is desired forage by livestock in early spring, which after it forms seedheads and burrows into animals or soil. A reduction in some noxious and invasive weeds continue, reducing fine fuel fire hazards.

Livestock and wildlife species compete on palatable forage.

Federal, state and local contracts are maintained providing water for wildlife and improved management possibilities for livestock operators.

Livestock spread acacia, mesquite and other species requiring scarification by grazing during active seed set. Past grazing during these time frames, have established a seedbank where germination and establishment continues. Newly established species are grazed, reducing number reaching maturity. Drought and livestock lower water table to favor shrubs rather than grasses (Castellano and Valone 2007).

Continued grazing pressure may likely continue decreasing species like grama grasses and increase opportunistic species such as curly mesquite and threeawn. Warm season perennial grasses such as curly mesquite and three-awns are opportunistic and become productive following not only summer monsoonal moisture but spring moisture as well. Grama species should receive very light grazing pressure during periods of rapid growth, which typically follow

summer monsoon rain events. Growth points are higher above ground and more susceptible to grazing pressures, which require more energy to regrow during this time. They can then be grazed more aggressively following seed set in the fall and winter months with little negative effect. Curly mesquite should be protected from use during key growth periods to facilitate seed set and stolon production, which can help stabilize loose soils.

Terrain continues to create uneven livestock distribution. Many portions of project area have slopes greater than 40% and are typically not utilized by livestock, increasing pressure on slopes less than 40 percent.

Cumulative Effects

Heavy historic grazing, especially around late 1800's and early 1900's left a lasting impression. Stocking rates have declined markedly since early 1900's with adoption of basic tenets of rangeland management. Livestock numbers declined with adjusted carrying capacity from noticeable shifts in vegetation composition. Secondary results include loss of soil fertility and water holding capacity (Asner and Archer 2010). As livestock grazing continues, recovery is mixed especially with changes in climatic carbon dioxide, temperatures and precipitation fluctuations, which affects soil and vegetation response.

Dagger and Poison springs pasture inspections indicate livestock distribution is generally satisfactory. Even with improved water developments and properly maintained pasture divisions, livestock tend to concentrate on flatter terrain and near surface water. Many areas already exhibit impaired soil and vegetation conditions and proper use levels may be met quickly with concentrated use. Changes in management is necessary if the proposed range improvements, herding and salting are not effective in distributing animals.

Climate change and drought affects vegetation response and growth with or without presence of livestock. A recent summary of scientific information provided in Rangelands (Archer and Predick, 2008) projects a likely effect on vegetation composition, diversity, and rate of growth in desert ecosystems, reduce water availability, and trigger soil erosion losses through a reduction in stability as soil moisture content decreases and the intensity of rainfall events increases. Predicted climatic changes over the next several years indicate warmer and drier conditions develop in the southwest.

Research indicates livestock grazing affect climate through emissions of methane gas produced by cattle (Gill et al 2010). Continued grazing contributes to methane gas produced worldwide. It is difficult to pinpoint methane produced by livestock, since it depends on amount and type of feed intake (McGinn et al 2011). Studies conducted in the last ten years suggest higher greenhouse gas emissions from cow-calf operations rather than feedlots. For the United States beef herd, Johnson et al (2003), as phrased by McGinn (2011) found cow-calf operations accounted for 75 percent of greenhouse gas emissions, totaled from all beef production. In Canada in 2010, 84 percent of the nation's beef production greenhouse gas emissions were from cow-calf operations (Beauchemin et al 2010). Most studies focus on grazing animals on irrigated pasture rather than rangelands, which would present differing vegetative choices. Studies also may not highlight the indirect effects of forage production for feedlot systems.

Effects of rangeland grazing systems are geographically widespread and are thus likely a larger contributor to changes in the global carbon cycle. Decreased vegetative cover can lead to desertification in response to grazing, removing these carbon stocks increases wind and water erosion accelerating the loss of potential carbon sequestration (Asner and Archer 2010).

Biological crusts are affected by cattle grazing and mechanical disturbances from off-road vehicles. Compaction and erosion affect soil conditions as a result of off road vehicles and cattle grazing.

Cattle act as a vector for the transportation and seed dispersal of noxious weeds. Disturbance caused by cattle grazing increases likelihood of noxious weed establishment.

Limited accessibility in designated wilderness areas limits management options available to livestock producers. With proper authorization machinery can be operated in the wilderness to maintain range improvements.

Federal, state and local agency contracts are maintained providing water for wildlife and improved management possibilities for livestock operators.

Improvements located within the wild and scenic designation corridor may restrict designation.

Surrounding allotments are scheduled for future allotment analysis where grazing and associated actions will be analyzed. Vegetation in the project area would continue to receive use by wildlife, insects, unauthorized livestock, and be influenced by human activities such as harvesting, pruning under power lines, mining and mineral exploration, introduction and spread, and off-road travel. Climatic conditions ultimately determine rates of growth and reproduction for all species, influencing the degree to which this vegetation type move toward desired conditions. In 2012, a decision approved installation of a new pipeline and fence in Sedow allotment, which slightly increases water distribution and creates a new pasture.

Rangelands are adversely affected by drought regardless of condition, but fair, poor or very poor condition is more adversely affected and recovers more slowly than rangelands in good or excellent condition (Howery 1999).

With improved range conditions there is usually adequate cover (vegetation, litter) to prevent accelerated soil erosion. Higher range condition rating indicates a higher diversity of plants that possess different growing seasons (warm and cool season) and rooting habits (shallow, medium, and deep rooted plants). Increases in opportunities for plant communities to exploit the various temperatures and soil moisture regimes that occur across arid and semi-arid rangelands, is one benefit of diversity. Better soil stability improves the capacity of range sites to retain soil moisture and grow the kinds and amounts of plant species they are capable of producing (Howery 1999).

Hotter temperatures, especially during longer periods of time, affect livestock body score. This reflection is related to type and breed of livestock grazed. Climate change may increase air warming temperature from 34 F to 43.5 F, a range of conservative to extreme predictions. Increases of temperature affect increase ground temperatures, causing more extreme weather patterns from longer more frequent droughts to larger more intensive precipitation events. It is

assumed health of livestock is affected, as humans, by temperature related illnesses, diseases, resistance, feed and water shortages, and food borne illnesses (Nardone 2010). Animals acclimate to heat stress by reducing intake which affects other bodily functions. If an animal is exposed to heat for extended periods of time, body condition may suffer.

Semi-desert grasslands

Direct and Indirect Effects

Flowers and beans of catclaw, mesquite, palo verde, and mimosa are utilized potentially increasing seed propagation by livestock. Livestock spread acacia, mesquite and other species requiring scarification by grazing during active seed set. Catclaw, Mesquite, palo verde and mimosa are palatable and desirable to livestock when being produced in late spring and early summer following adequate winter precipitation. Mesquite and acacia grazed during height of seed production increases seed dispersal (Steinburg 2001 and Gucker 2005). Past grazing during these time frames, have established a seedbank where germination and establishment continues. Newly established species are grazed, reducing number reaching maturity. Drought and livestock lower water table to favor shrubs rather than grasses (Castellano and Valone 2007). In years of low precipitation or during hot summer months, these plants often become dormant and retain only a minimum cover of leaves.

False Mesquite displays grazing effects quickly. Changes in growth form from vertical to prostrate is common when species receives moderate or higher grazing pressure. False mesquite produces good quality browse in early spring following adequate winter precipitation and is often available before the onset of perennial grasses. It has a tendency to become dormant in early summer when precipitation is scarce but becomes productive again following adequate moisture from summer monsoon rains. False mesquite can withstand aggressive grazing pressure and often becomes the dominant forage plant on the landscape when perennial grasses have been removed.

Range Ratany is grazed, affecting vigor and future species recruitment. Range Ratany produces high quality browse in spring and summer months. According to FEIS database, species has a high tolerance for hedging and fair to good palatability for livestock, with grazing tolerance at 50% or less. Studies show conflicting information about species recruitment; it may be a locally genetic manipulation.

Shrubby buckwheat is intolerant of hedging and often decreases. It used by livestock with a medium palatability, slow growth rate and ability to resprout.

Various species of spring annuals are preferred by livestock when adequate winter moisture, soil warmth occur, usually during March through April. Tonto Basin ranger district pasture inspections indicate grazing pressure on accompanying shrubs are reduced while annuals are actively growing. Once they begin to cure, use of palatable shrubs in those areas begins to increase, as the shrubs are typically experiencing new growth and flower production resulting from winter moisture. Selection by livestock of more palatable annual forbs and grasses over those less palatable could lead to a reduction in species richness and diversity, although to what degree is unknown.

Grazing annual forbs and grasses led to changes in composition of annual plant communities, documented in a two-year study on grazed versus ungrazed desert sites (Waser and Price, 1981). Sites became dominated by a few annual species while those considered relatively rare on the sites tended to drop out of grazed sites.

Rangeland management research indicates conservative or moderate livestock use may result in plant vigor and landscape similar to an absence of livestock grazing (Holochek et al. 1999, Navarro et al. 2002, Loeser et al. 2007). These studies do not specify whether soils and vegetation being influenced by livestock grazing pressure were in satisfactory condition or some form of impaired condition (i.e. compaction, limited diversity) when the studies began. Climatic carbon dioxide levels, temperature and precipitation are leading factors on rangeland species production (Izaurrealde et al 2011). Stocking rates, timing and frequency must be assessed, due to bimodal, localized precipitation patterns and frequent regional drought events.

Lack of water developments, terrain, time of year and large pastures create uneven livestock distribution. Installation of new rangeland developments awaits NEPA analysis. Livestock trailing occur, especially to and from water developments, salt and bedding areas. Heavier trailing occurs in areas where distribution is uneven.

Livestock grazing spreads noxious and invasive weeds. Red Brome and Stork's Bill are opportunistic exotic species, early spring germinators that are spread through cattle grazing and attachment to coats. Temperature, precipitation and elevation are primary drivers of germination. Red Brome has a short window of grazing before seedheads form and attach to animals or blow in wind. Stork's Bill is desired forage by livestock in early spring, which after it forms seedheads and burrows into animals or soil. A reduction in some noxious and invasive weeds continue, reducing fine fuel fire hazards.

Maintenance and installation of new water developments utilize above ground pipelines, potentially increasing temperature of water in troughs. Above ground pipelines exposed to high temperatures and direct sunlight, which is not charged with water, may speed breakdown. Some water developments provide water to wildlife.

Livestock and wildlife species compete on palatable forage.

Federal, state and local contracts are maintained providing water for wildlife and improved management possibilities for livestock operators.

Terrain continue to create uneven livestock distribution. Many portions of project area have slopes greater than 40% and are typically not utilized by livestock, increasing pressure on slopes less than 40 percent.

Livestock grazing affects soil crusts by trampling reduces crust cover, frequency biomass, species richness and diversity, and ecological function (The World Conservation Union et al 2005). Biological soil crusts influence nutrient cycling, nitrogen fixation, and nutrient availability to plants; seedling germination and vascular plant growth; water infiltration and runoff; and soil stabilization and erosion. Biological crusts, depending on type of moss, inhibit germination of cheatgrass, a close cousin to red brome (Sheley 1995). As trampling continues, biological crusts may no longer inhibit growth of red brome.

Continued grazing pressure may likely continue decreasing species like grama grasses and increase opportunistic species such as curly mesquite and threeawn. Warm season perennial grasses such as curly mesquite and three-awns are opportunistic and become productive following not only summer monsoonal moisture but spring moisture as well. Grama species should receive very light grazing pressure during periods of rapid growth, which typically follow summer monsoon rain events. Growth points are higher above ground and more susceptible to grazing pressures, which require more energy to regrow during this time. They can then be grazed more aggressively following seed set in the fall and winter months with little negative effect. Curly mesquite should be protected from use during key growth periods to facilitate seed set and stolon production, which can help stabilize loose soils.

Cumulative Effects

Rangelands are adversely affected by drought regardless of condition, but fair, poor or very poor condition is more adversely affected and recovers more slowly than rangelands in good or excellent condition (Howery 1999).

With improved range conditions there is usually adequate cover (vegetation, litter) to prevent accelerated soil erosion. Higher range condition rating indicates a higher diversity of plants that possess different growing seasons (warm and cool season) and rooting habits (shallow, medium, and deep rooted plants). Increases in opportunities for plant communities to exploit the various temperatures and soil moisture regimes that occur across arid and semi-arid rangelands, is one benefit of diversity. Better soil stability improves the capacity of range sites to retain soil moisture and grow the kinds and amounts of plant species they are capable of producing (Howery 1999).

Heavy historic grazing, especially around late 1800's and early 1900's left a lasting impression. Stocking rates have declined markedly since early 1900's with adoption of basic tenets of rangeland management. Livestock numbers declined with adjusted carrying capacity from noticeable shifts in vegetation composition. Secondary results include loss of soil fertility and water holding capacity (Asner and Archer 2010). As livestock grazing continues, recovery is mixed especially with changes in climatic carbon dioxide, temperatures and precipitation fluctuations, which affects soil and vegetation response. Historical overuse by livestock in the lower elevations and flatter terrain of the allotments has led to impaired soil conditions and a reduction in the vigor and diversity of desirable plant species.

Biological crusts are affected by cattle grazing and mechanical disturbances from off-road vehicles. Compaction and erosion affect soil conditions as a result of off road vehicles and cattle grazing.

Trespass cattle affect usable forage and may force authorized cattle to be limited in pastures uses based on use limits. Difficult to determine unauthorized cattle from authorized cattle use.

Cattle act as a vector for the transportation and seed dispersal of noxious weeds. Disturbance caused by cattle grazing increase likelihood of noxious weed establishment.

Limited accessibility in designated wilderness areas limits management options available to livestock producers. With proper authorization machinery can be operated in the wilderness to maintain range improvements.

Federal, state and local agency contracts are maintained providing water for wildlife and improved management possibilities for livestock operators.

Improvements located within the wild and scenic designation corridor may restrict designation.

Surrounding allotments are scheduled for future allotment analysis where grazing and associated actions will be analyzed. Vegetation in the project area would continue to receive use by wildlife, insects, unauthorized livestock, and be influenced by human activities such as harvesting, pruning under power lines, mining and mineral exploration, introduction and spread, and off-road travel. Climatic conditions ultimately determine rates of growth and reproduction for all species, influencing the degree to which this vegetation type move toward desired conditions. In 2012, a decision approved installation of a new pipeline and fence in Sedow allotment, which slightly increases water distribution and creates a new pasture.

Hotter temperatures, especially during longer periods of time, affect livestock body score. This reflection is related to type and breed of livestock grazed. Climate change increases air warming temperature from 34 F to 43.5 F, a range of conservative to extreme predictions. Increases of temperature affect increase ground temperatures, causing more extreme weather patterns from longer more frequent droughts to larger more intensive precipitation events. It is assumed health of livestock is affected, as humans, by temperature related illnesses, diseases, resistance, feed and water shortages, and food borne illnesses (Nardone 2010). Animals acclimate to heat stress by reducing intake which affects other bodily functions. If an animal is exposed to heat for extended periods of time, body condition may suffer.

Climate change and drought affects vegetation response and growth with or without presence of livestock. A recent summary of scientific information provided in Rangelands (Archer and Predick, 2008) projects a likely effect on vegetation composition, diversity, and rate of growth in desert ecosystems, reduce water availability, and trigger soil erosion losses through a reduction in stability as soil moisture content decreases and the intensity of rainfall events increases. Current management continues to remove some vegetative cover through grazing that protects soil and stabilize stream channels from extreme weather events. Predicted climatic changes over the next several years indicate warmer and drier conditions develop in the southwest.

Research indicates livestock grazing affect climate through emissions of methane gas produced by cattle (Gill et al 2010). Continued grazing contributes to methane gas produced worldwide. It is difficult to pinpoint methane produced by livestock, since it depends on amount and type of feed intake (McGinn et al 2011). Studies conducted in the last ten years suggest higher greenhouse gas emissions from cow-calf operations rather than feedlots. For the United States beef herd, Johnson et al (2003), as phrased by McGinn (2011) found cow-calf operations accounted for 75 percent of greenhouse gas emissions, totaled from all beef production. In Canada in 2010, 84 percent of the nation's beef production greenhouse gas emissions were from cow-calf operations (Beauchemin et al 2010). Most studies focus on grazing animals on

irrigated pasture rather than rangelands, which would present differing vegetative choices. Studies also may not highlight the indirect effects of forage production for feedlot systems.

Effects of rangeland grazing systems are geographically widespread and are thus likely a larger contributor to changes in the global carbon cycle. Decreased vegetative cover can lead to desertification in response to grazing, removing these carbon stocks increases wind and water erosion accelerating the loss of potential carbon sequestration (Asner and Archer 2010).

Juniper Savanna

Direct and Indirect Effects

Grazing annual forbs and grasses led to changes in composition of annual plant communities, documented in a two-year study on grazed versus ungrazed desert sites (Waser and Price, 1981). Sites became dominated by a few annual species while those considered relatively rare on the sites tended to drop out of grazed sites.

Rangeland management research indicates conservative or moderate livestock use may result in plant vigor and landscape similar to an absence of livestock grazing (Holochek et al. 1999, Navarro et al. 2002, Loeser et al. 2007). These studies do not specify whether soils and vegetation being influenced by livestock grazing pressure were in satisfactory condition or some form of impaired condition (i.e. compaction, limited diversity) when the studies began. Climatic carbon dioxide levels, temperature and precipitation are leading factors on rangeland species production (Izaurre et al 2011). Stocking rates, timing and frequency must be assessed, due to bimodal, localized precipitation patterns and frequent regional drought events.

Lack of water developments, terrain, time of year and large pastures create uneven livestock distribution. Installation of new rangeland developments await NEPA analysis. Livestock trailing occur, especially to and from water developments, salt and bedding areas. Heavier trailing occurs in areas where distribution is uneven.

Maintenance and installation of new water developments utilize above ground pipelines, potentially increasing temperature of water in troughs. Above ground pipelines exposed to high temperatures and direct sunlight, which is not charged with water, may speed breakdown. Some water developments provide water to wildlife.

Livestock and wildlife species compete on palatable forage.

Federal, state and local contracts are maintained providing water for wildlife and improved management possibilities for livestock operators.

Continued grazing pressure may likely continue decreasing species like grama grasses and increase opportunistic species such as curly mesquite and threeawn. Warm season perennial grasses such as curly mesquite and three-awns are opportunistic and become productive following not only summer monsoonal moisture but spring moisture as well. Grama species should receive very light grazing pressure during periods of rapid growth, which typically follow summer monsoon rain events. Growth points are higher above ground and more susceptible to

grazing pressures, which require more energy to regrow during this time. They can then be grazed more aggressively following seed set in the fall and winter months with little negative effect. Curly mesquite should be protected from use during key growth periods to facilitate seed set and stolon production, which can help stabilize loose soils.

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Terrain continue to create uneven livestock distribution. Many portions of project area have slopes greater than 40% and are typically not utilized by livestock, increasing pressure on slopes less than 40 percent.

Cumulative Effects

Lack of fire and mechanical treatments increased juniper cover, converting many acres into juniper woodlands. Livestock and drought created a loss of understory grasses, which reduced amount of fine fuels, diminishing fire frequency and rapidly changing vegetation type (Tausch, N.E. et al 1981). Past and present droughts have also removed grass species and once wet seasons return, it promotes growth of juniper without competition to grasses. Soil erosion continue while succession is in flux.

Recreational users and cattle grazing conflicts continue.

Cattle act as a vector for the transportation and seed dispersal of noxious weeds. Disturbance caused by cattle grazing increase likelihood of noxious weed establishment.

Compaction and erosion continue to affect soil conditions as a result of off road vehicles and cattle grazing.

Federal, state and local agency contracts are maintained providing water for wildlife and improved management possibilities for livestock operators.

Trespass cattle affect usable forage and may force authorized cattle to be limited in pastures uses based on use limits. Difficult to determine unauthorized cattle from authorized cattle use.

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Limited accessibility in designated wilderness areas limit the management options available to livestock producers. With proper authorization machinery can still be operated in the wilderness to maintain range improvements.

Heavy historic grazing, especially around late 1800's and early 1900's left a lasting impression. Stocking rates have declined markedly since early 1900's with adoption of basic tenets of rangeland management. Livestock numbers declined with adjusted carrying capacity from noticeable shifts in vegetation composition. Secondary results include loss of soil fertility and water holding capacity (Asner and Archer 2010). As livestock grazing continues, recovery is mixed especially with changes in climatic carbon dioxide, temperatures and precipitation fluctuations, which affects soil and vegetation response. Historical overuse by livestock in the lower elevations and flatter terrain of the allotments has led to impaired soil conditions and a reduction in the vigor and diversity of desirable plant species.

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Juniper Woodlands

Direct and Indirect Effects

Continued grazing pressure may likely continue decreasing species like grama grasses and increase opportunistic species such as curly mesquite and threeawn. Warm season perennial grasses such as curly mesquite and three-awns are opportunistic and become productive following not only summer monsoonal moisture but spring moisture as well. Grama species should receive very light grazing pressure during periods of rapid growth, which typically follow summer monsoon rain events. Growth points are higher above ground and more susceptible to grazing pressures, which require more energy to regrow during this time. They can then be grazed more aggressively following seed set in the fall and winter months with little negative effect. Curly mesquite should be protected from use during key growth periods to facilitate seed set and stolon production, which can help stabilize loose soils.

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Livestock and wildlife continue to compete, in areas, for forage needs. Grasses are less common in this vegetation type, increasing competition of preferred browse species.

Terrain continue to create uneven livestock distribution. Many portions of project area have slopes greater than 40% and are typically not utilized by livestock, increasing pressure on slopes less than 40 percent.

Cumulative Effects

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Turbinella Oak Chaparral

Direct and Indirect Effects

Disproportionate use of limited palatable shrubs and grasses over less palatable chaparral species can result in a less diverse vegetative composition. Use of areas dominated by chaparral depends on vegetative composition and access to palatable forage. Species which are palatable include sporadic perennial grasses and half-shrubs, mountain mahogany, buckbrush, and skunkbush sumac. These large shrubs are also desirable to wildlife browsers and often occur in limited quantities because they are selected for by all browsers over less palatable shrubs such as turbinella oak and manzanita.

Continued grazing pressure may likely continue decreasing species like grama grasses and increase opportunistic species such as curly mesquite and threeawn. Warm season perennial grasses such as curly mesquite and three-awns are opportunistic and become productive following not only summer monsoonal moisture but spring moisture as well. Grama species should receive very light grazing pressure during periods of rapid growth, which typically follow summer monsoon rain events. Growth points are higher above ground and more susceptible to grazing pressures, which require more energy to regrow during this time. They can then be grazed more aggressively following seed set in the fall and winter months with little negative effect. Curly mesquite should be protected from use during key growth periods to facilitate seed set and stolon production, which can help stabilize loose soils.

Lack of water developments, terrain, time of year and large pastures create uneven livestock distribution. Installation of new rangeland developments await NEPA analysis. Livestock

trailing occur, especially to and from water developments, salt and bedding areas. Heavier trailing occurs in areas where distribution is uneven.

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Livestock and wildlife continue to compete, in areas, for forage needs. Grasses are less common in this vegetation type, increasing competition of preferred browse species.

Rangeland management research indicates conservative or moderate livestock use may result in plant vigor and landscape similar to an absence of livestock grazing (Holochek et al. 1999, Navarro et al. 2002, Loeser et al. 2007). These studies do not specify whether soils and vegetation being influenced by livestock grazing pressure were in satisfactory condition or some form of impaired condition (i.e. compaction, limited diversity) when the studies began. Climatic carbon dioxide levels, temperature and precipitation are leading factors on rangeland species production (Izaurrealde et al 2011). Stocking rates, timing and frequency must be assessed, due to bimodal, localized precipitation patterns and frequent regional drought events.

Terrain continue to create uneven livestock distribution. Many portions of project area have slopes greater than 40% and are typically not utilized by livestock, increasing pressure on slopes less than 40 percent.

Cumulative Effects

Lack of fire has increased shrub density and reduced an occasional browse species component in many areas. Continued management limit cattle grazing opportunities in this shrub dominated vegetation type.

Cumulative effects are similar to those in Juniper Savannas, above.

Cattle act as a vector for the transportation and seed dispersal of noxious weeds. Disturbance caused by cattle grazing increase likelihood of noxious weed establishment. Federal, state and local agency contracts are maintained providing water for wildlife and improved management possibilities for livestock operators. Trespass cattle affect usable forage and may force authorized cattle to be limited in pastures uses based on use limits. Difficult to determine unauthorized cattle from authorized cattle use. Improvements located within the wild and scenic designation corridor may restrict designation. Limited accessibility in designated wilderness areas limit the management options available to livestock producers. Heavy historic grazing,

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Ponderosa Pine

Direct and Indirect Effects

In Upper Oak Creek pasture in Dagger Allotment, the understory is largely shrub dominated limiting palatable vegetation and access. Only in a burned area on Center Mountain is there a significant amount of palatable forage. This area contains abundant and diverse perennial

grasses where the tree canopy was reduced by wildfire. Cattle are currently not grazing in this vegetation type due to resource limitations (water, access, MSO habitat guidelines).

On Globe Ranger District, cattle have access to and utilize preferred understory vegetation in MSO habitats. Grazing outside MSO habitat time frames occur occasionally.

Water developments provide water to wildlife, in preferred wildlife areas.

Livestock utilization and trailing in Ponderosa pine is present but occasional to light in use. On Dagger allotment, Ponderosa pine vegetation has not been grazed by permittee to date, but can be grazed in future.

Livestock and wildlife grazing competes over preferable forage.

Terrain continues to create uneven livestock distribution. Many portions of project area have slopes greater than 40% and are typically not utilized by livestock, increasing pressure on slopes less than 40 percent.

Cumulative Effects

Recreational users and cattle grazing conflicts will continue.

Cattle, wildlife, recreationists, road maintenance equipment, and all other motorized vehicles act as a vector for the transportation and seed dispersal of noxious weeds. Disturbance caused by cattle grazing will increase likelihood of noxious weed establishment. Compaction and erosion continue to affect soil conditions as a result of off road vehicles and cattle grazing.

Federal, state and local agency contracts are maintained providing water for wildlife and improved management possibilities for livestock operators.

Trespass cattle affect usable forage and may force authorized cattle to be limited in pastures uses based on use limits. Difficult to determine unauthorized cattle from authorized cattle use.

Improvements located within the wild and scenic designation corridor may restrict designation.

Limited accessibility in designated wilderness areas limit the management options available to livestock producers. With proper authorization machinery can still be operated in the wilderness to maintain range improvements.

Heavy historic grazing, especially around late 1800's and early 1900's left a lasting impression. Stocking rates have declined markedly since early 1900's with adoption of basic tenets of rangeland management. Livestock numbers declined with adjusted carrying capacity from noticeable shifts in vegetation composition. Secondary results include loss of soil fertility and water holding capacity (Asner and Archer 2010). As livestock grazing continues, recovery is mixed especially with changes in climatic carbon dioxide, temperatures and precipitation fluctuations, which affects soil and vegetation response. Historical overuse by livestock in the lower elevations and flatter terrain of the allotments has led to impaired soil conditions and a reduction in the vigor and diversity of desirable plant species.

Rangelands are adversely affected by drought regardless of condition, but fair, poor or very poor condition is more adversely affected and recovers more slowly than rangelands in good or excellent condition (Howery 1999).

With improved range conditions there is usually adequate cover (vegetation, litter) to prevent accelerated soil erosion. Higher range condition rating indicates a higher diversity of plants that possess different growing seasons (warm and cool season) and rooting habits (shallow, medium, and deep rooted plants). Increases in opportunities for plant communities to exploit the various temperatures and soil moisture regimes that occur across arid and semi-arid rangelands, is one benefit of diversity. Better soil stability improves the capacity of range sites to retain soil moisture and grow the kinds and amounts of plant species they are capable of producing (Howery 1999).

Surrounding allotments are scheduled for future allotment analysis where grazing and associated actions will be analyzed. Vegetation in the project area would continue to receive use by wildlife, insects, unauthorized livestock, and be influenced by human activities such as harvesting, pruning under power lines, mining and mineral exploration, introduction and spread, and off-road travel. Climatic conditions ultimately determine rates of growth and reproduction for all species, influencing the degree to which this vegetation type move toward desired conditions. In 2012, a decision approved installation of a new pipeline and fence in Sedow allotment, which slightly increases

Climate change and drought affects vegetation response and growth with or without presence of livestock. A recent summary of scientific information provided in Rangelands (Archer and Predick, 2008) projects a likely effect on vegetation composition, diversity, and rate of growth in desert ecosystems, reduce water availability, and trigger soil erosion losses through a reduction in stability as soil moisture content decreases and the intensity of rainfall events increases. Predicted climatic changes over the next several years indicate warmer and drier conditions develop in the southwest.

Hotter temperatures, especially during longer periods of time, affect livestock body score. This reflection is related to type and breed of livestock grazed. Climate change increases air warming temperature from 34 F to 43.5 F, a range of conservative to extreme predictions. Increases of temperature affect increase ground temperatures, causing more extreme weather patterns from longer more frequent droughts to larger more intensive precipitation events. It is assumed health of livestock is affected, as humans, by temperature related illnesses, diseases, resistance, feed and water shortages, and food borne illnesses (Nardone 2010). Animals acclimate to heat stress by reducing intake which affects other bodily functions. If an animal is exposed to heat for extended periods of time, body condition may suffer.

Mixed Conifer

Direct and Indirect Effects

In Upper Oak Creek pasture in Dagger Allotment, the understory is largely shrub dominated limiting palatable vegetation and access. Only in a burned area on Center Mountain is there a significant amount of palatable forage. This area contains abundant and diverse perennial

grasses where the tree canopy was reduced by wildfire. Cattle are currently not grazing in this vegetation type due to resource limitations (water, access, MSO habitat guidelines).

On Globe Ranger District, cattle have access to and utilize preferred understory vegetation in MSO habitats. Grazing outside MSO habitat time frames occur occasionally.

Water developments continue to provide water to wildlife, in preferred wildlife areas.

Livestock utilization and trailing is present but occasional to light in use. On Dagger allotment, vegetation has not been grazed by permittee to date, but can be grazed in future.

Livestock and wildlife grazing competes over preferable forage.

Cumulative Effects

Cumulative effects are similar to those in Ponderosa Pine, above.

Alternative 3 – Proposed Action

Riparian

Direct and Indirect Effects

Potential riparian fencing may allow full use pastures containing Cherry Creek, Coon Creek, and Salt River or if livestock continually meet riparian utilization levels, requiring significant cost to permittees. All other riparian areas and key reaches on remaining portions of project area continue to receive some level of livestock grazing. Pastures containing key riparian areas that are not fenced or actively managed should be either, rotated through very quickly with little upland use, if used during the growing season due the cattle quickly reaching utilization standards on riparian vegetation, or those pastures would need to be used between leaf fall and bud break to minimize concentrated effects that happen in riparian areas.

Livestock trail through riparian zones, where they forage, water and bed down. Especially during hot seasons, livestock seek riparian areas to bed down, increasing disturbance to vegetation and streambank alteration. Inspections have shown that grazing will still occur on available riparian vegetation such as deergrass and terminal leaders of accessible willows and cottonwoods, however to a much lower degree than in the summer time while plants are actively growing. Under this proposed action full permitted numbers are expected to only briefly be allowed to access the river before utilization and stream bank alteration guidelines are exceeded. This would prevent further usage of the pasture which could still have a significant amount of upland vegetation available. This could be mitigated by allowing grazing next to the river but using natural boundaries to fence off actual access for when guidelines are exceeded along the river.

Use along the Salt River may help us move towards desired conditions in specific locations where natural boundaries allow for water access but prevent cattle from being allowed to move

up and down the banks and thus impacting bank stabilization and plant growth. This could have positive effects with cattle distribution providing for better upland utilization rather than being a limiting factor for removal from the pasture, however many places that have gentle enough slopes to allow for cattle access also have the greatest density of riparian vegetation since these gentle slopes allow for soil accumulation alongside the river.

Trailing, especially in flood plain, increase occurrences of compaction and erosion. Foraging on riparian or riparian obligate species affect bank stabilization. Water sources located in drainages and riparian areas, cause increased livestock traffic and trailing. Loss of riparian vegetation weakens stream banks and disrupts substrates (Poff 2011), which is caused by livestock grazing, drought and periodic flooding.

Riparian water developments draw water from springs and seeps, impacting water levels. Approximately 12 gallons of water per head/day is required for livestock (NRCS, 2006), often from small springs and seeps. Many springs and seeps have pipelines and troughs, often lying within riparian areas or drainages, requiring a minimum of yearly maintenance. Level of impacts to these systems depends on time of year and type of maintenance. Water developments are often sacrifice areas because of high trampling and forage utilization nearby. Cattle often ruminate at these areas, where high concentrations of nutrients from feces and urine collect (Milchunas 2006). Natural or live watering areas, where water is at surface level, receive much use because of shade and cooler temperatures. Water developments provide water for wildlife, depending on location and accessibility.

Spreading noxious or invasive weeds continue with current management as livestock are vectors of seed transport via animal coats and consumption.

Grazing in uplands causes erosion and sedimentation into watersheds and subsequent riparian areas. Obedsinzki et al (2001) state health in riparian areas are measured by overall watershed function.

Livestock graze and browse many plants in riparian corridors. Those monitored for use include deergrass sedges , rushes, willows , cottonwood, and ash . Livestock utilize new leaders of palatable riparian species. Even with light utilization inspections on the districts have shown that cattle prefer young cottonwood and willows over salt cedar, potentially promoting the conversion of native vegetation to Salt Cedar stands that are be highly susceptible to the invasion of the defoliating tamarisk beetle. Salt cedar may be grazed, reducing regeneration and wildlife habitat.

In the early spring when annuals are abundant and plants are greening up early on southern facing slopes, studies have shown that cattle prefer to graze upland vegetation. Cattle favor these sunny slopes during colder parts of the year when cold air settles into these riparian areas (Baker et. al 2006).

Salt River corridor presents a challenge to monitor since riparian vegetation occurs on small, sandy benches. Once in the corridor, cattle tend to congregate on these benches since there is nowhere else to go. As a result, benches can become highly impacted quickly. Inspections on the districts have shown that similar areas reach riparian use standards within days, even with very small cattle herds, limiting the continued use of those pastures.

Cumulative Effects

Salt River corridor has greater monitoring difficulty, presence of tamarisk and native riparian vegetation on beaches where cattle congregate. Recovery to these benches and beaches is unlikely with passive approaches.

Continued drought, higher temperatures coupled with piping water from riparian areas for use by livestock, a high probability smaller springs may dry up. Mortality and reduced production may occur, on all riparian vegetation throughout project area. Inspections and discussion with long time land owners have shown that some springs in the region have gone dry in recent years for the first time in several decades. It is not known if this is an effect of climate change and the recent drought conditions or due to the water developments associated with some of these springs.

Compaction and erosion continue to affect soil conditions as a result of off road vehicles and cattle grazing.

River rafting along the salt is a popular event. Cattle grazing along the river would interfere with recreational users, where camping and rafting may be affected by livestock presence or sign.

Limited accessibility in designated wilderness areas limit the management options available to livestock producers. With proper authorization machinery can still be operated in the wilderness to maintain range improvements.

Long term grazing impacts vegetation through bedding and foraging; this may affect riparian cover and increase water temperatures. As livestock graze riparian obligate species, a reduction in overall canopy may occur. When trampling and disturbance is caused to streambanks, changes in morphology may affect water flow.

Historic grazing concentrated around riparian areas, causing bank destabilization, erosion and loss of vegetation. Current management removes concentrated pressure around riparian areas, allowing only incidental use. Riparian recovery often is slow, since cattle access these areas.

Many historic adits hit underground water sources, which have been used by livestock operators for additional water sources. Current management would continue to utilize these sources and potentially develop more breached underground water sources, possibly depleting ground water and affecting riparian surface flow.

Trespass cattle utilize riparian areas and owners will be notified by Forest Service personnel.

Recreation use, especially camping, competes with livestock in congregation areas.

Livestock provides a vector of seed dispersal across riparian areas and throughout allotments. Noxious weeds have increased throughout project area. Although seed dispersal is still occurring, livestock reduce salt cedar seedling encroachment. Other dispersal vectors such as campers, off road users and hikers transport noxious weeds, but to a lesser extent than livestock.

Cooperative contracts may be maintained and improve management possibilities for livestock operators.

Depletion of ground water for cattle operations may likely continue to affect plant recovery in riparian areas after drought. As referenced by Allington and Valone (2011), van de Koppel,

Reitkerk (2004) and Castellano, Valone (2007), water supply strongly limits plant growth. Increase in shrub species changes water infiltration dynamics. This process may favor shrubs since grass roots are not deep enough to access water.

During active growth, grazing in riparian areas prevents seedling establishment of willows which are required for willow fly catcher habitat.

Improvements located within the wild and scenic designation corridor may restrict designation.

Climate change and drought affects vegetation response and growth with or without presence of livestock. A recent summary of scientific information provided in *Rangelands* (Archer and Predick, 2008) projects a likely effect on vegetation composition, diversity, and rate of growth in desert ecosystems, reduce water availability, and trigger soil erosion losses through a reduction in stability as soil moisture content decreases and the intensity of rainfall events increases. Current management removes vegetative cover that protects soil and stabilizing stream channels from extreme weather events. Predicted climatic changes over the next several years indicate warmer and drier conditions develop in the southwest.

Research indicates livestock grazing affect climate through emissions of methane gas produced by cattle (Gill et al 2010). Continued grazing contributes to methane gas produced worldwide. It is difficult to pinpoint methane produced by livestock, since it depends on amount and type of feed intake (McGinn et al 2011). Studies conducted in the last ten years suggest higher greenhouse gas emissions from cow-calf operations rather than feedlots. For the United States beef herd, Johnson et al (2003), as phrased by McGinn (2011) found cow-calf operations accounted for 75 percent of greenhouse gas emissions, totaled from all beef production. In Canada in 2010, 84 percent of the nation's beef production greenhouse gas emissions were from cow-calf operations (Beauchemin et al 2010). Most studies focus on grazing animals on irrigated pasture rather than rangelands, which would present differing vegetative choices. Studies also may not highlight the indirect effects of forage production for feedlot systems.

Effects of rangeland grazing systems are geographically widespread and are thus likely a larger contributor to changes in the global carbon cycle. Decreased vegetative cover can lead to desertification in response to grazing, removing these carbon stocks increases wind and water erosion accelerating the loss of potential carbon sequestration (Asner and Archer 2010).

Sonoran desert

Direct and Indirect Effects

Rangeland management research indicates conservative or moderate livestock use may result in plant vigor and landscape similar to an absence of livestock grazing (Holochek et al. 1999, Navarro et al. 2002, Loeser et al. 2007). These studies do not specify whether soils and vegetation being influenced by livestock grazing pressure were in satisfactory condition or some form of impaired condition (i.e. compaction, limited diversity) when the studies began. Climatic carbon dioxide levels, temperature and precipitation are leading factors on rangeland species production (Izaurrealde et al 2011). Stocking rates, timing and frequency must be assessed, due to bimodal, localized precipitation patterns and frequent regional drought events.

Heavy browsing greatly reduces shrub size and forage yield, but moderate browsing results in yields similar to ungrazed plants (Roundy et al, 1989). Browsing of jojoba by deer and cattle could be severe enough to prevent fruit development and leaders may be consumed faster than they grow (Matthews 1994). A study conducted on Tonto Basin Ranger Districts' Campaign Allotment demonstrated jojoba's tolerance of browsing by cattle. Jojoba initiated new twigs from lateral buds to compensate for the loss of apical buds and twigs. Plants at lowest elevations on Dagger, Poison Springs and Hicks Pikes Peak are hedged from high historical use and often occur in areas of compacted soils. They may respond differently to livestock browsing than plants used in the study, which was located at a higher elevation.

Studies considering woody perennial Sonoran Desert species demonstrate that climate and elevation are more responsible for diversity and density than livestock grazing (The World Conservation Union et al 2005). Perennial grass survival are also more dependent upon climatic factors for survival however some studies indicated that grasses were more vigorous when grazing pressure occurred during dormancy (The World Conservation Union et al 2005).

Livestock affect saguaro seedling establishment by trampling under nurse plants (particularly mesquite and paloverde) and through herbivory (Martin and Turner 1977). Saguaro seedling establishment is slow and highly dependent upon temperature, rainfall (soil moisture), and herbivory by insects. Microsites (nurse plants) are important for regulating temperature and providing shade essential for saguaro establishment. A reduction of multi-storied canopy layers reduces litter, understory cover, and nurse plant cover (The World Conservation Union et al 2005).

Livestock grazing tramples soil crusts reduces crust cover, frequency biomass, species richness and diversity, and ecological function (The World Conservation Union et al 2005). Biological soil crusts in the Sonoran Desert influence nutrient cycling, nitrogen fixation, and nutrient availability to plants; seedling germination and vascular plant growth; water infiltration and runoff; and soil stabilization and erosion. Biological crusts, depending on type of moss, inhibit germination of cheatgrass (Sheley 1995), a close cousin to red brome. As trampling continues, biological crusts may no longer inhibit growth of red brome.

Flowers and beans of catclaw, mesquite, palo verde, and mimosa continue to be utilized potentially increasing seed propagation. Catclaw, Mesquite, palo verde and mimosa are palatable and desirable to livestock when being produced in late spring and early summer following adequate winter precipitation. Mesquite and acacia grazed during height of seed production increases seed dispersal (Steinburg 2001 and Gucker 2005). In years of low precipitation or during hot summer months, these plants often become dormant and retain only a minimum cover of leaves.

False Mesquite continue to be grazed and display grazing effects quickly. Changes in growth form from vertical to prostrate is common when species receives moderate or higher grazing pressure. False mesquite produces good quality browse in early spring following adequate winter precipitation and is often available before the onset of perennial grasses. It has a tendency to become dormant in early summer when precipitation is scarce but become productive again following adequate moisture from summer monsoon rains. False mesquite can withstand aggressive grazing pressure and often becomes the dominant forage plant on the landscape when perennial grasses have been.

Range Ratany continue to be grazed, affecting vigor and future species recruitment. Range Ratany produces high quality browse in spring and summer months. According to FEIS (Fire Effects Information System) database, species has a high tolerance for hedging and fair to good palatability for livestock, with grazing tolerance at 50% or less. Studies show conflicting information about species recruitment; it may be a locally genetic manipulation.

Shrubby buckwheat is intolerant of hedging and continue to decrease when this type of grazing pressure is applied. Shrubby buckwheat is used by livestock and is of medium palatability. It has a slow growth rate and able to resprout.

Grazing of annual forbs and grasses led to changes in composition of annual plant communities in a two-year study on grazed versus ungrazed desert sites (Waser and Price, 1981). Sites became dominated by a few annual species while those considered relatively rare on the sites tended to drop out of grazed sites.

Various species of spring annuals are preferred by livestock when adequate winter moisture, soil warmth occur, usually during March through April. Tonto Basin ranger district pasture inspections indicate grazing pressure on accompanying shrubs is reduced while annuals are actively growing. Once they begin to cure, use of palatable shrubs in those areas begins to increase, as the shrubs are typically experiencing new growth and flower production resulting from winter moisture. Selection by livestock of more palatable annual forbs and grasses over those less palatable could lead to a reduction in species richness and diversity, although to what degree is unknown.

Livestock grazing spreads noxious and invasive weeds. Red Brome and Stork's Bill are opportunistic exotic species, early spring germinators, which are spread through cattle grazing and attachment to coats. Temperature, precipitation and elevation are primary drivers of germination. Red Brome has a short window of grazing before seedheads form and attach to animals or blow in wind. Stork's Bill is desired forage by livestock in early spring, which after it forms seedheads and burrows into animals or soil. A reduction in some noxious and invasive weeds continue, reducing fine fuel fire hazards.

Terrain continue to create uneven livestock distribution. Many portions of project area have slopes greater than 40% and are typically not utilized by livestock, increasing pressure on slopes less than 40 percent.

New proposed water developments is dependent on water availability through springs and wells, where water is not available, livestock distribution will be uneven. Maintenance and installation of new water developments have been utilizing above ground pipelines and potentially increasing temperature of water in troughs. Some water developments will continue to provide water to wildlife.

Livestock trailing continue to occur throughout allotments, especially to and from water developments, salt and bedding areas. Heavier trailing may continue in areas where distribution is uneven.

New proposed fencing decrease pasture size, reducing uneven distribution of larger pastures and potentially overutilization of riparian areas.

Livestock grazing continue to spread noxious and invasive weeds. A reduction in some noxious and invasive weeds continue, reducing fine fuel fire hazards.

Livestock and wildlife species continue to have some level of competition on forage.

Livestock grazing negatively affects soil crusts through trampling, which reduces crust cover, frequency biomass, species richness and diversity, and ecological function (The World Conservation Union et al 2005). Biological soil crusts influence nutrient cycling, nitrogen fixation, and nutrient availability to plants; seedling germination and vascular plant growth; water infiltration and runoff; and soil stabilization and erosion.

Continued grazing pressure may likely continue decreasing species like grama grasses and increase opportunistic species such as curly mesquite and threeawn. Warm season perennial grasses such as curly mesquite and three-awns are opportunistic and become productive following not only summer monsoonal moisture but spring moisture as well. Grama species should receive very light grazing pressure during periods of rapid growth, which typically follow summer monsoon rain events. Growth points are higher above ground and more susceptible to grazing pressures, which require more energy to regrow during this time. They can then be grazed more aggressively following seed set in the fall and winter months with little negative effect. Curly mesquite should be protected from use during key growth periods to facilitate seed set and stolon production, which can help stabilize loose soils.

Cumulative Effects

Heavy historic grazing, especially around late 1800's and early 1900's left a lasting impression. Stocking rates have declined markedly since early 1900's with adoption of basic tenets of rangeland management. Livestock numbers declined with adjusted carrying capacity from noticeable shifts in vegetation composition. Secondary results include loss of soil fertility and water holding capacity (Asner and Archer 2010). As livestock grazing continues, recovery is mixed especially with changes in climatic carbon dioxide, temperatures and precipitation fluctuations, which affects soil and vegetation response.

Improved water developments and properly maintained pasture divisions, increases distribution but livestock tend to concentrate on flatter terrain and near surface water. Pasture inspections conducted on Dagger and Poison Springs allotments indicate that livestock distribution is generally satisfactory. Many of these areas already exhibit impaired soil and vegetation conditions and proper use levels may be met quickly with concentrated use. Changes in management are necessary if the proposed range improvements, herding and salting are not effective in distributing animals across the landscape.

Climate change and drought affects vegetation response and growth with or without presence of livestock. A recent summary of scientific information provided in Rangelands (Archer and Predick, 2008) projects a likely effect on vegetation composition, diversity, and rate of growth in desert ecosystems, reduce water availability, and trigger soil erosion losses through a reduction

in stability as soil moisture content decreases and the intensity of rainfall events increases. Predicted climatic changes over the next several years indicate warmer and drier conditions develop in the southwest.

Biological crusts are affected by cattle grazing and mechanical disturbances from off-road vehicles. Compaction and erosion affect soil conditions as a result of off road vehicles and cattle grazing.

Cattle continue to act as a vector for the transportation and seed dispersal of noxious weeds. Disturbance caused by cattle grazing increase likelihood of noxious weed establishment.

Limited accessibility in designated wilderness areas limit the management options available to livestock producers. With proper authorization machinery can still be operated in the wilderness to maintain range improvements.

Federal, state and local contracts awarded would continue to be maintained providing water for wildlife and improved management possibilities for livestock operators.

Improvements located within the wild and scenic designation corridor may restrict designation.

Surrounding allotments are scheduled for future allotment analysis where grazing and associated actions will be analyzed. Vegetation in the project area would continue to receive use by wildlife, insects, unauthorized livestock, and be influenced by human activities such as harvesting, pruning under power lines, mining and mineral exploration, introduction and spread, and off-road travel. Climatic conditions ultimately determine rates of growth and reproduction for all species, influencing the degree to which this vegetation type move toward desired conditions. In 2012, a decision approved installation of a new pipeline and fence in Sedow allotment, which slightly increases water distribution and creates a new pasture.

Rangelands are adversely affected by drought regardless of condition, but fair, poor or very poor condition is more adversely affected and recovers more slowly than rangelands in good or excellent condition (Howery 1999).

With improved range conditions there is usually adequate cover (vegetation, litter) to prevent accelerated soil erosion. Higher range condition rating indicates a higher diversity of plants that possess different growing seasons (warm and cool season) and rooting habits (shallow, medium, and deep rooted plants). Increases in opportunities for plant communities to exploit the various temperatures and soil moisture regimes that occur across arid and semi-arid rangelands, is one benefit of diversity. Better soil stability improves the capacity of range sites to retain soil moisture and grow the kinds and amounts of plant species they are capable of producing (Howery 1999).

Hotter temperatures, especially during longer periods of time, affect livestock body score. This reflection is related to type and breed of livestock grazed. Climate change increases air warming temperature from 34 F to 43.5 F, a range of conservative to extreme predictions. Increases of temperature affect increase ground temperatures, causing more extreme weather patterns from longer more frequent droughts to larger more intensive precipitation events. It is assumed health of livestock is affected, as humans, by temperature related illnesses, diseases, resistance, feed

and water shortages, and food borne illnesses (Nardone 2010). Animals acclimate to heat stress by reducing intake which affects other bodily functions. If an animal is exposed to heat for extended periods of time, body condition may suffer.

Research indicates livestock grazing affect climate through emissions of methane gas produced by cattle (Gill et al 2010). Continued grazing contributes to methane gas produced worldwide. It is difficult to pinpoint methane produced by livestock, since it depends on amount and type of feed intake (McGinn et al 2011). Studies conducted in the last ten years suggest higher greenhouse gas emissions from cow-calf operations rather than feedlots. For the United States beef herd, Johnson et al (2003), as phrased by McGinn (2011) found cow-calf operations accounted for 75 percent of greenhouse gas emissions, totaled from all beef production. In Canada in 2010, 84 percent of the nation's beef production greenhouse gas emissions were from cow-calf operations (Beauchemin et al 2010). Most studies focus on grazing animals on irrigated pasture rather than rangelands, which would present differing vegetative choices. Studies also may not highlight the indirect effects of forage production for feedlot systems.

Semi-desert grasslands

Direct and Indirect Effects

Rangeland management research indicates conservative or moderate livestock use may result in plant vigor and landscape similar to an absence of livestock grazing (Holochek et al. 1999, Navarro et al. 2002, Loeser et al. 2007). These studies do not specify whether soils and vegetation being influenced by livestock grazing pressure were in satisfactory condition or some form of impaired condition (i.e. compaction, limited diversity) when the studies began. Climatic carbon dioxide levels, temperature and precipitation are leading factors on rangeland species production (Izaurrealde et al 2011). Stocking rates, timing and frequency must be assessed, due to bimodal, localized precipitation patterns and frequent regional drought events.

Flowers and beans of catclaw, mesquite, palo verde, and mimosa continue to be utilized potentially increasing seed propagation. Catclaw, Mesquite, palo verde and mimosa are palatable and desirable to livestock when being produced in late spring and early summer following adequate winter precipitation. Mesquite and acacia grazed during height of seed production increases seed dispersal (Steinburg 2001 and Gucker 2005). In years of low precipitation or during hot summer months, these plants often become dormant and retain only a minimum cover of leaves.

False Mesquite displays grazing effects quickly. Changes in growth form from vertical to prostrate is common when species receives moderate or higher grazing pressure. False mesquite produces good quality browse in early spring following adequate winter precipitation and is often available before the onset of perennial grasses. It has a tendency to become dormant in early summer when precipitation is scarce but become productive again following adequate moisture from summer monsoon rains. False mesquite can withstand aggressive grazing pressure and often becomes the dominant forage plant on the landscape when perennial grasses have been removed.

Range Ratany is grazed, affecting vigor and future species recruitment. Range Ratany produces high quality browse in spring and summer months. According to FEIS database, species has a high tolerance for hedging and fair to good palatability for livestock, with grazing tolerance at 50% or less. Studies show conflicting information about species recruitment; it may be a locally genetic manipulation.

Shrubby buckwheat is intolerant of hedging and decrease. It used by livestock with a medium palatability, slow growth rate and ability to resprout.

Various species of spring annuals are preferred by livestock when adequate winter moisture, soil warmth occur, usually during March through April. Tonto Basin ranger district pasture inspections indicate grazing pressure on accompanying shrubs are reduced while annuals are actively growing. Once they begin to cure, use of palatable shrubs in those areas begins to increase, as the shrubs are typically experiencing new growth and flower production resulting from winter moisture. Selection by livestock of more palatable annual forbs and grasses over those less palatable could lead to a reduction in species richness and diversity, although to what degree is unknown.

Grazing annual forbs and grasses led to changes in composition of annual plant communities, documented in a two-year study on grazed versus ungrazed desert sites (Waser and Price, 1981). Sites became dominated by a few annual species while those considered relatively rare on the sites tended to drop out of grazed sites.

Terrain and water distribution continue to create uneven livestock distribution. Many portions of project area have slopes greater than 40% and are typically not utilized by livestock, increasing pressure on slopes less than 40 percent.

New proposed water developments are dependent on water availability through springs and wells, where water is not available, livestock distribution be uneven. Maintenance and installation of new water developments utilize above ground pipelines, potentially increasing temperature of water in troughs. Above ground pipelines exposed to high temperatures and direct sunlight, which is not charged with water, may speed breakdown. Some water developments provide water to wildlife. Federal, state and local contracts are maintained providing water for wildlife and improved management possibilities for livestock operators.

Livestock trailing continue to occur throughout allotments, especially to and from water developments, salt and bedding areas. Heavier trailing may continue in areas where distribution is uneven.

New proposed fencing decrease pasture size, reducing uneven distribution of larger pastures and potentially overutilization of riparian areas.

Livestock grazing spreads noxious and invasive weeds. Red Brome and Stork's Bill are opportunistic exotic species, early spring germinators, which are spread through cattle grazing and attachment to coats. Temperature, precipitation and elevation are primary drivers of germination. Red Brome has a short window of grazing before seedheads form and attach to animals or blow in wind. Stork's Bill is desired forage by livestock in early spring, which after it forms seedheads and burrows into animals or soil. A reduction in some noxious and invasive weeds continue, reducing fine fuel fire hazards.

Livestock and wildlife species compete on palatable forage.

Livestock grazing affects soil crusts by trampling reduces crust cover, frequency biomass, species richness and diversity, and ecological function (Pagiola et al 2005). Biological soil crusts influence nutrient cycling, nitrogen fixation, and nutrient availability to plants; seedling germination and vascular plant growth; water infiltration and runoff; and soil stabilization and erosion. Biological crusts, depending on type of moss, inhibit germination of cheatgrass, a close cousin to red brome (Sheley 1995). As trampling continues, biological crusts may no longer inhibit growth of red brome.

Continued grazing pressure may likely continue decreasing species like grama grasses and increase opportunistic species such as curly mesquite and threeawn. Warm season perennial grasses such as curly mesquite and three-awns are opportunistic and become productive following not only summer monsoonal moisture but spring moisture as well. Grama species should receive very light grazing pressure during periods of rapid growth, which typically follow summer monsoon rain events. Growth points are higher above ground and more susceptible to grazing pressures, which require more energy to regrow during this time. They can then be grazed more aggressively following seed set in the fall and winter months with little negative effect. Curly mesquite should be protected from use during key growth periods to facilitate seed set and stolon production, which can help stabilize loose soils.

Cumulative Effects

Rangelands are adversely affected by drought regardless of condition, but those in fair or poor condition are more adversely affected and recover more slowly than rangelands in good or excellent condition (Howery 1999).

With improved range conditions there is usually adequate cover (vegetation, litter) to prevent accelerated soil erosion. Higher range condition rating indicates a higher diversity of plants that possess different growing seasons (warm and cool season) and rooting habits (shallow, medium, and deep rooted plants). Increases in opportunities for plant communities to exploit the various temperatures and soil moisture regimes that occur across arid and semi-arid rangelands, is one benefit of diversity. Better soil stability improves the capacity of range sites to retain soil moisture and grow the kinds and amounts of plant species they are capable of producing (Howery 1999).

Heavy historic grazing, especially around late 1800's and early 1900's left a lasting impression. Stocking rates have declined markedly since early 1900's with adoption of basic tenets of rangeland management. Livestock numbers declined with adjusted carrying capacity from noticeable shifts in vegetation composition. Secondary results include loss of soil fertility and water holding capacity (Asner and Archer 2010). As livestock grazing continues, recovery is mixed especially with changes in climatic carbon dioxide, temperatures and precipitation fluctuations, which affects soil and vegetation response. Historical overuse by livestock in the lower elevations and flatter terrain of the allotments has led to impaired soil conditions and a reduction in the vigor and diversity of desirable plant species.

Many historic adits hit underground water sources, which have been used by livestock operators for additional water sources. Proposed Action would continue to utilize these sources and potentially develop more breached underground water sources, possibly depleting ground water and affecting riparian surface flow.

Biological crusts continue to be affected by cattle grazing and mechanical disturbances from off-road vehicles. Compaction and erosion continue to affect soil conditions as a result of off road vehicles and cattle grazing.

Trespass cattle still affect usable forage and may force authorized cattle to be limited in pastures uses based on unauthorized cattle reaching use limits. Difficult to determine unauthorized cattle from authorized cattle use.

Cattle act as a vector for the transportation and seed dispersal of noxious weeds. Disturbance caused by cattle grazing increase likelihood of noxious weed establishment.

Limited accessibility in designated wilderness areas limits management options available to livestock producers. With proper authorization machinery can be operated in the wilderness to maintain range improvements.

Federal, state and local agency contracts are maintained providing water for wildlife and improved management possibilities for livestock operators.

Improvements located within the wild and scenic designation corridor may restrict designation.

Juniper Savanna

Direct and Indirect Effects

Continued grazing pressure may likely continue decreasing species like grama grasses and increase opportunistic species such as curly mesquite and threeawn. Grama species should receive very light grazing pressure during periods of rapid growth, which typically follow summer monsoon rain events. They can then be grazed more aggressively following seed set in the fall and winter months with little negative effect. Opportunistic species become productive following summer monsoonal or spring moisture or both.

Terrain continue to create uneven livestock distribution. Many portions of project area have slopes greater than 40% and are typically not utilized by livestock, increasing pressure on slopes less than 40 percent.

New proposed water developments are dependent on water availability through springs and wells, where water is not available, livestock distribution be uneven. Maintenance and installation of new water developments have been utilizing above ground pipelines and potentially increasing temperature of water in troughs. Some water developments continue to provide water to wildlife.

Livestock trailing continue to occur throughout allotments, especially to and from water developments, salt and bedding areas. Heavier trailing may continue in areas where distribution is uneven.

New proposed fencing decrease pasture size, reducing uneven distribution of larger pastures and potentially overutilization of riparian areas.

Livestock grazing continue to spread noxious and invasive weeds. A reduction in some noxious and invasive weeds continue, reducing fine fuel fire hazards.

Livestock and wildlife continue to compete, in areas, for forage needs.

Grazing annual forbs and grasses led to changes in composition of annual plant communities, documented in a two-year study on grazed versus ungrazed desert sites (Waser and Price, 1981). Sites became dominated by a few annual species while those considered relatively rare on the sites tended to drop out of grazed sites.

Rangeland management research indicates conservative or moderate livestock use may result in plant vigor and landscape similar to an absence of livestock grazing (Holochek et al. 1999, Navarro et al. 2002, Loeser et al. 2007). These studies do not specify whether soils and vegetation being influenced by livestock grazing pressure were in satisfactory condition or some form of impaired condition (i.e. compaction, limited diversity) when the studies began. Climatic carbon dioxide levels, temperature and precipitation are leading factors on rangeland species production (Izaurrealde et al 2011). Stocking rates, timing and frequency must be assessed, due to bimodal, localized precipitation patterns and frequent regional drought events.

Federal, state and local contracts are maintained providing water for wildlife and improved management possibilities for livestock operators.

Livestock grazing spreads noxious and invasive weeds. Red Brome and Stork's Bill are opportunistic exotic species, early spring germinators, which are spread through cattle grazing and attachment to coats. Temperature, precipitation and elevation are primary drivers of germination. Red Brome has a short window of grazing before seedheads form and attach to animals or blow in wind. Stork's Bill is desired forage by livestock in early spring, which after it forms seedheads and burrows into animals or soil. A reduction in some noxious and invasive weeds continue, reducing fine fuel fire hazards.

Cumulative Effects

Lack of fire and mechanical treatments increased juniper cover, converting many acres into juniper woodlands. Livestock and drought created a loss of understory grasses, which reduced amount of fine fuels, diminishing fire frequency and rapidly changing vegetation type (Tausch et al 1981). Past and present droughts have also removed grass species and once wet seasons return, it promotes growth of juniper without competition to grasses. Soil erosion continue while succession is in flux.

Juniper fuel wood treatments would damage or remove desirable herbaceous and shrubby vegetation through mechanical disturbance. Recovery of desirable herbaceous and woody species would occur quickly as more natural resources become available. Historical juniper treatments provide additional forage for cattle grazing and future treatments occur to maintain landscape conditions.

Current grazing removes fine fuels and reduces the ability for fire to limit establishment of junipers.

Recreational users and cattle grazing conflicts continue.

Cattle continue to act as a vector for the transportation and seed dispersal of noxious weeds. Disturbance caused by cattle grazing increase likelihood of noxious weed establishment.

Compaction and erosion continue to affect soil conditions as a result of off road vehicles and cattle grazing.

Federal, state and local contracts awarded would continue to be maintained providing water for wildlife and improved management possibilities for livestock operators.

Trespass cattle still affect usable forage and may force authorized cattle to be limited in pastures uses based on unauthorized cattle reaching use limits.

Improvements located within the wild and scenic designation corridor may restrict designation.

Limited accessibility in designated wilderness areas limit the management options available to livestock producers. With proper authorization machinery can still be operated in the wilderness to maintain range improvements.

Heavy historic grazing, especially around late 1800's and early 1900's left a lasting impression. Stocking rates have declined markedly since early 1900's with adoption of basic tenets of rangeland management. Livestock numbers declined with adjusted carrying capacity from noticeable shifts in vegetation composition. Secondary results include loss of soil fertility and water holding capacity (Asner and Archer2010). As livestock grazing continues, recovery is mixed especially with changes in climatic carbon dioxide, temperatures and precipitation fluctuations, which affects soil and vegetation response. Historical overuse by livestock in the lower elevations and flatter terrain of the allotments has led to impaired soil conditions and a reduction in the vigor and diversity of desirable plant species.

Rangelands are adversely affected by drought regardless of condition, but fair, poor or very poor condition is more adversely affected and recovers more slowly than rangelands in good or excellent condition (Howery 1999).

With improved range conditions there is usually adequate cover (vegetation, litter) to prevent accelerated soil erosion. Higher range condition rating indicates a higher diversity of plants that possess different growing seasons (warm and cool season) and rooting habits (shallow, medium, and deep rooted plants). Increases in opportunities for plant communities to exploit the various temperatures and soil moisture regimes that occur across arid and semi-arid rangelands, is one benefit of diversity. Better soil stability improves the capacity of range sites to retain soil

moisture and grow the kinds and amounts of plant species they are capable of producing (Howery 1999).

Surrounding allotments are scheduled for future allotment analysis where grazing and associated actions will be analyzed. Vegetation in the project area would continue to receive use by wildlife, insects, unauthorized livestock, and be influenced by human activities such as harvesting, pruning under power lines, mining and mineral exploration, introduction and spread, and off-road travel. Climatic conditions ultimately determine rates of growth and reproduction for all species, influencing the degree to which this vegetation type move toward desired conditions. In 2012, a decision approved installation of a new pipeline and fence in Sedow allotment, which slightly increases

Climate change and drought affects vegetation response and growth with or without presence of livestock. A recent summary of scientific information provided in Rangelands (Archer and Predick, 2008) projects a likely effect on vegetation composition, diversity, and rate of growth in desert ecosystems, reduce water availability, and trigger soil erosion losses through a reduction in stability as soil moisture content decreases and the intensity of rainfall events increases. Predicted climatic changes over the next several years indicate warmer and drier conditions develop in the southwest.

Research indicates livestock grazing affect climate through emissions of methane gas produced by cattle (Gill et al 2010). Continued grazing contributes to methane gas produced worldwide. It is difficult to pinpoint methane produced by livestock, since it depends on amount and type of feed intake (McGinn et al 2011). Studies conducted in the last ten years suggest higher greenhouse gas emissions from cow-calf operations rather than feedlots. For the United States beef herd, Johnson et al (2003), as phrased by McGinn (2011) found cow-calf operations accounted for 75 percent of greenhouse gas emissions, totaled from all beef production. In Canada in 2010, 84 percent of the nation's beef production greenhouse gas emissions were from cow-calf operations (Beauchemin et al 2010). Most studies focus on grazing animals on irrigated pasture rather than rangelands, which would present differing vegetative choices. Studies also may not highlight the indirect effects of forage production for feedlot systems.

Effects of rangeland grazing systems are geographically widespread and are thus likely a larger contributor to changes in the global carbon cycle. Decreased vegetative cover can lead to desertification in response to grazing, removing these carbon stocks increases wind and water erosion accelerating the loss of potential carbon sequestration (Asner and Archer2010).

Hotter temperatures, especially during longer periods of time, affect livestock body score. This reflection is related to type and breed of livestock grazed. Climate change increase air warming temperature from 34 F to 43.5 F, a range of conservative to extreme predictions. Increases of temperature affect increase ground temperatures, causing more extreme weather patterns from longer more frequent droughts to larger more intensive precipitation events. It is assumed health of livestock is affected, as humans, by temperature related illnesses, diseases, resistance, feed and water shortages, and food borne illnesses (Nardone 2010). Animals acclimate to heat stress by reducing intake which affects other bodily functions. If an animal is exposed to heat for extended periods of time, body condition may suffer.

Juniper Woodlands

Direct and Indirect Effects

Continued grazing pressure may likely continue decreasing species like grama grasses and increase opportunistic species such as curly mesquite and threeawn. Warm season perennial grasses such as curly mesquite and three-awns are opportunistic and become productive following not only summer monsoonal moisture but spring moisture as well. Grama species should receive very light grazing pressure during periods of rapid growth, which typically follow summer monsoon rain events. Growth points are higher above ground and more susceptible to grazing pressures, which require more energy to regrow during this time. They can then be grazed more aggressively following seed set in the fall and winter months with little negative effect. Curly mesquite should be protected from use during key growth periods to facilitate seed set and stolon production, which can help stabilize loose soils.

Terrain continue to create uneven livestock distribution. Many portions of project area have slopes greater than 40% and are typically not utilized by livestock, increasing pressure on slopes less than 40 percent.

New proposed water developments be dependent on water availability through springs and wells, where water is not available, livestock distribution be uneven. Maintenance and installation of new water developments utilize above ground pipelines, potentially increasing temperature of water in troughs. Above ground pipelines exposed to high temperatures and direct sunlight that are not charged with water may speed breakdown. Some water developments provide water to wildlife.

Livestock trailing continue to occur throughout allotments, especially to and from water developments, salt and bedding areas. Heavier trailing may continue in areas where distribution is uneven.

New proposed fencing decrease pasture size, reducing uneven distribution of larger pastures and potentially overutilization of riparian areas.

Livestock and wildlife continue to compete, in areas, for forage needs. Grasses are less common in this vegetation type, increasing competition of preferred browse species.

Juniper control treatments can impact soils by removing over story cover leaving soils, at least temporarily, more susceptible to erosion. However, juniper treatments that add slash cover can indirectly lead to an increase in herbaceous cover and a decrease in erosion potential. Fires used in juniper control projects can indirectly impact soils by, in some cases, allowing an increase in noxious plants. Historic juniper treatments have left areas of woodlands with an increased density of smaller trees. Without juniper treatments these areas are not likely to improve.

Cumulative Effects

As Juniper Savannas continue to convert into woodlands with lack of fire and mechanical treatment, soil erosion will subsequently continue.

Cumulative effects are similar to those in Juniper Savannas, above.

Turbinella Oak Chaparral

Direct and Indirect Effects

Disproportionate use of limited palatable shrubs and grasses over less palatable chaparral species can result in a less diverse vegetative composition. Use of areas dominated by chaparral depends on vegetative composition and access to palatable forage. Species which are palatable include sporadic perennial grasses and half-shrubs, mountain mahogany, buckbrush, and skunkbush sumac. These large shrubs are also desirable to wildlife browsers and often occur in limited quantities because they are selected for by all browsers over less palatable shrubs such as turbinella oak and manzanita.

Continued grazing pressure may likely continue decreasing species like grama grasses and increase opportunistic species such as curly mesquite and threeawn. Warm season perennial grasses such as curly mesquite and three-awns are opportunistic and become productive following not only summer monsoonal moisture but spring moisture as well. Grama species should receive very light grazing pressure during periods of rapid growth, which typically follow summer monsoon rain events. Growth points are higher above ground and more susceptible to grazing pressures, which require more energy to regrow during this time. They can then be grazed more aggressively following seed set in the fall and winter months with little negative effect. Curly mesquite should be protected from use during key growth periods to facilitate seed set and stolon production, which can help stabilize loose soils.

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Livestock trailing continue to occur throughout allotments, especially to and from water developments, salt and bedding areas. Heavier trailing may continue in areas where distribution is uneven. Where heavier trailing may occur, concern of compaction on soil types may increase when soils are wet.

Livestock grazing spreads noxious and invasive weeds. Red Brome and Stork's Bill are opportunistic exotic species, early spring germinators, which are spread through cattle grazing and attachment to coats. Temperature, precipitation and elevation are primary drivers of germination. Red Brome has a short window of grazing before seedheads form and attach to animals or blow in wind. Stork's Bill is desired forage by livestock in early spring, which after it forms seedheads and burrows into animals or soil. A reduction in some noxious and invasive weeds continue, reducing fine fuel fire hazards.

Livestock and wildlife continue to compete, in areas, for forage needs. Grasses are less common in this vegetation type, increasing competition of preferred browse species.

Cumulative Effects

Lack of fire has increased shrub density and reduced an occasional browse species component in many areas. Continued management limit cattle grazing opportunities in this shrub dominated vegetation type.

Cumulative effects are similar to those in Juniper Savannas, above.

Ponderosa Pine

Direct and Indirect Effects

In Upper Oak Creek pasture in Dagger Allotment, the understory is largely shrub dominated limiting palatable vegetation and access. Only in a burned area on Center Mountain is there a significant amount of palatable forage. This area contains abundant and diverse perennial grasses where the tree canopy was reduced by wildfire.

On Globe Ranger District, cattle have access to and utilize preferred understory vegetation in MSO habitats. Grazing outside MSO habitat time frames occur occasionally.

Water developments provide water to wildlife, in preferred wildlife areas.

Livestock utilization and trailing in Ponderosa pine is present but occasional to light in use. On Dagger allotment, Ponderosa pine vegetation has not been grazed by permittee to date, but can be grazed in future.

Livestock and wildlife grazing competes over preferable forage.

Terrain continue to create uneven livestock distribution. Many portions of project area have slopes greater than 40% and are typically not utilized by livestock, increasing pressure on slopes less than 40 percent.

Cumulative Effects

Recreational users and cattle grazing conflicts continue.

Cattle act as a vector for the transportation and seed dispersal of noxious weeds. Disturbance caused by cattle grazing increase likelihood of noxious weed establishment. Compaction and erosion continue to affect soil conditions as a result of off road vehicles and cattle grazing.

Federal, state and local agency contracts are maintained providing water for wildlife and improved management possibilities for livestock operators.

Trespass cattle affect usable forage and may force authorized cattle to be limited in pastures uses based on use limits.

Improvements located within the wild and scenic designation corridor may restrict designation.

Limited accessibility in designated wilderness areas limit the management options available to livestock producers. With proper authorization machinery can still be operated in the wilderness to maintain range improvements.

Heavy historic grazing, especially around late 1800's and early 1900's left a lasting impression. Stocking rates have declined markedly since early 1900's with adoption of basic tenets of rangeland management. Livestock numbers declined with adjusted carrying capacity from noticeable shifts in vegetation composition. Secondary results include loss of soil fertility and water holding capacity (Asner and Archer 2010). As livestock grazing continues, recovery is mixed especially with changes in climatic carbon dioxide, temperatures and precipitation fluctuations, which affects soil and vegetation response. Historical overuse by livestock in the lower elevations and flatter terrain of the allotments has led to impaired soil conditions and a reduction in the vigor and diversity of desirable plant species.

Rangelands are adversely affected by drought regardless of condition, but fair, poor or very poor condition is more adversely affected and recovers more slowly than rangelands in good or excellent condition (Howery 1999).

With improved range conditions there is usually adequate cover (vegetation, litter) to prevent accelerated soil erosion. Higher range condition rating indicates a higher diversity of plants that possess different growing seasons (warm and cool season) and rooting habits (shallow, medium, and deep rooted plants). Increases in opportunities for plant communities to exploit the various temperatures and soil moisture regimes that occur across arid and semi-arid rangelands, is one benefit of diversity. Better soil stability improves the capacity of range sites to retain soil moisture and grow the kinds and amounts of plant species they are capable of producing (Howery 1999).

Surrounding allotments are scheduled for future allotment analysis where grazing and associated actions will be analyzed. Vegetation in the project area would continue to receive use by wildlife, insects, unauthorized livestock, and be influenced by human activities such as harvesting, pruning under power lines, mining and mineral exploration, introduction and spread, and off-road travel. Climatic conditions ultimately determine rates of growth and reproduction for all species, influencing the degree to which this vegetation type move toward desired conditions. In 2012, a decision approved installation of a new pipeline and fence in Sedow allotment, which slightly increases

Climate change and drought affects vegetation response and growth with or without presence of livestock. A recent summary of scientific information provided in Rangelands (Archer and Predick, 2008) projects a likely effect on vegetation composition, diversity, and rate of growth in desert ecosystems, reduce water availability, and trigger soil erosion losses through a reduction in stability as soil moisture content decreases and the intensity of rainfall events increases. Predicted climatic changes over the next several years indicate warmer and drier conditions develop in the southwest.

Hotter temperatures, especially during longer periods of time, affect livestock body score. This reflection is related to type and breed of livestock grazed. Climate change increases air warming temperature from 34 F to 43.5 F, a range of conservative to extreme predictions. Increases of temperature affect increase ground temperatures, causing more extreme weather patterns from longer more frequent droughts to larger more intensive precipitation events. It is assumed health of livestock is affected, as humans, by temperature related illnesses, diseases, resistance, feed and water shortages, and food borne illnesses (Nardone 2010). Animals acclimate to heat stress

by reducing intake which affects other bodily functions. If an animal is exposed to heat for extended periods of time, body condition may suffer.

Mixed Conifer

Direct and Indirect Effects

In Upper Oak Creek pasture in Dagger Allotment, the understory is largely shrub dominated limiting palatable vegetation and access. Only in a burned area on Center Mountain is there a significant amount of palatable forage. This area contains abundant and diverse perennial grasses where the tree canopy was reduced by wildfire.

On Globe Ranger District, cattle have access to and utilize preferred understory vegetation in MSO habitats. Grazing outside MSO habitat time frames occur occasionally.

Water developments continue to provide water to wildlife, in preferred wildlife areas.

Livestock utilization and trailing in Ponderosa pine is present but occasional to light in use. On Dagger allotment, Ponderosa pine vegetation has not been grazed by permittee to date, but can be grazed in future.

Livestock and wildlife grazing competes over preferable forage.

Cumulative Effects

Cumulative effects are similar to those in Ponderosa Pine, above.

Alternative 4 – Habitat Optimization

Riparian

Direct and Indirect Effects

Livestock impacts to riparian vegetation will be limited except occasional cases of unauthorized livestock. All key riparian reaches and along the Salt River corridor will be removed from grazing through fencing or other management techniques.

Stream channel and riparian area recovery are optimal when the direct effects of livestock grazing are eliminated (Clary and Kruse 2003). Riparian areas have high potential for recovery from disturbance (Milchunas 2006). 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). Most rapid recovery can be expected in channels with small watersheds, perennial flow

or sub-surface flow, an existing source of riparian vegetation, and availability of fine sediments. As stated by the Government Accounting Office (1988), the overriding factor in achieving success in restoring riparian areas is the management of livestock to give the native vegetation more opportunity to grow.

Winter grazing plans to increase 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. A case study of this effect can be seen on Date Creek in Arizona where after 24 years of dormant seasonal only grazing the riparian area has recovered significantly as compared to a neighboring yearlong grazing rotation. These effects were even more apparent after a flood event in July of 1991 that devastated the yearlong grazing portion but left most seasonal grazing section intact (Ohmart 1996).

Installation of wells, proposed fencing of key reaches and other riparian areas, and new pasture fencelines, often o decrease grazing pressure to riparian and uplands.

Livestock would spend more time foraging in uplands during winter and spring months. Early summer livestock prefer uplands and riparian areas equally. During late summer, especially when upland vegetation dries out, riparian areas provide increased vegetation production, shade and cooler temperatures (Bailey and Brown 2011). Riparian areas offer water shade and highly palatable forage, especially during active growth and respond favorably to exclusion of livestock during active growth.

Cumulative Effects

Additional water sources from wells, continue to decrease below ground water table. Depletion of ground water for cattle operations continue to affect plant recovery in riparian areas after drought. As referenced by Allington and Valone (2011), van de Koppel, Reitkerk (2004) and Castellano, Valone (2007), water supply strongly limits plant growth. Increase in shrub species changes water infiltration dynamics. This process may favor shrubs since grass roots are not deep enough to access water.

Historic grazing concentrated around riparian areas causing bank destabilization, erosion and loss of vegetation. Seasonal grazing and livestock removal along salt river and in key reaches would increase vegetation and soil productivity and recovery in riparian areas.

Many historic adits hit underground water sources, which have been used by livestock operators for additional water sources. Seasonal grazing utilize these sources and potentially develop more breached underground water sources, possibly depleting ground water and affecting riparian surface flow.

Raising the level of the lake has created a new riparian area dominated by salt cedar. Winter grazing would promote growth of native riparian obligates, which are dominate, but still allowing livestock to utilize salt cedar.

Trespass cattle utilize riparian areas and owners will be notified by Forest Service personnel.

Livestock, provides a vector of seed dispersal across riparian areas and throughout allotments,. Noxious weeds have increased throughout project area. Although seed dispersal is still

occurring, livestock reduce salt cedar seedling encroachment. Transport of weeds may occur offsite to new infestation locations.

Livestock provides a vector of seed dispersal across riparian areas and throughout allotments. . Other dispersal vectors such as campers, off road users and hikers transport noxious weeds, but to a lesser extent than livestock.

Seasonal livestock would eliminate utilization by domestic animals but not wild animals. Salt cedar may increase, but similarly areas where native vegetation is still present an increase may displace salt cedar. Salt cedar invasion has displaced many native riparian species. During certain times of the year, livestock graze salt cedar seedlings. Invasive trees such as salt cedar have enjoyed a certain competitive advantage in past years, with domestic livestock preferentially browsing on the more palatable cottonwood and willow seedlings & saplings. Salt cedar is already present in most locations where it could possibly grow, at this time.

Compaction and erosion continue as a result of off road vehicles. Limited grazing season reducing livestock impact to soil condition.

Cooperative contracts be maintained and improve management possibilities for livestock operators. Improvements in key reaches are no longer be accessible by livestock which may affect contracts with ranchers.

Livestock grazing in wilderness continues only during winter months. Improvements continue to be maintained with proper authorization.

Salt River corridor has greater monitoring difficulty, presence of tamarisk and native riparian vegetation on beaches where cattle congregate. Recovery to these benches and beaches is unlikely with passive approaches.

A reduction in season of grazing allows native riparian obligates to regenerate without disturbance by livestock. Winter and spring grazing is often when native species are dormant and livestock use of vegetation and shade is significantly reduced. Reducing impacts to vegetation positively affects canopy cover and potentially water temperature.

River rafting along the salt is a popular event. Cattle grazing along the river would interfere with recreational users, where camping and rafting may be affected by livestock presence or sign.

Limited accessibility in designated wilderness areas limit the management options available to livestock producers. With proper authorization machinery can still be operated in the wilderness to maintain range improvements.

Limiting new spring developments removes one factor in the probability of smaller springs drying up. Although, continued drought and higher temperatures continue to affect spring areas. Slight mortality and reduced production may occur, on all riparian vegetation throughout project area. Inspections and discussion with long time land owners have shown that some springs in the region have gone dry in recent years for the first time in several decades. It is not known if this is an effect of climate change and the recent drought conditions or due to the water developments associated with some of these springs.

Climate change and drought affects vegetation response and growth with or without presence of livestock. A recent summary of scientific information provided in *Rangelands* (Archer and Predick, 2008) projects a likely effect on vegetation composition, diversity, and rate of growth in desert ecosystems, reduce water availability, and trigger soil erosion losses through a reduction in stability as soil moisture content decreases and the intensity of rainfall events increases. Predicted climatic changes over the next several years indicate warmer and drier conditions develop in the southwest.

Research indicates livestock grazing affect climate through emissions of methane gas produced by cattle (Gill et al 2010). Continued grazing contributes to methane gas produced worldwide. It is difficult to pinpoint methane produced by livestock, since it depends on amount and type of feed intake (McGinn et al 2011). Studies conducted in the last ten years suggest higher greenhouse gas emissions from cow-calf operations rather than feedlots. For the United States beef herd, Johnson et al (2003), as phrased by McGinn (2011) found cow-calf operations accounted for 75 percent of greenhouse gas emissions, totaled from all beef production. In Canada in 2010, 84 percent of the nation's beef production greenhouse gas emissions were from cow-calf operations (Beauchemin et al 2010). Most studies focus on grazing animals on irrigated pasture rather than rangelands, which would present differing vegetative choices. Studies also may not highlight the indirect effects of forage production for feedlot systems.

Effects of rangeland grazing systems are geographically widespread and are thus likely a larger contributor to changes in the global carbon cycle. Decreased vegetative cover can lead to desertification in response to grazing, removing these carbon stocks increases wind and water erosion accelerating the loss of potential carbon sequestration (Asner and Archer 2010).

Sonoran desert

Direct and Indirect Effects

Installation of wells, proposed fencing of key reaches and other riparian areas, and new pasture fencelines, often decrease grazing pressure during winter and spring in uplands.

New proposed water developments are dependent on water availability through wells and where water is not available, livestock distribution be uneven. Maintenance and installation of new water developments have been utilizing above ground pipelines and potentially increasing temperature of water in troughs. Some water developments continue to provide water to wildlife.

New proposed fencing decrease pasture size, reducing uneven distribution in larger pastures.

Winter grazing may increase browsing and foraging on some winter growing plant species.

Cattle may also benefit from management prescriptions that optimize forage and production except where those prescriptions limit grazing to reduce livestock and wildlife competition for forage.

Increase vigor and diversity of warm season forbs, grasses, subshrubs and shrubs with a winter and spring grazing period.

Growth and vigor of jojoba would potentially increase with reduced livestock grazing pressure. Increased shrub production may promote saguaro establishment.

Winter and spring flexible stocking rates and ability to quickly move livestock in response to changing conditions is a best management strategy. A conclusion of a literature by World Conservation Union (2005) states “continuous grazing in which livestock are maintained within fenced allotments yearlong is not a feasible grazing management strategy on Sonoran Desert public lands.”

Perennial grass survival are also more dependent upon climatic factors for survival however some studies indicated that grasses were more vigorous when grazing pressure occurred during dormancy (The World Conservation Union et al 2005). Studies considering woody perennial Sonoran Desert species demonstrate that climate and elevation are more responsible for diversity and density than livestock grazing (The World Conservation Union et al 2005).

Mesquite and palo verde would receive lighter grazing pressure, reducing trampling which positively increased saguaro establishment, and decreased seed spread through herbivory. Mesquite and palo verde produce in late spring and early summer following adequate winter precipitation. According to Martin and Turner (1977) livestock may slightly affect saguaro seedling establishment. Saguaro seedling establishment is slow and highly dependent upon temperature, rainfall (soil moisture), and herbivory by insects. Microsites (nurse plants) are important for regulating temperature and providing shade essential for saguaro establishment.

Various species of spring annuals are preferred by livestock when adequate winter moisture, soil warmth occur, usually during March through April. Tonto Basin ranger district pasture inspections indicate grazing pressure on accompanying shrubs is reduced while annuals are actively growing. Once they begin to cure, use of palatable shrubs in those areas begins to increase, as the shrubs are typically experiencing new growth and flower production resulting from winter moisture. Selection by livestock of more palatable annual forbs and grasses over those less palatable could lead to a reduction in species richness and diversity, although to what degree is unknown.

Grazing of annual forbs and grasses led to changes in composition of annual plant communities in a two-year study on grazed versus ungrazed desert sites (Waser and Price, 1981). Sites became dominated by a few annual species while those considered relatively rare on the sites tended to drop out of grazed sites. Decreasing annual forb and grass cover may increase native plant species, especially warm season bunchgrasses.

Terrain continue to create uneven livestock distribution. Many portions of project area have slopes greater than 40% and are typically not utilized by livestock, increasing pressure on slopes less than 40 percent. Although with decreased temperatures of winter and spring seasons, cattle may travel farther upslope than during hotter months.

Livestock trailing continue to occur throughout allotments, especially to and from water developments, salt and bedding areas. Heavier trailing may continue in areas where distribution is uneven.

Active growth livestock grazing spreads noxious and invasive weeds. Red Brome and Stork's Bill are opportunistic exotic species, early spring germinators, which are spread through cattle grazing and attachment to coats. Temperature, precipitation and elevation are primary drivers of germination. Red Brome has a short window of grazing before seedheads form and attach to animals or blow in wind. Stork's Bill is desired forage by livestock in early spring, which after it forms seedheads and burrows into animals or soil. A reduction in some noxious and invasive weeds continue, reducing fine fuel fire hazards.

Winter and spring season grazing may slightly negatively affects soil crusts through trampling, but less than yearlong grazing, which reduces crust cover, frequency biomass, species richness and diversity, and ecological function (The World Conservation Union et al 2005). Biological soil crusts influence nutrient cycling, nitrogen fixation, and nutrient availability to plants; seedling germination and vascular plant growth; water infiltration and runoff; and soil stabilization and erosion.

Warm season perennial grasses such as curly mesquite and three-awns are opportunistic and are grazed during spring, following appropriate moisture. Curly mesquite should be protected from use during key growth periods to facilitate seed set and stolon production, which can help stabilize loose soils. Grama species would not receive grazing pressure during periods of rapid growth, which typically follow summer monsoon rain events. Growth points are higher above ground and more susceptible to grazing pressures, which require more energy to regrow during this time. In winter and spring months, grazing may be more aggressive with little negative effect.

Many rangeland studies indicate conservative or moderate use is appropriate grazing levels (Holochek et al. 1999, Navarro et al. 2002, Loeser et al. 2007), but it is inferred that without grazing pressure during active growth periods, grasses significantly increase in vigor. These studies do not specify whether soils and vegetation being influenced by livestock grazing pressure were in satisfactory condition or some form of impaired condition (i.e. compaction, limited diversity) when the studies began. Climatic carbon dioxide levels, temperature and precipitation are leading factors on rangeland species production (Izaurre et al 2011). Stocking rates, timing and frequency must be assessed, due to bimodal, localized precipitation patterns and frequent regional drought events.

Flowers and beans of catclaw, mesquite, palo verde, and mimosa continue to be utilized potentially increasing seed propagation. Catclaw, Mesquite, palo verde and mimosa are palatable and desirable to livestock when being produced in late spring and early summer following adequate winter precipitation. Mesquite and acacia grazed during height of seed production increases seed dispersal (Steinburg 2001 and Gucker 2005). In years of low precipitation or during hot summer months, these plants often become dormant and retain only a minimum cover of leaves.

False Mesquite continue to be grazed during the winter. Changes in growth form from vertical to prostrate is common when species receives moderate or higher grazing pressure. False mesquite produces good quality browse in early spring following adequate winter precipitation and is often available before the onset of perennial grasses. It has a tendency to become dormant in early summer when precipitation is scarce but become productive again following adequate moisture from summer monsoon rains. False mesquite can withstand aggressive grazing pressure and often becomes the dominant forage plant on the landscape when perennial grasses have been removed.

Range Ratany continue to be grazed, affecting a small portion of vigor and future species recruitment. Range Ratany produces high quality browse in spring and summer months. According to FEIS database, species has a high tolerance for hedging and fair to good palatability for livestock, with grazing tolerance at 50% or less. Studies show conflicting information about species recruitment; it may be a locally genetic manipulation.

Shrubby buckwheat is intolerant of hedging and may slightly decrease when this type of grazing pressure is applied. Shrubby buckwheat is used by livestock and is of medium palatability. It has a slow growth rate and able to resprout.

Cumulative Effects

Heavy historic grazing, especially around late 1800's and early 1900's left a lasting impression. Stocking rates have declined markedly since early 1900's with adoption of basic tenets of rangeland management. Livestock numbers declined with adjusted carrying capacity from noticeable shifts in vegetation composition. Secondary results include loss of soil fertility and water holding capacity (Asner and Archer 2010). As livestock grazing continues, recovery is mixed especially with changes in climatic carbon dioxide, temperatures and precipitation fluctuations, which affects soil and vegetation response. Proposed seasonal grazing and livestock removal along salt river and in key reaches would increase vegetation and soil productivity and recovery.

Trespass cattle still affect usable forage and may force authorized cattle to be limited in pastures uses based on unauthorized cattle reaching use limits.

Noxious weeds continue to be spread by animals coats or consumption, only during the winter and spring months. Transport of weeds may occur offsite to new infestation locations.

Federal, state and local contracts may be focused toward providing water through wells and other systems rather than springs and seeps. Improvements in key reaches no longer be accessible by livestock which may affect contracts with rancher.

Climate change and drought affects vegetation response and growth with or without presence of livestock. A recent summary of scientific information provided in Rangelands (Archer and Predick, 2008) projects a likely effect on vegetation composition, diversity, and rate of growth in desert ecosystems, reduce water availability, and trigger soil erosion losses through a reduction in stability as soil moisture content decreases and the intensity of rainfall events increases. Predicted climatic changes over the next several years indicate warmer and drier conditions develop in the southwest. Seasonal grazing place pressure on cool season grasses and spring annual forbs and grasses. Warm season bunchgrasses and forbs will not receive late spring and

summer grazing allowing recovery and increased production. Without active growth grazing these species are likely to fully recover after drought or warmer drier conditions.

Livestock grazing in wilderness continue, only during winter months. Improvements continue to be maintained with proper authorization.

Biological crusts are affected by cattle grazing and mechanical disturbances from off-road vehicles. Compaction and erosion affect soil conditions as a result of off road vehicles and cattle grazing.

Improved water developments and properly maintained pasture divisions, increases distribution but livestock tend to concentrate on flatter terrain and near surface water. Pasture inspections conducted on Dagger and Poison Springs allotments indicate that livestock distribution is generally satisfactory. Many of these areas already exhibit impaired soil and vegetation conditions and proper use levels may be met quickly with concentrated use. Changes in management are necessary if the proposed range improvements, herding and salting are not effective in distributing animals across the landscape.

Improvements located within the wild and scenic designation corridor may restrict designation.

Surrounding allotments are scheduled for future allotment analysis where grazing and associated actions will be analyzed. Vegetation in the project area would continue to receive use by wildlife, insects, unauthorized livestock, and be influenced by human activities such as harvesting, pruning under power lines, mining and mineral exploration, introduction and spread, and off-road travel. Climatic conditions ultimately determine rates of growth and reproduction for all species, influencing the degree to which this vegetation type move toward desired conditions. In 2012, a decision approved installation of a new pipeline and fence in Sedow allotment, which slightly increases water distribution and creates a new pasture.

Rangelands are adversely affected by drought regardless of condition, but fair, poor or very poor condition is more adversely affected and recovers more slowly than rangelands in good or excellent condition (Howery 1999).

With improved range conditions there is usually adequate cover (vegetation, litter) to prevent accelerated soil erosion. Higher range condition rating indicates a higher diversity of plants that possess different growing seasons (warm and cool season) and rooting habits (shallow, medium, and deep rooted plants). Increases in opportunities for plant communities to exploit the various temperatures and soil moisture regimes that occur across arid and semi-arid rangelands, is one benefit of diversity. Better soil stability improves the capacity of range sites to retain soil moisture and grow the kinds and amounts of plant species they are capable of producing (Howery 1999).

Hotter temperatures, especially during longer periods of time, affect livestock body score. This reflection is related to type and breed of livestock grazed. Climate change increases air warming temperature from 34 F to 43.5 F, a range of conservative to extreme predictions. Increases of temperature affect increase ground temperatures, causing more extreme weather patterns from longer more frequent droughts to larger more intensive precipitation events. It is assumed health of livestock is affected, as humans, by temperature related illnesses, diseases, resistance, feed

and water shortages, and food borne illnesses (Nardone 2010). Animals acclimate to heat stress by reducing intake which affects other bodily functions. If an animal is exposed to heat for extended periods of time, body condition may suffer.

Research indicates livestock grazing affect climate through emissions of methane gas produced by cattle (Gill et al 2010). Continued grazing contributes to methane gas produced worldwide. It is difficult to pinpoint methane produced by livestock, since it depends on amount and type of feed intake (McGinn et al 2011). Studies conducted in the last ten years suggest higher greenhouse gas emissions from cow-calf operations rather than feedlots. For the United States beef herd, Johnson et al (2003), as phrased by McGinn (2011) found cow-calf operations accounted for 75 percent of greenhouse gas emissions, totaled from all beef production. In Canada in 2010, 84 percent of the nation's beef production greenhouse gas emissions were from cow-calf operations (Beauchemin et al 2010). Most studies focus on grazing animals on irrigated pasture rather than rangelands, which would present differing vegetative choices. Studies also may not highlight the indirect effects of forage production for feedlot systems.

Semi-desert grasslands

Direct and Indirect Effects

Cattle distribution may decrease slightly with removal of live watering locations from fenced key reaches. Installation of wells, away from fenced key reaches may offset decreased cattle distribution by adding additional watering sources.

New proposed water developments are dependent on water availability through wells and where water is not available, livestock distribution is uneven. Maintenance and installation of new water developments have been utilizing above ground pipelines and potentially increasing temperature of water in troughs. Some water developments continue to provide water to wildlife. New proposed fencing decrease pasture size, reducing uneven distribution of larger pastures.

Proposed fencing of key reaches and other riparian areas as listed increase livestock pressure on uplands, but overall decrease pressure to all riparian areas, strictly due to winter and spring grazing.

Winter grazing may increase browsing and foraging on some winter growing plant species.

Cattle may also benefit from management prescriptions that optimize forage and production except where those prescriptions limit grazing to reduce livestock and wildlife competition for forage.

Studies do show that including grazing in parts of a landscape may contribute to an increase in plant diversity and habitat fragmentation that can benefit wildlife. Cattle do alter composition of plant communities and when used properly can alter habitat structures to enhance wildlife (Vavra 2005).

Increase vigor and diversity of warm season forbs, grasses, subshrubs and shrubs with a winter and spring grazing period.

Flowers and beans of catclaw, mesquite, palo verde, and mimosa continue to be utilized potentially increasing seed propagation. Catclaw, Mesquite, palo verde and mimosa are palatable and desirable to livestock when being produced in late spring and early summer following adequate winter precipitation. Mesquite and acacia grazed during height of seed production increases seed dispersal (Steinburg 2001 and Gucker 2005). In years of low precipitation or during hot summer months, these plants often become dormant and retain only a minimum cover of leaves.

False Mesquite displays grazing effects quickly. Changes in growth form from vertical to prostrate is common when species receives moderate or higher grazing pressure. False mesquite produces good quality browse in early spring following adequate winter precipitation and is often available before the onset of perennial grasses. It has a tendency to become dormant in early summer when precipitation is scarce but become productive again following adequate moisture from summer monsoon rains. False mesquite can withstand aggressive grazing pressure and often becomes the dominant forage plant on the landscape when perennial grasses have been removed.

Range Ratany is grazed, affecting vigor and future species recruitment. Range Ratany produces high quality browse in spring and summer months. According to FEIS database, species has a high tolerance for hedging and fair to good palatability for livestock, with grazing tolerance at 50% or less. Studies show conflicting information about species recruitment; it may be a locally genetic manipulation.

Shrubby buckwheat is intolerant of hedging and decrease. It used by livestock with a medium palatability, slow growth rate and ability to resprout.

Increase vigor and diversity of warm season forbs, grasses, subshrubs and shrubs with a winter and spring grazing period. Grama species would receive no livestock grazing pressure during periods of rapid growth, which typically follow summer monsoon rain events. Curly mesquite should be protected from use during key growth periods to facilitate seed set and stolon production, which can help stabilize loose soils.

Various species of spring annuals continue to be a preferred choice for livestock grazing when adequate winter moisture allows sufficient growth, especially in spring. Spring annuals can occur in all life zones on the allotments. They are most abundant following winter and early spring rains when the ground begins to warm, usually in March and April but occasionally extending into early May. Pasture inspections on allotments on the Tonto Basin Ranger District indicate that grazing pressure on accompanying shrubs are reduced while annuals are green and palatable. Once they begin to cure, use of palatable shrubs in those areas begins to increase, as the shrubs are typically experiencing new growth and flower production resulting from winter moisture. Selection by livestock of more palatable annual forbs and grasses over those less palatable could lead to a reduction in species richness and diversity, although to what degree is unknown.

Grazing of annual forbs and grasses led to changes in composition of annual plant communities in a two-year study on grazed versus ungrazed desert sites (Waser and Price, 1981). Sites became dominated by a few annual species while those considered relatively rare on the sites

tended to drop out of grazed sites. Decreasing annual forb and grass cover may increase native plant species, especially warm season bunchgrasses.

Terrain continue to create uneven livestock distribution. Many portions of project area have slopes greater than 40% and are typically not utilized by livestock, increasing pressure on slopes less than 40 percent. Although with decreased temperatures of winter and spring seasons, cattle may travel farther upslope than during hotter months.

Livestock trailing continue to occur throughout allotments, especially to and from water developments, salt and bedding areas. Heavier trailing may continue in areas where distribution is uneven.

Livestock grazing spreads noxious and invasive weeds. Red Brome and Stork's Bill are opportunistic exotic species, early spring germinators, which are spread through cattle grazing and attachment to coats. Temperature, precipitation and elevation are primary drivers of germination. Red Brome has a short window of grazing before seedheads form and attach to animals or blow in wind. Stork's Bill is desired forage by livestock in early spring, which after it forms seedheads and burrows into animals or soil. A reduction in some noxious and invasive weeds will continue, reducing fine fuel fire hazards. Many species grow during early spring and would be utilized strictly by livestock. A reduction in some noxious and invasive weeds continue, reducing fine fuel fire hazards.

Livestock grazing negatively affects soil crusts through trampling, which reduces crust cover, frequency biomass, species richness and diversity, and ecological function (Pagiola et al 2005). Biological soil crusts influence nutrient cycling, nitrogen fixation, and nutrient availability to plants; seedling germination and vascular plant growth; water infiltration and runoff; and soil stabilization and erosion.

Cumulative Effects

Rangelands are adversely affected by drought regardless of condition, but those in fair or poor condition are more adversely affected and recover more slowly than rangelands in good or excellent condition (Howery 1999).

With improved range conditions there is usually adequate cover (vegetation, litter) to prevent accelerated soil erosion. Higher range condition rating indicates a higher diversity of plants that possess different growing seasons (warm and cool season) and rooting habits (shallow, medium, and deep rooted plants). Increases in opportunities for plant communities to exploit the various temperatures and soil moisture regimes that occur across arid and semi-arid rangelands, is one benefit of diversity. Better soil stability improves the capacity of range sites to retain soil moisture and grow the kinds and amounts of plant species they are capable of producing (Howery 1999).

Heavy historic grazing, especially around late 1800's and early 1900's left a lasting impression. Stocking rates have declined markedly since early 1900's with adoption of basic tenets of rangeland management. Livestock numbers declined with adjusted carrying capacity from noticeable shifts in vegetation composition. Secondary results include loss of soil fertility and

water holding capacity (Asner and Archer 2010). As livestock grazing continues, recovery is mixed especially with changes in climatic carbon dioxide, temperatures and precipitation fluctuations, which affects soil and vegetation response. Historical overuse by livestock in the lower elevations and flatter terrain of the allotments has led to impaired soil conditions and a reduction in the vigor and diversity of desirable plant species.

Trespass cattle affect usable forage and may force authorized cattle to be limited in pastures uses based on unauthorized cattle reaching use limits.

Noxious weeds continue to be spread by animals coats or consumption, only during the winter and spring months. Transport of weeds may occur offsite to new infestation locations.

Federal, state and local contracts may be focused toward providing water through wells and other systems rather than springs and seeps. Improvements in key reaches are no longer be accessible by livestock which may affect contracts with rancher.

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Livestock grazing in wilderness continue, only during winter months. Improvements continue to be maintained with proper authorization.

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Improved water developments and properly maintained pasture divisions, increases distribution but livestock tend to concentrate on flatter terrain and near surface water. Pasture inspections conducted on Dagger and Poison Springs allotments indicate that livestock distribution is generally satisfactory. Many of these areas already exhibit impaired soil and vegetation conditions and proper use levels may be met quickly with concentrated use. Changes in management are necessary if the proposed range improvements, herding and salting are not effective in distributing animals across the landscape.

Improvements located within the wild and scenic designation corridor may restrict designation.

Surrounding allotments are scheduled for future allotment analysis where grazing and associated actions will be analyzed. Vegetation in the project area would continue to receive use by wildlife, insects, unauthorized livestock, and be influenced by human activities such as harvesting, pruning under power lines, mining and mineral exploration, introduction and spread, and off-road travel. Climatic conditions ultimately determine rates of growth and reproduction

for all species, influencing the degree to which this vegetation type move toward desired conditions. In 2012, a decision approved installation of a new pipeline and fence in Sedow allotment, which slightly increases water distribution and creates a new pasture.

Hotter temperatures, especially during longer periods of time, affect livestock body score. This reflection is related to type and breed of livestock grazed. Climate change increase air warming temperature from 34 F to 43.5 F, a range of conservative to extreme predictions. Increases of temperature increases ground temperatures, causing more extreme weather patterns from longer more frequent droughts to larger more intensive precipitation events. It is assumed health of livestock is affected, as humans, by temperature related illnesses, diseases, resistance, feed and water shortages, and food borne illnesses (Nardone 2010). Animals acclimate to heat stress by reducing intake which affects other bodily functions. If an animal is exposed to heat for extended periods of time, body condition may suffer.

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Juniper Savanna

Direct and Indirect Effects

Increase vigor and diversity of warm season forbs, grasses, subshrubs and shrubs with a winter and spring grazing period. Grama species would receive no livestock grazing pressure during periods of rapid growth, which typically follow summer monsoon rain events. Curly mesquite should be protected from use during key growth periods to facilitate seed set and stolon production, which can help stabilize loose.

Winter grazing may increase browsing and foraging on some winter growing plant species. Grama species can be grazed more aggressively following seed set in the fall and winter months with little negative effect.

Cattle may also benefit from management prescriptions that optimize forage and production except where those prescriptions limit grazing to reduce livestock and wildlife competition for forage.

Terrain continue to create uneven livestock distribution. Many portions of project area have slopes greater than 40% and are typically not utilized by livestock, increasing pressure on slopes less than 40 percent. Although with decreased temperatures of winter and spring seasons, cattle may travel farther upslope than during hotter months.

New proposed water developments are dependent on water availability through wells and where water is not available, livestock distribution will be uneven. Maintenance and installation of new water developments have been utilizing above ground pipelines and potentially increasing temperature of water in troughs. Some water developments continue to provide water to wildlife.

Livestock trailing continue to occur throughout allotments, especially to and from water developments, salt and bedding areas. Heavier trailing may continue in areas where distribution is uneven.

Proposed fencing of key reaches and other riparian areas as listed increase livestock pressure on uplands, but overall decrease pressure to all riparian areas, strictly due to winter and spring grazing.

Livestock grazing may continue to spread noxious and invasive weeds. Many species grow during early spring and would be utilized strictly by livestock. A reduction in some noxious and invasive weeds continue, reducing fine fuel fire hazards.

New proposed water developments are dependent on water availability through wells and where water is not available, livestock distribution be uneven. Maintenance and installation of new water developments have been utilizing above ground pipelines and potentially increasing temperature of water in troughs. Some water developments continue to provide water to wildlife. New proposed fencing decrease pasture size, reducing uneven distribution of larger pastures.

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Livestock grazing may continue to spread noxious and invasive weeds. Many species grow during early spring and would be utilized strictly by livestock. A reduction in some noxious and invasive weeds continue, reducing fine fuel fire hazards.

Cumulative Effects

Lack of fire and mechanical treatments have increased juniper cover throughout much of this vegetation type, converting many acres into juniper woodlands. Soil erosion continue along with conversion of vegetation type.

Juniper fuel wood treatments would damage or remove desirable herbaceous and shrubby vegetation through mechanical disturbance. Recovery of desirable herbaceous and woody species would occur quickly as more natural resources become available. Historical juniper

treatments provide additional forage for cattle grazing and future treatments occur to maintain landscape conditions.

Current grazing removes fine fuels and reduces the ability for fire to limit establishment of junipers.

Recovery of desirable species would be expected to occur quickly in the absence of juniper cover, as more natural resources become available for herbaceous and woody species.

Heavy historic grazing, especially around late 1800's and early 1900's left a lasting impression. Stocking rates have declined markedly since early 1900's with adoption of basic tenets of rangeland management. Livestock numbers declined with adjusted carrying capacity from noticeable shifts in vegetation composition. Secondary results include loss of soil fertility and water holding capacity (Asner and Archer 2010). As livestock grazing continues, recovery is mixed especially with changes in climatic carbon dioxide, temperatures and precipitation fluctuations, which affects soil and vegetation response. Historical overuse by livestock in the lower elevations and flatter terrain of the allotments has led to impaired soil conditions and a reduction in the vigor and diversity of desirable plant species. Proposed seasonal grazing and livestock removal along salt river and in key reaches would increase vegetation and soil productivity and recovery.

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Livestock grazing in wilderness continue, only during winter months. Improvements continue to be maintained with proper authorization.

Surrounding allotments are scheduled for future allotment analysis where grazing and associated actions will be analyzed. Vegetation in the project area would continue to receive use by wildlife, insects, unauthorized livestock, and be influenced by human activities such as harvesting, pruning under power lines, mining and mineral exploration, introduction and spread, and off-road travel. Climatic conditions ultimately determine rates of growth and reproduction

for all species, influencing the degree to which this vegetation type move toward desired conditions. In 2012, a decision approved installation of a new pipeline and fence in Sedow allotment, which slightly increases water distribution and creates a new pasture.

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Hotter temperatures, especially during longer periods of time, affect livestock body score. This reflection is related to type and breed of livestock grazed. Climate change increases air warming temperature from 34 F to 43.5 F, a range of conservative to extreme predictions. Increases of temperature affect increase ground temperatures, causing more extreme weather patterns from longer more frequent droughts to larger more intensive precipitation events. It is assumed health of livestock is affected, as humans, by temperature related illnesses, diseases, resistance, feed and water shortages, and food borne illnesses (Nardone 2010). Animals acclimate to heat stress by reducing intake which affects other bodily functions. If an animal is exposed to heat for extended periods of time, body condition may suffer.

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Juniper Woodlands

Direct and Indirect Effects

D/I effects same as Juniper Savannas above.

Cumulative Effects

CE Effects same as Juniper Savannas above.

Turbinella Oak Chaparral

Direct and Indirect Effects

Disproportionate use of limited palatable shrubs and grasses over less palatable chaparral species can result in a less diverse vegetative composition. Use of areas dominated by chaparral depends on vegetative composition and access to palatable forage. Species which are palatable include sporadic perennial grasses and half-shrubs, mountain mahogany, buckbrush, and skunkbush sumac. These large shrubs are also desirable to wildlife browsers and often occur in limited quantities because they are selected for by all browsers over less palatable shrubs such as turbinella oak and manzanita.

Continued grazing pressure may likely continue on curly mesquite and threeawn during spring months, allowing grama grasses to increase. Grama species would receive no livestock grazing pressure during periods of rapid growth, which typically follow summer monsoon rain events. They can then be grazed more aggressively following seed set in the fall and winter months with little negative effect.

New proposed water developments are dependent on water availability through wells and where water is not available, livestock distribution will be uneven. Maintenance and installation of new water developments have been utilizing above ground pipelines and potentially increasing temperature of water in troughs. Some water developments continue to provide water to wildlife.

Maintenance and installation of new water developments have been utilizing above ground pipelines and potentially increasing temperature of water in troughs. Some water developments continue to provide water to wildlife.

Livestock trailing continue to occur throughout allotments, especially to and from water developments, salt and bedding areas. Heavier trailing may continue in areas where distribution is uneven. Where heavier trailing may occur, concern of compaction on soil types may increase when soils are wet.

Livestock grazing continue to spread noxious and invasive weeds. A reduction in some noxious and invasive weeds continue, reducing fine fuel fire hazards.

Livestock and wildlife continue to compete, in areas, for forage needs. Grasses are less common in this vegetation type, increasing competition of preferred browse species.

Terrain continue to create uneven livestock distribution. Many portions of project area have slopes greater than 40% and are typically not utilized by livestock, increasing pressure on slopes less than 40 percent. Although with decreased temperatures of winter and spring seasons, cattle may travel farther upslope than during hotter months.

Cumulative Effects

Cumulative effects are similar to those found in Juniper Woodlands.

Ponderosa Pine

Direct and Indirect Effects

Cattle would be removed from the Ponderosa Pine and Mixed Conifer in the Oak Creek Mesa Pasture on the Dagger allotment but would still be allowed to graze in the Ponderosa Pine Mixed Conifer vegetation type on the Chysotile and Haystack Allotments.

Cattle may also benefit from management prescriptions that optimize forage and production except where those prescriptions limit grazing to reduce livestock and wildlife forage competition.

On Globe Ranger District, cattle have access to and utilize preferred understory vegetation in MSO habitats. Grazing outside MSO habitat time frames occur occasionally.

Water developments continue to provide water to wildlife, in preferred wildlife areas.

Livestock utilization and trailing in Ponderosa pine is present but occasional to light in use. On Dagger allotment, Ponderosa pine vegetation has not been grazed by permittee to date, but can be grazed in future.

Terrain continue to create uneven livestock distribution. Many portions of project area have slopes greater than 40% and are typically not utilized by livestock, increasing pressure on slopes less than 40 percent. Although with decreased temperatures of winter and spring seasons, cattle may travel farther upslope than during hotter months.

Cumulative Effects

Cumulative effects are similar to those found in Juniper Woodlands.

Mixed Conifer

Direct and Indirect Effects

Grazing would be eliminated from the Oak Creek Mesa Pasture on the Dagger Allotment but would still continue on a seasonal basis in the Tony, Timber, Home, Carol, Horse #1, #2, #3 pastures of the Chrysotile Allotment and the Bronson Pasture on the Haystack Butte Allotment. Snow fall in this vegetation type can limit grazing capacity reducing the timing and availability of these pastures to be used on a seasonal basis. Effects of grazing be most pronounced in the spring.

Water developments continue to provide water to wildlife, in preferred wildlife areas.

Cumulative Effects

A possible increase in the number of wells that are proposed to be drilled due to the removal of new developments on springs and seeps and no grazing in the river corridor.

Cumulative effects are similar to those found in Ponderosa Pine.

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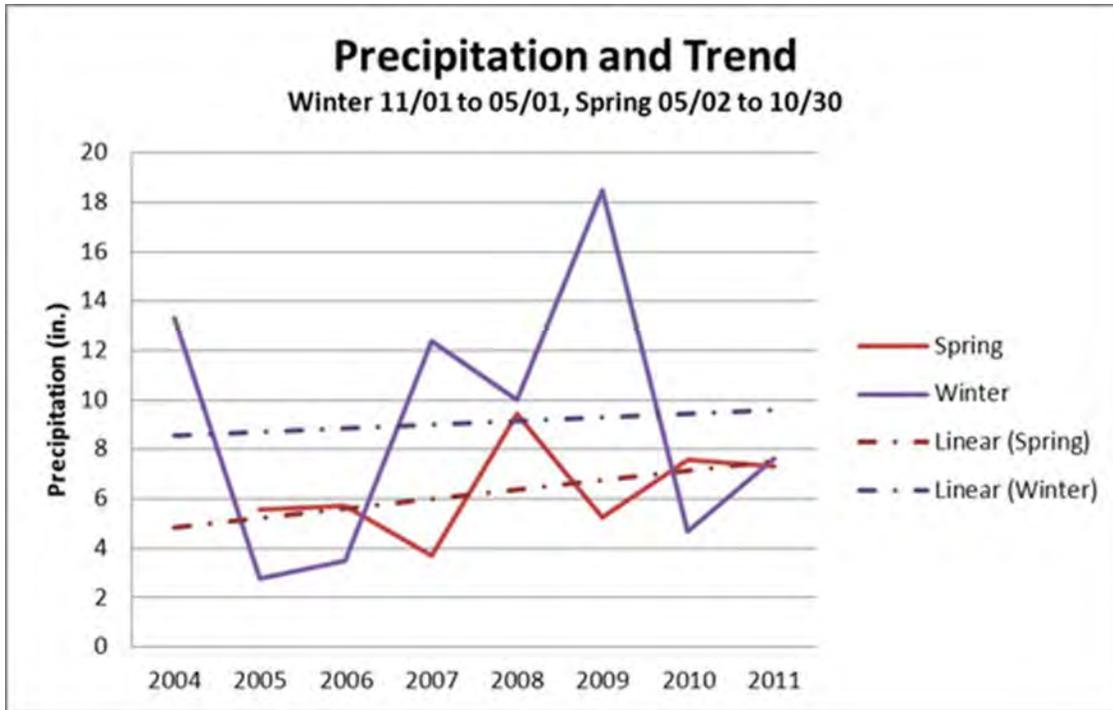
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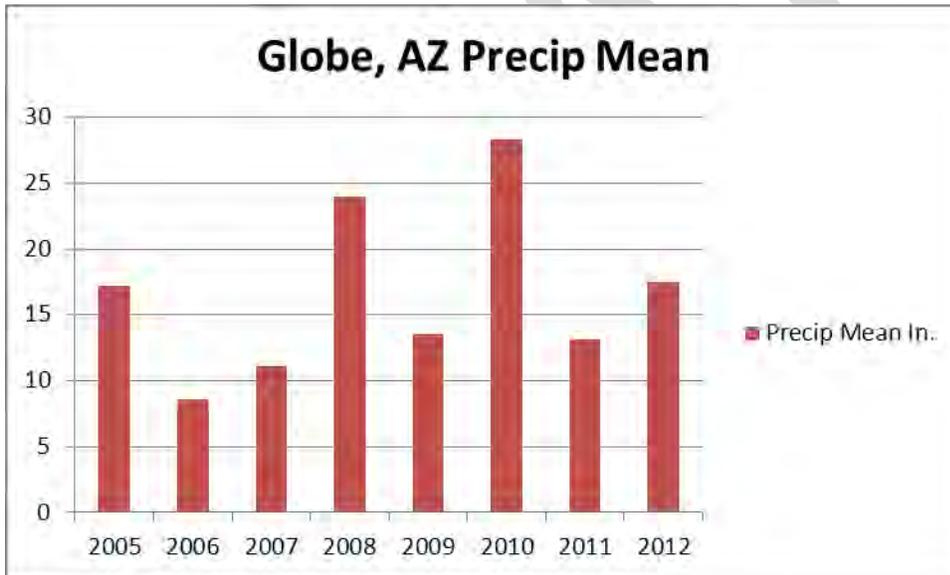
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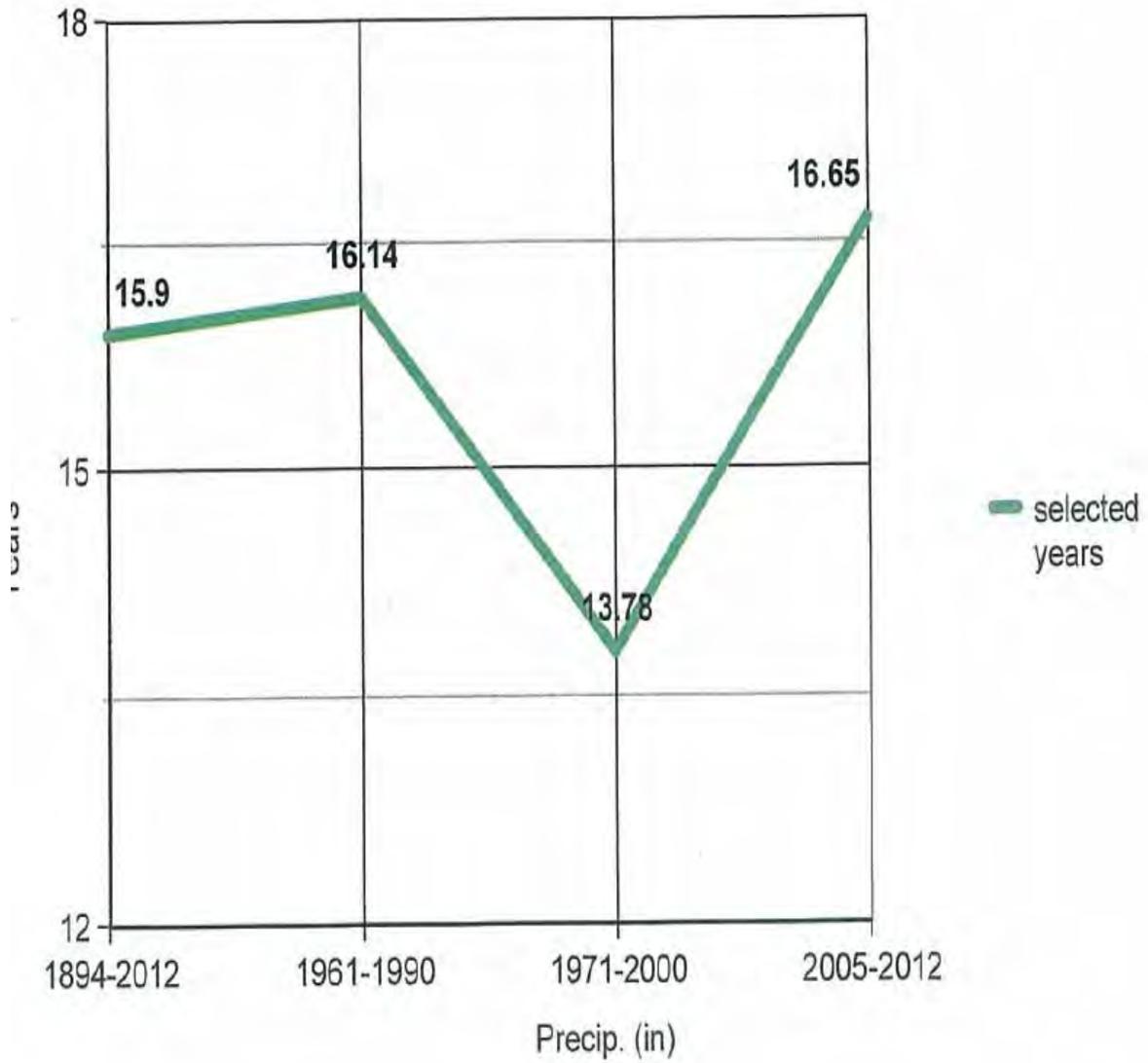


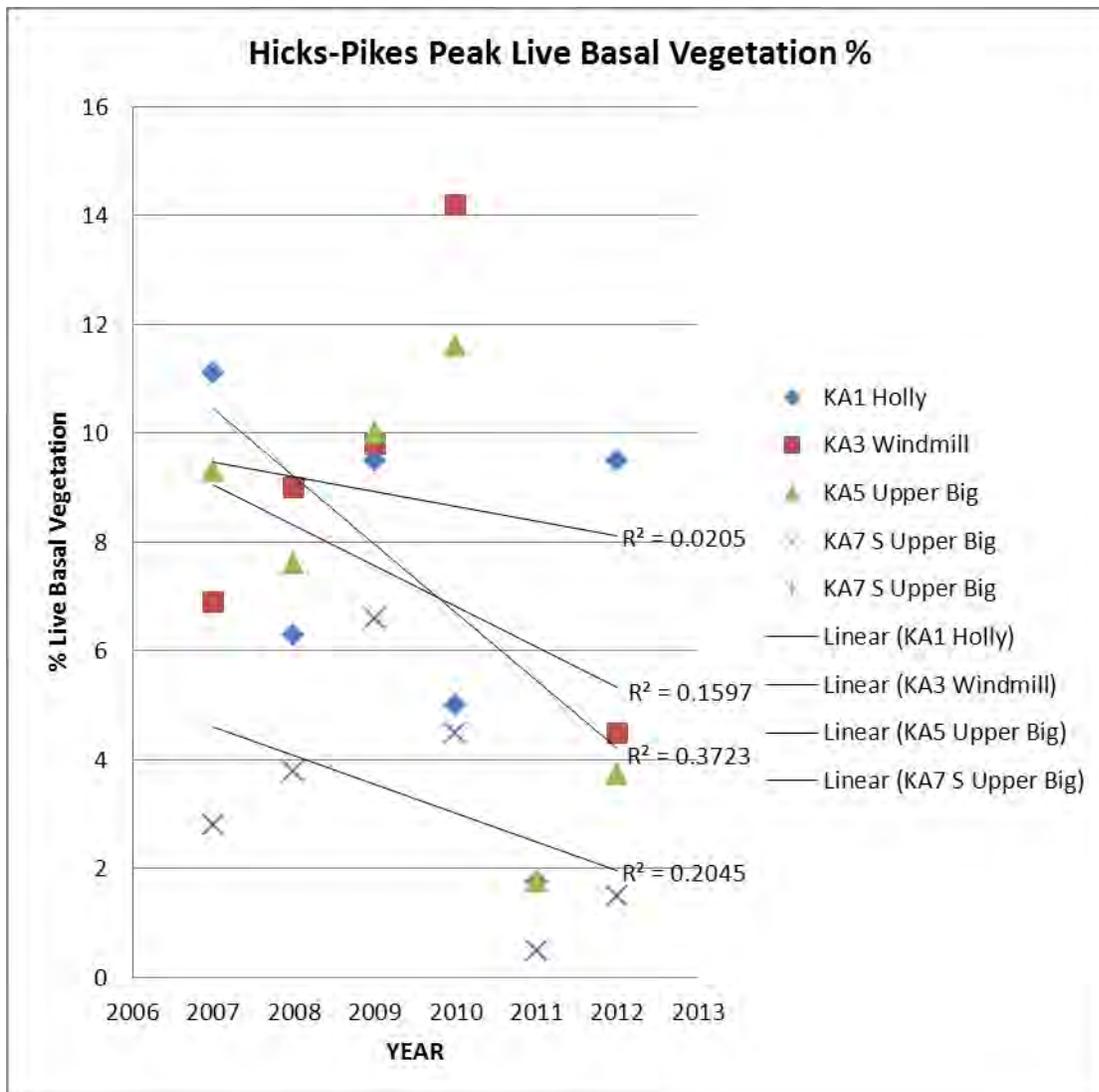
Globe, AZ Precipitation 2004-2011



Globe, AZ Annual Precipitation by Year

Precipitation Means for Selected Years Globe, AZ

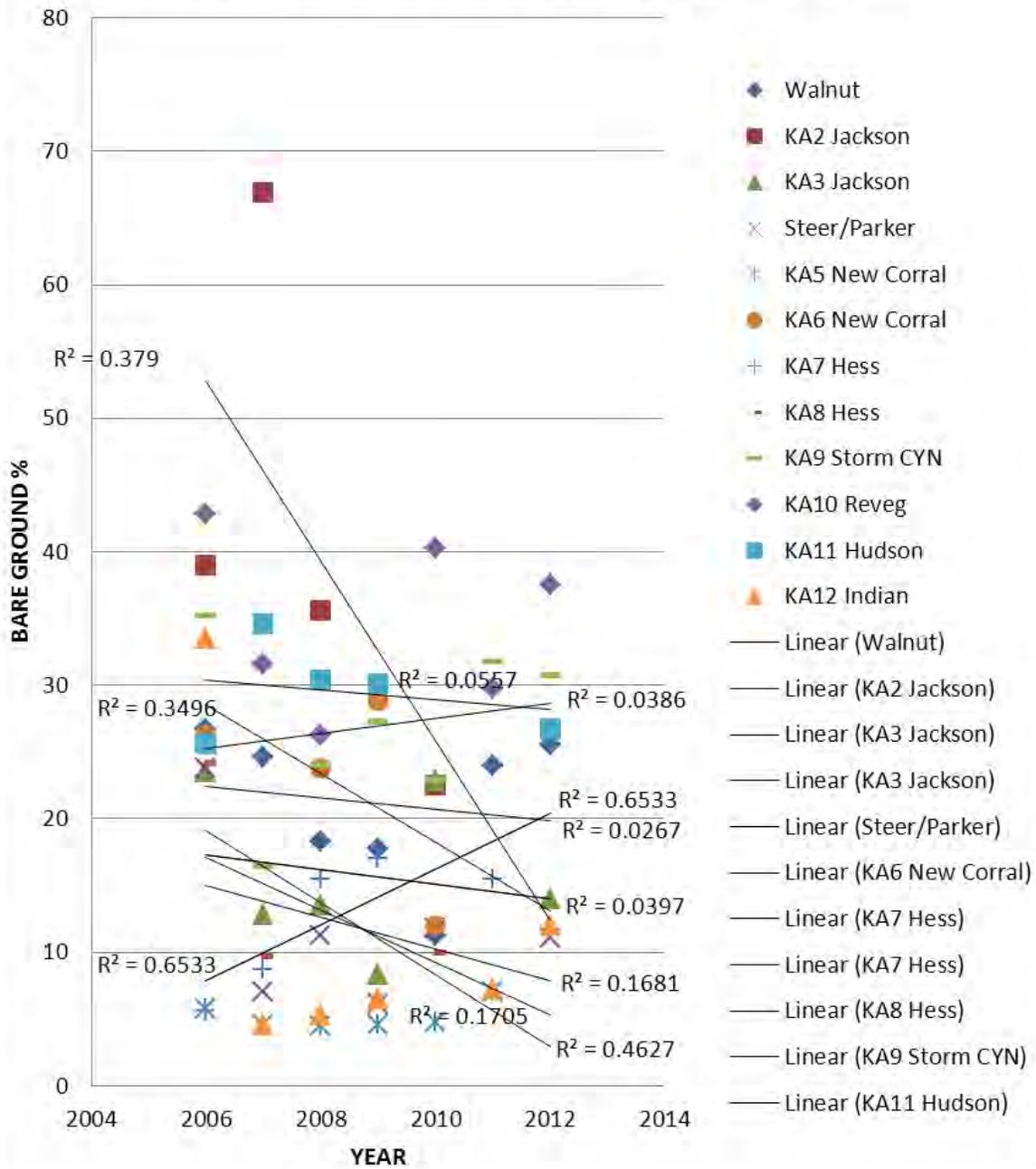




| | Walnut | KA2 Jackson | KA3 Jackson | Steer/Parker | KA5 New Corral | KA6 New Corral | KA7 Hess | KA8 Hess | KA9 Storm CYN | KA10 Reveg | KA11 Hudson | KA12 Indian |
|------|--------|-------------|-------------|--------------|----------------|----------------|----------|----------|---------------|------------|-------------|-------------|
| 2006 | 26.7 | 39 | 23.5 | 23.8 | 5.8 | 26.3 | 5.6 | 24.2 | 35.2 | 42.8 | 25.6 | 33.5 |
| 2007 | 24.6 | 66.9 | 12.8 | 7 | 4.6 | | 8.7 | 9.7 | 16.5 | 31.6 | 34.6 | 4.6 |
| 2008 | 18.3 | 35.6 | 13.5 | 11.3 | 4.5 | 23.8 | 15.5 | | 24.1 | 26.3 | 30.4 | 5.3 |
| 2009 | 17.8 | | 8.3 | 6.1 | 4.6 | 28.8 | 17 | | 27.3 | | 30.1 | 6.5 |
| 2010 | 11.3 | 22.5 | 22.9 | 11.8 | 4.8 | 12 | | 10 | 23 | 40.3 | | |
| 2011 | 24 | | | | 7 | | 15.5 | | 31.75 | 29.75 | | 7.25 |
| 2012 | 25.5 | | 14 | 11.06 | | | | | 30.75 | 37.5 | 26.75 | 12 |

Sedow Bare Ground % by Year

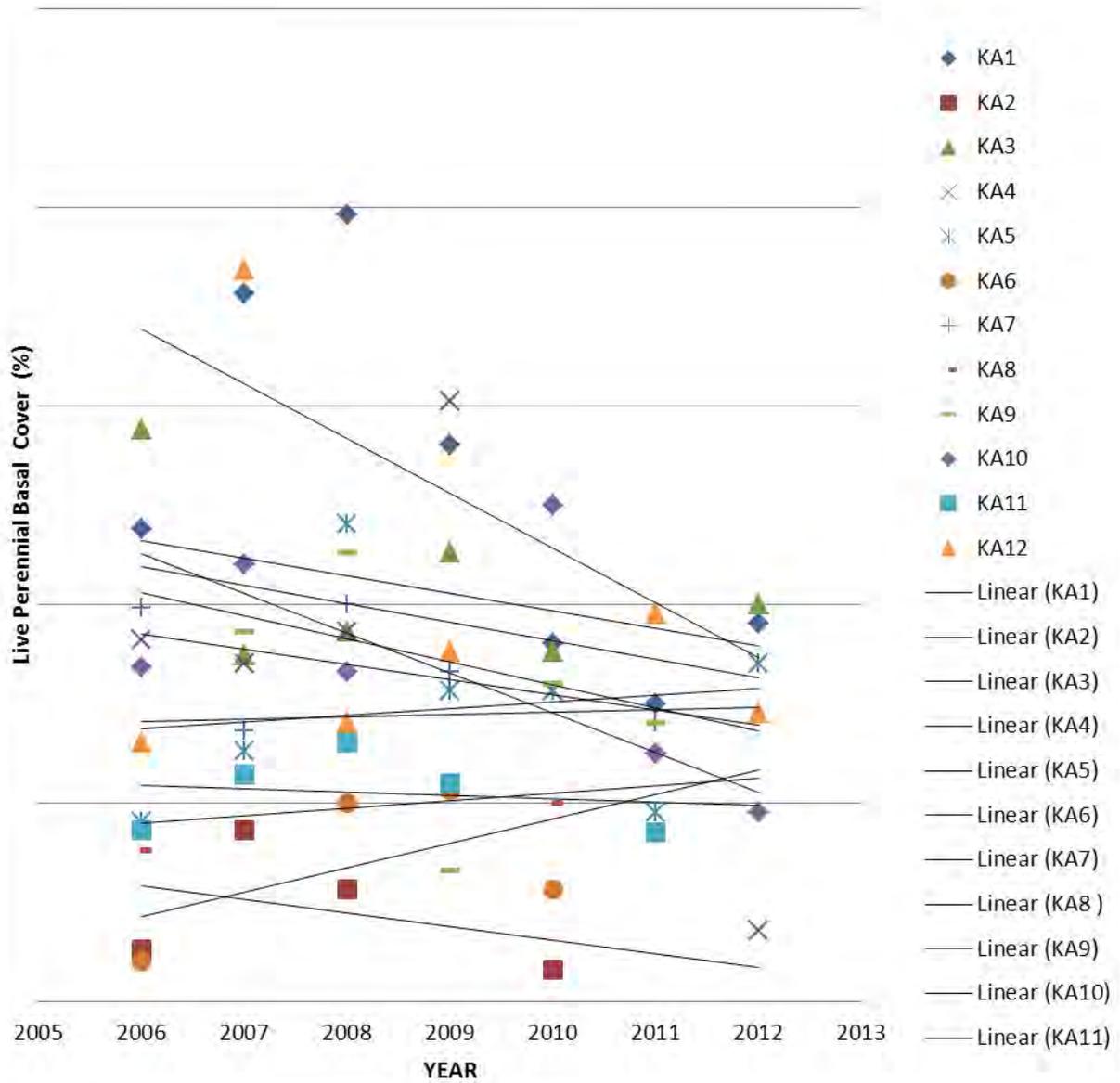
SEDOW BARE GROUND % by PASTURE



| Sedow VGS Reading the Range Data percent live Vegetation | | | | | | | | | | | | |
|--|--------|--------|--------|-------|--------|------|-------|--------|--------|--------|--------|--------|
| | KA1 | KA2 | KA3 | KA4 | KA5 | KA6 | KA7 | KA8 | KA9 | KA10 | KA11 | KA12 |
| 2006 | 11.9 | 1.3 | 14.4 | 9.1 | 4.5 | 1 | 9.9 | 3.8 | 4.2 | 8.4 | 4.3 | 6.5 |
| 2007 | 17.8 | 4.3 | 8.7 | 8.5 | 6.3 | | 6.8 | 5.6 | 9.3 | 11 | 5.7 | 18.4 |
| 2008 | 19.8 | 2.8 | 9.3 | 9.3 | 12 | 5 | 10 | | 11.3 | 8.3 | 6.5 | 7 |
| 2009 | 14 | | 11.3 | 15.1 | 7.8 | 5.3 | 8.3 | | 3.3 | | 5.5 | 8.8 |
| 2010 | 9 | 0.8 | 8.8 | 7.8 | 7.8 | 2.8 | | 5 | 8 | 12.5 | | |
| 2011 | 7.5 | | | | 4.75 | | 7 | | 7 | 6.25 | 4.25 | 9.75 |
| 2012 | 9.5 | | 10 | 1.76 | 8.5 | | | | | 4.75 | | 7.25 |
| R2 | 0.4104 | 0.1371 | 0.1912 | 0.258 | 0.0201 | 0.27 | 0.235 | 0.1758 | 0.0014 | 0.2277 | 0.0306 | 0.0576 |

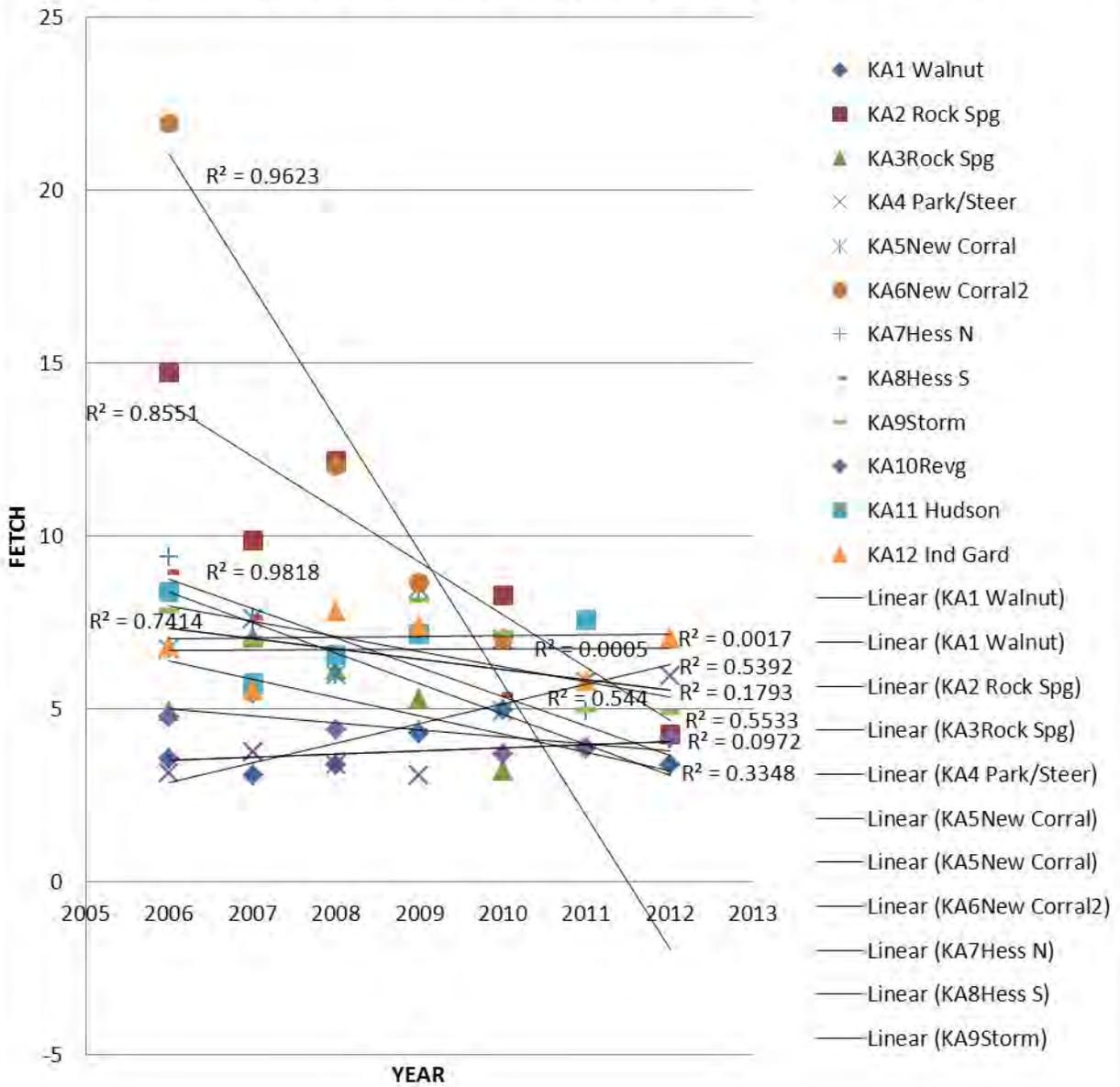
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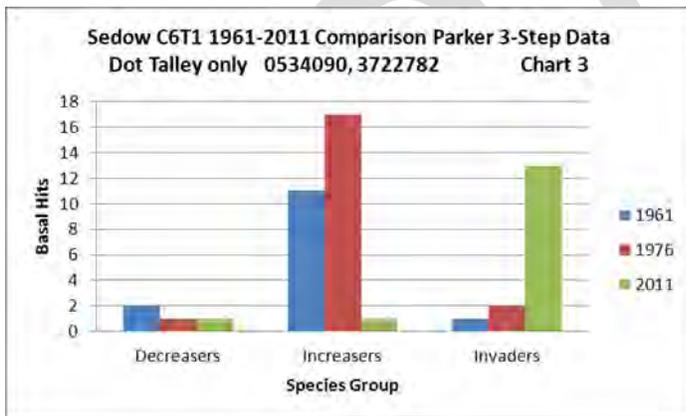
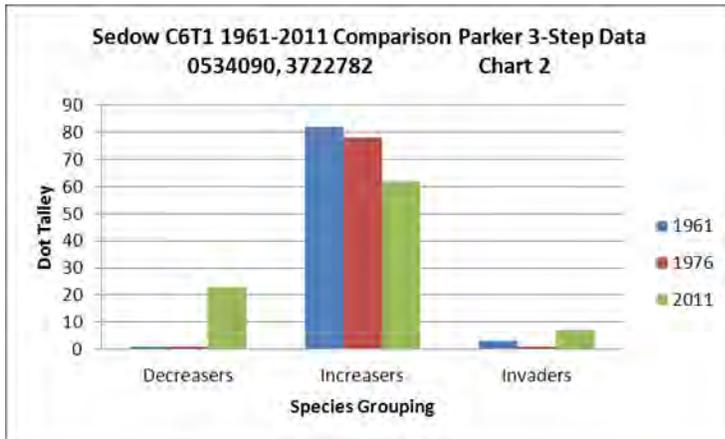
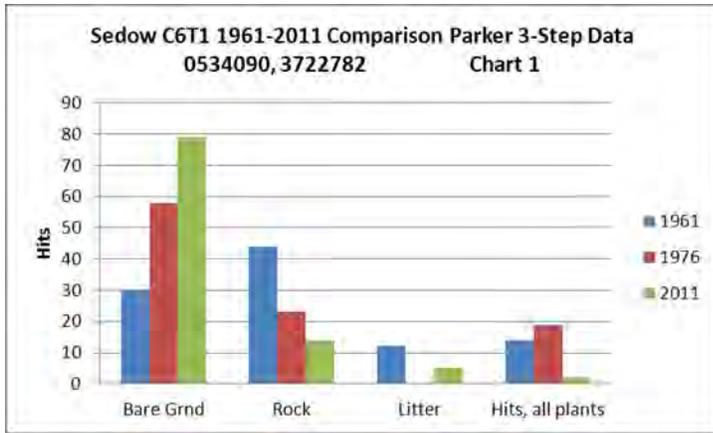
Sedow Live Perennial Cover by Year R Squared Trend Line

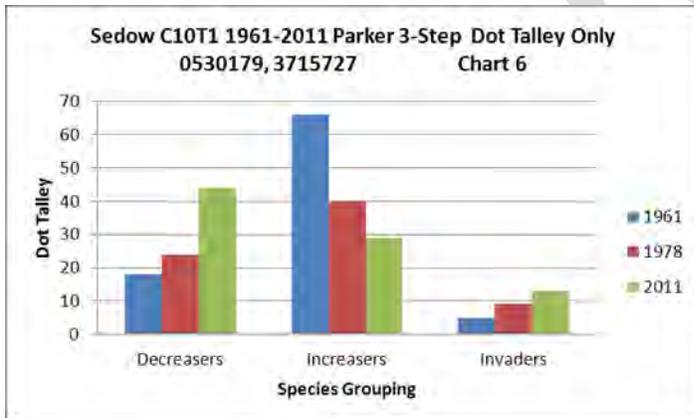
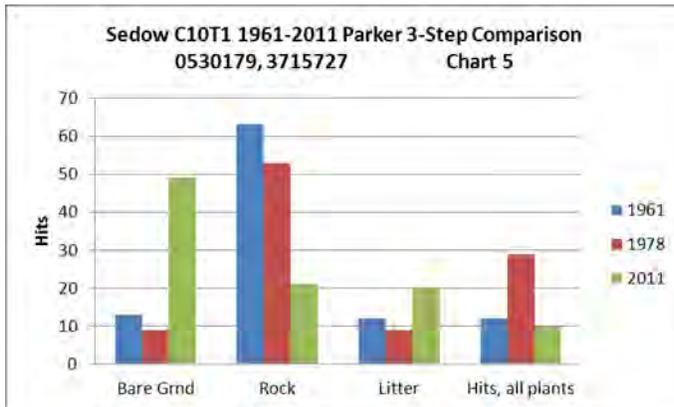
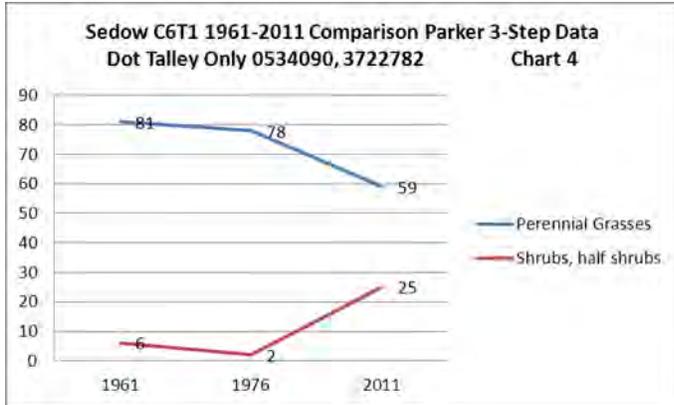


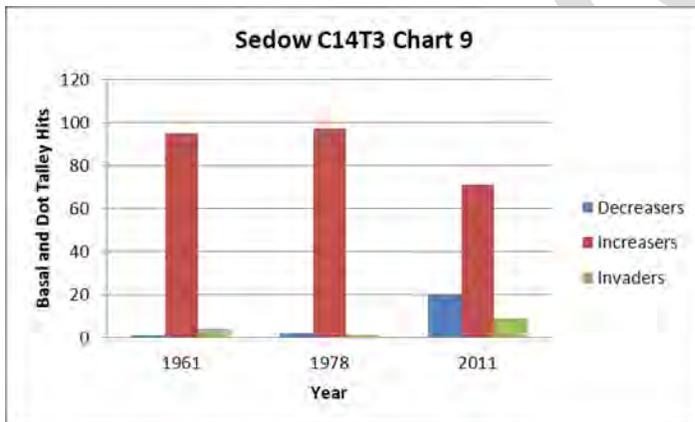
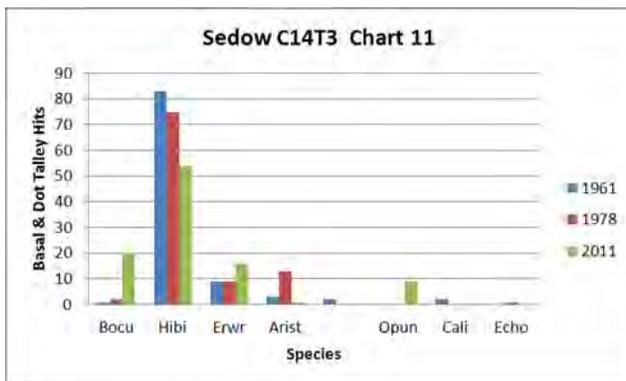
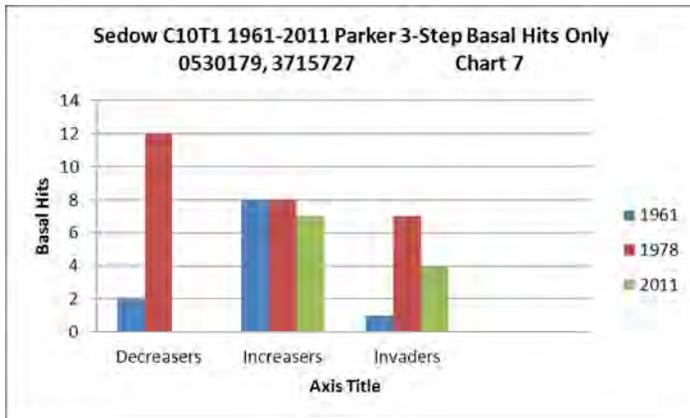
| | KA1 Walnut | KA2 Rock Spg | KA3 Rock Spg | KA4 Park/Steer | KA5 New Corral | KA6 New Corral2 | KA7 Hess N | KA8 Hess S | KA9 Storm | KA10 Revg | KA11 Hudson | KA12 Ind Gard |
|------|------------|--------------|--------------|----------------|----------------|-----------------|------------|------------|-----------|-----------|-------------|---------------|
| 2006 | 3.55 | 14.72 | 4.94 | 3.15 | 6.72 | 21.92 | 9.4 | 8.94 | 7.84 | 4.76 | 8.36 | 6.77 |
| 2007 | 3.06 | 9.87 | 7.05 | 3.73 | 7.61 | | 7.07 | 7.62 | 6.92 | 5.44 | 5.73 | 5.54 |
| 2008 | 3.38 | 12.17 | 6.12 | 3.38 | 5.96 | 12.04 | 6.39 | | 6.68 | 4.39 | 6.55 | 7.8 |
| 2009 | 4.28 | | 5.26 | 3.05 | 8.48 | 8.65 | 4.38 | | 8.15 | | 7.16 | 7.39 |
| 2010 | 4.97 | 8.27 | 3.21 | 6.99 | 4.94 | 7.01 | | 5.4 | 7.14 | 3.67 | | |
| 2011 | 3.84 | | | | 5.76 | | 4.94 | | 4.95 | 3.88 | 7.56 | 5.82 |
| 2012 | 3.38 | 4.24 | | 5.93 | | | | | 4.9 | 4.15 | | 7.02 |
| R2 | 0.0972 | 0.8551 | 0.3348 | 0.5392 | 0.1793 | 0.9623 | 0.7414 | 0.9818 | 0.544 | 0.5533 | 0.0017 | 0.0005 |

Sedow Fetch Distance to Nearest Perennial Plant



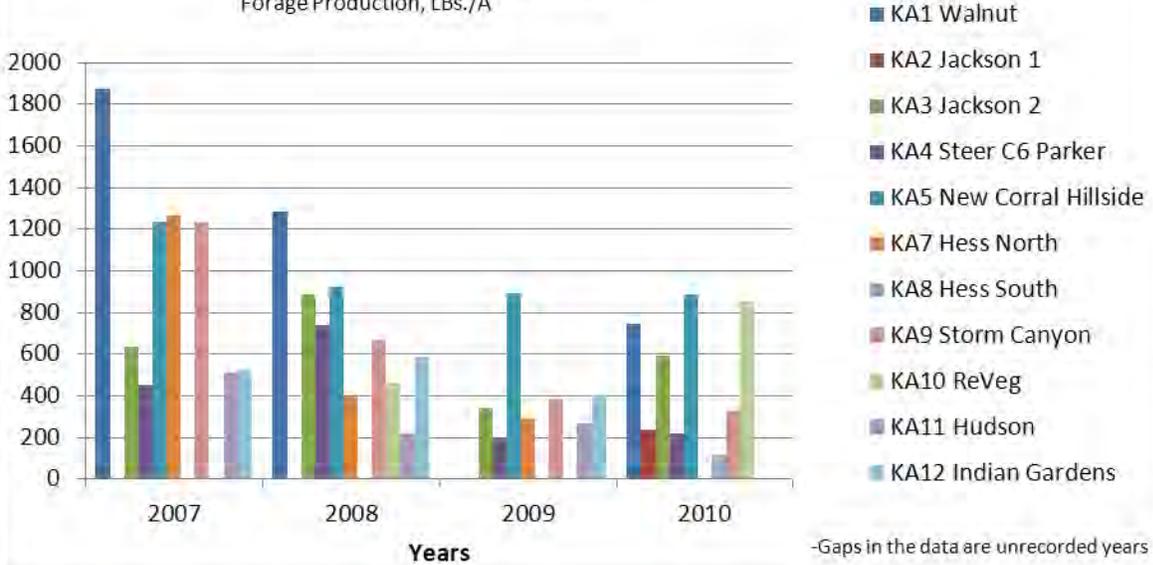




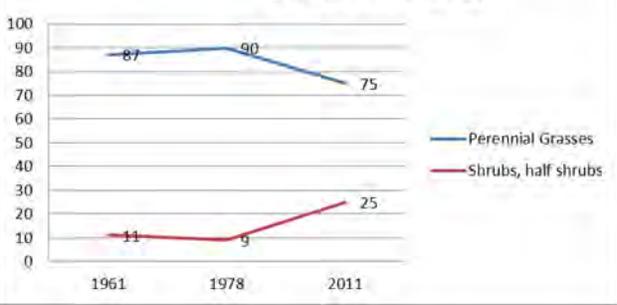


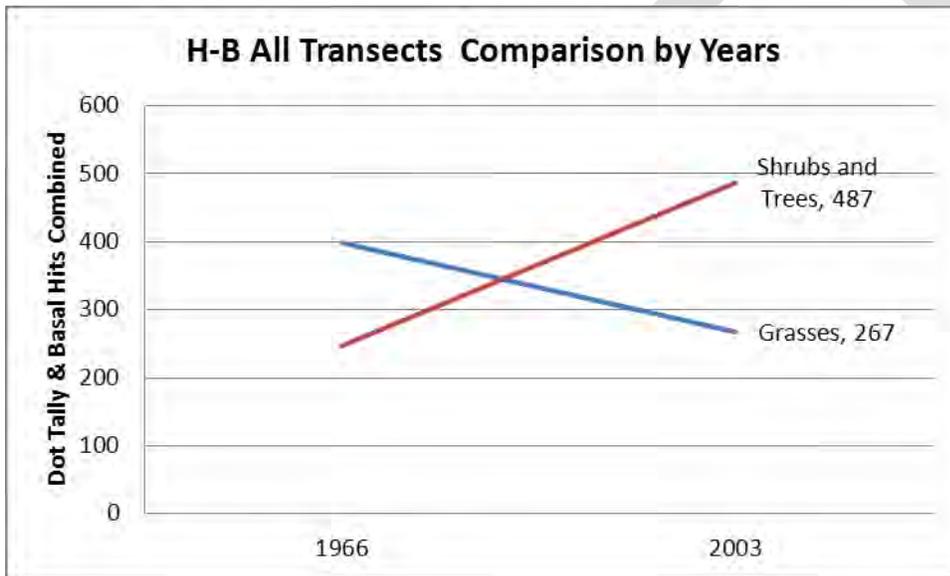
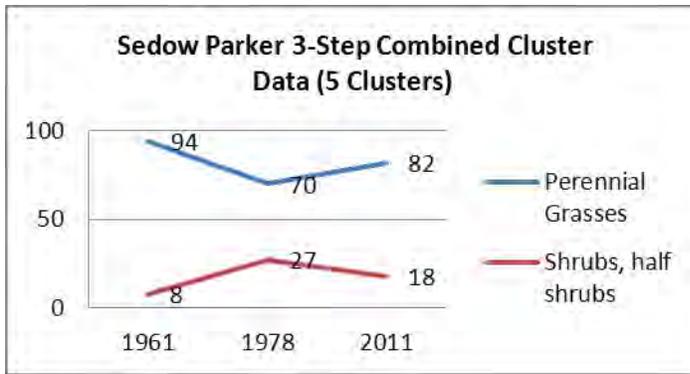
Sedow Allotment Unadjusted Forage Production

*Standing crop not adjusted for grazing
Forage Production, Lbs./A

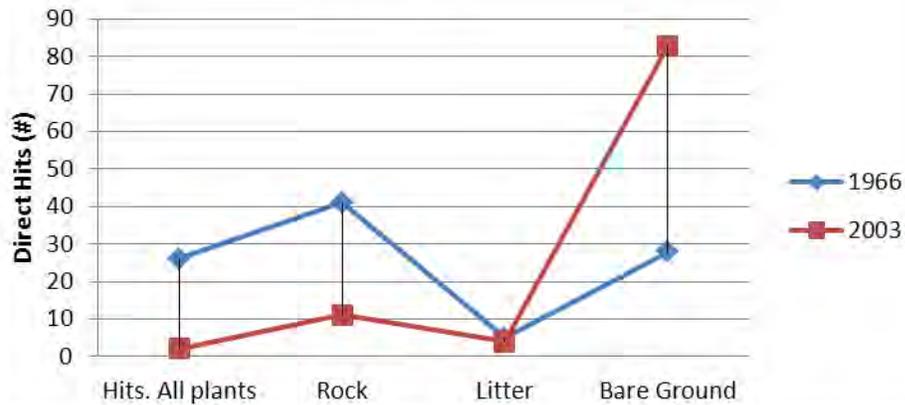


Sedow C14T3 Comparison Perennial Grasses & Shrubs Chart 10

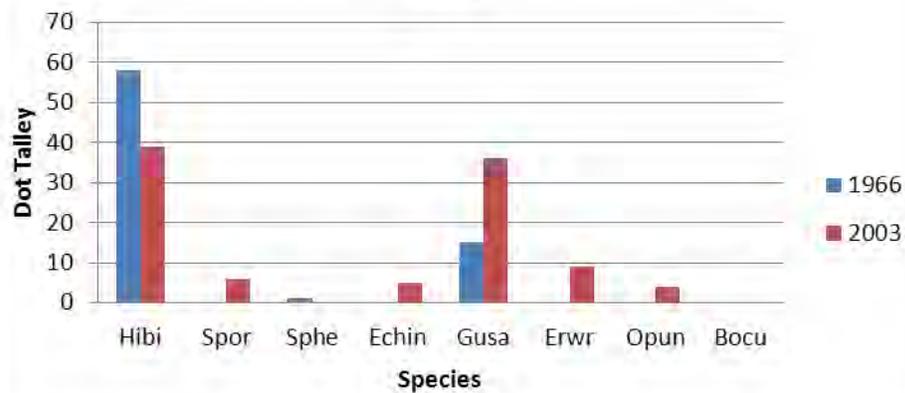




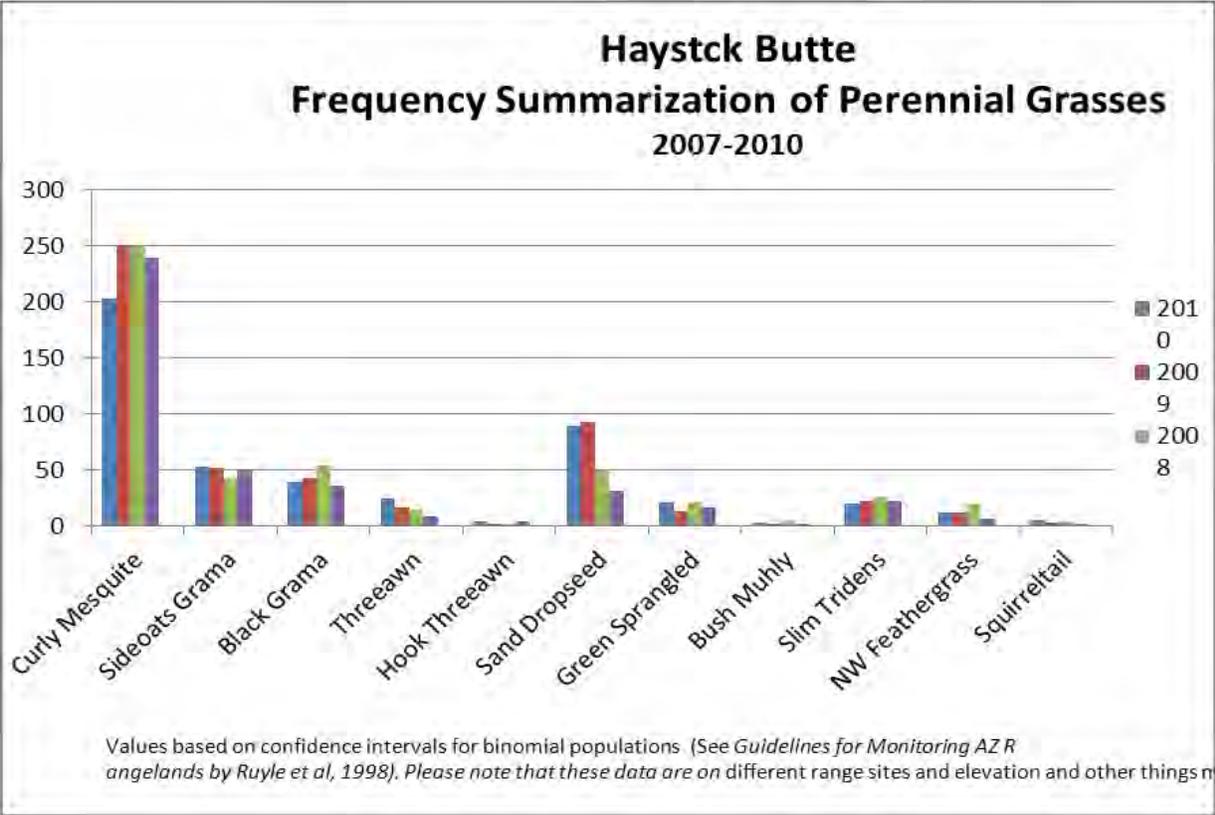
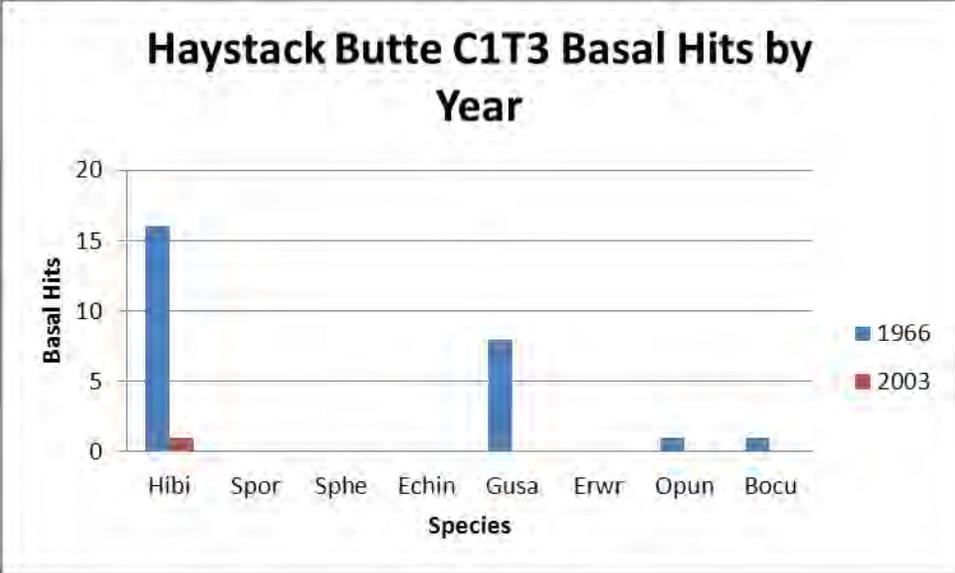
Haystack Butte Cluster 1, Transect 3 by year



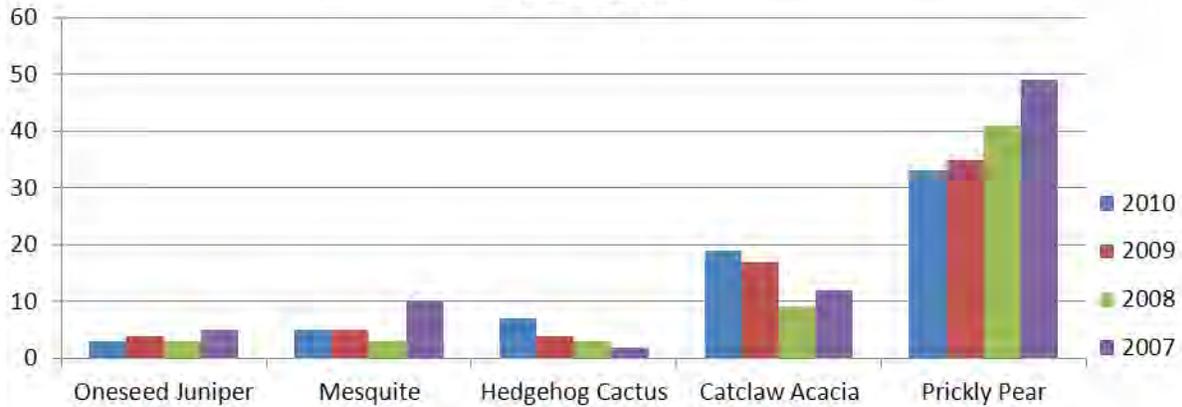
Haystack Butte C1T3 Dot Talley by Year



| | Basal Hits | Basal Hits |
|-------|------------|------------|
| | 1966 | 2003 |
| Hibi | 16 | 1 |
| Spor | | 0 |
| Sphe | 0 | |
| Echin | | 0 |
| Gusa | 8 | 0 |
| Erwr | | 0 |
| Opun | 1 | 0 |
| Bocu | 1 | |

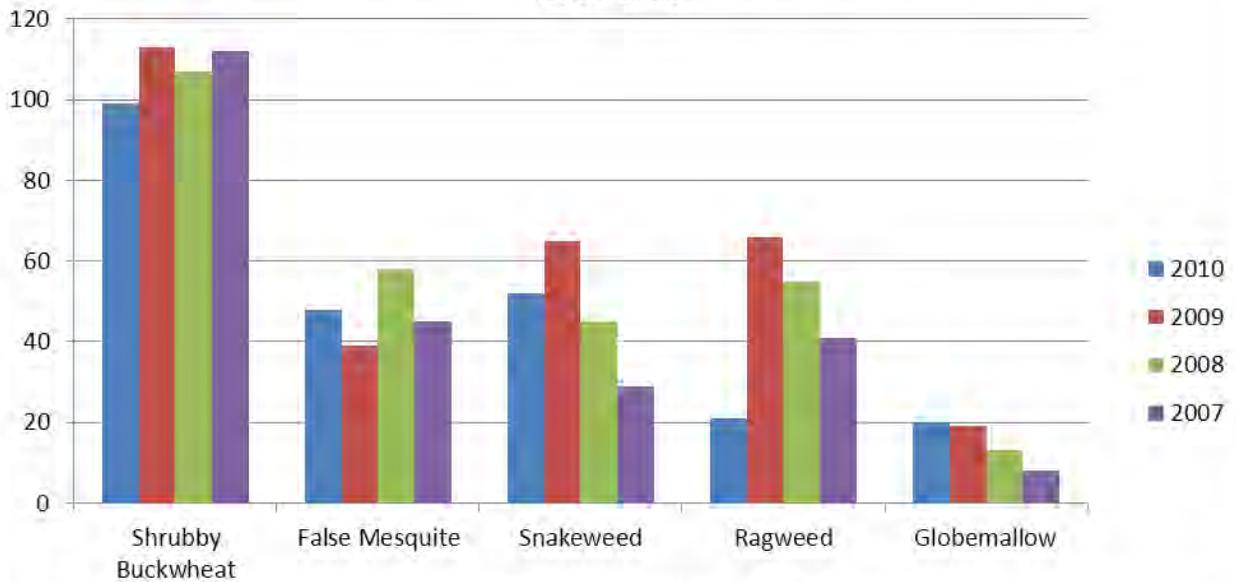


Haystack Butte Frequency Summarization for Trees, Shrubs, Cacti 2007-2010



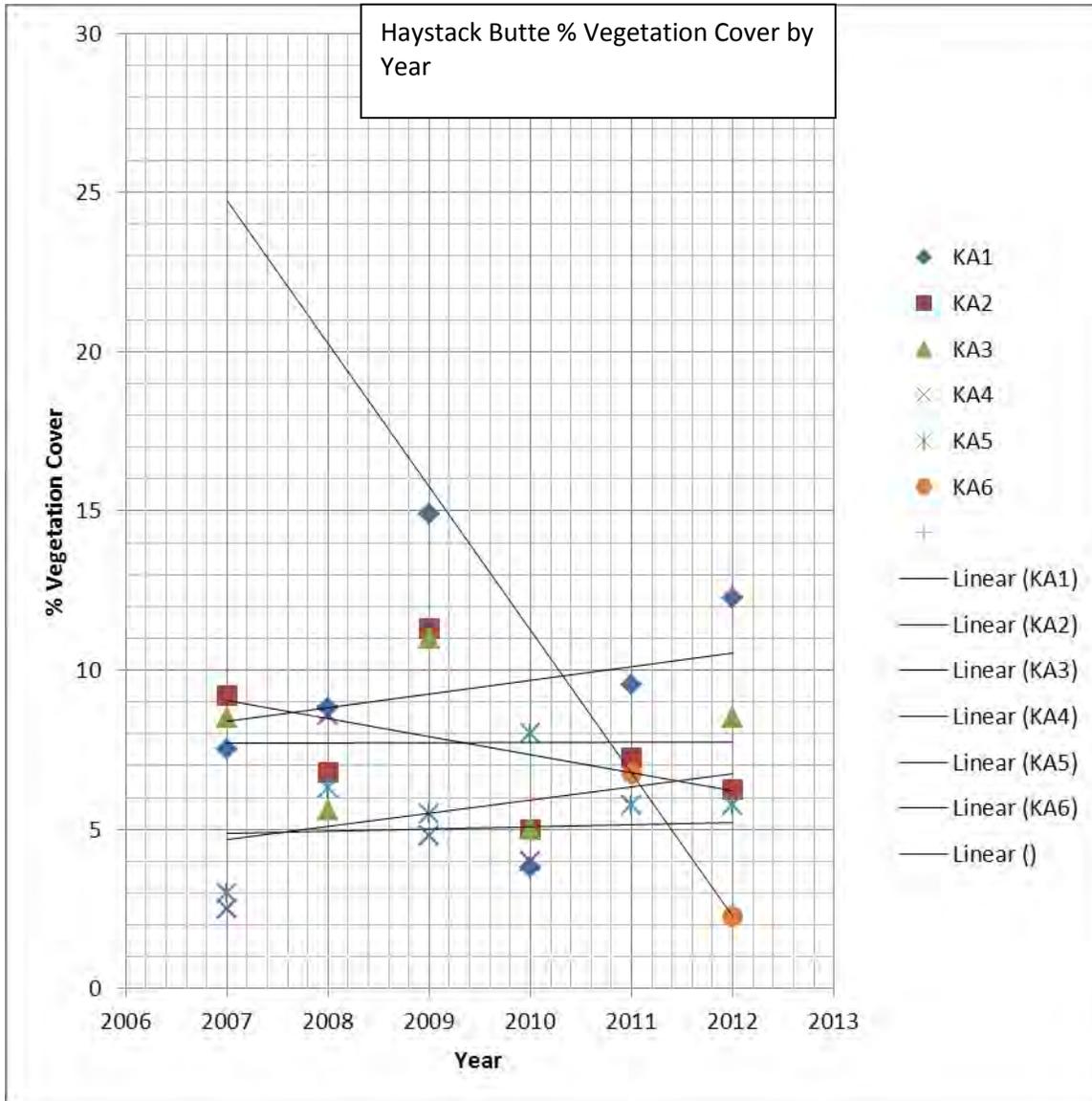
Values based on confidence intervals for binomial populations (See *Guidelines for Monitoring AZ Rangelands* by Ruyle et al, 1998). Please note that these data are on different range sites and elevation and other things may differ.

Haystack Butte Frequency Summarization of Half Shrubs/Forbs 2007-2010



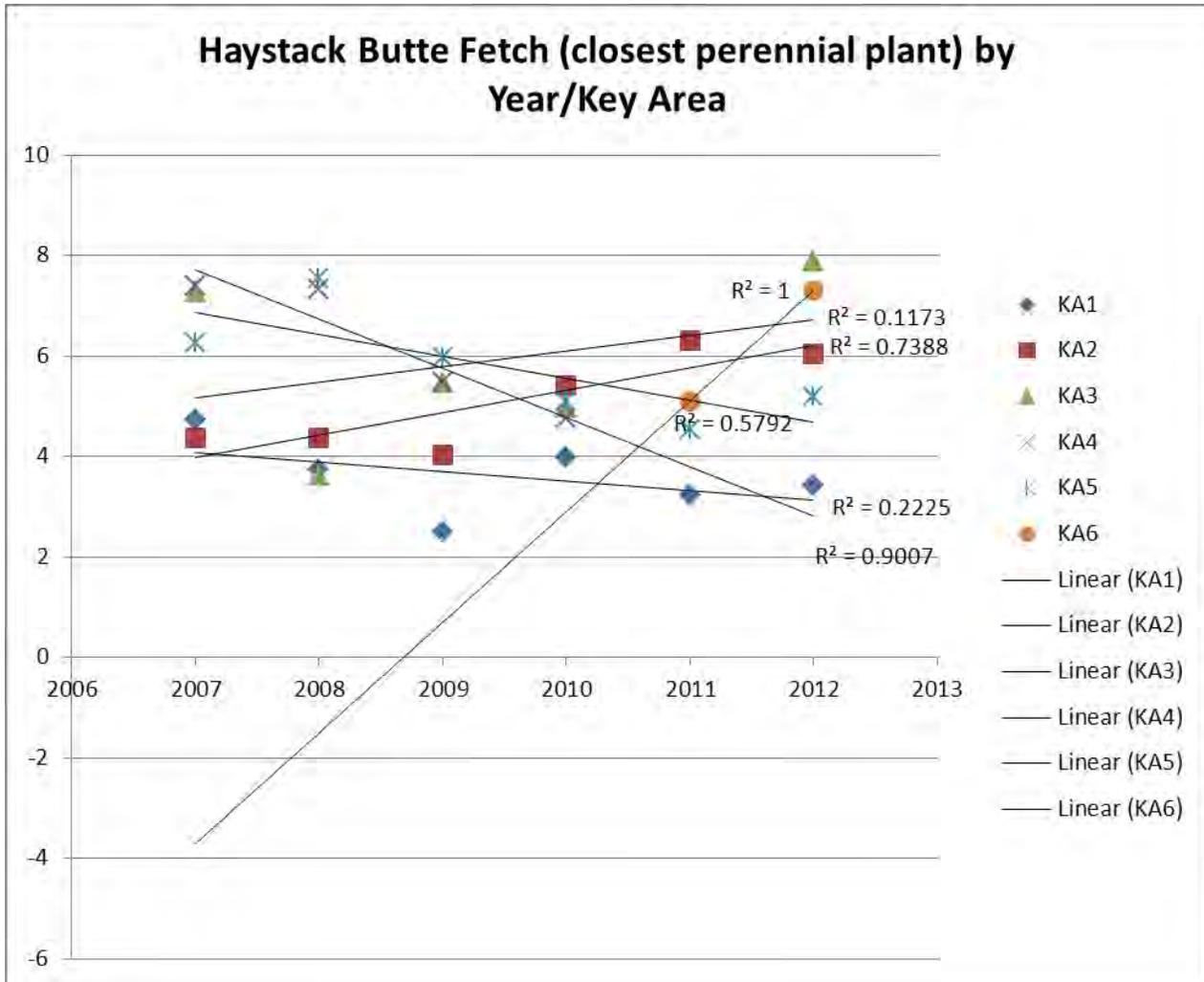
Values based on confidence intervals for binomial populations (See *Guidelines for Monitoring AZ Rangelands* by Ruyle et al, 1998). Please note that these data are on different range sites and elevation and other things may differ.

| | KA1 | KA2 | KA3 | KA4 | KA5 | KA6 | | |
|------|-------|--------|-----|--------|--------|------|--|--|
| 2007 | 7.5 | 9.2 | 8.5 | 2.5 | 3 | | | |
| 2008 | 8.8 | 6.8 | 5.6 | 8.6 | 6.3 | | | |
| 2009 | 14.9 | 11.3 | 11 | 4.8 | 5.5 | | | |
| 2010 | 3.8 | 5 | 5 | 4 | 8 | | | |
| 2011 | 9.55 | 7.25 | | | 5.75 | 6.75 | | |
| 2012 | 12.25 | 6.25 | 8.5 | | 5.75 | 2.25 | | |
| R2 | 0.043 | 0.2167 | | 0.0012 | 0.2345 | 1 | | |



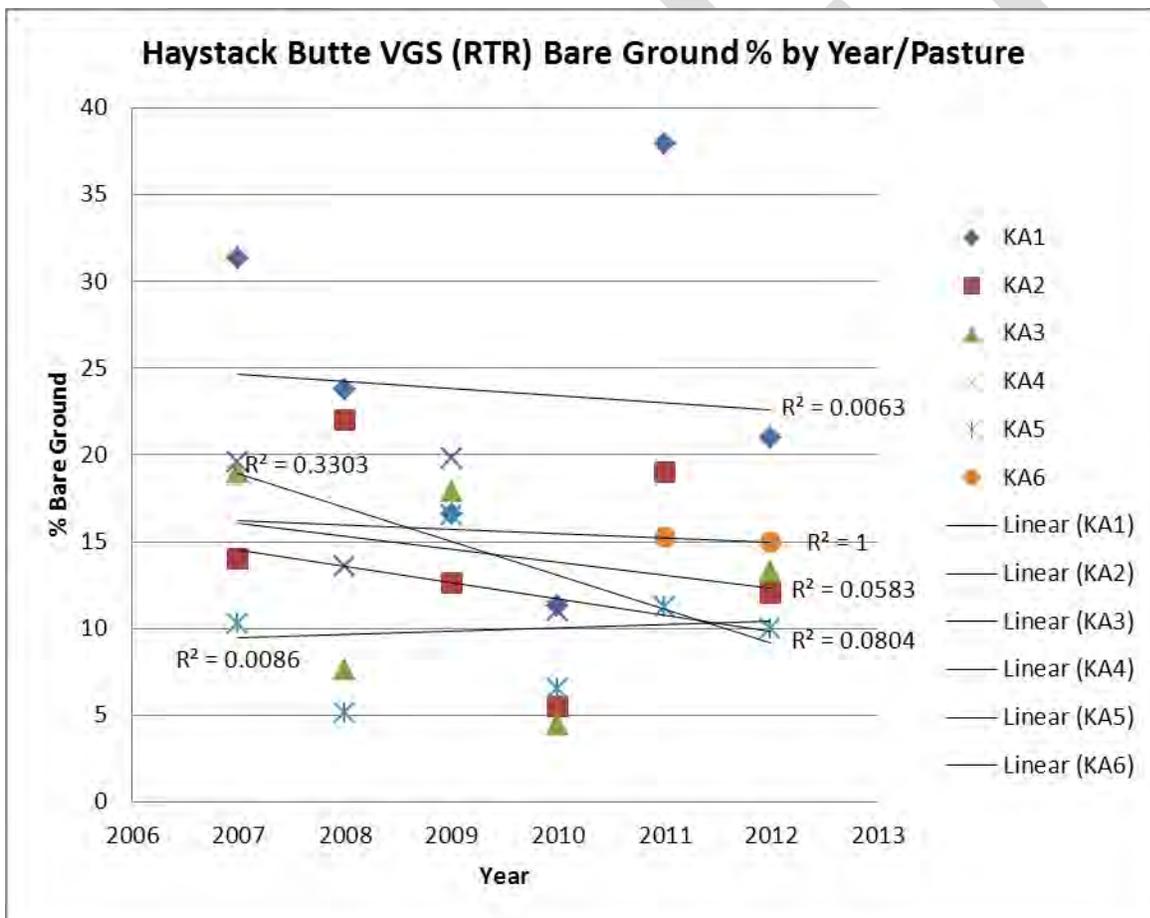
Haystack Butte % Vegetative Cover by Year/Key Area

| | KA1 | KA2 | KA3 | KA4 | KA5 | KA6 |
|------|--------|--------|--------|--------|--------|-----|
| 2007 | 4.73 | 4.37 | 7.29 | 7.4 | 6.26 | |
| 2008 | 3.73 | 4.37 | 3.61 | 7.33 | 7.54 | |
| 2009 | 2.51 | 4.02 | 5.45 | 5.48 | 5.98 | |
| 2010 | 3.97 | 5.41 | 4.98 | 4.75 | 5.09 | |
| 2011 | 3.23 | 6.32 | | | 4.54 | 5.1 |
| 2012 | 3.42 | 6.04 | 7.88 | | 5.19 | 7.3 |
| R2 | 0.2225 | 0.7388 | 0.1173 | 0.9007 | 0.9007 | 1 |



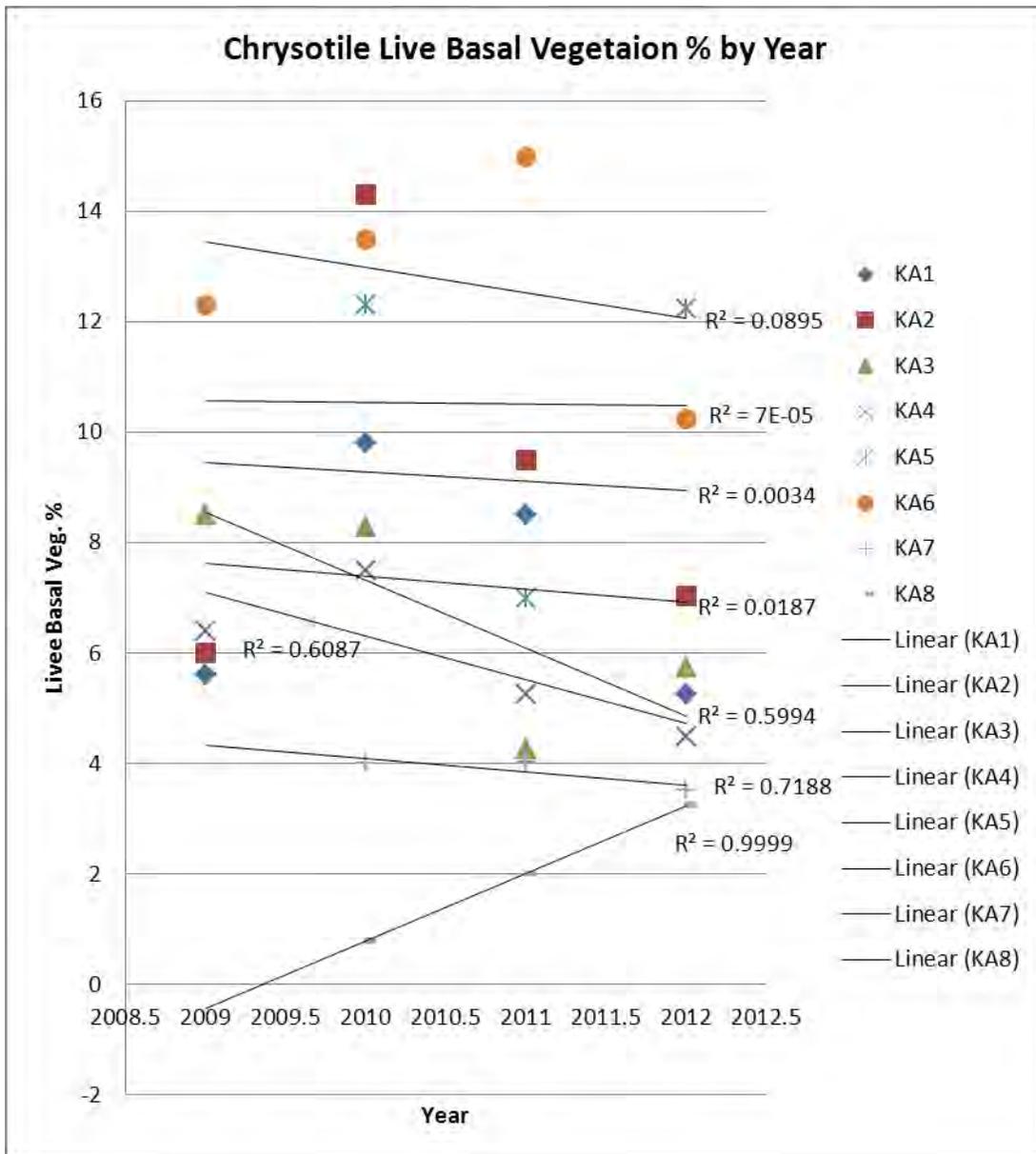
| | KA1 | KA2 | KA3 | KA4 | KA5 | KA6 |
|------|--------|--------|--------|--------|--------|-------|
| 2007 | 31.3 | 14 | 19 | 19.6 | 10.3 | |
| 2008 | 23.8 | 22 | 7.6 | 13.6 | 5.1 | |
| 2009 | 16.6 | 12.6 | 17.9 | 19.8 | 16.5 | |
| 2010 | 11.3 | 5.5 | 4.5 | 11 | 6.5 | |
| 2011 | 37.94 | 19 | | | 11.25 | 15.25 |
| 2012 | 21 | 12 | 13.25 | | 10 | 15 |
| R2 | 0.0063 | 0.0583 | 0.0804 | 0.3303 | 0.0086 | 1 |

Haystack Butte Bare Ground % and R-Squared Values (R2) by Year



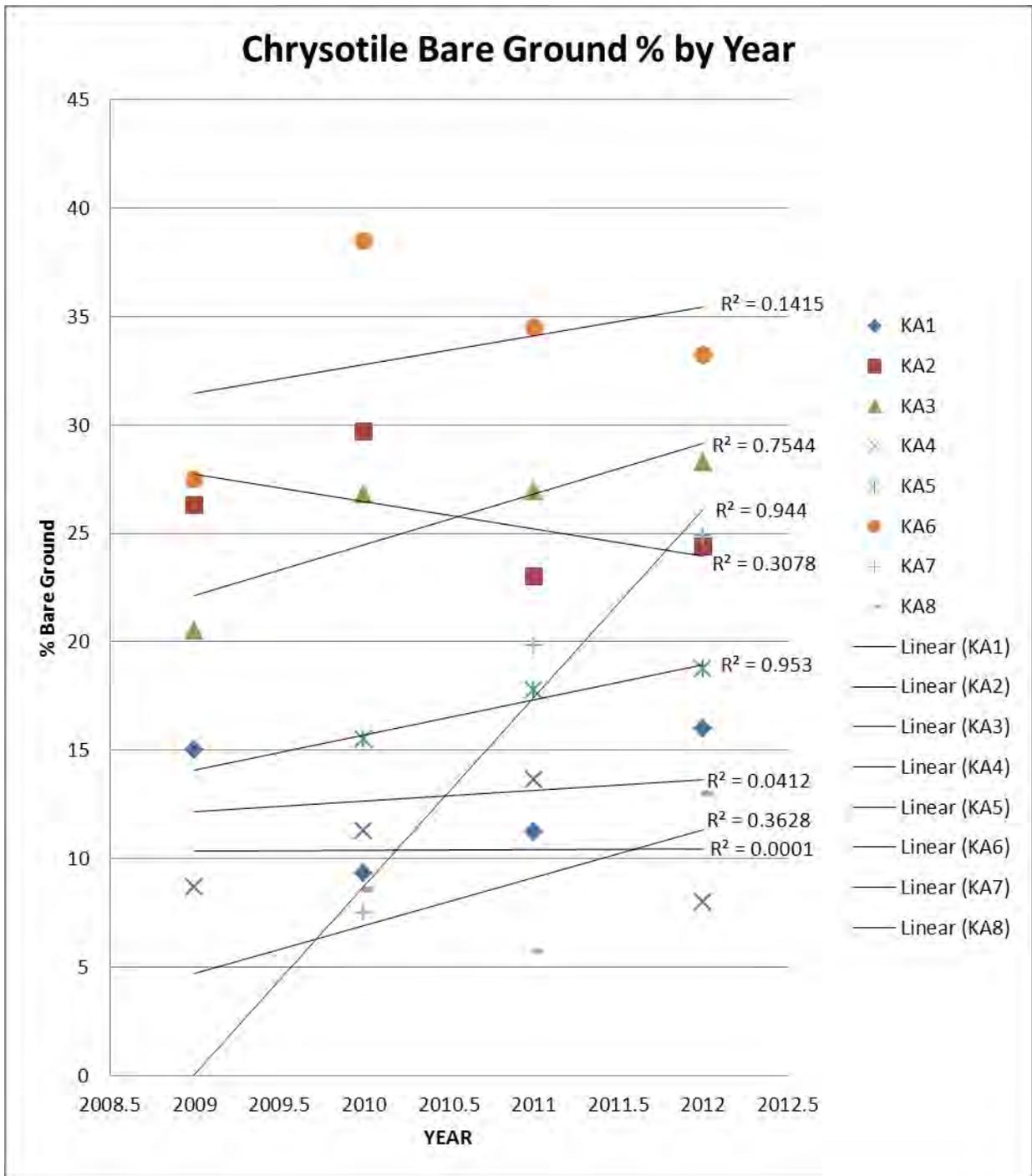
| | KA1 | KA2 | KA3 | KA4 | KA5 | KA6 | KA7 | KA8 |
|------|--------|--------|--------|--------|-------|--------|--------|--------|
| 2009 | 5.6 | 6 | 8.5 | 6.4 | | 12.3 | | |
| 2010 | 9.8 | 14.3 | 8.3 | 7.5 | 12.3 | 13.5 | 4 | 0.8 |
| 2011 | 8.5 | 9.5 | 4.28 | 5.26 | 7 | 15 | 4.02 | 2 |
| 2012 | 5.25 | 7.04 | 5.75 | 4.5 | 12.25 | 10.25 | 3.52 | 3.25 |
| | 0.0187 | 0.0034 | 0.5994 | 0.6087 | | 0.0895 | 0.7188 | 0.0999 |

Live Basal Veg % Chrysotile by Year



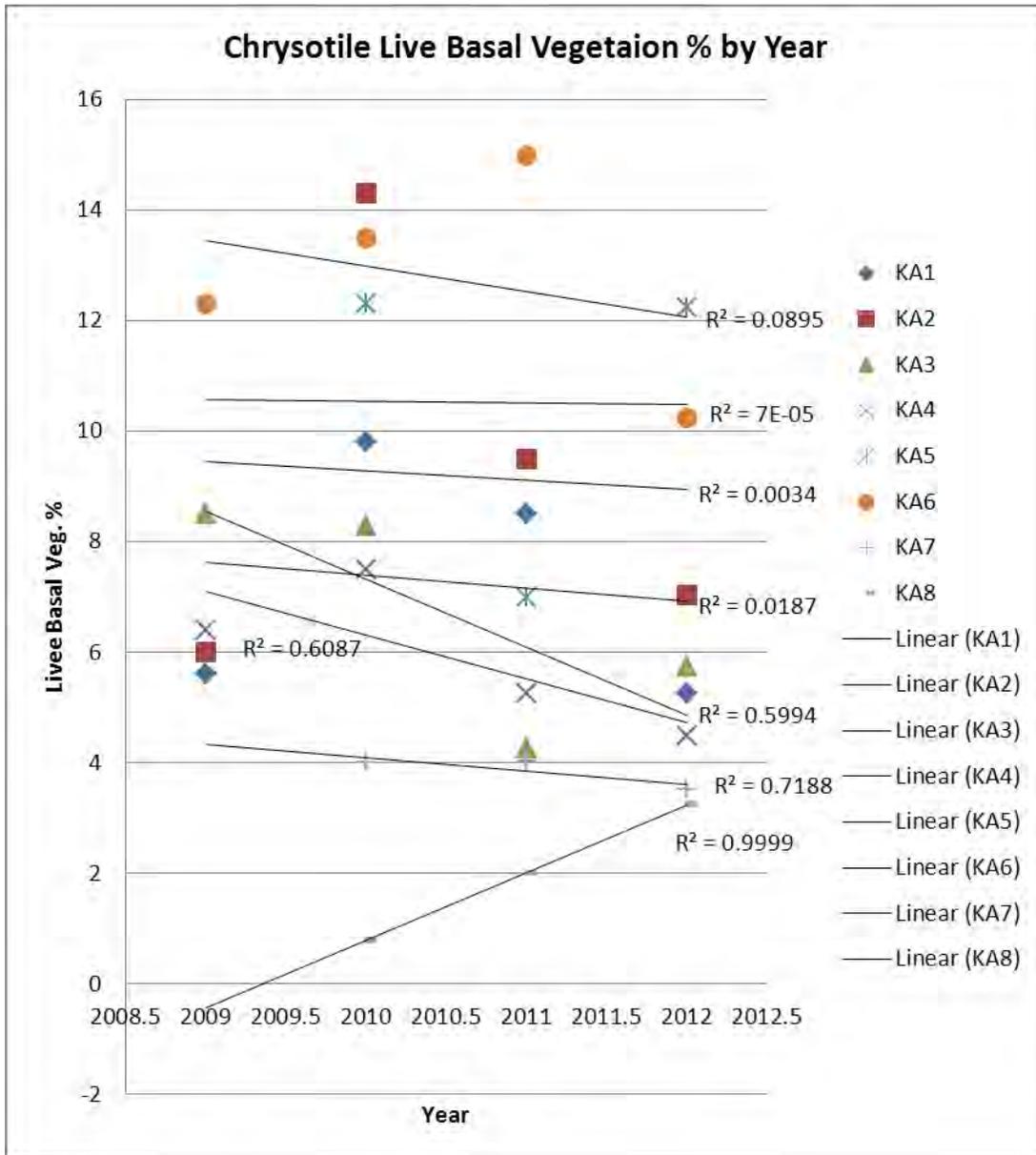
| | KA1 | KA2 | KA3 | KA4 | KA5 | KA6 | KA7 | KA8 |
|------|--------|--------|--------|--------|-------|--------|-------|--------|
| 2009 | 15 | 26.3 | 20.5 | 8.7 | | 27.5 | | |
| 2010 | 9.3 | 29.7 | 26.8 | 11.3 | 15.5 | 38.5 | 7.5 | 8.6 |
| 2011 | 11.25 | 23 | 26.95 | 13.64 | 17.75 | 34.5 | 19.85 | 5.75 |
| 2012 | 16 | 24.37 | 28.25 | 8 | 18.75 | 33.25 | 24.87 | 13 |
| R2 | 0.0412 | 0.3078 | 0.7544 | 0.0001 | 0.953 | 0.1415 | 0.944 | 0.3628 |

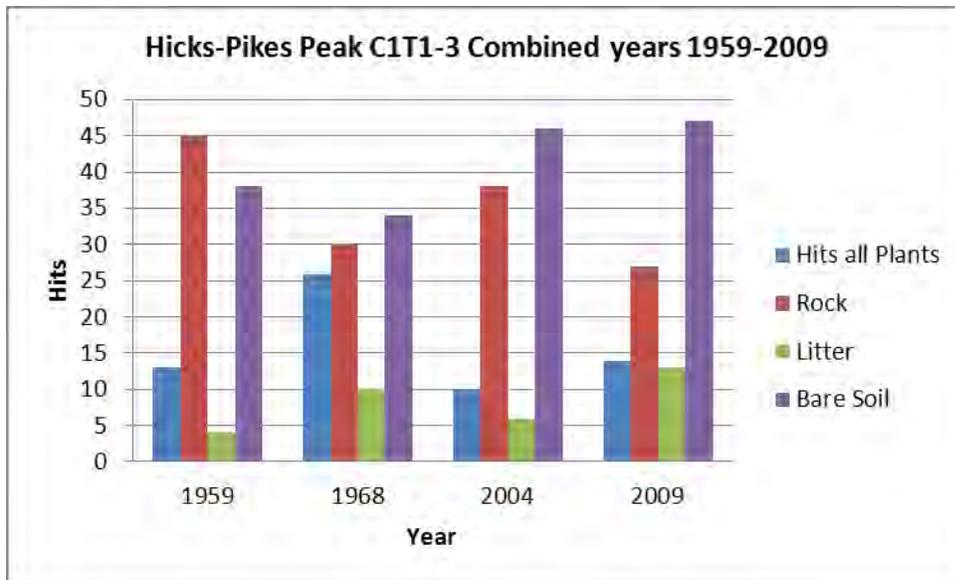
Chrysotile Bare Ground % by Year



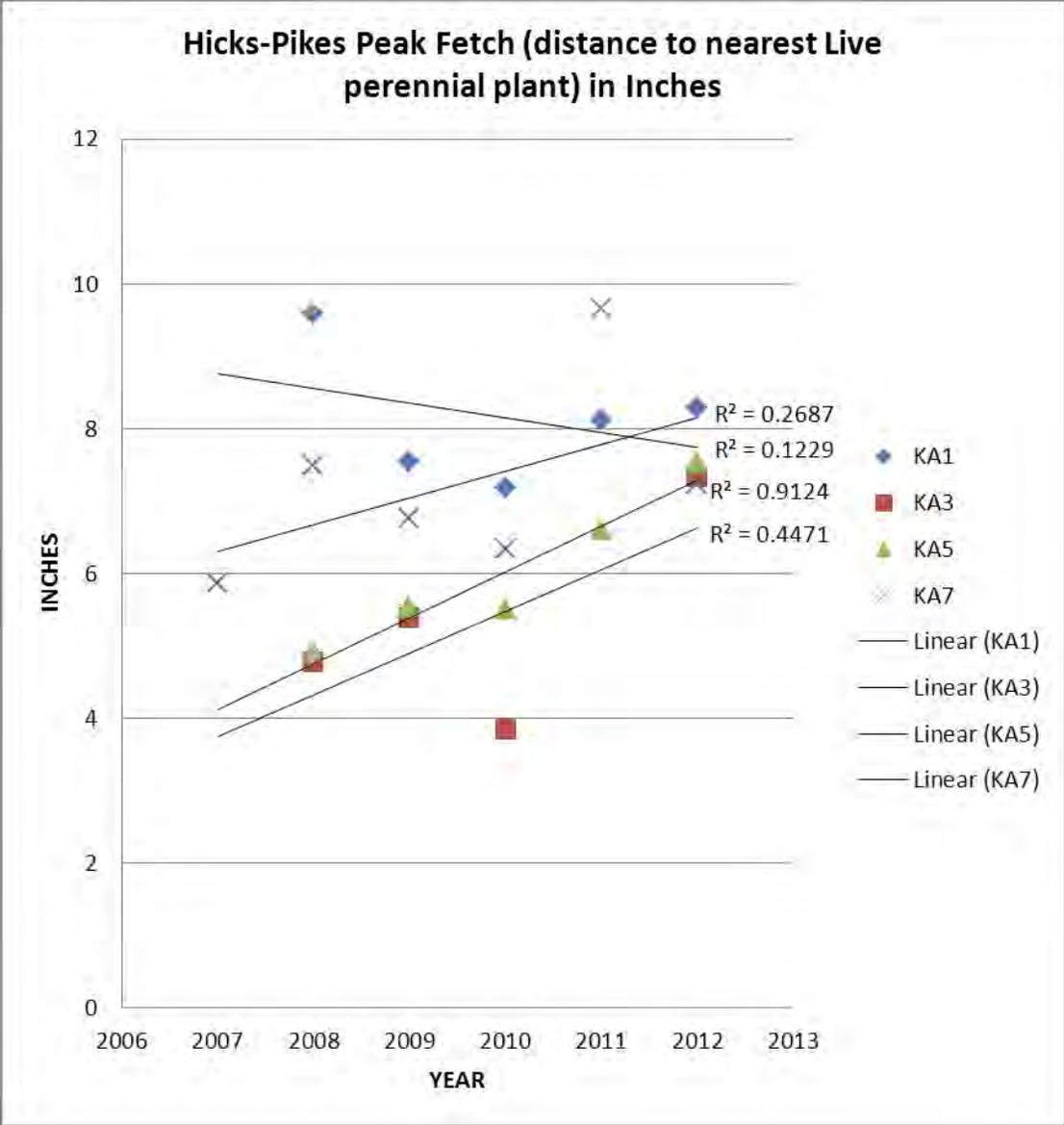
| | | | | | | | | |
|------|--------|--------|--------|--------|--------|-------|--------|-------|
| 2011 | 5.53 | 2.56 | 3.97 | 4.49 | 3.08 | 3.69 | 6.86 | 6.3 |
| 2012 | 5.36 | 3.51 | 3.96 | 10.7 | 2.14 | 3.61 | 7.45 | 6.8 |
| R2 | 0.7588 | 0.0699 | 0.8914 | 0.6479 | 0.9286 | 0.668 | 0.9872 | 0.431 |
| | | | | | | | | |

Chrysotile Fetch (distance to nearest perennial Plant) in inches



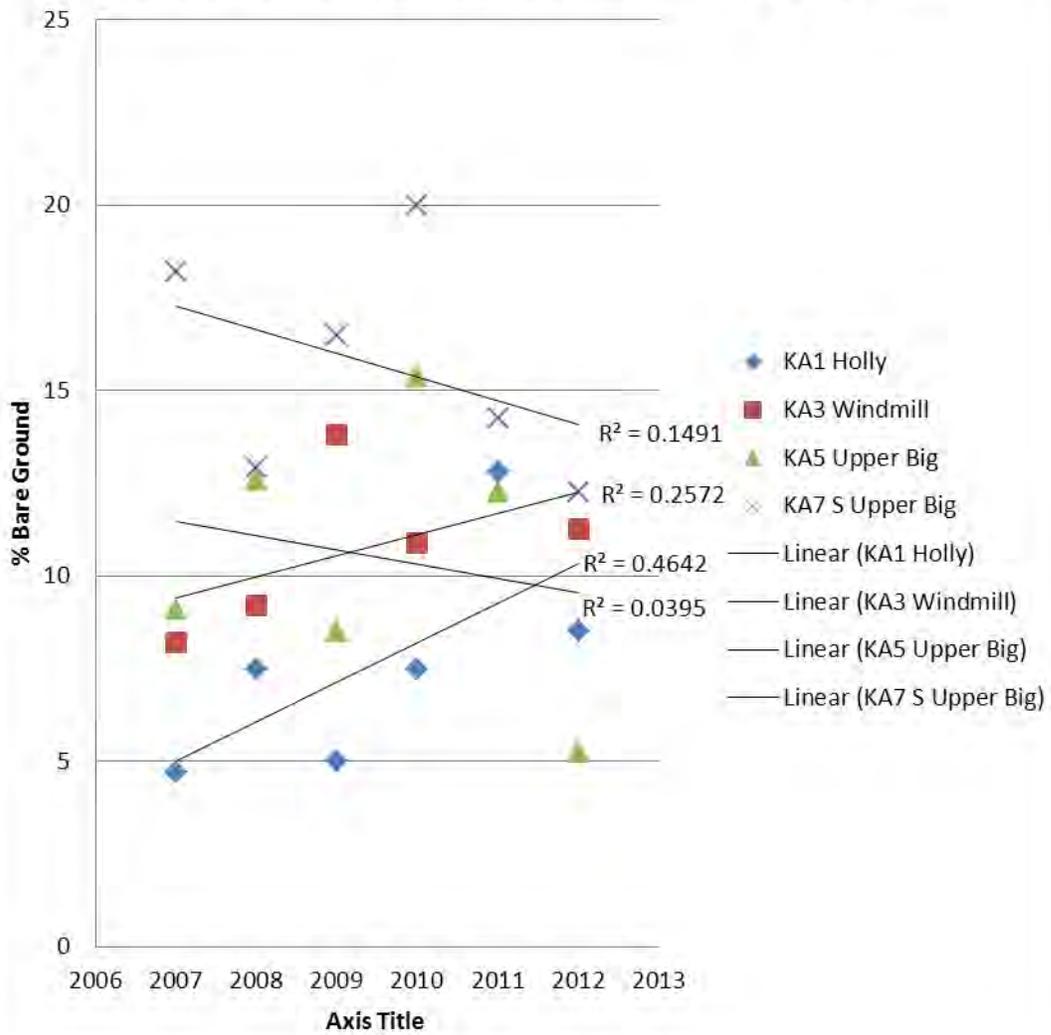


| | KA1 | KA3 | KA5 | KA7 |
|------|--------|--------|--------|--------|
| 2008 | 9.59 | 4.78 | 4.91 | 7.49 |
| 2009 | 7.54 | 5.38 | 5.54 | 6.76 |
| 2010 | 7.19 | 3.84 | 5.5 | 6.34 |
| 2011 | 8.12 | | 6.61 | 9.66 |
| 2012 | 8.28 | 7.33 | 7.54 | 7.23 |
| R2 | 0.1229 | 0.4471 | 0.9124 | 0.2687 |



| | KA1 Holly | KA3 Windmill | KA5 Upper Big | KA7 S Upper Big |
|--------------------------------|-----------|--------------|---------------|-----------------|
| 2007 | 4.7 | 8.2 | 9.1 | 18.2 |
| 2008 | 7.5 | 9.2 | 12.6 | 12.9 |
| 2009 | 5 | 13.8 | 8.5 | 16.5 |
| 2010 | 7.5 | 10.9 | 15.4 | 20 |
| 2011 | 12.81 | | 12.25 | 14.25 |
| 2012 | 8.5 | 11.25 | 5.25 | 12.25 |
| R2 | 0.4642 | 0.2572 | 0.0395 | 0.1491 |
| Hicks-Pikes Peak Bare Ground % | | | | |

Hicks-Pikes Peak Bare Ground % by Year



| | KA1 Holly | KA3 Wind | KA5 Uppe | KA7 S Upper Big |
|--|-----------|----------|----------|-----------------|
| 2007 | 11.1 | 6.9 | 9.3 | 2.8 |
| 2008 | 6.3 | 9 | 7.6 | 3.8 |
| 2009 | 9.5 | 9.8 | 10 | 6.6 |
| 2010 | 5 | 14.2 | 11.6 | 4.5 |
| 2011 | 1.76 | | 1.75 | 0.5 |
| 2012 | 9.5 | 4.5 | 3.75 | 1.5 |
| R2 | 0.1597 | 0.0205 | 0.3723 | 0.2045 |
| Hicks-Pikes Peak Live Basal Vegetation % | | | | |

