

Coordinated Resource Management Plan for Rose Tree Ranch

Introduction:

This livestock grazing management plan has been prepared as a guide for the management and administration of the ongoing livestock grazing operation on the Rose Tree Ranch. The plan identifies the management objectives, identifies existing and proposed improvements to the ranch, outlines the manner in which livestock grazing operations will be conducted, details the procedures for evaluation and modification to the livestock grazing plan, discusses issues related to fire management, and provides information regarding a monitoring plan to measure the effectiveness of management actions. The management objectives for this plan were developed to preserve, protect, and enhance the multiple-use values of the Rose Tree Ranch. Applicable federal and state guidelines are in force.

The Rose Tree Ranch is located entirely in Santa Cruz County, Arizona. It is located approximately 9 miles east of Sonoita, Arizona, and approximately 59 miles southeast of Tucson. It lies just west of the Mustang Mountains, and north of Elgin, Arizona. The entrance to the ranch is on the Upper Elgin Road, off of AZ Highway 82, east of Sonoita. All of the ranch's watersheds drain into the Babocomari River which is a tributary of the San Pedro River. Elevation of the ranch ranges between 4,770 and 6,470 feet. The ranch is owned and managed by Mr. Bill Brake and Mr. Al Wilcox. There is an onsite manager who is responsible for the day to day operation of the ranch. The ranch consists of State Grazing Lease #05-138, Bureau of Land Management Lease #06043 Rosetree, and private land.

The Rose Tree Ranch has a long and fascinating history. It was originally a Spanish Land Grant in the early 1600's and is one of the few ranches in the Sonoita Valley to be fairly intact from its origin. It also has the distinction of being a ranch that has continuously raised cattle over its long history. These two facts are amazing considering the encroachment of land development and other land uses. Originally, the ranch was over 12,000 acres and consisted of deeded land, State Trust Land grazing leases, and a Bureau of Land Management lease.

In the early 1600's grapes were grown on the Rose Tree to provide wine for the Catholic missions in the Santa Cruz Valley. This enterprise essentially disappeared by the late 1600's because of the forays of the Apaches. Features of the Rose Tree Ranch include prehistoric petroglyphs and Apache ruins. This area in the Sonoita Valley was under the control of the Apaches until the latter part of the 1800's. This was the heart of Cochise country. Cochise surrendered to the U.S. Army in 1871; he died in 1874. Following Cochise's surrender, Geronimo assumed the leadership of the Chiricahuan Apaches. Geronimo continued the defense of his homeland until he surrendered to Lieutenant George F. Cook, U.S. Army, in 1886. This area only became hospitable to white settlers about the time Tombstone became settled in the early 1880's.

In the mid-1930's the Stern family built the original house. The current owner, Mr. Bill Brake, and his family still use the house. Sometime prior to 1959, Harriet Whorton purchased the Rose Tree Ranch. For many years she ran it as a guest ranch with her husband; it was known as the Whorton Guest Ranch. The Rose Tree Ranch has several cement dams located in various pastures. Two dams of note are the Old Forester Dam and the Jack Daniels Dam. Both dams were built by Roy L. Green; the Old Forester Dam was built May 15, 1955, and the Jack Daniels Dam in December of 1956.

In 1959, Tom Hunt and Bill Lieurance became the new owners. They ran 1,200 head of sheep on the ranch during the summer of 1960. The sheep were grazed on a pasture on the east side of the Upper Elgin Road right along the south side of Highway 82. Eighteen months after taking ownership of the ranch, Bill Lieurance passed away. It took Tom Hunt about one year to liquidate all of the Rose Tree assets. In 1961, the Rose Tree Ranch became Rose Tree Ranches, Inc. In 1961/1962, Raymond A. Rich, owner of the Rail X Ranch, bought the Rose Tree Ranch property. In 1988, Mr. Rich was involved in a private land exchange, which resulted in the Bureau of Land Management acquiring some of the private lands of the Rose Tree Ranch. Prior to the land exchange in 1988, the ranch was in single ownership for about 27 years. The remaining parts of the ranch were sold to Bill Brake in 2000.

The ranch is currently co-owned by Mr. Bill Brake and Mr. Al Wilcox. Mr. Brake is in the petroleum business. He is Vice-President of the Arizona Cattle Growers' Association, and Vice-Chair of the School of Renewable Natural Resources Advisory Council at the University of Arizona. Mr. Brake operates several other ranches in Arizona. Mr. Wilcox is the former President of San Xavier Rock and Gravel in Tucson, and has previously owned a horse business.

The Rose Tree Ranch is a cow calf operation with Red Angus and Red Angus cross cattle managed under a prescribed rest rotation grazing system.

Objectives:

The objectives are to maintain the economic viability of the livestock operation while maintaining or improving the rangeland resources over the long term. The overall objective of this plan is to maintain or improve the ecological condition and trend on Rose Tree Ranch. The plan will also assure the physiological requirements for plant growth and reproduction for key forage plants. Average utilization on key species will be limited to 50% of current year's growth.

Vegetation:

The vegetation on the Rose Tree Ranch is within Major Land Resource Area 41, Southern Arizona Basin and Range. The ranch lies on at the upper end of the 12-16" precipitation zone and gradually grades into the 16-20" precipitation zone with increases in elevation. The vegetation is predominantly within the Southern Arizona Semi-desert Grassland biotic community, LRU 41-3, at the lower elevations, and grades into the Mexican Oak-Pine Woodland and Oak Savanna, LRU 41-1, with increases in elevation. Perennial grasses, shrubs, and succulents dominate the semi-desert grasslands, while the upper elevations are predominantly larger shrub species

and oaks. In the extreme eastern portion of the ranch there is some influence from LRU 41-2, the Chihuahuan-Sonoran Desert Shrub Mix biotic community. Sandpaper bush is a plant from this biotic community. It is found abundantly on the ranch in the southeast corner of the Chapo Beatty pasture.

Objective: Limit the average biomass utilization approximately 50% of the current year's growth on "key" perennial grass species; allow increased utilization to 80% when grazing Lehmann lovegrass depending on pasture condition and cattle health.

Goal 1: Ensure that the physiological requirements of plant vigor, rest, and reproduction are met for the following "key" species by following a planned grazing system.

Grasses

Sideoats grama	<i>Bouteloua curtipendula</i>
Black grama	<i>Bouteloua eriopoda</i>
Blue grama	<i>Bouteloua gracilis</i>
Three-awn spp.	<i>Aristida</i> spp.
Curly mesquite	<i>Hilaria belangeri</i>
Sacaton	<i>Sporobolus Wrightii</i>

Forbs

Sida	<i>Sida procumbens</i>
Hairy blue evolvulus	<i>Evolvulus arizonica</i>

Shrubs and Trees

Palmer's agave	<i>Agave Palmeri</i>
Guajilla (fairy duster)	<i>Calliandra eriophylla</i>
Shrubby buckwheat	<i>Eriogonum Wrightii</i>

Goal 2: Manage against invasive plant species by using mechanical and herbicidal treatments and natural burning in order to decrease the number of young invasive species plants and increase the native plants.

Goal 3: Monitor similarity index, trend, forage production, and biomass utilization at designated sites. Similarity index is defined as the index of where the current plant community is in relation to the historic climax plant community, or the desired plant community. Trend is a determination of the direction of change in the current plant community and associated soils in relation to the historic climax community or some desired plant community.

Watershed:

The watersheds on the ranch flow south into the Babocomari River. There is no free-flowing surface water on the ranch although the Loamy Bottom ecological site along the Babocomari River suggests that a 2.25 mile subsurface tributary flow may exist on a western portion of the ranch.

Objective: Reduce overall erosion and stabilize hydrologic features by increasing the overall vegetative ground cover and limiting livestock grazing in the bottomland. Water spreaders may be installed on the BLM area of the bottom

Goal 1: Improve ecological similarity index and range health and proper hydrologic functioning to the bottomland area.

Goal 2: Provide the widest variety of vegetation and habitat diversity.

Goal 3: Monitor bottomland usage by livestock. Periodic growing season rest will be implemented.

Wildlife:

The diversity of vegetation types present on the Rose Tree Ranch contributes to its value as wildlife habitat, movement corridors, and breeding and resting areas. The extensive open grasslands provide habitat for pronghorn, javelina, mule deer, reptiles and amphibians, rodents, and a variety of songbirds and raptors, as well as many species of insects. The Mustang Mountains provide good big game habitat. The bottomlands provide breeding, foraging, watering, resting, and escape cover for a wide variety of wildlife.

Goal 1: Build and maintain fences to facilitate free and safe movement of pronghorn antelope. See recommended specifications in Appendix C, Fence Designs.

Goal 2: Improve habitat for wildlife species by providing food resources, water, cover, and open space.

Goal 3: Consider wildlife habitat requirements when conducting vegetation monitoring and grazing operations.

Recreation:

Limited recreational activities are available on the ranch with proper permitting and licensing, and with permission from the landowner/lessee.

Goal 1: Coordinate with other land management agencies on recreational activities.

Goal 2: Develop procedures for regulating access to the ranch and minimizing the impacts to the environment.

Range Improvements

Current Range Improvements include:

Pastures:

	Acres
• New Pasture	339
• High Lonesome	244
• Telles	482
• Westside	1,480
• Schock	1,104
• Triangle	302
• House	421
• Runway	652
• Horse	136
• Lake	1,262
• Gap	682
• Chapo Beatty	<u>1,866</u>
Total acres	8,970

Wells & Windmills:

- Schock Pasture Well and Windmill SE $\frac{1}{4}$, NE $\frac{1}{4}$, SE $\frac{1}{4}$, Sec.16, T20S, R18E.
- Antelope Well and Windmill SE $\frac{1}{4}$, SE $\frac{1}{4}$, SE $\frac{1}{4}$, Sec.17, T20S, R18E.
- Capped abandoned well (Rose Tree LS Well) NW $\frac{1}{4}$, SW $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.17, T20S, R18E.
- High Lonesome Well and Windmill NW $\frac{1}{4}$, SW $\frac{1}{4}$, NE $\frac{1}{4}$, Sec.19, T20S, R18E.
- Telles Pasture Well (Rose Tree Submersible Well) NE $\frac{1}{4}$, NE $\frac{1}{4}$, NE $\frac{1}{4}$, Sec.20, T20S, R18E.
- Corral Well West SE $\frac{1}{4}$, SE $\frac{1}{4}$, SE $\frac{1}{4}$, Sec.20, T20S, R18E.
- Triangle Well (capped) NW $\frac{1}{4}$, NW $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.21, T20S, R18E.
- Corral Well East SW $\frac{1}{4}$, SW $\frac{1}{4}$, SW $\frac{1}{4}$, Sec.21, T20S, R18E.
- Abner Well and Windmill SE $\frac{1}{4}$, NW $\frac{1}{4}$, SE $\frac{1}{4}$, Sec.22, T20S, R18E.
- House Trap Well SW $\frac{1}{4}$, SE $\frac{1}{4}$, SW $\frac{1}{4}$, Sec.22, T20S, R18E.
- Highway Well NW $\frac{1}{4}$, SW $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.28, T20S, R18E.
- Homestead Well NE $\frac{1}{4}$, NE $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.35, T20S, R18E.
- Windmill (dismantled) SW $\frac{1}{4}$, SW $\frac{1}{4}$, NE $\frac{1}{4}$, Sec.36, T20S, R18E.

Stockponds:

- Westside Tank #4 (South Tank) NW $\frac{1}{4}$, SW $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.8, T20S, R18E.
- Westside Tank #5 (East Reservoir and Drainage) SW $\frac{1}{4}$, SW $\frac{1}{4}$, SW $\frac{1}{4}$, Sec.8, T20S, R18E.
- Westside Tank #3 NW $\frac{1}{4}$, SW $\frac{1}{4}$, SW $\frac{1}{4}$, Sec.8, T20S, R18E.
- Schock Pond (Schock Reservoir and Draw) NE $\frac{1}{4}$, SE $\frac{1}{4}$, SW $\frac{1}{4}$, Sec.9, T20S, R18E.
- Old Forester SE $\frac{1}{4}$, SE $\frac{1}{4}$, SW $\frac{1}{4}$, Sec.14, T20S, R18E.
- Old Forester (sand trap) SE $\frac{1}{4}$, SE $\frac{1}{4}$, SW $\frac{1}{4}$, Sec.14, T20S, R18E.

- Gap Pasture Pond NW $\frac{1}{4}$, NW $\frac{1}{4}$, SE $\frac{1}{4}$, Sec.15, T20S, R18E.
- Westside Tank #1 SW $\frac{1}{4}$, NE $\frac{1}{4}$, NE $\frac{1}{4}$, Sec.17, T20S, R18E.
- Westside Tank #2 SW $\frac{1}{4}$, SW $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.17, T20S, R18E.
- Westside Tank #6 SW $\frac{1}{4}$, SW $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.17, T20S, R18E.
- Upper High Lonesome Tank (Rose Tree LS #7 Pond) SE $\frac{1}{4}$, NE $\frac{1}{4}$, NE $\frac{1}{4}$, Sec.19, T20S, R18E
- Lower High Lonesome Tank (Rose Tree LS #8 Pond) SE $\frac{1}{4}$, SE $\frac{1}{4}$, NE $\frac{1}{4}$, Sec.19, T20S, R18E.
- High Lonesome Tank #3 SW $\frac{1}{4}$, SW $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.20, T20S, R18E.
- Abner Pond and Wash SE $\frac{1}{4}$, NW $\frac{1}{4}$, SE $\frac{1}{4}$, Sec.22, T20S, R18E.
- Jack Daniels Dam, Reservoir NW $\frac{1}{4}$, NW $\frac{1}{4}$, SE $\frac{1}{4}$, Sec.22, T20S, R18E.
- Hill NE $\frac{1}{4}$, SE $\frac{1}{4}$, NE $\frac{1}{4}$, Sec.22, T20S, R18E.
- Hill and Hill Reservoir and Draw NW $\frac{1}{4}$, SW $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.23, T20S, R18E.
- Hill and Hill (sand trap) NW $\frac{1}{4}$, SW $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.23, T20S, R18E.
- Old Crow SW $\frac{1}{4}$, SE $\frac{1}{4}$, SE $\frac{1}{4}$, Sec.25, T20S, R18E.
- Yellowstone NW $\frac{1}{4}$, SW $\frac{1}{4}$, SW $\frac{1}{4}$, Sec.25, T20S, R18E.

Corrals:

- Schock Pasture (trap) SE $\frac{1}{4}$, NE $\frac{1}{4}$, SE $\frac{1}{4}$, Sec.16, T20S, R18E.
- Horse Corral SW $\frac{1}{4}$, SE $\frac{1}{4}$, SW $\frac{1}{4}$, Sec.22, T20S, R18E.
- House Corral SW $\frac{1}{4}$, SW $\frac{1}{4}$, SW $\frac{1}{4}$, Sec.21, T20S, R18E.

Pipelines:

- Schock Pasture SE $\frac{1}{4}$, NE $\frac{1}{4}$, SE $\frac{1}{4}$, to the NE $\frac{1}{4}$, NE $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.16, T20S, R18E.
- Gap Pasture SE $\frac{1}{4}$, NE $\frac{1}{4}$, SE $\frac{1}{4}$, Sec.16, to the SW $\frac{1}{4}$, SW $\frac{1}{4}$, NE $\frac{1}{4}$, Sec.15, T20S, R18E.
- Westside NE $\frac{1}{4}$, NE $\frac{1}{4}$, NE $\frac{1}{4}$, Sec.20, to the NW $\frac{1}{4}$, SW $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.17, T20S, R18E.
- High Lonesome Pasture/New Pasture SW $\frac{1}{4}$, SW $\frac{1}{4}$, SW $\frac{1}{4}$, Sec.21, to the NW $\frac{1}{4}$, NW $\frac{1}{4}$, NE $\frac{1}{4}$, Sec 19, T20S, R18E.
- Highway Well/ House Corral NW $\frac{1}{4}$, SW $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.28, to the SW $\frac{1}{4}$, SW $\frac{1}{4}$, SW $\frac{1}{4}$, Sec.21, T20S, R18E.
- Highway Well/Headquarters NW $\frac{1}{4}$, SW $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.28, to the SW $\frac{1}{4}$, SE $\frac{1}{4}$, SW $\frac{1}{4}$, Sec.22, T20S, R18E.

Storage Tanks:

- Gap Pasture Storage Tank SW $\frac{1}{4}$, SW $\frac{1}{4}$, NE $\frac{1}{4}$, Sec.15, T20S, R18E.
- High Lonesome Storage Tank NW $\frac{1}{4}$, NW $\frac{1}{4}$, NE $\frac{1}{4}$, Sec 19, T20S, R18E.
- Westside Storage Tank NW $\frac{1}{4}$, SW $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.17, T20S, R18E.

Troughs:

- Schock Drinker NW $\frac{1}{4}$, NE $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.16, T20S, R18E.
- Southwest Schock Drinker SW $\frac{1}{4}$, SW $\frac{1}{4}$, SW $\frac{1}{4}$, Sec.16, T20S, R18E.
- New Pasture Drinker NE $\frac{1}{4}$, NE $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.19, T20S, R18E.
- High Lonesome Drinker NE $\frac{1}{4}$, SW $\frac{1}{4}$, NE $\frac{1}{4}$, Sec.19, T20S, R18E.
- Westside Pasture Drinker SW $\frac{1}{4}$, SW $\frac{1}{4}$, SE $\frac{1}{4}$, Sec.18, T20S, R18E.
- Triangle Drinker NW $\frac{1}{4}$, NW $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.21, T20S, R18E.
- Lake Pasture Drinker SW $\frac{1}{4}$, SW $\frac{1}{4}$, SE $\frac{1}{4}$, Sec.22, T20S, R18E.

Spreader Dikes:

- | | |
|-----------------------|------------------------------------|
| • Triangle Pasture | E½, NW¼, Sec.21, T20S, R18E. |
| • Westside Pasture #1 | NW¼, NW¼, NW¼, Sec.17, T20S, R18E. |
| • Westside Pasture #2 | NE¼, NW¼, SW¼, Sec.17, T20S, R18E. |
| • Westside Pasture #3 | NE¼, NW¼, SW¼, Sec.17, T20S, R18E. |
| • Westside Pasture #4 | NW¼, SW¼, SW¼, Sec.17, T20S, R18E. |
| • Westside Pasture #5 | SW¼, SW¼, SW¼, Sec.17, T20S, R18E. |
| • Westside Pasture #6 | NW¼, NW¼, NW¼, Sec.20, T20S, R18E. |
| • Westside Pasture #7 | SW¼, SW¼, NW¼, Sec.20, T20S, R18E. |

See map for locations

Proposed Range Improvements Include:

There are two major projects proposed on the Rose Tree Ranch. The first proposed improvement is in the Chapo Beatty Pasture. This project divides the Chapo Beatty Pasture into two separate pastures by installing a 4-wire fence between the south butte and the Mustang Mountains. The second project divides the Westside Pasture. The proposed changes to this pasture include fencing off the bottomland on both sides of the stream channel with a 3-wire electric fence. This would divide the pasture into two separate pastures (W. Westside and E. Westside pastures) and the bottomland area (Westside Bottomland). Other improvements include installing solar equipment to facilitate water pumping, water storage tanks, and erosion control measures.

Improvements Needed**Quantities Needed**

Storage tanks (approx. 10,000 gal each)	11 ea
Troughs (500 gal each)	16 ea
Pipeline (1¼", plastic)	10 mi
Fence, rough country (3,168 lf, 4-wire)	0.6 mi
Fence, electric (23,232 lf, 3-wire)	4.4 mi
Solar booster pump	1 ea
Transport trailer	1 ea
Solar submersible pumps	3 ea
Solar panels	5 ea
Solar panel tracker	1 ea
Erosion control (check dam and re-seeding)	Field survey of the area must be conducted to determine materials needed.

Fire Management

The probability of wildland fires on the Rose Tree Ranch is very high from March through July. Increased air temperature (greater than 85 degrees Fahrenheit) and low relative humidity (less than 20%) cure both the winter annual vegetation in the mountainous areas and the continuous grasses that occupy the foothills and flats of the planning area. The probability of a fire-start decreases in July and August with

the arrival of the seasonal monsoon rainfall. The planning areas wildland/urban interface situation is not a large concern since all of the seven structures contain the recommended "30 feet of defensible space" around them.

There have been a number of fires recorded on the Rose Tree over the past several years. The largest fire, the West Dome fire, occurred in June 2002. The fire covered approximately 1000 acres. Six hundred thirty-seven acres burned into the mountainous east portion of the management area, including portions of the Chapo Beatty, Lake, and Gap pastures. Two major fires occurred in 2001. The Bruce fire, in June 2001, consumed 178 acres, burned up the east aspect of Mt. Bruce, and continued into 112 acres of the Gap pasture. In July, the Bruce Mountain fire ignited just southeast of the Bruce fire and consumed 158 acres, but only six acres were within the Gap pasture of the management area. Evidence of two other fires was found during plant surveys of the management area. A fire in the Chapo Beatty pasture (SE¼, NE¼, Sec.35, T20S, R18E) was estimated at 25 acres, and a fire in the Lake pasture (NE¼, NE¼, Sec.22, T20S, R18E) consumed approximately 15 acres. See Fire Map.

Prescribed fire and wildfire management (let burn) is a tool that may be used within the management area of the Rose Tree Ranch. The lessee (or designated representative), coordinating with the landowner/agency, may develop prescribed fire and wildfire use management plans which will set pre-determined boundaries. These plans will allow the use of fire to improve herbaceous cover of the rangelands within the Rose Tree Ranch.

Grazing Management

Numbers and Season of Use

The base carrying capacity is 344.5 AU's on the State and BLM leases. The breakdown by land status is as follows:

STATE	3,719 acres	98.5 AU's	1182 AUM's
BLM	4,781 acres	200 AU's	1104 AUM's
PRIVATE CONTROLLED	1,200 acres	46 AU's	552 AUM's
TOTAL	9700 acres	344.5 AU's	2838 AUM's

Grazing System:

The grazing system on the Rose Tree Ranch is a Deferred Rotation system with a single cow/calf herd. The key to this management approach is to have a variety of options available for any planned rotations, and to be able to quickly change from the plan when range conditions or livestock needs are different than anticipated.

The grazing schedule was developed with a specific objective, which is to use pastures that are dominated by Lehmann lovegrass while allowing rest in pastures that are native perennial grasses. Pastures that were dominated by Lehmann lovegrass would be used during the months when Lehmanns' is greening up and is most palatable, while resting the native perennial grasses during the majority of the growing season. The objective is to allow the pastures with native perennials to maintain a high state of vigor, reproduce and reduce the potential for Lehmanns' to invade these sites. In keeping with that objective, Chapo Beatty and Lake Pastures will be used during the winter. Chapo Beatty is dominated by native grasses and is the pasture used during the calving season. In an effort to use Lehmann lovegrass as forage, the rotation is switched to short duration, high intensity for the remaining months.

An additional consideration must be addressed in the grazing rotation in the Chapo Beatty pasture when the planned herbicide treatment on sandpaper bush (*Petalonyx tuber*) is initiated. When the herbicide treatment is applied, after the pasture is divided, then the rotation into the "Western Chapo Beatty pasture" must be of shorter duration. With the removal of the "Eastern Chapo Beatty pasture" from the rotation, each of the other pastures would receive approximately 10-15 extra days of grazing, depending on their condition. Cattle must remain out of the treated area for at least one year; this option also rests the Chapo Beatty pasture.

Salting / Supplemental Feeding:

Salting is done ¼ mile or more from waters. During drought, livestock numbers are reduced as needed.

Monitoring Studies

General: A monitoring system will be in place as of fall of 2003 to evaluate the effects of livestock and wildlife use on the rangeland resource and to aid in management decisions necessary to maintain or improve rangeland condition.

Key Areas: Monitoring data is collected at Key Areas. Permanent transects utilize the pace-frequency and point cover methodology developed at the University of Arizona. One hundred plots, using 40 x 40 cm frame, are recorded every other year. These records will be included in the plan and contain % frequency by species and ground cover. Photographs will be taken yearly as well. In addition, records are kept for the following:

- 1. Actual Use**

The ranch will record actual use data throughout the year showing when, where, and how many livestock used the ranch during the grazing year.

- 2. Climate**

Rainfall records will be kept by the Rose Tree Ranch owner Bill Brake and the ranch manager Darrel Howell. The rain gauges are located as follows:

Rain Gauges:

	Elevation	Coordinates
West Chapo Beatty	4,928	12 548873 E, 3503288 N
East Chapo Beatty	4,831	12 551634 E, 3502192 N
House	4,939	12 547589 E, 3504282 N
Lake	5,136	12 549062 E, 3505434 N
Gap	5,160	12 548264 E, 3506457 N
New	4,774	12 542158 E, 3504548 N
Runway	4,787	12 545797 E, 3503627 N
High Lonesome	-----	12 543046 E, 3505494 N
Westside	4,848	12 544183 E, 3508255 N
Telles	4,802	12 544533 E, 3504708 N
Triangle	5,000	12 547161 E, 3507640 N
Schock	4,871	12 545590 E, 3505732 N

See map for locations

3. Utilization

Utilization on key grass species will be measured using weight comparisons of grazed versus ungrazed plants. Utilization will be measured by NRCS, AzSLD and BLM range personnel and the producer.

4. Trend

Trend in rangeland condition will be measured using the Pace- Frequency Method. Annual photographs may serve as the appropriate general view for trend. This trend data will be measured by NRCS, AzSLD and BLM personnel and the producer.

Timetable for Data Collection:

The Rose Tree Ranch owners and manager will initiate range monitoring data collection every fall with the assistance of the USDA Natural Resources Conservation Service (NRCS), Arizona State Land Department (AzSLD) and the Bureau of Land Management (BLM). University of Arizona Extension and Arizona Game and Fish may periodically assist if requested and they so choose. The landowner/lessee will maintain copies of the monitoring studies. For the new key areas, regular monitoring will begin after the growing season (September through November) and take place annually for at least three consecutive years. Once baseline data has been established, the frequency of monitoring may be reduced to once every two to three years, depending on observed changes in vegetation trends and/or drought conditions. These changes are important to record in the monitoring notes along with the other monitoring data.

The following key areas were decided on jointly by ranch manager Darrell Howell, Kristen Egen, Dan Robinett and Emilio Carrillo from the NRCS, Grant Drennen from the BLM, Wally Alexander from the AzSLD, and students in the Range Planning class from the University of Arizona. Several criteria were used to select new areas to be monitored. These criteria included choosing areas with the potential to improve with management, areas where management is planned (e.g., sandpaper bush control),

areas for utilization monitoring, and areas that have been burned in the past. Photographs were taken of each of these monitoring sites.

Location of Key Areas:

Monitoring Transect No.	Legal Description	Pasture
#1	SE $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.8, T20S, R18E	Westside Pasture
#2	SW $\frac{1}{4}$, NE $\frac{1}{4}$, Sec.18, T20S, R18E	Westside Pasture
#3	SE $\frac{1}{4}$, SW $\frac{1}{4}$, Sec.23, T20S, R18E	Lake Pasture
#4	SW $\frac{1}{4}$, SE $\frac{1}{4}$, Sec.23, T20S, R18E	Lake Pasture
#5	SE $\frac{1}{4}$, NE $\frac{1}{4}$, Sec.36, T20S, R18E	Chapo Beatty Pasture
#6	NW $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.16, T20S, R18E	Schock Pasture

See map for locations

Transect #1 is located on the Loamy Bottom in the West Side Pasture. The transect starts at the rain gauge in the northern part of the pasture and continues 100 paces south following the drainage crossing headcuts and sacaton patches present in the bottom. No dry-weight rank was conducted at this site, but these data may be collected in the fall of 2003. This site is important to monitor because of the presence of headcutting, heavy use by cattle noted by the landowner, and planned improvements to alleviate these problems. Planned improvements for this site include two electric fences on both sides of the bottom to allow the area to be rested, and repair of existing spreader dikes. Regardless of what improvements are made, it is important to monitor and document the potential improvement of site conditions.

Transect #2 is located on the Loamy Upland on the western side of the West Side Pasture. A pile of rocks just east of the western fence-line marks its starting point. Dry-weight rank, comparative yield, and utilization data were collected on this site along three transects of 33 paces each directed eastward. In the future, two transects of 50 paces each will run eastward from the start, and the rock pile will be replaced by a metal T-post. This area still supports a good amount of native perennial grasses and will be useful to monitor utilization in the pasture. When the planned electric fences are installed on either side of the Loamy Bottom, transect #2 will fall in the western half of the pasture.

Transect #3 is located on the Shallow Hills in the Lake Pasture. It was left unburned after a 2002 fire although the fire did pass adjacent to this area. Dry-weight rank was not conducted on this site, and these data may need to be collected in fall 2003. Transect data will be collected along two lines of 50 paces each heading northward in the direction of the ridge. A metal T-post marks the starting point of this transect. Evidence of cattle use has been found in these hills, so utilization data will be useful to monitor the extent of use in these higher elevation areas.

Transect #4 is also located on the Shallow Hills in the Lake Pasture slightly east and north of transect #3, near the historic stone sheep corrals. This area was burned during the 2002 fire and is adjacent to transect #3. Dry-weight rank was not

conducted for this site, and it may need to be done in fall 2003. Transect data will be collected along two lines of 50 paces each heading north toward the ridge. A metal T-post marks the starting point of the transect. Transects #3 and #4 are useful because they can be compared to each other to understand the vegetation changes following fire. Although a causal relationship between fire and vegetation changes cannot be statistically made, general comparisons can be used to better understand vegetation dynamics in these areas. Since fire is common in this area during the monsoon season, it is not unlikely that the unburned area will burn at some time in the future. However, it is still useful to collect these baseline data to make comparisons.

Transect #5 is located in the transition between Limy Slopes and Limestone Hills in the Chapo Beatty Pasture. The transect is marked by a pile of rocks at the road and another pile of rocks walking east from the road toward the ridge. This transect will later be marked by a metal T-post. Dry-weight rank data were collected along a transect of 100 paces heading southwest toward the top of the ridge. This transect was chosen because herbicide treatment is planned in this area to reduce the high density of sandpaper bush and whitethorn acacia. This project has already been approved as part of an EQIP project to be completed in the next three to five years. The transect was selected to cover both ecological sites because whitethorn acacia occurs more abundantly on the Limy Slopes and sandpaper bush occurs more abundantly on the Limestone Hills, so in this case, both invasive species can be monitored within one transect. Monitoring on this site should begin one year previous to the planned treatment and continue annually for three years, after which regular monitoring will occur every other year.

Transect #6 is located on the Loamy Upland 90%/Loamy Bottom 10% ecological site in the western part of the Schock Pasture. The transect is marked by a metal T-post. Two transects of 50 paces each run north toward the top of the peak. There is still good composition of native perennial grasses on this site, and the transect will be useful to monitor utilization on this site, which was identified as important by the ranch manager.

Long-Term Monitoring:

Long-term monitoring should occur every ten years or as needed to monitor extreme vegetation changes or effects of drought on vegetation. Long-term monitoring sites include the six new key areas (see list above) and the ten historic key areas (see list below) that were used in the past for limited monitoring activities. Numbering of historic key areas follows the numbering from the inventory worksheets. While data are not currently available for these sites, it is possible that they will be available at some future date (it may be stored in the BLM Phoenix Office and we are attempting to locate at this time). This information would be extremely useful to understand the vegetation dynamics on the ranch. The monitoring procedures for these transects should be comparable with the methods used during the 2003 inventory of the ranch. The data should record species composition by using dry weight rank, comparative yield and/or ocular estimation methods. Rangeland health should be utilized to evaluate the biotic community, soil and site stability and watershed function. The data should be evaluated and compared with previous long-term monitoring data to evaluate management goals. These data must be kept within the management plan.

Location of Historic Key Areas:

Monitoring Study No.	Legal Description	Pasture
KA #5	SE $\frac{1}{4}$, NE $\frac{1}{4}$, Sec.36, T20S, R18E	Chapo Beatty Pasture
KA #9	SW $\frac{1}{4}$, SW $\frac{1}{4}$, Sec.25, T20S, R18E	Chapo Beatty Pasture
KA #22	NE $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.28, T20S, R18E	Runway Pasture
KA #23	SW $\frac{1}{4}$, SE $\frac{1}{4}$, Sec.21, T20S, R18E	House Pasture
KA #28	NW $\frac{1}{4}$, SW $\frac{1}{4}$, Sec.21, T20S, R18E	Triangle Pasture
KA #29	NE $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.21, T20S, R18E	Triangle Pasture
KA #32	SW $\frac{1}{4}$, NW $\frac{1}{4}$, Sec.16, T20S, R18E	Schock Pasture
KA #33	SE $\frac{1}{4}$, NE $\frac{1}{4}$, Sec.17, T20S, R18E	Westside Pasture
KA #36	NE $\frac{1}{4}$, NE $\frac{1}{4}$, Sec.19, T20S, R18E	High Lonesome Pasture
KA #40	SW $\frac{1}{4}$, NE $\frac{1}{4}$, Sec.18, T20S, R18E	Westside Pasture

See map for locations

Evaluation and Revision

A review of the plan will be conducted each year in cooperation with the owners. Data collected from the monitoring sites will be used to aid in management decisions.

The Ecological Site and condition inventory was conducted in 2002 by the NRCS range specialists. This inventory was conducted using NRCS Ecological Site legends, range condition, and trend assessments. This will be updated every 10 years or so to assess changes. See Appendix and map for locations and data.

Concurrence

Accepted by:

Rose Tree Ranch

Date

State Land Commissioner

Date

NRCS Conservationist

Date

BLM

Date

Santa Cruz NRCD

Date

Extension

Date

Arizona Game and Fish

Date

(Appendices and maps attached)

INVASIVE SPECIES

On the Rose Tree Ranch there are several native and exotic invasive plant species varying in abundance. Although none of these plants is on the Arizona Noxious Weed List maintained by the Arizona Department of Agriculture, they should be monitored to ensure that they are not rapidly spreading or interfering with land management objectives. Such is the case with a few of these species – they are becoming highly abundant and may be out-competing native grasses. For example, in parts of the southeast one-third of the Chapo Beatty pasture, the relative composition of whitethorn acacia (*Acacia angustissima*) and sandpaper bush (*Mortonia scabrella*) has been estimated as having high densities of 20% and 50%, respectively.

Other species that may be considered weedy are yerba de pasmo (*Baccharis pteronioides*) and cocklebur (*Xanthium saccharatum*). Cocklebur, a summer annual, can become troublesome in pastures. The spiny burs can attach to the manes and tails of horses and become an irritant. The seeds and seedlings of the cocklebur contain a glucoside, xanthostrumarin, which is poisonous to livestock. With yerba de pasmo the problem is invasion. Yerba de pasmo may slowly spread over a pasture and aggressively compete with desirable forage species.

Another invasive species is Lehmann lovegrass (*Eragrostis Lehmanniana*). Lehmann lovegrass is an exotic perennial that can be found on several areas of the ranch. In some places it has formed dense stands, excluding native species. Research has shown that prescribed burning stimulates reproduction and growth, and is not planned to manage this species. Local ranchers have experimented with heavy grazing of this species and observed that it had little effect. Although Lehmann lovegrass is an aggressive species that can dominate rangeland and displace natives, where established it should be recognized as forage for livestock.

Ecological Site Acreage Total for the Rose Tree Ranch

<u>Ecological Sites</u>	<u>LRU</u>	<u>Acreage</u>
Limestone Hills	41-1	1,077
Shallow Hills	41-1 / 41-3	944
Limy Slopes (Hathaway)	41-1 / 41-3	1,990
Limy Slopes (Kimbrough soils)	41-1 / 41-3	636
Clay Loam Upland	41-1 / 41-3	150
Loamy Upland	41-1 / 41-3	1,291
Loamy Upland 90%, Loamy Bottom 10%	41-1 / 41-3	1,010
Loamy Upland 80%, Limy Slopes 10%, Loamy Bottom 10%	41-1 / 41-3	786
Shallow Upland	41-1 / 41-3	580
Loamy Bottom	41-1 / 41-3	438
Sandy Bottom	41-1 / <u>41-3</u>	<u>68</u>
	Total	8,970

An Ecological Site Map for the Rose Tree Ranch is located in the map pocket.

Summary of ecological sites in the Rose Tree Ranch

Ecological Site	Soils	Similarity Index %	Approximate % Ground Cover	Range Health	Estimated Production lbs/A	Apparent Trend
Clay Loam Uplands	McNeal	63	26	Healthy	550	Static
Limestone Hills	Tortuga	44	78	Healthy	580	Static to Slightly Up
Limy Slopes	Kimbrough	61	78	Healthy	990	Static to Slightly Up
	Hathaway	74	39	Healthy	520	Static to Slightly Up
Loamy Bottoms	Pima	70	32	Healthy	635	Static
Loamy Uplands 80%, Limy Slopes 10%, Loamy Bottoms 10%	Whitehouse Hathaway Pima	39	28	Healthy	975	Static
Loamy Uplands 90%, Loamy Bottoms 10%	Whitehouse Bernardino Pima	23	35	Biotic at Risk	840	Static
Loamy Uplands	Whitehouse	4	47	Biotic at Risk	1200	Static
	Bernardino	57	28	Healthy	690	Static
Sandy Bottoms	Torrifluvents	72	45	Healthy	800	Slightly Down
Shallow Hills	Lampshire	65	77	Healthy	900	Static to Slightly Up
Shallow Uplands	Lampshire	69	80	Healthy	725	Static to Slightly Up

Clay Loam Uplands

The Clay Loam Uplands ecological site occurs in the Schock, Telles, and Triangle Pastures of the Rose Tree Ranch. This ecological site totals approximately 150 acres. Deep McNeal clay loam soils formed on clayey alluvium of mixed origin characterize this site. The soils have sticky surfaces when wet. Dense clay horizons occur close to the surface and exhibit some cracking due to shrink/swell characteristics. The plant/soil moisture relationship of these soils is very good. The Clay Loam Uplands site has slopes that range from 1 to 5%, and elevations from 3,200 to 5,200 feet. The potential plant community of this site is dominated at 80 to 90% by warm-season perennial mid-grasses. The major grass species are tobosa, sideoats grama, blue grama, hairy grama, vine mesquite, and curly mesquite. Trees and shrubs and forbs make up a very minor component of the plant community with globe mallow

and annual goldeneye the major forbs. Shrubby buckwheat and yucca are the major shrubs.

There was a high percentage (97%) of native perennial grasses on the Clay Loam Uplands on the Rose Tree Ranch. The major grass species were blue grama, sideoats grama, and tobosa along with small amounts of hairy grama, cane beardgrass, wolftail, vine mesquite, black grama, sacaton, spidergrass, and several threeawn spp. Small amounts of forbs such as ragweed, morning glory, hyssops, Bigelove's milkvetch, and prickly poppy were also present. Burroweed, yucca, nipple cactus, and prickly pear were the most common shrubs on the site. The similarity index for this ecological site was 63%. The apparent trend was static. Soil surface cover was 26%. The soils and site were stable, the overall biotic integrity was intact, and the watershed was functioning. The overall rangeland health of the site was healthy. Total estimated production was 550 lbs/acre.

Limestone Hills

The Limestone Hills ecological site occurs on approximately 1077 acres in the Chapo Beatty, Gap, and Lake Pastures on the Rose Tree Ranch. This site appears on shallow, cobbly, gravelly loam and sandy loam Tortuga soils. These soils are calcic throughout and have numerous rock outcrops. This site has slopes ranging from 10 to 60% and elevations ranging from 4,000 to 5,500 feet. Fifty-five to 70% of the plant community is grasses with sideoats grama, cane bluestem, prairie Junegrass, plains lovegrass, black grama, bush muhly, blue threeawn, and purple threeawn the dominant species. Annual and perennial forbs make up 10 to 15% of the plant community with cloak-fern spp., Texas blueweed, Arizona bluecurls, noseburn, and penstemon spp. the most common forbs on the site. Shrubs and trees make up 20 to 30% of the plant community. Guajilla, range ratany, desert zinnia, sandpaper bush, creosote bush, Mormon tea, littleleaf sumac, agave, yucca, and various cacti are the common shrubs and trees.

The Limestone Hills ecological site on the Rose Tree Ranch was dominated by grasses, which made up 61% of the plant community. Sideoats grama, bullgrass, red threeawn, tanglehead, slim tridens, cane beardgrass, and curly mesquite were the dominant grass species with minor amounts of other species also present. Annual and perennial forbs made up a small portion of the plant community with narrow cloak-fern the dominant forb. Shrubs present on the site were sandpaper bush, ocotillo, spicebush, lechuguilla, prickly pear, and guajilla. Some areas on the site had large amounts of sandpaper bush. These areas may benefit from some type of shrub control. Treatment by control burning or herbicide spraying may be advisable. Some areas on this site burned in 2002. This burn greatly reduced the amount of sandpaper bush and whitethorn, although the whitethorn was resprouting. Grasses were common on some of the burned areas. The overall similarity index of the site was 44%. Estimated production was 580 lbs/acre. The overall apparent trend was static to slightly up. The vigor of key forage plants was high with young plants and seedlings present. The soil surface cover was 78%. This high percentage gave the soils and ecological site a stable rating. The biotic integrity was intact and the watershed was functioning. The overall rangeland health of this site was healthy.

Limy Slopes

The Limy Slopes ecological site occurs in the eastern and central portions of the Rose Tree Ranch. The eastern Limy Slopes site occurs on Kimbrough soils and totals approximately 636 acres in the Chapo Beatty Pasture. These soils are calcareous, shallow to very shallow cobbly gravelly loam and sandy loam soils that have a well defined calcic pan. The Limy Slopes on the central portion of the ranch occurs on Hathaway soils. These soils are very deep, well-drained gravelly loam soils that have formed on mixed alluvium. The Limy Slopes ecological site has slopes ranging from 1 to 10% and elevations that range from 4,800 to 5,100 feet. The potential plant community is a mix of short grasses, a few mid-grasses, and a small percentage of shrubs and forbs. Approximately 60 to 80% of the potential plant community is native grasses dominated by sideoats grama, black grama, cane bluestem, several threeawn spp., bush muhly, sprucetop grama, curly mesquite, spike pappusgrass, tobosa, and other species. Forbs make up 0 to 10% of the potential plant community. Trees and shrubs make up 10 to 20% of the community. The dominant forbs are desert zinnia, and other perennial forbs. Common shrubs and trees include velvet pod mimosa, guajilla, cacti, ocotillo, agave, whitethorn acacia, Mormon tea, cliffrose, sacahuista, and others.

On the Rose Tree Ranch, the Limy Slopes on the Kimbrough soil series had a fairly high percentage of sideoats grama, black grama, cane beardgrass and red threeawn. Fair amounts of bush muhly, slim tridens, spike pappusgrass, tanglehead, several threeawn spp., and other grasses were present on the site. The invasive species, Lehmann lovegrass, was also present. Forbs occurred in trace amounts. These included hairy blue evolvulus, pink perezia, ragweed, trailing four o'clock, wormwood, ragged nettlespurge, croton, and others. A fairly high percentage of shrubs and trees occurred on this site and included whitethorn acacia, sandpaper bush, ocotillo, guajilla, sacahuista, prickly pear, and littleleaf sumac. Other shrubs and trees appearing in small amounts were desert zinnia, spicebush, yerba de pascmo, agave, yucca, sotol, desert broom, and hedgehog cactus. The overall similarity index for this site was 61%. The overall trend was static to slightly up. The vigor of the key forage grasses and shrubs was high with an abundance of sideoats and black grama seedlings and young plants present. The average annual production of the site was estimated at 990 lbs/acre. Soil surface cover ranged from 57 to 95%. The soils and the site were stable, the biotic integrity was intact, and the watershed was functioning. The overall rangeland health of this ecological site was healthy.

The Limy Slopes ecological site on the Hathaway soils occurs in the Gap, High Lonesome, Horse, House, Lake, Runway, Schock, Telles, Triangle, and Westside Pastures on the Rose Tree Ranch. The Hathaway soils covers a total of approximately 1990 acres. Ninety percent of the plant community was grasses with sideoats grama, black grama, hairy grama, blue grama, and a variety of threeawn species. There were very few forbs on the site. The major shrubs were yucca and sacahuista. The overall similarity index for this site was 74% and apparent trend was static to slightly up. The average annual production was 520 lbs./acre. Soil surface cover was approximately 39%. The soils and site were stable, the biotic integrity was intact, and the watershed was functioning. Overall, this site was healthy.

Loamy Bottoms

The Loamy Bottoms ecological site occurs in the High Lonesome, New, Telles, and Westside Pastures and covers approximately 438 acres on the Rose Tree Ranch. Slopes range from 1 to 2% and elevations range from 3,400 to 5,000 feet. The aspect of the site is an open grassland. Soils are mostly in the Pima series and are very young loam and clay loam soils that have formed on clay alluvium of mixed origin. Some Grabe soils occur here as well. The potential plant community is dominantly warm-season grasses with a mixture of tall and short bunchgrasses, shrubs and trees. Sixty to 80% of the community is grasses. Some of the dominant grasses include sacaton, sideoats and blue grama, vine mesquite, and cane bluestem. Annual and perennial forbs make up 5 to 10% of the community. Shrubs and trees make up 10 to 20% of the community. The dominant trees are Arizona ash, Arizona walnut, desert willow, live oak species, Fremont cottonwood, and netleaf hackberry. Shrubs include minor amounts of manzanita, canyon grape, Chuparosa bush, Mormon tea, shrubby buckwheat, and others.

The Loamy Bottoms site on the Rose Tree Ranch was dominated by native grasses, which made up 94% of the plant community. The major species represented were blue grama, sideoats grama, sacaton, tobosa, hairy grama, cane beardgrass, and small amounts of vine mesquite. A variety of other grass species occurred in lesser amounts. Forbs made up 4% of the plant community with cocklebur and ragweed the most common species; other forbs occurred in lesser amounts. Shrubs and trees made up 2% of the plant community. Yerba de pasmo, wait-a-bit, yucca, mesquite, and sacahuista were common throughout the site. The similarity index for this site was high at 70%. The overall apparent trend was static. The soils and site were stable, the biotic integrity was intact, and the watershed was functioning. There was some head-cutting, but the bottoms were beginning to heal and stabilize with vegetation. The overall rangeland health assessment for this site was healthy. Overall current estimated production was 635 lbs/acre.

Loamy Uplands 80% / Limy Slopes 10% / Loamy Bottoms 10%

The Loamy Uplands 80% / Limy Slopes 10% / Loamy Bottoms 10% ecological site occurs in the Horse, House, Lake, Runway, Telles, and Triangle Pastures of the Rose Tree Ranch and totals approximately 786 acres. Elevations range from 3,200 to 5,200 feet and slopes range from 1 to 15%. This site is on deep, gravelly sandy loam to loam White House soils with some Hathaway and Bernardino soils. The potential plant community is a diverse mix of warm-season grasses, forbs, succulents, shrubs and trees. Seventy-five to 85% of the plant community is grasses dominated by sideoats grama, wolftail, perennial threeawns, and curly mesquite. Annual and perennial forbs make up approximately 10 to 15% of the potential plant community with sida, hairy blue evolvulus, daisy, ragweed, and other species occurring throughout the community. Shrubs and trees make up 10 to 15% of the community. Guajilla, shrubby buckwheat, burroweed and desert zinnia are the dominant shrub species. Mesquites are also common and widely dispersed on the site.

This site complex on the Rose Tree Ranch was dominated by grasses, which made up 97% of the plant community. The major grass species were Lehmann lovegrass, wolftail, cane beardgrass, spike pappusgrass, and curly mesquite in order of abundance. Wolftail was abundant and, in fact, was present in a larger percentage than allowed in the potential plant community. Shrubs and trees made up 3% of the plant community. The overall similarity index for the site was 39%. This low index was mainly due to the invasion of Lehmann lovegrass. Plant vigor for the key species, Lehmann lovegrass, sideoats grama, and black grama, was rated medium to high with a moderate number of seedlings occurring. Of interest was that no seedlings of the invader Lehmann lovegrass were observed in one area. This could be an indicator of the grass's natural die back. Production on this site was high averaging 975 lbs/acre. Residues and litter, as well as erosion stability, were high to moderate. Slight sheet and rill erosion were apparent on the site. The apparent trend was static and the site was rated as healthy. However, it is suggested that attention be given to addressing the issue of high Lehmann lovegrass density.

Loamy Uplands 90% / Loamy Bottoms 10%

The Loamy Uplands 90% / Loamy Bottoms 10% ecological site complex occurs on approximately 1,018 acres in the High Lonesome, New, and Westside Pastures on the Rose Tree Ranch. Elevations range between 3,200 to 5,200 feet and slopes range from 1 to 15%. The dominant soils are gravelly loam to sandy loam White House soils and gravelly clay loam to sandy clay loam Bernardino soils. The potential plant community is a mix of warm-season grasses, forbs and trees and shrubs. Seventy-five to 85% of the community is grasses dominated by sideoats grama, blue grama, slender grama, hairy grama, several threeawn spp., wolftail, and other native grasses. Dominant forbs are sida, hairy blue evolvulus, fleabane, ragweed, and other perennial and annual forbs. Common shrubs and trees are burroweed, shrubby buckwheat, yucca, agave, mesquite, and others.

This ecological site complex on the Rose Tree Ranch was dominated by grass species, which made up 90% of the plant community. The dominant grasses were Lehmann lovegrass, wolftail, black grama, sideoats grama, blue grama, hairy grama, and other perennial and annual species. Dominant forbs were sida, wire lettuce, camphorweed, ragweed, and morning glory. Burroweed and velvet pod mimosa were the most common shrubs. No trees were observed. The species composition of this complex was very diverse. Some areas were primarily monocultures of Lehmann lovegrass, while other areas contained exclusively native species. The overall similarity index was 23%. The estimated ground cover was 35% and annual production was approximately 840 lbs/acre. Apparent trend was static, the soils and site were stable, and the watershed was functioning. However, the overall biotic factor was at risk due to the amounts of Lehmann lovegrass throughout the site.

Loamy Uplands

The Loamy Uplands ecological site occurs in the Chapo Beatty, Lake, Runway, Schock, Telles, and Westside Pastures. This site totals approximately 1,291 acres of the Rose Tree Ranch. The major soils are all phases of the White House and Bernardino soil series. The White House soils are deep, gravelly loams and sandy

loams that have formed on alluviums of mixed origins. They are characterized by a well-developed argillic horizon. The Bernardino soils are deep gravelly clay loam and sandy clay loam soils. The elevation of the Loamy Uplands site ranges from 3,200 to 5,200 feet on slopes ranging from 1 to 15%. The potential plant community is a mix of warm-season perennial grasses, perennial forbs, and a few species of low shrubs. Seventy-five to 85% of the plant community is native grasses dominated by sideoats grama, blue grama, hairy grama, cane beardgrass, plains lovegrass, sprucetop grama, several threeawn spp., and other grasses. Forbs make up 10 to 15% of the potential plant community and include sida, hairy blue evolvulus, fleabane, cudweed, ragweed, spiny haplopappus along with other forbs. Shrubs and trees make up 10 to 15% of the potential plant community. They include mesquite, guajilla, catclaw acacia, agave, yerba de pasmo, and other species.

The Loamy Uplands site on the White House soils on the Rose Tree Ranch was dominated by Lehmann lovegrass, which accounted for 97% of the plant community. Shrubs and trees were present in small amounts and included burroweed, shrubby buckwheat, yerba de pasmo, desert broom, yucca, prickly pear, other cacti, velvet pod mimosa, mesquite, and whitethorn acacia. The similarity index for the site was 4% due to the large amount of the non-native Lehmann lovegrass. The apparent trend was static. The soil surface was approximately 47% covered by litter and gravel. The soil and site were stable, the watershed was functioning, but the biotic factor was at risk, again due to the high percentage of Lehmann lovegrass present. Estimated production on this site was 1200 lbs/acre.

The Loamy Uplands ecological site on the Bernardino soils on the ranch had a high percentage of grama grasses dominated by blue grama. Other grasses included sideoats grama, cane beardgrass, plains lovegrass, hairy grama, sprucetop grama, black grama, wolftail, sand dropseed, Hall's panicgrass, Lehmann lovegrass, and a large amount of annual grasses. Forbs were common but were a minor component of the plant community. Trees and shrubs were also a minor component with yucca, yerba de pasmo and burroweed the most common. The estimated overall production was 690 lbs/acre. The overall similarity index was 57%. Overall apparent trend was static. Soil surface cover was 28%. The soils and site were stable, overall the biotic integrity was intact, and the watershed was functioning. The overall rangeland health of this site was healthy.

Sandy Bottoms

The Sandy Bottoms ecological site occurs on approximately 68 acres in the Horse, Lake, and Runway Pastures of the Rose Tree Ranch. This site is on deep, gravelly sandy loam to sandy loam torrifluent soils. The site has slopes ranging from 0 to 8 % and elevations ranging from 3,300 to 5,000 feet. The potential plant community is a mixture of grasses, forbs, trees and shrubs. Grasses make up 40 to 55% of the community with sideoats grama, Arizona cottontop, spike dropseed, green sprangletop, plains bristleggrass, cane beardgrass, and other species dominant. Forbs contribute 10 to 15% of the community with sida, hairy blue evolvulus, scarlet morning glory, and trailing four o'clock the dominant forbs. Shrubs and trees make up 25 to 35% of the community. Emory oak, Arizona white oak, alligator juniper, mesquite, catclaw acacia, desert willow, and other trees and shrubs are dominant.

The Sandy Bottoms ecological site on the Rose Tree Ranch had a large amount of sideoats grama and Lehmann lovegrass; spidergrass, deergrass, annual

threeawn, and needle grama occurred in minor amounts. Trees and shrubs totaled 31% of the community with Emory oak the dominant tree. Minor amounts of alligator juniper, desert broom, burroweed, shrubby buckwheat, velvet pod mimosa and other species were also present. Forbs made up 11% of the plant community with cosmos, ragweed, morning glory, narrow cloak-fern, lambs' quarter, and other annuals also common on the site. The overall similarity index for this site was 72%. The vigor of the key forage plants, sideoats grama, black grama, and hairy grama, was rated as medium with seedlings and young plants observed. The estimated production was 800 lbs/acre. The soil surface cover was 45%. The overall apparent trend was slightly down. The soils and site were stable, the biotic integrity was intact, and the watershed was functioning. The overall rangeland health of the site was healthy.

Shallow Hills

The Shallow Hills ecological site occurs in the Chapo Beatty and Lake Pastures of the Rose Tree Ranch and encompasses approximately 944 acres. Slopes range from 10 to 60% with elevations ranging from 4,500 to 5,800 feet. This site occurs on shallow to very shallow cobbly loam soils in the Lampshire soil series. The potential plant community is a mix of warm-season and cool-season grasses, forbs, trees and shrubs. Approximately 50 to 70% of the community is grasses and grass-like species. Forbs make up 15 to 25% and trees and shrubs make up 20 to 30% of the potential plant community. Common grasses on the site are plains lovegrass, bullgrass, sideoats grama, and other grama grasses. Common forbs are Bigelove's milkvetch, wire lettuce, fleabane, various fern species, and numerous annuals. The major trees are Emory oak, Arizona white oak, and alligator juniper. California brickellbush, yerba de pasmo, velvet pod mimosa, wait-a-bit, and western coral bean are the most common shrubs.

On the Rose Tree Ranch approximately 70% of the plant community was native grasses dominated by sideoats grama, plains lovegrass, Texas bluestem, hairy grama, sprucetop grama, and slender grama. A variety of other grass species were represented in lesser amounts. Forbs made up 3% of the plant community. Goldeneye was the dominant forb with others occurring in lesser amounts. Emory oak, alligator juniper, velvet pod mimosa, spicebush, ocotillo, agave, and other shrubs and trees were present throughout the site. The overall similarity index for the site was 65% and the apparent trend was static to slightly up. Vigor of the key forage plants was high with some seedlings and young plants occurring throughout the site. Lehmann and plains lovegrass seedlings were abundant. Soil surface cover was estimated at 77%. The soils and site were stable, the biotic integrity was intact, and the watershed was functioning. Estimated production averaged 900 lbs/acre. The overall rangeland health of this site was healthy.

Shallow Uplands

The Shallow Uplands ecological site occurs on approximately 581 acres in the Lake and Schock Pastures of the Rose Tree Ranch. Elevation on this site ranges from 3,200 to 5,200 feet; slopes range from 1 to 15%. This site is on shallow, cobbly sandy loam to sandy loam soils in the Lampshire and Tortugas soil series. Warm-season perennial grasses and several species of low shrubs dominate the potential plant community. Seventy to 80% of the plant community is grasses with

black grama, hairy grama, sprucetop grama, slender grama, blue grama, curly mesquite, and aparejo grass as the dominant species. Annual and perennial forbs compose 1 to 5% of the plant community; shrubs and trees compose 15 to 30% of the community. False mesquite, shrubby buckwheat, spreading ratany, and velvet pod mimosa are the dominant shrubs. Emory oak and alligator juniper are the dominant trees.

The Shallow Uplands site on the Rose Tree Ranch had a good percentage of sideoats grama, sprucetop grama, slender grama, blue grama, hairy grama, Texas bluestem, curly mesquite, aparejo grass, and other grasses. These grass species represented 90% of the plant community. Shrub and tree species, including guajilla, shrubby buckwheat, sacahuista, shin dagger, velvet pot mimosa, Emory oak, and alligator juniper, represented 10% of the plant community. The similarity index for the site was 69%. The apparent trend for the site was static to slightly up. Vigor of the key forage species was high, soils and site were stable, and the watershed was functioning. Estimated production on the site was 725 lbs/acre. Overall the site was healthy, however, the biotic integrity of some areas within the site was at risk due to high plant mortality caused by the 2002 drought.

Insert Range inventory and Range health sheets.

Common and Scientific Names of Plant Species on the Rose Tree Ranch

Abutilon	<i>Abutilon</i> spp.
Alligator juniper	<i>Juniperus Deppeana</i>
Annual buckwheat	<i>Eriogonum</i> spp.
Annual goldeneye	<i>Viviera longiflora</i>
Annual spiderling	<i>Boerhaavia</i> spp.
Annual threeawn	<i>Aristida</i> spp.
Aparejo grass	<i>Muhlenbergia repens</i>
Arizona bluecurls	<i>Trichostema arizonicum</i>
Arizona cottontop	<i>Digitarius californica</i>
Arizona muhly	<i>Muhlenbergia arizonica</i>
Arizona panic	<i>Panicum arizonicum</i>
Arizona rainbow cactus	<i>Echinocereus pectinatus</i> var. <i>rigidissimus</i>
Arizona rosewood	<i>Vauquelinia californica</i>
Arizona walnut	<i>Juglans major</i>
Arizona white oak	<i>Quercus arizonica</i>
Ayenia	<i>Ayenia pusilla</i>
Bahia	<i>Bahia absinthifolia</i>
Beggartick threeawn	<i>Aristida orcuttiana</i>
Bigelove's milkvetch	<i>Astragalus Bigelovei</i>
Black grama	<i>Boutelous eriopoda</i>
Blazingstar	<i>Mentzelia pumila</i> var. <i>multiflora</i>
Blue grama	<i>Bouteloua gracilis</i>
Blue threeawn	<i>Aristida glauca</i>
Boer lovegrass	<i>Eragrostis chlorormelas</i>
Bullgrass	<i>Muhlenbergia Emersleyi</i>
Bundleflower	<i>Desmanthus</i> spp.
Burroweed	<i>Haplopappus tenuisectus</i>
Bush muhly	<i>Muhlenbergia Porteri</i>
California brickellbush	<i>Brickelli californica</i>
Camphorweed	<i>Heterotheca psammophila</i>
Cane beardgrass	<i>Andropogon barbinodis</i>
Canyon grape	<i>Vitis arizonica</i>
Carelessweed	<i>Amaranthus Palmeri</i>
Carpeweed	<i>Mullugo verticillata</i>
Catclaw acacia	<i>Acacia Greggii</i>
Chinese thornapple	<i>Datura quercifolia</i>
Chuparosa bush	<i>Anisacanthus Thurberi</i>
Cliffrose	<i>Cowania mexicana</i>
Cocklebur	<i>Xanthium saccharatum</i>
Cosmos	<i>Cosmos parviflorus</i>
Covena	<i>Dichelostemma pulchellum</i>
Creeping bentgrass	<i>Aristida palustris</i>
Crinkleawn	<i>Trachypogon secundus</i>
Croton	<i>Croton corymbulosus</i>
Cudweed	<i>Gnaphalium Wrightii</i>

Cup grass	<i>Eriochloa Lemmoni</i>
Curly mesquite	<i>Hilaria Belangeri</i>
Deergrass	<i>Muhlenbergia rigens</i>
Delicate muhly	<i>Muhlenbergia fragilis</i>
Desert anemone	<i>Anemone tuberosa</i>
Desert broom	<i>Baccharis sarothroides</i>
Desert ceanothus	<i>Ceanothus Greggii</i>
Desert willow	<i>Chilopsis linearis</i>
Desert zinnia	<i>Zinnia pumila</i>
Emory oak	<i>Quercus Emoryi</i>
Evening primrose	<i>Oenothera</i> spp.
Fall's witchgrass	<i>Leptoloma cognatum</i>
False penny royal	<i>Hedeoma</i> spp.
Feather finger grass	<i>Chloris virgata</i>
Finger gourd	<i>Cucurbita digitata</i>
Fleabane	<i>Erigeron</i> spp.
Fluff grass	<i>Tridens pulchellus</i>
Fremont cottonwood	<i>Populus Fremontii</i>
Galleta	<i>Hilaria Jamesii</i>
Globe mallow	<i>Sphaeralcea ambigua</i>
Golden cloak-fern	<i>Notholaena sinuate</i>
Goldeneye	<i>Viuiera longiflora</i>
Green sprangletop	<i>Leptochloa dubia</i>
Gregg's dalea	<i>Dalea Greggii</i>
Guajilla	<i>Calliandra eriophylla</i>
Hairy blue evolvulus	<i>Evolvulus arizonicus</i>
Hairy grama	<i>Bouteloua hirsuta</i>
Hall's panic	<i>Panicum Hallii</i>
Hedgehog cactus	<i>Echinocereus</i> spp.
Horse nettle	<i>Solanum elaeagnifolium</i>
Hyssops	<i>Euphorbia hyssopifolia</i>
Indianroot	<i>Aristolochia Watsoni</i>
Lambsquarter	<i>Chenopodium alabum</i>
Lechuguilla	<i>Agave Schottii</i>
Lehmann lovegrass	<i>Eragrostis Lehmanniana</i>
Lindheimer's lip fern	<i>Cheilanthes Lindheimeri</i>
Littleleaf sumac	<i>Rhus microphylla</i>
MacDougal pincushion	<i>Mammillaria MacDougalii</i>
Manzanita	<i>Arctostaphylos pungens</i>
Mariola	<i>Parthenium incanum</i>
Mearns sumac	<i>Rhus choriophylla</i>
Mesa threeawn	<i>Aristida hamulosa</i>
Mesquite	<i>Prosopis juliflora</i>
Mexican pinyon	<i>Pinus cembroides</i>
Mexican star	<i>Milla biflora</i>

Mormon tea
Morning glory
Mountain mahogany

Narrow cloak-fern
Needle grama
Netleaf hackberry
New Mexico copperleaf
Nipple cactus
Noseburn

Oak-belt grounset
Ocotillo
One-seed juniper

Pacific mistletoe
Palmer agave
Parry's goldenrod
Penstemon
Pincushion
Pink perezia
Plains blackfoot
Plains lovegrass
Plains bristlegrass
Prairie junegrass
Pricklyleaf dogweed
Prickly pear cactus
Prickly-poppy
Purple flower aster
Purple threeawn

Ragged nettlespurge
Ragweed
Range ratany
Red threeawn
Ring muhly

Sacahuista
Sacaton
Sand dropseed
Sandpaper bush
Scarlet gaura
Senecio
Shortleaf baccharis
Shrubby buckwheat
Shrubby dalea
Shrubby goldeneye
Sida
Sideoats grama
Skunkbush
Sleepy catchfly
Slender grama
Slim-leaf bean

Ephedra trifurca
Ipomoea spp.
Cercocarpus montanus

Notholaena cochisensis
Bouteloua aristoides
Celtis reticulata
Acalypha neomexicana
Coryphantha vivipara var. *arizonica*
Tragia nepetaefolia

Senecio quercetorum
Fouquieria splendens
Juniperus monosperma

Phoradendron Coryae
Agave Palmeri
Solidago Parryi
Penstemon spp.
Mammillaria microcarpa
Perezia Wrightii var. *arizonica*
Melampodium leucanthum
Eragrostis intermedia
Setaria macrostachya
Koeleria cristata
Dyssodia acerosa
Opuntia pheacantha
Argemone pleiacantha
Aster tanacetifolius
Aristida purpurea

Jatropha maceorrhiza
Franseria confertiflora
Krameria parvifolia
Aristida longiseta
Muhlenbergia Torreyi

Nolina microcarpa
Sporobolus Wrightii
Sporobolus cryptandrus
Mortonia scabrella
Gaura coccinea
Senecio monoensis
Baccharis brachyphylla
Eriogonum Wrightii
Dalea Greggii
Viguiera dentata
Sida procumbens
Bouteloua curtipendula
Rhus trilobata
Silene anthirrhima
Bouteloua filiformis
Phaseolus angustissimus

Slim tridens
Snake cotton
Snakeweed
Sotol
Spanish dagger
Spicebush
Spidergrass
Spike dropseed
Spike pappusgrass
Spiny cliff brake
Spiny haplopappus
Spreading ratany
Sprucetop grama
Squirreltail
Spurge
Staghorn cholla
Star cloak-fern
Stinkgrass

Talinum
Tanglehead
Texas bluestem
Texas blueweed
Texas croton
Thistle
Threadleaf groundsel
Tobosa
Trailing four-o'clock
Trixis
Twinleaf senna

Velvet pod mimosa
Verbena
Vine mesquite

Wait-a-bit
Western coralbean
Whitethorn
Whiteball acacia
Whitemouth dayflower
Wire lettuce
Wolftail
Woolly bunchgrass
Wormwood

Yerba de Pasmó
Yucca

Tridens muticus
Froelichia arizonica
Gutierrezia sarothrae
Dasyilirion Wheeleri
Yucca baccata
Alousia Wrightii
Aristida ternipes
Sporobolus contractus
Enneapogon Desvauxii
Peliaea truncata
Haplopappus spinulosus
Krameria lanceolata
Bouteloua chondrosioides
Sitanion hystrix
Euphorbia spp.
Opuntia versicolor
Notholaena standleyi
Eragrostis cilianensis

Talinum spp.
Heteropogon contortus
Andropogon cirratus
Helianthus ciliaris
Croton texensis
Cirsium spp.
Senecio longilobus
Hilaria mutica
Allionia incarnata
Trixis californica
Senna bauginioides

Mimosa dysocarpa
Verbena spp.
Panicum obtusum

Mimosa biuncifera
Erythrina flabelliformis
Acacia constricta
Acacia angustissima
Commelina erecta
Stephanomeria pauciflora
Lycurus phleoides
Elyonurus barbiculmis
Artemisia ludoviciana

Baccharis pteronioides
Yucca elata

LOCATION BERNARDINO

AZ

Established Series

Rev. MLR/DLR/PDC/WWJ

06/2000

BERNARDINO SERIES

The Bernardino series consists of very deep, well drained soils that formed in fan alluvium from igneous and sedimentary rock. Bernardino soils are on fan terraces and have slopes of 0 to 30 percent. The mean annual precipitation is about 14 inches and the mean annual air temperature is about 62 degrees F.

TAXONOMIC CLASS: Fine, mixed, superactive, thermic Ustic Calciargids

TYPICAL PEDON: Bernardino gravelly clay loam - rangeland. (Colors are for dry soil unless otherwise noted.)

A--0 to 2 inches; dark brown (7.5YR 3/2) gravelly clay loam, dark brown (7.5YR 3/2) moist; weak medium platy structure parting to moderate fine granular; slightly hard, friable, moderately sticky and moderately plastic; common very fine and fine roots; many very fine irregular pores; 35 percent gravel; slightly alkaline (pH 7.5); abrupt smooth boundary. (1 to 3 inches thick)

Bt1--2 to 9 inches; dark reddish brown (5YR 3/3) gravelly clay loam, dark reddish brown (5YR 3/4) moist; moderate fine subangular blocky structure; hard, friable, moderately sticky and moderately plastic; common very fine and fine roots; few very fine tubular and irregular pores; common faint patchy clay films on faces of peds and lining pores; 20 percent gravel; slightly alkaline (pH 7.5); clear wavy boundary. (5 to 8 inches thick)

Bt2--9 to 15 inches; dark reddish brown (5YR 3/4) gravelly clay, dark reddish brown (5YR 3/4) moist; moderate fine and medium subangular and angular blocky structure; hard, friable, moderately sticky and moderately plastic; few very fine and medium roots; few very fine tubular and common very fine irregular pores; common faint clay films on faces of peds and lining pores; 15 percent gravel; strongly effervescent in spots; moderately alkaline (pH 8.0); clear wavy boundary. (4 to 9 inches thick)

2Bk1--15 to 48 inches; pinkish gray (5YR 7/2) gravelly sandy loam, reddish brown (5YR 5/3) moist; massive; very hard, friable, nonsticky and slightly plastic; few very fine and fine roots; many very fine and fine irregular pores; 30 percent gravel; common fine irregular calcium carbonate masses; violently effervescent; moderately alkaline (pH 8.0); gradual smooth boundary. (30 to 40 inches thick)

2Bk2--48 to 60 inches; pinkish gray (5YR 7/2) very gravelly sandy loam, reddish brown (5YR 5/3) moist; massive; very hard, friable, nonsticky and slightly plastic; many very fine and fine irregular pores; 40 percent gravel; few fine irregular calcium carbonate masses; strongly effervescent; moderately alkaline (pH 8.0).

TYPE LOCATION: Santa Cruz County, Arizona; about 2 miles southeast of Sonoita; 500 feet west and 650 feet north of the southeast corner of Section 29, T. 20 S., R. 17 E.

RANGE IN CHARACTERISTICS:

Soil Moisture: Intermittently moist in some part of the soil moisture control section during July-September and December-February. Driest during May and June. Ustic aridic soil moisture regime.

Soil Temperature: 60 to 70 degrees F.

Depth to calcic horizon: 5 to 20 inches. Calcium carbonate equivalent averages 15 to 40 percent and decreases with increasing depth

Rock Fragments: Averages less than 35 percent in the control section; can range to 80 percent in any one horizon

Organic matter: Averages 1 percent or more in the surface

Reaction: Neutral or slightly alkaline in the upper part and slightly or moderately alkaline in the lower part

A horizon

Hue: 5YR, 7.5YR, 10YR

Value: 3 through 6 dry, 2 through 5 moist

Chroma: 2, 3 or 4, dry or moist

Bt horizon

Hue: 2.5YR, 5YR, 7.5YR

Value: 3, 4 or 5 dry, 2, 3 or 4 moist

Chroma: 2 through 6, dry or moist

Texture: Clay loam, clay

Bk or C horizon

Hue: 2.5YR through 10YR

Value: 5 through 8 dry, 4 through 7 moist

Chroma: 2 through 6, dry or moist

Texture: Sandy loam, sandy clay loam, clay loam, loam, loamy sand

COMPETING SERIES: These are the [Forrest](#) and [Stellar](#) series. A potential competitor that does not yet have CEA class assigned is the [Penthouse](#) series. All these soils have a calcic horizon at depths of 20 to 40 inches.

GEOGRAPHIC SETTING: Bernardino soils are on fan terraces and have slopes of 0 to 30 percent. These soils formed in fan alluvium from mixed sources. Elevation ranges from 3500 to 5500 feet. The mean annual precipitation ranges from 12 to 16 inches. The mean annual air temperature is 58 to 68 degrees F. The frost-free period is 160 to 250 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Bonita](#), [McAllister](#), [Stronghold](#), [Tombstone](#) and the competing [Forrest](#) and [White House](#) soils. Bonita soils are fine textured. McAllister soils are fine-loamy. Stronghold and Tombstone soils do not have argillic horizons.

DRAINAGE AND PERMEABILITY: Well drained; slow or medium runoff; slow permeability.

USE AND VEGETATION: Bernardino soils are used for livestock grazing and wildlife habitat. The present vegetation is sideoats grama, slender grama, purple grama, plains lovegrass, cane beardgrass, curly mesquite, tobosa, beargrass, and mesquite.

DISTRIBUTION AND EXTENT: Southern Arizona. This series is of moderate extent. MLRA is 41.

MLRA OFFICE RESPONSIBLE: Phoenix, Arizona

SERIES ESTABLISHED: Santa Cruz County (Santa Cruz County Area), Arizona; 1971.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - The zone from 0 to 2 inches (A horizon)

Argillic horizon - The zone from 2 to 15 inches (Bt1, Bt2 horizons)

Calcic horizon - The zone from 15 to 60 inches (2Bk1, 2Bk2 horizons)

Soil Taxonomy Second Edition, 1999

LOCATION HATHAWAY
Established Series
Rev. JEJ/HHS/CLG/CEM/WWJ
06/2000

AZ+NM

HATHAWAY SERIES

The Hathaway series consists of very deep, well drained soils that formed in fan alluvium from mixed sources. Hathaway soils are on fan terraces and have dominant slopes of 10 to 40 percent. Mean annual precipitation is about 18 inches and the mean annual air temperature is about 61 degrees F.

TAXONOMIC CLASS: Loamy-skeletal, mixed, superactive, thermic Aridic Calciustolls

TYPICAL PEDON: Hathaway gravelly loam - rangeland. (Colors are for dry soil unless otherwise noted.)

A--0 to 8 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure (immediate surface is single grained); soft, friable, slightly sticky and slightly plastic; many fine roots; many fine interstitial pores; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary. (7 to 16 inches thick)

Bk1--8 to 24 inches; pale brown (10YR 6/3) gravelly loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and plastic; few fine roots; few fine tubular pores; few fine irregular calcium carbonate masses; violently effervescent; more than 15 percent calcium carbonate; moderately alkaline (pH 8.2); gradual wavy boundary. (8 to 20 inches thick)

Bk2--24 to 60 inches; light gray (10YR 7/2) pinkish gray (7.5YR 6/2) and light reddish brown (5YR 6/3) stratified very gravelly loamy sand and sand, grayish brown (10YR 5/2), brown (7.5YR 5/2), and reddish brown (5YR 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine roots; common medium irregular calcium carbonate masses; many very fine and fine interstitial pores; violently effervescent; more than 15 percent calcium carbonate; moderately alkaline (pH 8.2)

TYPE LOCATION: Santa Cruz County, Arizona; about 6 miles east and 2 1/2 miles north of Sonoita; about 300 feet west of the southeast corner of section 1, T. 20 S., R. 17 E.

RANGE IN CHARACTERISTICS:

Soil Moisture - Intermittently moist in some part of the soil moisture control section during July-September and December-February. Driest during May and June. Aridic ustic soil moisture regime.

Soil Temperature - averages 59 to 67 degrees F.

Rock Fragments - averages 35 to 50 percent in the particle-size control section; but can have as much as 85 percent in any one subhorizon.

Organic Matter Content - averages 1 to 3 percent in the upper 7 inches.

Depth to the calcic horizon - 5 to 20 inches.

Reaction - slightly or moderately alkaline. Calcium carbonate equivalent averages 15 to 40 percent; can be as much as 55 percent in any one subhorizon.

A horizon

Hue: 10YR, 7.5YR

Value: 3 through 5 dry, 2 or 3 moist

Chroma: 1 through 3, dry or moist

B horizon

Hue: 10YR, 7.5YR, 5YR

Value: 5 through 7 dry, 4, 5 or 6 moist

Chroma: 2, 3, or 4, dry or moist

Texture: loam, sandy loam, loamy sand, sand, fine sandy loam

COMPETING SERIES: These are the [Tascosa](#) series. Tascosa soils are moist in the moisture control section in spring and early summer and are typical of the [Blackwater](#) Draw Ogallala [Formation](#) in the [Canadian](#) Breaks-MLRA 77 and 78.

GEOGRAPHIC SETTING: Hathaway soils are at elevations of 2,500 to 6,200 feet, on nearly level to steep slopes of fan terraces. Slopes are dominantly 10 to 40 percent, and range from 2 to 70 percent. The soils formed in fan alluvium from mixed sources of limestone, rhyolite, granite, dacite, andesite, tuff, quartzite, sandstone, and shale. Hathaway soils occur in warm, semiarid, continental climate. The mean annual air temperature is 57 to 66 degrees F. The mean annual precipitation is 15 to 20 inches. About 55 percent of the precipitation occurs during July, August, and September; 35 percent in December and January. The frost-free period is 180 to 230 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Bernardino](#), [Cave](#), [Continental](#), [Graham](#), [Sonoita](#), and [White House](#) soils. Bernardino, Continental, White House, Sonoita, and Graham soils have reddish brown or dark reddish brown Bt horizons and the Graham soils are underlain by bedrock at depths of less than 20 inches. Cave soils are light colored, have less than 1 percent organic matter, and have a strongly cemented horizon at shallow depths.

DRAINAGE AND PERMEABILITY: Well drained; medium to rapid runoff; moderate to moderately rapid permeability.

USE AND VEGETATION: These soils are used mainly for livestock grazing. Small areas are used for homesites. Vegetation is mostly grass with some scattered brush. The grasses are black, sideoats, and hairy gramas; curly mesquite, bush muhly, threeawn, fluffgrass, and slim tridens. The brush is dominantly mesquite and wait-a-bit, with widely spaced creosote, whitethorn, beargrass, yucca, cacti, and ocotillo.

DISTRIBUTION AND EXTENT: Southeastern Arizona and central Arizona. Hathaway soils are moderately extensive.

MLRA OFFICE RESPONSIBLE: Phoenix, Arizona

SERIES ESTABLISHED: Santa Cruz County Area, Arizona; 1971.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Mollic epipedon - the zone from 0 to 8 inches (A horizon)

Calcic horizon - the zone from 8 to 60 inches (Bk1, Bk2 horizons)

Soil Taxonomy Second Edition, 1999

LOCATION KIMBROUGH
Established Series
Rev. RAH-TCB-ACT
01/2000

NM+TX

KIMBROUGH SERIES

The Kimbrough series consists of soils that are very shallow to shallow to a petrocalcic horizon. They are well drained, calcareous, gravelly soils that formed in moderately fine textured eolian sediments of the Blackwater Draw Formation of Pleistocene age. These soils are typically on gently sloping plains, narrow ridges, and side slopes along draws. Slope ranges from 0 to 3 percent. Mean annual precipitation is 15 inches, and mean annual temperature is 63 degrees F.

TAXONOMIC CLASS: Loamy, mixed, superactive, thermic, shallow Ustic Petrocalcids

TYPICAL PEDON: Kimbrough gravelly loam, in rangeland at an elevation of about 3,900 feet. (Colors are for dry soil unless otherwise stated.)

A1--0 to 2 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak thin platy structure; slightly hard, friable, sticky and slightly plastic; many fine roots; many fine irregular pores; about 15 percent of the surface covered with caliche fragments; 10 percent pebble size and 5 percent cobble size calcium carbonate fragments; strongly effervescent, calcium carbonate disseminated; moderately alkaline (pH 7.8); abrupt smooth boundary. (1 to 5 inches thick)

A2--2 to 8 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak granular and subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; many fine irregular pores; 20 percent pebble size and 10 percent cobble size calcium carbonate fragments; strongly effervescent, calcium carbonate is disseminated and occurs in threads and masses; moderately alkaline (pH 7.8); abrupt smooth boundary. (2 to 12 inches thick)

Bkm--8 to 36 inches; white (N 8/) indurated layer containing a few fractures; laminar in upper part, with indurated to strongly cemented calcium carbonate with pea-shaped calcitic structures (pisolites) below the laminae; becomes softer with depth. (5 to 40 inches thick)

Bk--36 to 80 inches; white (10YR 8/1); massive; soft calcium carbonate soil material with a loam texture; 15 percent strongly cemented caliche fragments, 25 percent moderately cemented caliche fragments; most caliche fragments have a laminar cap 1 to 2 mm thick; violently effervescent.

TYPE LOCATION: Lea County, New Mexico; 5 miles southeast of Lovington on New Mexico Highway 18, then 0.25 mile northeast, 0.5 mile north, 0.5 mile east on north side of road, or 1000 feet north and 1000 feet west corner of Sec 30, T. 16 S., R. 37 E; Latitude: 32 degrees, 53 minutes, 15 seconds N; Longitude: 103 degrees, 11 minutes, 27 seconds W; Humble City NW, New Mexico USGS quad; NAD 27.

RANGE IN CHARACTERISTICS:

Soil moisture: An aridic moisture regime bordering on ustic. The soil moisture control section is dry in all parts for 150 to 225 days, cumulative, in normal years. The soil is intermittently moist July through October. December through February are the driest months.

Mean annual soil temperature: 59 to 67 degrees F. Depth to petrocalcic horizon: 4 to 20 inches. Solum thickness: 4 to 20 inches. Particle-size control section: 15 to 20 percent silicate clay.

A horizon: Hue: 7.5YR or 10YR

Value: 3 to 5 dry, 2 or 3 moist

Chroma: 2 to 4

Texture: loam, fine sandy loam, gravelly loam, gravelly fine sandy loam

Calcium carbonate equivalent: 0 to 5 percent

Effervescence: strong to violent

Reaction: slightly to moderately alkaline

Bkm horizon:

This horizon ranges from fractured, indurated, and thin to thickly laminar to continuously indurated, thickly laminar. Some pedons have indurated to moderately cemented pea-shaped, calcitic structures below the laminar caps (pisolitic structure).

Bk horizon:

Hue: 7.5YR or 10YR

Value: 7 or 8 dry, 6 or 7 moist

Chroma: 1 to 4

Coarse fragments: 25 to 60 percent imbedded in soil matrix

Texture: loam

Calcium carbonate equivalent: more than 40 percent

Effervescence: violent

Reaction: moderately alkaline

COMPETING SERIES: These are the [Blakeney](#) (TX), [Conger](#) (TX), and [Kolar](#) (NM) series.

Blakeney and Kolar soils: do not have mollic colors in the surface horizon.

Conger soils: average greater than 18 to 20 percent clay in the particle size control section.

GEOGRAPHIC SETTING:

Parent material: a thin mantle of medium to moderately coarse textured eolian sediments over an indurated layer.

Landform: level to gently sloping plains with common shallow depressions.

Slope: 0 to 3 percent.

Elevation: 3,600 to 4,600 feet.

Mean annual air temperature: 57 to 65 degrees F.

Mean annual precipitation: 10 to 17 inches.

Frost-free period: 175 to 215 days.

Thornthwaite annual P-E Index: 22 to 32

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Amarose](#), [Arizer](#), [Lea](#), [Sharvana](#), and [Simona](#) soils.

Amarose and Arizer soils: do not have a petrocalcic horizon, and occur on slightly lower landscape positions.

Lea soils have a petrocalcic horizon more than 20 inches from the soil surface, and occur on the same landscape positions.

Sharvana, and Simona soils have an ochric epipedon, and occur on slightly lower landscape positions.

Sharvana soils: have an argillic horizon, and occur in similar landscape positions.

DRAINAGE AND PERMEABILITY: Well drained. Moderate permeability. Runoff is low on slopes less than 1 percent and medium on 1 to 3 percent slopes.

USE AND VEGETATION: These soils are used nearly exclusively for rangeland.

In the southern part of the distribution of this series, the climax vegetation includes sideoats grama, little bluestem, buffalograss, hairy grama, slim tridens, purple and wright threeawns, bushsunflower, gray goldaster, daleas, gayfeather, plains blackfoot, sundrops, catclaw, ephedra, hackberry, and javelinabrush. In the northern part of the distribution, the climax vegetation consists of blue grama, lack grama, sideoats grama, little bluestem, sand dropped, New Mexico feathergrass, galleta, catclaw, feather dahlia, dotted gayfeather, plains blackfoot, slim tridens, hairy grama, rock daisy, catclaw, and broom snakeweed.

DISTRIBUTION AND EXTENT: Southeastern New Mexico and Southwestern High Plains of Texas (MLRA-77). The series is extensive.

MLRA OFFICE RESPONSIBLE: Temple, Texas.

SERIES ESTABLISHED: Lea County, New Mexico, (Reconnaissance Survey of Eastern New Mexico), 1936.

REMARKS: Classification change from Petrocalcic Calciustolls to Ustic Petrocalcids based on an evaluation of the geographic extent of these soils, and the climate in which they occur.

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon: 0 to 8 inches. (A1, A2 horizons) This horizon qualifies for a mollic epipedon except for dryness.

Petrocalcic horizon: 8 to 36 inches. (Bkm horizon)

Soil interpretations record: NM0337

Taxonomic version: Keys to Soil Taxonomy, Eight Edition, 1998.

National Cooperative Soil Survey
U.S.A.

LOCATION LAMPSHIRE
Established Series
Rev. MLR/PDC/WWJ
11/2001

AZ

LAMPSHIRE SERIES

The Lampshire series consists of very shallow and shallow, well drained soils that formed in alluvium and colluvium from igneous rocks. Lampshire soils are on hills and mountains and have slopes of 3 to 90 percent. The mean annual precipitation is about 14 inches and the mean annual air temperature is about 62 degrees F.

TAXONOMIC CLASS: Loamy-skeletal, mixed, superactive, nonacid, thermic Lithic Ustic Torriorthents

TYPICAL PEDON: Lampshire very cobbly loam - rangeland. (Colors are for dry soil unless otherwise noted.)

A--0 to 8 inches; grayish brown (10YR 5/2) very cobbly loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and few medium roots; many fine tubular pores; 20 percent gravel and 40 percent cobble; neutral (pH 7.0); abrupt irregular boundary. (4 to 20 inches thick)

2R--8 inches; tuff.

TYPE LOCATION: Santa Cruz County, Arizona; approximately 2 miles west - northwest of Tubac; on the southeast slope of low hill; 800 feet south and 500 feet west of the northeast corner of Section 11, T.21 S., R.12 E.

RANGE IN CHARACTERISTICS:

Soil Moisture: Intermittently moist in some part of the soil moisture control section during July-September and December-February. Driest during May and June. Ustic aridic soil moisture regime. The epipedon is moist in some part less than 90 days (cumulative) when the soil temperature is above 41 degrees F. in 7 out of 10 years.

Rock Fragments: 35 to 70 percent cobble and gravel; mainly igneous and tuffaceous

Soil Temperature: 59 to 72 degrees F.

Depth to bedrock: 4 to 20 inches. Some pedons may have a layer less than 3 inches thick of weathered bedrock above the lithic contact.

A or C horizon

Hue: 7.5YR, 10YR

Value: 3, 4, or 5 dry, 2 through 4 moist

Chroma: 1 through 4, dry or moist

Organic matter: 1 to 2 percent

Texture: Loam, sandy loam, fine sandy loam, silt loam (10 to 20 percent clay)

Reaction: Slightly acid to moderately alkaline

Calcium carbonate: Few coatings on bedrock in some pedons

COMPETING SERIES: These are the [Lingua](#) and [Reduff](#) series. Lingua soils contain 20 to 35 percent clay and formed from basalt of the [Cottonwood Springs Formation](#). Reduff soils have mean annual precipitation of 10 to 14 inches and hue ranges to 2.5YR and formed from tuffaceous bedrock of the [Duff](#) and Pruett Formation.

GEOGRAPHIC SETTING: Lampshire soils are on hills and mountains at elevations of 2,500 to 5,800 feet. These soils formed in alluvium and colluvium from basalt, tuff, andesite, rhyolite, dacite, granite and schist. Slopes range from 3 to 90 percent. The mean annual precipitation is 12 to 16 inches. The mean annual air temperature is 57 to 70 degrees F. The frost-free period is 170 to 250 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Caralampi](#), [Chiricahua](#), [Graham](#) and [Signal](#) soils. Caralampi and Signal soils are very deep. Chiricahua and Graham soils have a fine-textured argillic horizon.

DRAINAGE AND PERMEABILITY: Well drained; medium to rapid runoff; moderate or moderately rapid permeability.

USE AND VEGETATION: Lampshire soils are used for livestock grazing and wildlife habitat. Vegetation is sideoats, sprucetop, hairy and slender grammas, three-awn, canebeardgrass, plains lovegrass, bristlegrass, tanglehead, curly mesquite, black grama, ocotillo, whitethorn, range ratany, mimosa, catclaw, agave, beargrass, sotol, barrel cacti, palo verde and desert hackberry.

DISTRIBUTION AND EXTENT: Southern and Central Arizona. This series is extensive. This soil occurs in LRR-D, MLRAs 38 and 41.

MLRA OFFICE RESPONSIBLE: Phoenix, Arizona

SERIES ESTABLISHED: Santa Cruz County Area, Arizona; 1971.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - The zone from 0 to 8 inches (A horizon)

Lithic contact - The boundary at 8 inches (2R horizon)

Classified according to Soil Taxonomy Second Edition, 1999.

National Cooperative Soil Survey
U.S.A.

LOCATION MCNEAL
Established Series
Rev. SDH/MLR/PDC/CEM/WWJ
06/2000

AZ

MCNEAL SERIES

The McNeal series consists of very deep, well drained soils that formed in mixed alluvium from volcanic, granitic and limestone rock. McNeal soils are on fan terraces and have slopes of 1 to 15 percent. The mean annual precipitation is about 14 inches and the mean annual air temperature is about 61 degrees F.

TAXONOMIC CLASS: Fine-loamy, mixed, superactive, thermic Ustic Calciargids

TYPICAL PEDON: McNeal very gravelly sandy loam - rangeland. (Colors are for dry soil unless otherwise noted.)

45 to 55 percent of the surface is covered with gravel

A--0 to 1 inch; strong brown (7.5YR 5/6) very gravelly sandy loam, brown (7.5YR 4/4) moist; weak thin platy structure; loose, moderately sticky and moderately plastic; common very fine and fine roots; common fine irregular and tubular pores; few fine vesicular pores; 38 percent gravel; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Btk1--1 to 6 inches; yellowish red (5YR 4/6) clay loam, reddish brown (5YR 4/4) moist; moderate fine subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; common very fine and fine roots and few medium roots; few fine tubular pores; many distinct clay films on ped faces and common distinct calcium carbonate coatings on rock fragments; 10 percent gravel; strongly effervescent, 4 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Btk2--6 to 13 inches; 80 percent yellowish red (5YR 4/6) and 20 percent pink (5YR 7/4) clay loam, reddish brown (5YR 4/4) moist; moderate fine subangular blocky structure; moderately sticky and moderately plastic; common very fine and fine roots; few fine tubular pores; common distinct clay films on ped faces and many distinct calcium carbonate coatings on rock fragments; common fine soft calcium carbonate masses; 10 percent gravel; violently effervescent, 43 percent calcium carbonate equivalent; moderately alkaline (pH 8.4) clear smooth boundary.

Btk3--13 to 21 inches; 50 percent light reddish brown (5YR 6/4) and 50 percent pink (5YR 7/4) clay loam, light reddish brown (5YR 6/4) moist; moderate fine subangular blocky structure; slightly hard, friable, moderately sticky and

moderately plastic; common fine roots; many fine tubular pores; common distinct clay films on ped faces; many distinct calcium carbonate coatings on rock fragments; common fine soft calcium carbonate masses; 10 percent gravel; violently effervescent, 53 percent calcium carbonate equivalent; moderately alkaline (pH 8.4); abrupt smooth boundary.

Btk4--21 to 41 inches; 50 percent light reddish brown (5YR 6/4) and 50 percent pinkish white (5YR 8/2) sandy clay loam, light reddish brown (5YR 6/4) moist; moderate fine subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; common fine roots; many fine tubular pores; common distinct clay films on ped faces; many distinct calcium carbonate coatings on rock fragments; common fine soft calcium carbonate masses; 10 percent gravel; violently effervescent, 33 percent calcium carbonate equivalent; moderately alkaline (pH 8.4); abrupt smooth boundary.

Btk5--41 to 60 inches; 90 percent strong brown (7.5YR 5/6) and 10 percent pinkish white (7.5YR 8/2) sandy loam, yellowish red (5YR 4/6) moist; moderate fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few fine roots; many fine tubular pores; common distinct clay films on ped faces; many distinct calcium carbonate coatings on rock fragments; common fine calcium carbonate filaments; 10 percent gravel; violently effervescent, 9 percent calcium carbonate equivalent; moderately alkaline (pH 8.4).

TYPE LOCATION: Cochise County, Arizona; located at a latitude of 31 degrees, 44 minutes, 22 seconds North and a longitude of 110 degrees, 03 minutes, 31 seconds West; 1,275 feet south and 200 feet west of the northeast corner of section 36, Township 19 S., Range 22 E.

RANGE IN CHARACTERISTICS:

Soil moisture: Intermittently moist in some part of the soil moisture control section during July-September and December-February. Driest during May and June. Ustic aridic soil moisture regime.

Rock fragments: 0 to 35 percent

Reaction: slightly to strongly alkaline

Depth to calcic horizon: 5 to 20 inches

Organic matter: less than 1 percent in the surface

Thickness of solum: 20 to 40 inches

A horizon

Hue: 5YR, 7.5YR, 10YR

Value: 3 through 6 dry, 3, 4 or 5 moist

Chroma: 3 through 6, dry or moist

Btk horizon

Hue: 5YR, 7.5YR

Value: 4 through 8 dry, 4 through 6 moist

Chroma: 2 through 6 dry, 4 through 6 moist

Texture: loam, sandy clay loam, clay loam, sandy loam (averages 20 to 35 percent clay)

Calcium carbonate equivalent: more than 15 percent

COMPETING SERIES: These are the Amorose, [Grizzle](#), [Gulch](#), [Headquarters](#), [McAllister](#), and [Redona](#) series. Amorose, McAllister, and Redona soils have calcic horizons at depths more than 20 inches. Grizzle soils have bedrock at depths of 20 to 40 inches. Gulch soils contain gypsum in the lower Bt horizon. Headquarters soils have Ck horizons that lack structure and have cementation that ranges from hard to extremely hard. In addition, Redona soils are in LRR-G, MLRA 70 and are moist during [May](#) and June.

GEOGRAPHIC SETTING: McNeal soils are in the Chihuahuan desert on gently sloping to sloping fan terraces at elevations of 3,000 to 5,200 feet. Slopes range from 1 to 15 percent. These soils formed in mixed alluvium from rhyolite, andesite, granite, and limestone. The mean annual precipitation is 12 to 16 inches, occurring as summer thunderstorms and gentle winter rains. The mean annual air temperature is about 59 to 67 degrees F. The frost-free period is 180 to 250 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Bonita](#), [Forrest](#) and [Luckyhills](#) series. Bonita soils are fine textured. Forrest soils are fine textured and have greater than 1 percent organic matter. Luckyhills soils have less than 18 percent clay and do not have an argillic horizon.

DRAINAGE AND PERMEABILITY: Well drained; medium runoff; moderately slow permeability.

USE AND VEGETATION: Used for livestock grazing, wildlife habitat and irrigated cropland. Vegetation is whitethorn, tarbush, creosotebush, bush muhly, plains bristlegrass, desert zinnia and mariola. Irrigated crops are cotton, corn, small grains and alfalfa.

DISTRIBUTION AND EXTENT: Southeastern Arizona portion of the Chihuahuan desert. McNeal soils are moderately extensive. MLRA is 41.

MLRA OFFICE RESPONSIBLE: Phoenix, Arizona

SERIES ESTABLISHED: Sulphur Spring Valley Area, Arizona; 1940.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - The zone from 0 to 1 inches (A horizon)

Argillic horizon - The zone from 1 to 60 inches (Btk1, Btk2, Btk3, Btk4, Btk5 horizons)

Calcic horizon - The zone from 6 to 41 inches (Btk2, Btk3, Btk4 horizons)

Proposal made to move the type location to the Douglas-Tombstone TUD April 2000.

Soil Taxonomy Second Edition, 1999.

National Cooperative Soil Survey
U.S.A.

LOCATION PIMA
Established Series
Rev. YHH/RCH/WWJ
11/2001

AZ+NM

PIMA SERIES

The Pima series consists of deep, well drained soils formed in stream alluvium. Pima soils are on alluvial fans and flood plains and have slopes of 0 to 3 percent. The average annual precipitation is about 10 inches and the mean annual temperature is about 65 degrees F.

TAXONOMIC CLASS: Fine-silty, mixed, superactive, calcareous, thermic Typic Torrifluvents

TYPICAL PEDON: Pima silty clay loam--cultivated. (Colors are for dry soil unless otherwise noted.)

Ap--0 to 4 inches; yellowish brown (10YR 5/4) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; common fine roots; many very fine tubular pores; slightly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary. (4 to 8 inches thick)

A1--4 to 10 inches; brown (10YR 5/3) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; many fine roots; many fine tubular pores; slightly effervescent; moderately alkaline (pH 8.0); clear smooth boundary. (6 to 8 inches thick)

A2--10 to 25 inches; brown (10YR 5/3) silty clay loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, friable, sticky and slightly plastic; common fine roots; many fine tubular pores; slightly effervescent; moderately alkaline (pH 8.0); clear smooth boundary. (10 to 16 inches thick)

C1--25 to 37 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) moist; massive; slightly hard, friable, sticky and slightly plastic; many fine tubular pores; few very fine lime filaments; strongly effervescent; moderately alkaline (pH 8.0).

C2--37 to 60 inches; light yellowish brown (10YR 6/4) silty clay loam, dark yellowish brown (10YR 3/4) moist; massive; slightly hard, friable sticky and slightly plastic; many fine tubular pores; few fine lime filaments; strongly effervescent; moderately alkaline (pH 8.0).

TYPE LOCATION: Cochise County, Arizona; about 6 miles southwest of Bowie; 3000 feet east and 500 feet north of SW corner section 8, T. 14 S., R. 29 E.

RANGE IN CHARACTERISTICS:

Soil Moisture - Intermittently moist in the soil moisture control section in some part during July to September and December to February.

Rock fragments (particle-size control section) - less than 35 percent pebbles.

Thickness of dark epipedon - 20 to more than 40 inches.

A horizon - Hue: 10YR or 7.5YR.

Value: 4 or 5 dry, 2 or 3 moist.

Chroma: 2 or 3 dry and moist.

Texture: Silt loam, silty clay loam, loam or clay loam. Particle-size control section averages more than 18 percent clay and less than 15 percent sand coarser than very fine sand.

Organic matter: More than 1 percent to more than 20 inches; decreases irregularly or remains high in deep layers.

Reaction: Neutral to moderately alkaline.

Carbonates: Slightly or strongly effervescent.

Stratification: Thin strata of contrasting textures are common.

C horizon - Hue: 10YR or 7.5YR.

Value: 4,5 or 6 dry, 3,4 or 5 moist.

Chroma: 2,3 or 4 dry and moist.

Texture: Silt loam, silty clay loam, loam, clay loam, and fine sandy loam; particle size control section averages more than 18 percent clay and less than 15 percent sand coarser than very fine sand.

Reaction: Mildly or moderately alkaline.

Carbonates: Strongly or violently effervescent; lime filaments occur in some pedons.

Stratification: Thin strata of contrasting textures are common.

COMPETING SERIES: This is the [Glendale](#) series. A potential competitor that does not yet have CEA class assigned is the [Rift](#) series. Glendale soils have less than 1 percent organic matter. Rift soils are moist in the soil moisture control section for less than 20 days cumulative during July-September and occur in MLRA 30 of the [Mohave](#) Desert.

GEOGRAPHIC SETTING: Pima soils are on alluvial fans and flood plains. Elevations range from 1,100 to 5,400 feet. Slopes range from 0 to 3 percent. These soils formed in stratified and mixed alluvium from volcanic, granitic, metamorphic and sedimentary rock. The climate is warm and dry. The average

annual precipitation is 6 to 12 inches occurring as summer thunderstorms and winter rain and snow. The mean annual temperature is 54 degrees F. Frost-free season is 180 to 240 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Anthony](#), [Brazito](#), [Gila](#), [Grabe](#) and [Hantz](#) and the competing [Glendale](#) soils. Anthony soils are coarse-loamy. [Arizo](#) soils are sandy-skeletal. Brazito soils are sandy. Gila and Grabe soils are coarse-silty. Hantz soils are fine.

DRAINAGE AND PERMEABILITY: Well drained; runoff is medium; moderately slow permeability.

USE AND VEGETATION: Used for grazing and irrigated cropland. Alfalfa, cotton, grain, and vegetables are major irrigated crops. Native vegetation is mesquite, quailbush, creosotebush, squawbush, alkali sacaton, sixweeks grama, Indianwheat, alfileria, and annual weeds and grasses.

DISTRIBUTION AND EXTENT: Southern Arizona and southern New Mexico. Pima soils are moderately extensive. This soil occurs in LRR-D, MLRAs 40, 41, and 42.

MLRA OFFICE RESPONSIBLE: Phoenix, Arizona

SERIES ESTABLISHED: Middle Gila Area, Arizona, 1917.

REMARKS: Move type location from Santa Cruz County to Cochise County, Arizona.

Diagnostic horizons and features recognized in the Pima Series are:

- 1) No diagnostic horizons are recognized.
- 2) Stratification is common feature in massive horizons.

Fluvial feature - Irregular decrease in organic carbon in the zone from 25 to 60 inches (C1, C2 horizons)

Classified according to Soil Taxonomy Second Edition, 1999.

ADDITIONAL DATA: NSS Laboratory sample S44AZ-003-001.

LOCATION TORTUGAS
Established Series
Rev. JEJ/MSJ/YHH
12/71

AZ+NM NV UT

TORTUGAS SERIES

Typically, Tortugas soils have grayish brown loam A horizons that are strongly effervescent and contain more than 50 percent by volume of stones, cobblestones, or pebbles; and bedrock is at a depth of about 12 inches.

TAXONOMIC CLASS: Loamy-skeletal, carbonatic, mesic Lithic Haplustolls

TYPICAL PEDON: Tortugas cobbly loam - rangeland
(Colors are for dry soil unless otherwise noted.)

A11--0 to 1 inch; Grayish brown (10YR 5/2) cobbly light loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky and moderate medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; few medium roots; few fine tubular pores, many very fine irregular pores; strongly effervescent, moderately alkaline (pH 8.2); clear smooth boundary. (1 to 3 inches thick)

A12--1 to 12 inches; Grayish brown (10YR 5/2) very cobbly loam, dark brown (10YR 3/3) moist, weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and few medium roots; few fine tubular pores, many very fine and fine irregular pores; violently effervescent; moderately alkaline (pH 8.2); abrupt irregular boundary. (5 to 17 inches thick)

R--12 to 14 inches; Gray (10YR 6/1), gray (10YR 5/1) moist; fractured limestone with soil material in rock fractures; thin discontinuous layer of CaCO₃ on top surface of limestone; strongly to violently effervescent; common fine roots along cracks in rocks.

TYPE LOCATION: Cochise County, Arizona; 2 1/2 miles west of Dos Cabezas; 1,000 feet north of SW corner of sec. 25, T.14S., R.26E.

RANGE IN CHARACTERISTICS: The soil contains more than 40 percent CaCO₃. Depth to hard limestone or calcareous sandstone ranges from 6 to 20 inches and averages about 12 inches. The mean annual soil temperature ranges from 50 degrees to 59 degrees F. In most years, the soil is dry for more than 90 cumulative days but not for as long as 60 consecutive days. The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 dry and 2 or 3 moist, and chroma of 2 or 3. The surface layer is gravelly loam, cobbly loam, very stony loam, very gravelly loam, and very cobbly loam. Some pedons have a C horizon. Where

present the C horizon has hue of 7.5YR or 10YR, value of 5 through 8 dry, and 4 through 7 moist, and chroma of 2 through 4. Size of coarse fragments is quite variable, and averages more than 50 percent by volume coarser than 2mm. In some pedons, lime coatings or lime accumulations are just above the limestone.

COMPETING SERIES: These are the [Heizer](#), [Mabray](#), and [Winona](#) series. Heizer soils have soft, chalky limestone at depths of 10 to 20 inches and occur in an area with 17 to 28 inches of mean annual precipitation. Mabray soils have a thermic temperature regime. Winona soils lack a mollic epipedon and have less than 35 percent coarse fragments.

GEOGRAPHIC SETTING: The Tortugas soils are on gently rolling ridges to very steep hills at elevations of 4,000 to 7,000 feet. Slopes are dominantly 5 to 45 percent and range from 2 to 70 percent. These soils formed on and from limestone, calcareous sandstone and shale. The climate is semiarid continental. The mean annual temperature ranges from 48 degrees to 58 degrees F. The freeze-free season ranges from 120 to 200 days. The average annual precipitation ranges from 10 to 18 inches falling mainly in thundershowers in July and August and in gentle rains in December and January.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Dye](#), [Graham](#), [House Mountain](#), [Mokiak](#), Motaqua, [Partridge](#), [Poley](#), Ruin, and [Welring](#) soils. Dye and Graham soils have argillic horizons and fine texture. House Mountain soils lack mollic epipedons and have mean annual soil temperatures above 59 degrees F. Partridge, Poley, and Ruin soils are deep and have fine texture. Mokiak and Motaqua soils are noncalcareous and have argillic horizons. Welring soils have an ochric epipedon.

DRAINAGE AND PERMEABILITY: Well-drained; medium to rapid runoff; moderate permeability.

USE AND VEGETATION: These soils are used for range. Native vegetation is cliffrose, juniper, cacti snakeweed, whitethorn, creosotebush, ocotillo, blue, black, and sideoats grama, chamiza, and annual weeds and grasses.

DISTRIBUTION AND EXTENT: Southern and central Arizona, southern Utah, and possibly southern New Mexico. The series is extensive.

MLRA OFFICE RESPONSIBLE: Temple, Texas

SERIES ESTABLISHED: Gila River Project, 1936.

REMARKS: The Tortugas soils were formerly classified as Lithosols.OSED scanned by SSQA. Last revised by state on 12/71.

National Cooperative Soil Survey
U.S.A.

LOCATION WHITE HOUSE
Established Series
Rev. MLR/JEJ/PDC/CEM/WWJ
06/2000

AZ+NM

WHITE HOUSE SERIES

The White House series consists of very deep, well drained soils that formed in fan alluvium from mixed sources. White House soils are on fan terraces and have slopes of 0 to 35 percent. The mean annual precipitation is about 14 inches and the mean annual air temperature is about 62 degrees F.

TAXONOMIC CLASS: Fine, mixed, superactive, thermic Ustic Haplargids

TYPICAL PEDON: White House gravelly loam - rangeland. (Colors are for dry soil unless otherwise noted.)

A--0 to 3 inches; brown (7.5YR 5/4) gravelly loam, dark brown (7.5YR 3/2) moist; weak thin platy structure parting to moderate fine granular; slightly hard, friable, nonsticky and slightly plastic; many very fine and fine roots; common fine irregular pores; 15 percent gravel; moderately acid (pH 5.6); clear smooth boundary. (2 to 8 inches thick)

Bt1--3 to 9 inches; reddish brown (5YR 5/4) clay loam, dark reddish brown (5YR 3/4) moist; weak medium subangular blocky structure; hard, friable, moderately sticky and moderately plastic; common fine and very fine roots; few fine and very fine tubular pores; few faint clay films on faces of peds; 2 percent fine gravel; slightly acid (pH 6.2) clear smooth boundary. (5 to 9 inches thick)

Bt2--9 to 22 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; moderate medium and coarse prismatic structure; hard, firm, moderately sticky and moderately plastic; common fine and very fine roots; few very fine irregular and tubular pores; many distinct clay films on faces of peds; 2 percent fine gravel; neutral (pH 7.0); clear wavy boundary. (9 to 26 inches thick)

Btk1--22 to 26 inches; dark red (2.5YR 3/6) clay, dark red (2.5YR 3/6) moist; moderate medium and coarse subangular and angular blocky structure; hard, firm, moderately sticky and moderately plastic; common fine roots; few fine tubular pores; many distinct clay films on faces of peds; common pressure faces; common medium slickensides; 2 percent gravel; 9 percent calcium carbonate equivalent; strongly effervescent; moderately alkaline (pH 8.0); clear wavy boundary. (3 to 10 inches thick)

Btk2--26 to 39 inches; mixed red (2.5YR 4/6) and pink (5YR 7/4) clay loam, dark red (2.5YR 3/6) and light reddish brown (5YR 6/4) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; few fine roots; few

very fine and fine tubular pores; common faint clay films on faces of peds; 5 percent gravel; common medium irregular calcium carbonate masses; 10 percent calcium carbonate equivalent; strongly effervescent; moderately alkaline (pH 8.0); gradual wavy boundary. (6 to 15 inches thick)

Bk1--39 to 49 inches; mixed yellowish red (5YR 5/6) and pink (5YR 7/4) sandy clay loam, yellowish red (5YR 4/6) and light reddish brown (5YR 6/3) moist; massive; hard, friable, slightly sticky and moderately plastic; few very fine tubular and irregular pores; 10 percent medium and coarse gravel; few fine and medium calcium carbonate masses; 2 percent calcium carbonate equivalent; slightly effervescent; moderately alkaline (pH 8.0); gradual wavy boundary. (8 to 12 inches thick)

Bk2--49 to 60 inches; mixed yellowish red (5YR 5/8) and pink (5YR 7/3) very gravelly sandy clay loam, yellowish red (5YR 4/6) and light reddish brown (5YR 6/3) moist; massive; hard, friable, moderately sticky and moderately plastic; few very fine irregular pores; 35 percent medium and coarse gravel; few fine calcium carbonate masses; 2 percent calcium carbonate equivalent; slightly effervescent; moderately alkaline (pH 8.0).

TYPE LOCATION: Santa Cruz County, Arizona; 1.3 miles east southeast of Highway 83 and .1 mile south of the El Paso Natural Gas pipeline in the San Ignacio Del Babocomari Grant, 3 miles south and 4.5 miles east of Sonoita in Section 11, T. 21 S., R. 17 E.

RANGE IN CHARACTERISTICS:

Soil Moisture: Intermittently moist in some part of the soil moisture control section during July-September and December-February. Driest during May and June. Ustic aridic soil moisture regime.

Soil Temperature: 59 to 70 degrees F.

Rock Fragments: Averages less than 35 percent in the control section

Organic matter: Averages 1 percent or more in the surface

Reaction: moderately acid through moderately alkaline

A horizon

Hue: 2.5YR, 5YR, 7.5YR

Value: 3 through 6, dry or moist

Chroma: 2 through 6, dry or moist

Bt horizon

Hue: 2.5YR, 5YR, 7.5YR

Value: 3 through 6, dry or moist
Chroma: 2 through 8, dry or moist
Texture: Clay loam, clay, sandy clay loam (averages more than 35 percent clay)

B, Bk or C horizon
Hue: 2.5YR through 10YR
Value: 3 through 8 dry, 3 through 7 moist
Chroma: 2 through 8, dry or moist
Texture: Sandy clay loam, clay loam, clay
Some pedons contain thin layers of coarse sandy loam, loamy sand, or loamy coarse sand at depths greater than 25 inches.

COMPETING SERIES: There are no competitors.

GEOGRAPHIC SETTING: White House soils are on fan terraces and have slopes of 0 to 35 percent. These soils formed in fan alluvium from mixed sources. Elevations range from 3000 to 5400 feet. The mean annual precipitation is 12 to 16 inches. The mean annual air temperature is 57 to 67 degrees F. The frost-free period is 160 to 250 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Forrest](#) and [Bernardino](#) soils. In addition is the [Caralampi](#) soil. Caralampi soils are loamy-skeletal. Forrest and Bernardino soils have calcic horizons.

DRAINAGE AND PERMEABILITY: Well drained; slow or medium runoff; slow or very slow permeability.

USE AND VEGETATION: White House soils are used for livestock grazing and wildlife habitat. A few areas are used for homesites and other urban uses. Present vegetation is grama grasses, plains lovegrass, wolftail, curly mesquite, tobosa, and mesquite.

DISTRIBUTION AND EXTENT: Southern Arizona. This series is extensive. MLRA is 38 and 41.

MLRA OFFICE RESPONSIBLE: Phoenix, Arizona

SERIES ESTABLISHED: Pima County (Tucson Area) Arizona; 1931.

REMARKS: Diagnostic horizons and features recognized in this pedon are:
Ochric epipedon - The zone from 0 to 3 inches (A horizon)
Argillic horizon - The zone from 3 to 39 inches (Bt1, Bt2, Btk1, Btk2 horizons)
Soil Taxonomy Second Edition, 1999

Insert blank Inventory, Health, Frequency, Dry Weight, and Comparative Yield forms.