

**NRCS CONSERVATION INNOVATION GRANT  
Final Report**

<b>Grantee Entity Name:</b> First Nations Development Institute	
<b>Project Title:</b> Conservation Planning for Navajo Livestock Producers	
<b>Agreement Number:</b> 69-3A75-14-261	
<b>Project Director:</b> Ms. Jackie Francke	
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<b>Final Report:</b> September 1, 2014 – December 31, 2015	
<b>Project End Date:</b> December 31, 2015	

**A. Project Status: Completed**

The overall goal of the project was to develop and/or refine a conservation planning process focused on grazing management on the 14R acreage that serves Navajo (Native American) livestock producers. 14R producers will assess current conservation practices utilized by 14R producers, assess existing USDA-NRCS, BIA and Navajo Nation Chapter conservation planning practices, and work with the 14R producers to develop a conservation process that will be offered as a template to USDA-NRCS, BIA and the Navajo Nation. To achieve the overall goal, First Nations identified the following three project objectives:

1. To build 14R Capacity
2. To build producers' capacity to develop a conservation planning process for 14R producers.
3. To document and share emerging models and conservation planning templates to encourage replication by other Native producers.

**1. Summary of Activities and Outcomes**

**I. OBJECTIVE 1:** *Build 14R Capacity*

- a. First Nations awarded a \$15,000 grant to 14R through their fiscal sponsor, Tolani Lake Enterprise. The grant was directed to strengthened capacity building initiatives such as the purchase of financial management platform, office equipment, organizational website and internet access and for use toward the outreach and training to Native American producers.
  - i. The 14R Ranch was incorporated under the Navajo Nation Business Regulatory Department Division of Economic Development as a nonprofit corporation in June 2013. The 14R Ranch is comprised of Navajo families managing 14 range management units where Navajo families own and care for cattle and practice in-common grazing. 14R producers are uniform in their feeding and vaccination strategies, sell their cattle as a group, and cooperatively purchase resources to produce high quality beef.
- b. An MOA was initiated between First Nations and Tolani Lake Enterprise. The MOA outlined roles, responsibilities and expectations on both sides, and was implemented prior to the disbursement of the first grant payment.
- c. As a part of their grant objectives, the 14R Ranch identified the following activities to be achieved:
  - i. To conduct four conservation training workshops for a total outreach to 24 producers, and
  - ii. To purchase organizational equipment and conduct capacity building activities that will contribute to organization sustainability.

- d. Technical assistance provided to the 14R organization was based on the results identified from the completed organizational assessment that outlined areas of focus, best method of technical assistance delivery, communication strategy, frequency and organizational/ programmatic goals of 14R.
- e. Technical assistance identified included the completion and submittal of IRS Form 1023 to obtain their 501(c)(3) tax exempt status.
- f. One 1.5-day site visit to 14R was proposed, however, an additional three visits were provided by First Nations to assist in the completion of IRS Form 1023. In December 2015, the application was filed with the IRS.

**OBJECTIVE 2:** *Build producers' capacity to develop a conservation planning process for 14R producers.*

- a. First Nations conducted onsite technical training and education on conservation planning and input from 14R producers was used to develop a template designed by producers for producers.
- a. On August 27-28<sup>th</sup>, a regional convening was conducted by 14R and First Nations to showcase and seek input on the conservation planning template. The 1½ - day convening was held in Flagstaff, Arizona and attended by 35-40 producers.
- b. In December 2015, a conservation planning guide (Attachment 1) for Native ranchers and sample conservation plan (Attachment 2) were finalized in collaboration in 14R producers in addition to development of a *Soil Report and Conservation Plan for the Chambers Range Units* where 14R producers are located (Attachment 3).

**OBJECTIVE 3:** *Document and share emerging models and conservation planning templates to encourage replication by other Native producers.*

- a. Conservation planning strategies, emerging models and templates were documented and shared with other Native producers at quarterly workshops hosted by 14R producers in collaboration with First Nations.
- b. A webinar titled, *Tribal Conservation Planning* was provided by First Nations on August 19, 2015 and was attended by 35 attendees.
- c. Emerging models for implementing group-based conservation plans and providing technical assistance to other Tribal communities were shared at the annual meeting of the Indian Nations Conservation Alliance and Arizona Association of Tribal Conservation Districts (AATCD). As a result of this activity, First Nations initiated technical assistance with the AATCD in their efforts to providing conservation planning and assistance to the 10 Tribal conservation districts throughout Arizona.
- d. The *Conservation Planning Guide for Native Ranchers* was completed and published on the First Nations Knowledge Center.

**ADDITIONAL ACTIVITIES CONDUCTED:**

- a. On September 9, 2015, First Nations requested a no-cost extension changing the grant expiration date from September 30, 2015
- b. On September 28, 2015, First Nations attended the 2501 Partners Symposium in Jackson, Mississippi.
- c. On August 19, 2015, First Nations conducted a one hour webinar titled, *Tribal Conservation Planning*. The webinar was attended by 35 individuals.
- d. First Nations identified and contributed matching funds in the amount of \$74,476 that increased the overall project budget from \$68,706 to \$143,182.

- 2. Problems** – First Nations halted project activities in June 2015 due to outstanding project reimbursements totaling approximately \$30,000 that was due to First Nations for activities conducted during the period of October 2014 through March 2015. The project was halted until outstanding project reimbursements were paid. As a result of this 1.5 month delay, First Nations was required to request a No-Cost extension to completed technical assistance and allow the 14R organization to complete outstanding deliverables.
- 3. Reasons why goals and objectives were not met (if applicable)**  
All project goals and objectives were completed.
- 4. Additional pertinent information - None**
- 5. Any funded or unfunded time extensions** – Request for not cost extension was requested from August 31, 2015 to December 31, 2015.
- 6. Changes to project’s original objectives, methods or timeline** – Completion of 14R Activities outlined under their grant agreement was changed from August 31, 2015 to November 30, 2015 so that they could complete their activities.
- 7. Lessons learned** – Lesson to be learned is get a better understanding of the reimbursement process that resulted in a 1-2 month delay in the project.
- 8. Work to be performed during next six month period**  
Project Completed.

**B. Project Results:**

- 1. Preliminary results that can be used by NRCS** – Development of a soil report for the Chambers range unit for 14R producers.
- 2. Products, software tools, or technologies ready for adoption or transfer** – Development of conservation planning guide for Native American producers and sample conservation plan.
- 3. Potentially promising products, software tools, or technologies not yet ready for adoption or transfer** – N/A
- 4. Identification of new data or research needs to inform broader efforts** – The approach taken with 14R producers was a community-wide planning process. The process engaged all producers at each step. As a result, a tiered conservation planning process evolved that now enables individual producers to branch off the community-wide plan.
- 5. Project activities that have been featured on recipient or partner websites and success stories that could be amplified by NRCS** – None.

**C. EQIP Requirements:**

1. **Listing of EQUP-eligible producers involved in the project –**
  - a. **El Pahi** – 14R producer
  - b. **Andersen White** – Padres Mesa Demonstration Ranch
  - c. **Helen Benally** – 14R producer
  - d. **Libby Dugi** – 14R producer
  - e. **Caroline Nicotine** – 14R producer
  - f. **Danny Richard** – 14R producer
  - g. **Nina Yazzie** – 14R producer.
  
2. **Dollar amount of any direct or indirect payment made to each individual producer or entity for any structural, vegetative or management practices.**
  - a. No direct or indirect payment was made to any individual producer.
  
3. **Self-certification statement indicating compliance – N/A**

# A Conservation Planning Guide for Native American Ranchers

DEVELOPED IN COOPERATION WITH THE  
14R RANCH ON THE NAVAJO NATION, ARIZONA

A project funded with generous support from the U.S. Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) and The Christensen Fund.



FIRST NATIONS  
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## **Acknowledgements**

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We thank them for their support but acknowledge that the content presented in this planning guide is that of the authors alone and does not necessarily reflect the opinions of these organizations. This planning guide was compiled by Steve Barker, First Nations consultant, Resource Management Systems, LLC and the Arizona Association of the Conservation Districts, with generous feedback by First Nations staff Jackie Francke. We would like to thank the 14R Ranch who received grant support through the “Conservation for Navajo Livestock Producers” project. Their exceptional work and partnership informs the content of this Conservation Planning Guide.

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# WHAT IS CONSERVATION PLANNING

Keeping the rangeland healthy and productive is an important part of ranching. As a result, ranchers increase herd health, production, and profitability while protecting the ecosystem and wildlife for future generations, a goal for many ranchers. The development of a conservation plan provides the roadmap for ranchers to accomplish that goal. The plan provides a long-term vision and implementation process for ranchers to follow to get each acre of land as healthy and productive as possible, and keep it that way.

The goal of a conservation plan is to harvest products from the land in a sustainable and respectful manner. That means managing the soil, water, plant, and animal resources to be as healthy and productive as possible on each acre. That means trying to capture every drop of rain right where it falls. It also means taking the necessary actions to address resource problems such as erosion, excess runoff, heavily grazed areas, and excess sediment in the streams.

There are many things to learn as you work to improve the condition of the natural resources on your ranch, but there are two keys to being successful.

1. Engage and learn from other people – from ranchers who know the ecological rhythm, pulse, and capacity of the land and who are committed to keeping it healthy; and from university and agency specialists who are knowledgeable about managing the soil, water, air, plant, and animal resources.
2. Develop a plan of action.

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## DEVELOPING YOUR CONSERVATION PLAN

There are three basic steps to developing a conservation plan.

1. Inventory and assess the condition of your land and evaluate your current management
2. Identify goals, evaluate alternatives, and prioritize what you want to accomplish
3. Put together your plan, with a timeframe for getting it done

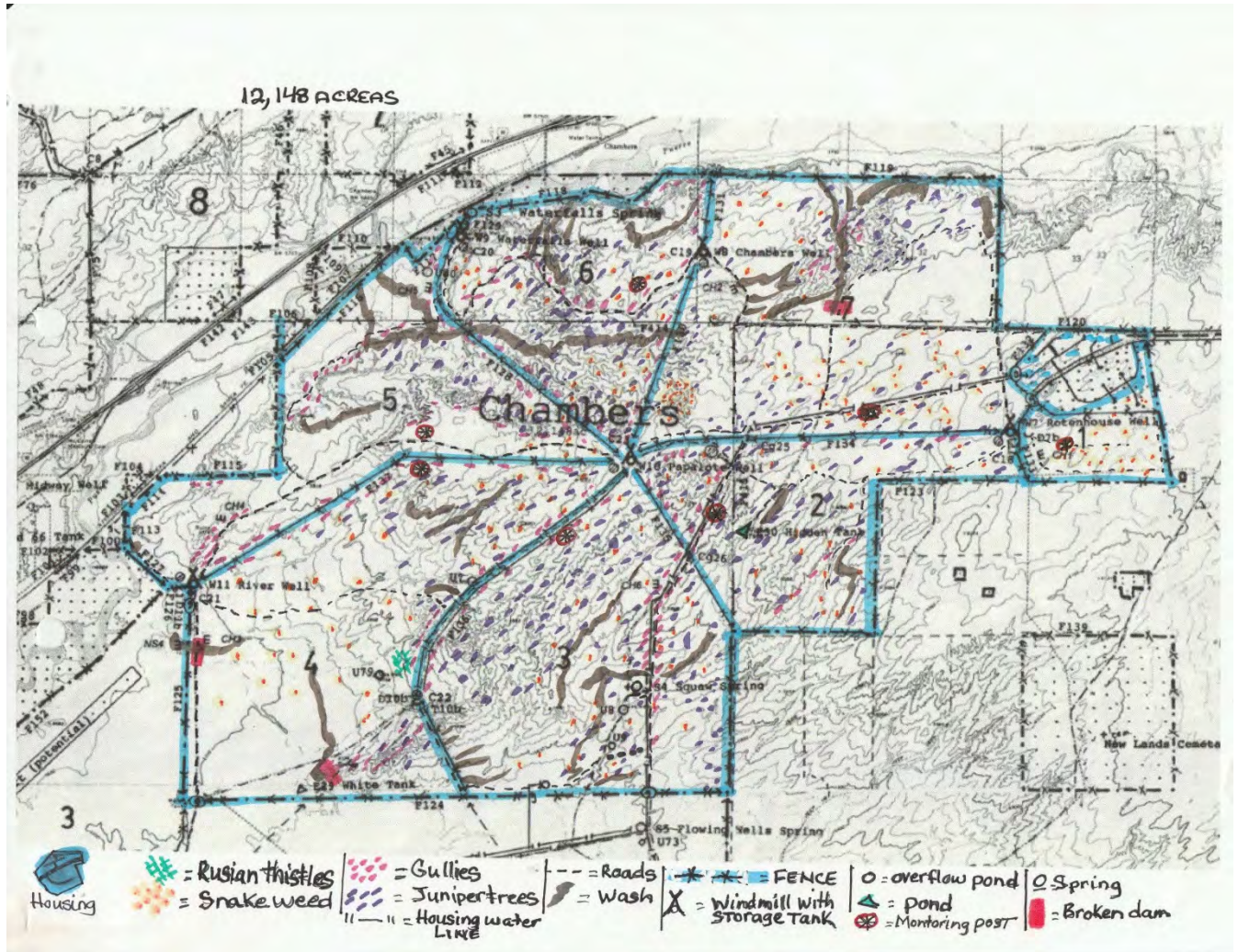
There are six important parts of a conservation plan

1. Conservation Plan Inventory Map
2. Conservation Plan Inventory Workbook
3. A Soil and/or Ecological Site Map
4. Vegetation Inventory
5. Conservation Plan Map
6. Conservation Plan and Practice Schedule



# STEP 1: CONSERVATION PLAN INVENTORY MAP

To develop a conservation plan, you need to start with an inventory of your ranch. That usually starts with a map of the ranch, showing where all the existing water, fencing, and other range improvements are. Show the existing pasture numbers and/or names and acres on the map.



## SHOW EXISTING IMPROVEMENTS ON YOUR INVENTORY MAP

Label existing range improvements, or use a system of numbering that will connect things shown on the map with information you will put in your inventory workbook. Here is an example for labeling that you could use to identify existing improvements on your inventory map.

- W1 - Well number 1
- E1 - Earth dam or pond number 1
- S1 - Storage tank number 1
- T1 - Trough number 1



## SHOW RESOURCE PROBLEM AREAS ON YOUR INVENTORY MAP

Show the problem areas on the inventory map – erosion problems, noxious weed or shrub invaded areas, areas where grazing is too heavy, and areas where livestock rarely graze, or can't graze. Label everything and/or use a legend on the map to identify everything. Labeling everything allows the things on the map to be connected to pictures, and information in the inventory workbook and conservation plan practice schedule.

- ER1 - Erosion area 1 (i.e., road erosion, gullies, streambank, wind erosion, sheet and rill erosion)
- NW3 - Area 3 with noxious weeds that need to be controlled
- ST1 - Area 1 with invasive shrubs or trees or cacti that need to be controlled
- HG2 - Heavily grazed area 2

# STEP 2: CONSERVATION PLAN INVENTORY WORKBOOK

Develop a Conservation Plan Inventory Workbook that provides information about your ranch, details about the existing improvements, the current condition of the resources, and your current management. The following example can be used a guideline of what to include in your Inventory Workbook. Adjust it to fit your needs.

## CONSERVATION PLAN INVENTORY WORKBOOK

### CONTACT INFORMATION

*Provide the contact information for the all of the land owners, grazing permittees or managers on this ranch.*

Business Name		Contact Person Name	
Position (Owner, Permittee, Manager Etc)			
Address			
City		State	Zip Code
Business Phone		Home Phone	
Email Address		Cell Phone	

### FIELDS AND PASTURES

*The following table provides information about existing and planned fields and pastures on the ranch.*

Field or Pasture Number	Pasture Name	Existing or Planned	Land Use (range, crop, pasture)	Acres	Land Ownership

### LIVESTOCK AND GRAZING MANAGEMENT

#### PERMITTED LIVESTOCK

*For lands leased or permitted from a State, Tribal, or Federal government, show the permitted animal numbers.*

Agency	Lease or Permit Expiration Date	Permitted Kind of Animal	Permitted Animal Unit Months (AUMs)	Permitted Number of Animals	Allowed Grazing Period Each Year

#### KINDS OF LIVESTOCK

*The following table provides general information about the livestock on the ranch.*

Herd Number	Animal Kind and Class	Current Number of Animals	Average Number of Animals	Registered Livestock	Average Weights	Yearlong or Typical Dates Grazed

### TYPICAL GRAZING ROTATION

*Shows the typical grazing rotation that has been followed over the last few years.*

Herd	Pasture	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

### WILDLIFE

*Identifies the kinds of wildlife on the operation, and whether the conservation plan will benefit the species or if the species is causing problems for the ranch.*

Wildlife Species	Desirable	Undesirable	Activities being done or planned to benefit the species	Reasons the species is undesirable

### LIVESTOCK WATER

#### WELLS AND SURFACE WATER SOURCES

*The following table provides information about the existing wells, streams springs and other water sources on the ranch.*

Label on Map	Water Type	Own Water Right	Pasture Where Located	Pastures Served	Flow Rate gpm	Pump Type	Water Quality (Excellent, Good, Fair, Poor)	Water Reliability (Excellent, Good, Fair, Poor)	Water Availability (Yearlong or Seasonal)

#### PONDS AND WATER HARVESTING CATCHMENTS

*The following table provides information about the existing ponds and catchments on the ranch.*

Label on Map	Water Type	Own Water Right	Pasture Where Located	Pastures Served	Size of Watershed or Catchment	Storage Capacity (gal)	Reliability (Excellent, Good, Fair, Poor)	Availability (Yearlong or Seasonal)

## STORAGE TANKS AND TROUGHS

*The following table provides information about the existing storage tanks and troughs on the ranch.*

Storage Number	Type	Water Source	Pastures Served	Storage Capacity	Condition (Excellent, Good, Fair, Poor)

## TROUGHS

Trough Number	Type	Water Source	Pastures Served	Storage Capacity (gal)	Escape Ramp?	Condition (Excellent, Good, Fair, Poor)

## PAST LAND TREATMENTS

*The following table provides information about past land treatments such as range seeding, noxious weed control, brush management, etc. that have been done on the ranch.*

Field or Pasture	Treatment Type	Treatment Acres	Description	Treatment Dates

## AVERAGE PRECIPITATION

*The following table provides the average precipitation measured on the ranch.*

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total

## MONITORING

*The following monitoring is being done or planned on the ranch*

Pasture Number	Key Area Number	Type of Monitoring	Year Established or Planned	Last Year Read

## OTHER CONSIDERATIONS

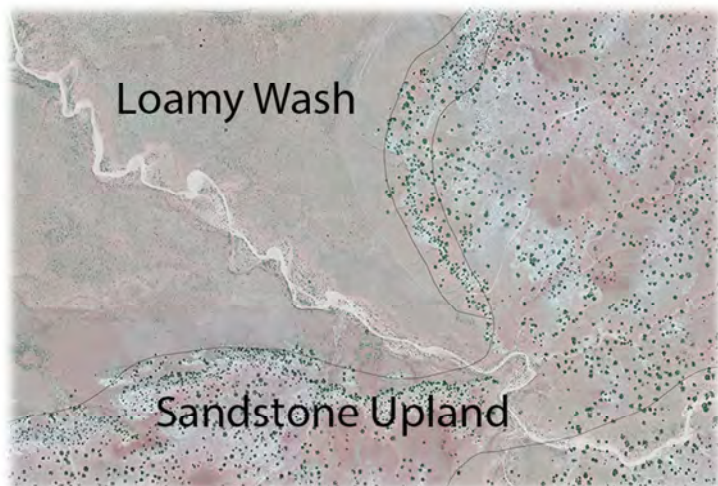
Provide information about other considerations that will need to be considered in designing and implementing the conservation plan. These considerations may include underground utilities, existing easements, cultural resources, federal, state, or tribally listed species, poisonous plant problems, predator problem areas or recreation activities that occur on the ranch, etc.

Include pictures in your inventory workbook. Label the pictures with the same symbols you used on the Inventory Map. If you have internet access, free tools like Google Earth will let you zoom in and print pictures of areas with gullies, road erosion, and other problems. Google Earth includes a scale on the photo that can be used for estimating distances or acres.

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## STEP 3: SOIL AND ECOLOGICAL SITE MAPS

An ecological site is an area of land that produces different kinds and amounts of vegetation from other areas. These plant community differences are typically because the soils are different across the

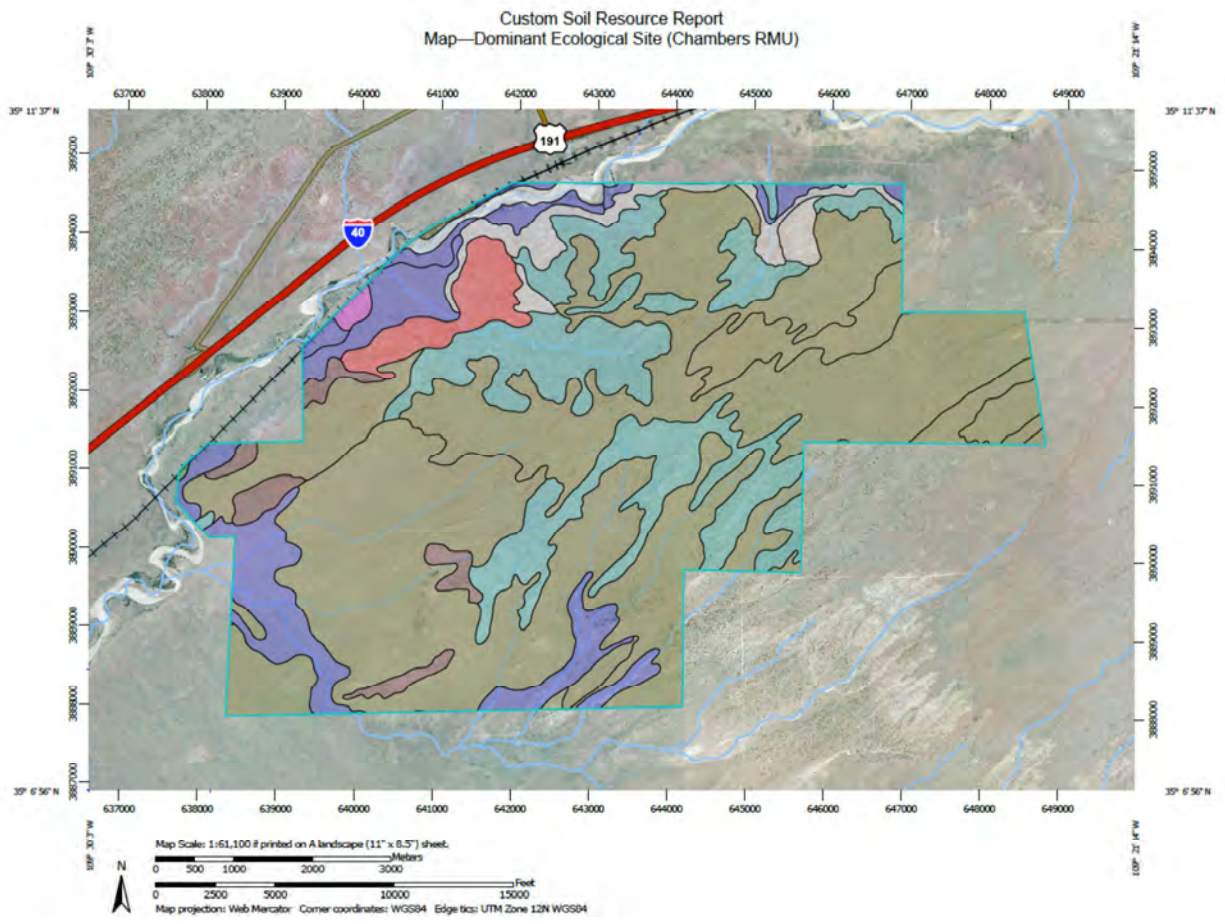


ranch. There may be deep sandy soils, heavy clay soils, or shallow rocky soils on steep mountain slopes. On larger ranches the plant community changes may also be due to significant differences in annual rainfall from the lower to the higher elevations on the ranch. NRCS ecological site descriptions provide information about the plant communities and plant production on each soil type. [Ecological Site Descriptions](#) are available on the internet.

For your Conservation Plan, include a map showing these different soils and ecological sites, along with descriptions of the soils and ecological sites. The [NRCS Web Soil Survey](#) is a free internet tool you can use to create a soil and/or ecological site map for your ranch, similar to the one shown here. This tool provides good descriptions of the soils. If you do not have internet access or a computer, your best option is to go to the local Conservation District, NRCS, BIA, or Cooperative Extension Service Office and ask them if they can provide you with an ecological site map and other maps that would cover your ranch area, along with a paper or electronic copies of the soil descriptions and ecological site descriptions.

If you have a smart phone and cell coverage, there is also a Web Soil Survey phone app that will give you a description of the soils and identify the ecological site you are standing on.

If you can't get a soil or ecological site map yourself or from one of the recommended contacts, use a tool like google earth to outline the areas on your ranch that have different plant communities.



## STEP 4: VEGETATION INVENTORY

The next step is to go out and collect information about the current production of the plant communities that are on each of the significant ecological sites on your ranch. If you have never done this, you might want to see if you can get someone from NRCS, BIA, Extension Service or another agency to come out and help you get started. There are many references available at libraries and on the internet that can provide more information about how to do this.

Pick locations that represent a typical plant community for each ecological site on your ranch. Mark the sample locations on the inventory map. Take a picture, and then collect information about the kinds of plants that are there, and how many pounds per acre are being produced.

The herbaceous plants can be clipped within in a frame of a known size. A standard frame size for clipping herbaceous plants on rangeland is 9.6 square feet which is 37.18 inches per side for a square plot frame, or you can make a 9.6 square foot hoop by connecting the ends of an 11 ft length of flexible pipe, or wire or cable.





**A 9.6 SQ. FT. FRAME USED FOR CIPPING GRASSES AND FORBS TO ESTIMATE PRODUCTION**

Set out at 10 frames and clip the non-woody plants that are rooted in each frame. Take only the growth you think grew in the last year – usually the green and light straw colored material – not the old gray material. Put the clipped material in a bag, let it dry for a few days if the plants are green, and then weigh it. Make sure you subtract the weight of the bag.

Grasses and forb material are normally weighed in grams. You can purchase gram scales to weigh your samples, or you could take your dried samples to the NRCS, BIS, Extension Service office to get them weighed. The total dry weight in grams from the 10 frames (9.6 Sq. Ft.) equals the pounds per acre of production. If you use a different size frame, use more or less than 10 frames, or use a different weight measure then you will need to make adjust your calculations.

If you know the species, you should measure the production by species. There are many guides available that can help you identify the plant species. If you don't know the plants, then just group them - perennial grasses (grasses that are present all year), perennial forbs (weeds and wildflowers that are present all year), annual grasses and annual forbs that come up from seed each year.

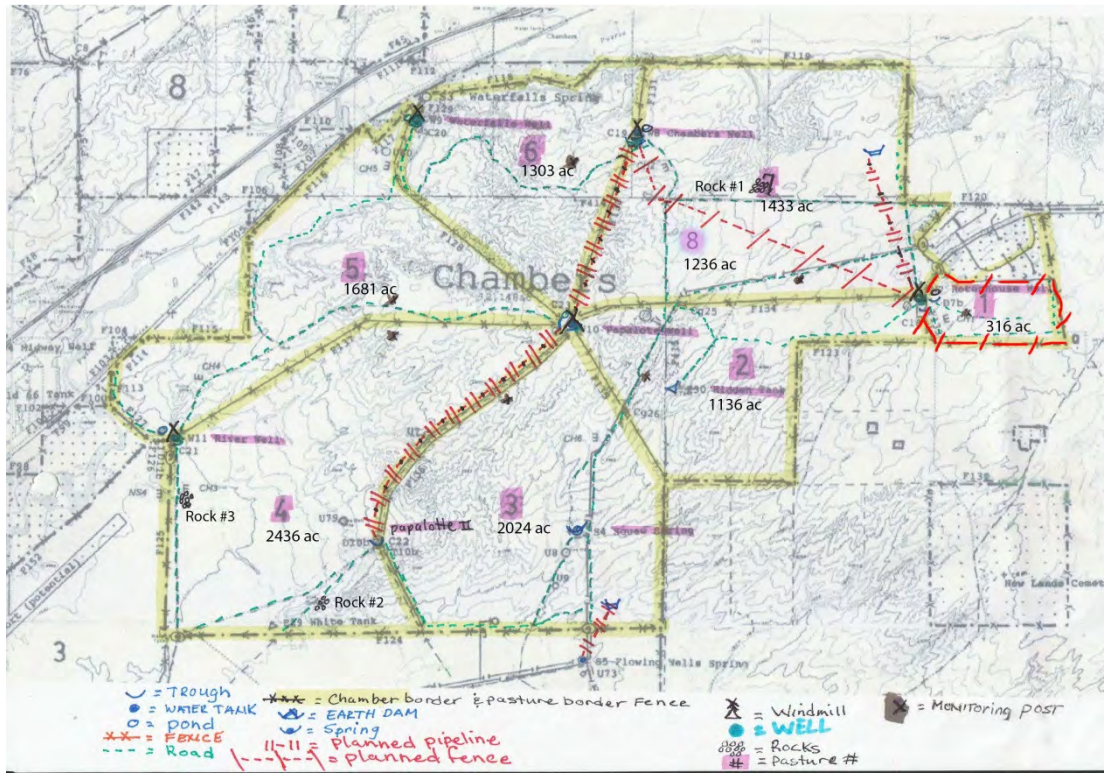
You also need to inventory any shrubs and trees at each inventory location. For this, it is recommended that you use a 1/100 acre plot (21 ft x 21 ft). You can pace out 7 big steps in each direction or use a tape to lay out your shrub plot.

Write down the average size for each shrub species in the area (height and diameter). Use that size shrub as your “sample unit” size. Then count number “sample units” for each species in the 21 x 21ft shrub plot. For example two or three small shrubs might be grouped together to be equal to one of your “sample units”. Or a very large shrub might be equal to 2 or 3 of your “sample units”.

Count the number of “sample units” – not shrubs. Inventory 3 or 4 shrub plots at each sampling location. That information, along with herbaceous production, can be used by BIA, NRCS, and others to get a reasonable estimate current production and composition of the plant communities. Attach to your vegetation inventory data along with the photos to your Inventory Workbook.

There are other assessments you might want to consider doing while you are at each inventory location if you are familiar with them or have agency staff helping you. They include an NRCS Wildlife Habitat Evaluation Guide, a Rangeland Health assessment, and ground cover measurements (bare soil, gravel, rock, litter, vegetation basal cover).

## STEP 5: CONSERVATION PLAN MAP



Conservation practices include

- structural range improvements like fences, pipelines, and storage tanks
- vegetation treatments such as seeding, brush management and noxious weed control
- and management activities such as grazing management and wildlife management

The existing and planned conservation practices work together as a Resource Management System to help manage the soil, water, plants, animals and other natural resources on the ranch.

Develop a Conservation Plan Map that shows the existing range improvements (fences, water etc.) and then clearly show the where the planned structural conservation practices you need will be installed, and where planned vegetative treatment areas like planned brush management areas will be done. Use a legend or label everything on the map so that each conservation practice shown on the Conservation Plan Map can be identified in the Conservation Plan Practice Schedule.



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## STEP 6: CONSERVATION PLAN AND PRACTICE SCHEDULE

The Conservation Plan and Practice Schedule identifies the goals and objectives for the Conservation Plan, and the Conservation Practices that will be implemented, including the kind, sizes, and amounts needed, and a schedule for when those practices are planned to be completed. The following pages provide a template you can use to develop your Conservation Plan Practice Schedule.

### BUSINESS NAME

Approximate Acres in this Conservation Plan

### BRIEF DESCRIPTION OF THE OPERATION

*This provides a brief description of the farming or ranching operation, including a general description of the land, and the kinds of livestock produced.*

### GOALS

*These include the broad goals for managing the natural resources on the operation, economic goals for the operation, and goals that identify how my conservation plan will benefit my community.*

### OBJECTIVES

*These are the specific actions or activities that are planned over the next two to five years that are needed to help achieve the overall goals.*

### PLANNED CONSERVATION PRACTICES

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Use the following section as a template. Remove any conservation practices you do not need, and include similar information about other conservation practices you might need on your ranch. There is a guide to common conservation practices used on rangeland in the appendix.

### PRESCRIBED GRAZING

Grazing will be managed to control the timing, frequency, duration, intensity, and distribution of livestock use in each pasture to maintain those portions of the rangeland that support the desired plant community, and to help address identified problems on those portions of the rangeland that have erosion problems, excess runoff, water quality problems, plant productivity and/or diversity problems, noxious or invasive species, forage quality and quantity problems, wildlife habitat concerns or other resource concerns.

An initial grazing management plan has been developed that balances the current forage production in each pasture with livestock numbers. The grazing management plan is based on the currently available livestock water in each pasture, and the reliability and distribution of those waters.

## EXAMPLE OF A PLANNED GRAZING ROTATION

### Year 1

C=cow, H=horse, T=stud, W=weaning calf, Y=yearling heifers.

Pasture	Acres	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
1	316												
2	1136								W	W	W	W	W
3	2024	CYH	CYH	CYH							BT	BT	BT
4	2436				CHB	CHB	CHB						
5	1681	BT	BT	BT				CHB	CHY	CHY			
6	1303				YT	YT	YT				CHY	CHY	CHY
7	1433							YT	BT	BT			
8	1236												

### Year 2

Pasture	Acres	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
1	316												
2	1136												
3	2024				CHB	CHB	CHB						
4	2436	BT	BT	BT				CHB	CHY	CHY			
5	1681				YT	YT	YT				CHY	CHY	CHY
6	1303							YT	BT	BT			
7	1433	CHY	CYH	CYH							BT	BT	BT
8	1236								W	W	W	W	W

### Year 3

Pasture	Acres	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
1	316												
2	1136								W	W	W	W	W
3	2024	BT	BT	BT				CHB	CHY	CHY			
4	2436				YT	YT	YT				CHY	CHY	CHY
5	1681							YT	BT	BT			
6	1303	CHY	CYH	CYH							BT	BT	BT
7	1433				CHB	CHB	CHB						
8	1236												

Flexibility is essential to the grazing management plan to adjust for variability in precipitation, the availability of livestock water, the potential need to adjust for wildfires, poisonous plant concerns, predator issues, and to adjust for vegetative treatments such as brush management. As the conservation plan is implemented, additional pastures, livestock water or other changes may occur

that will initiate changes to the initial grazing management plan. Monitoring will be done at the end of the growing season each year. Each year, the monitoring information will be combined with these other considerations to determine if the grazing management plan needs to be adjusted.

### PLANNED LIVESTOCK WATER DEVELOPMENTS

Livestock water developments will be installed or repaired to provide reliable livestock water in each pasture or grazing area to support the grazing management plan. These livestock water developments are intended to distribute livestock grazing as evenly as possible. The existing and planned water developments are shown on the Conservation Plan Map. The following table shows the planned components (wells, pumps, pipelines, storage tanks, troughs, etc.) for each planned water project on the ranch.

Project No.	Item	Field or Pasture	Planned Year	Planned Type (steel, pvc, etc)	Planned Number	Planned Amounts (length, depth etc)	Planned Capacity (gallons, gpm etc)

### PLANNED FENCES

Fences will be installed or repaired to help control livestock grazing as part of the grazing management plan. Planned fences are shown on the Conservation Plan Map.

Fence Number	Between Fields or Pastures (or on boundary of pasture(s))	Planned Year	New or Replace	Planned Fence Type (barbed wire, electric, woven wire, etc)	Planned Amount (feet or miles)

### PLANNED WATER DIVERSIONS FOR ROAD EROSION

Water bars will be installed on sections of dirt road that are eroding to divert runoff water away from the road where it can be done safely without causing new erosion problems. Put the location number here, and show them on the Conservation Plan Map with their number.

Location No	Fields or Pastures	Planned Year	Length of Road Section	Average Road Width	Average Slope of Road (%)	Planned Number of Diversions

## GRADE STABILIZATION STRUCTURES

Grade stabilization structures will be installed to control gully erosion head cuts using structures such as loose rock or rock and brush structures. Put a location number here, and show the location number on the Conservation Plan Map.

Location No	Field or Pasture	Planned Year	Size of gully (average depth, width, length)	Estimated acres that drain into the gully	Kind of structures planned	Number of Structures planned

## BRUSH MANAGEMENT

Woody species will be killed or removed to restore the natural balance of grasses, forbs, shrubs and trees as described in the ecological site description for the desired plant community phase. The location of the brush management projects are shown on the Conservation Plan Map.

Brush Project No	Fields or Pastures	Planned Year	Target Species	Planned Method of Treatment	Average Plants Per Acre Being Removed	Acres planned for treatment

## HERBACEOUS WEED CONTROL

Herbaceous noxious or invasive weeds will be treated to restore the natural balance of grasses, forbs, shrubs and trees as described in the ecological site description for the desired plant community phase. The locations of the projects are shown on the Conservation Plan Map.

Weed Project No	Fields or Pastures	Planned Year	Target Species	Planned Method of Treatment	Average Plants Per Acre Being Removed	Planned Amount



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# APPENDIX A: SOME BASIC PRINCIPLES OF RANGE MANAGEMENT

There are a few basic principles of range management that every rancher should know. Understanding these basic principles will go a long way toward helping you developing a good conservation plan that will accomplish your goals and objectives.

## PRINCIPLE NUMBER 1: IT ALL STARTS WITH PHOTOSYNTHESIS



All of us learned in high school that plants make their own food in a process called photosynthesis. Using sunlight energy, the chlorophyll in the plant's green leaves converts carbon dioxide from the air and water from the soil into a simple sugar (glucose).

Glucose - the simple sugar made in the green leaves using the energy of the sun is the food plants need to grow.

The first principle of range management is to understand that when grazing animals remove green leaves, they are removing the food producing parts of the plant. If grazing animals are allowed to continuously remove most of the leaves, the plants will not be able make enough food and they will die.

So what about nitrogen, phosphorus, and other nutrients in the soil that we know the plants use? Plants combine the glucose they makes during photosynthesis with these nutrients from the soil to make important compounds such as starch, protein, fats, lignin, and enzymes that are important for plant growth. These compounds become a source of food for animals and humans.

The important thing to remember is that plants must make the glucose in their green leaves before the nutrients in the soil can be used to make these other compounds. If you don't believe that photosynthesis provides the source of food for a plant... take a healthy potted plant, with plenty of moisture and nutrients in the soil, and put it in a dark closet. After a few days, it will die of starvation. Nutrients in the soil are only useful to plants that are making their own food using water, air, and sunlight.

To maximize plant health and production on your grazing lands, you need come up with a grazing management strategy that will maximize the amount of green leaves that your plants produce during the growing seasons. When you hear ranchers say they grow grass - not cows, you know they have an understanding of the first principle of grazing management. Ranchers use cows to harvest their real crop - grass.

## **PRINCIPLE NUMBER 2: CAPTURE THE RAIN RIGHT WHERE IT FALLS**

To maximize production on each acre of your ranch, you also need to capture every possible drop of rain and snow, and get it to infiltrate in the soil right where it falls. If every acre is capturing every possible drop of precipitation, then every acre will produce the maximum possible amount of vegetation. That means every acre must always be ready to capture the next big storm.

There are several things that affect how much precipitation can be captured. But the basic concept is to use vegetation and plant litter to create barriers on the surface of the soil, that will hold the precipitation where it falls long enough for the water to infiltrate into the soil. Once the water starts running off from where it landed, and starts collecting in flow channels, anything that cannot infiltrate into the channels will be lost. Vegetation and litter cover also reduces evaporation loss.

How fast water will infiltrate into the soil depends mostly on the texture of the soil surface. Texture describes the sizes of the soil particles. There are three sizes of soil particles – sand, silt, and clay. Sand is the largest soil particle. Silt is the next smallest soil particle and clay is the smallest soil particle. Usually the soil has a mixture of sand, silt and clay particle sizes, which is called a loam. If there is more sand, it is called a sandy loam, more clay – clay loam etc.

Because of their large particle sizes, sands soils have relatively large pore spaces between the sand particles. Those big pore spaces allow rain to infiltrate into sandy soils pretty rapidly. Generally speaking, soils that have a sandier textured surface are the easiest to manage and they tend to be more productive, because they can capture most or all of the precipitation they receive.

Clay particles are extremely small, and they tend to be somewhat flat. So they fit together very tightly like a shingled roof. The pore spaces are extremely small, so it takes much longer for water to infiltrate into clay soils. To capture the maximum amount of precipitation on clay soils, you have to maximize the vegetation and litter cover. The organic matter from decaying plant parts can also help bind small clay particles together into larger particles – creating bigger pore spaces.

This is where a soil map of your ranch is important. The soil descriptions will tell you about the soil textures on your ranch, and that will tell you which areas will capture precipitation the easiest, and which areas will be more difficult. Then you can make better decisions about where you need to leave the most vegetative cover. It should probably influence where you locate your livestock waters as well.

Once you start working on capturing rainfall, everything that helps water run off of your ranch will become your enemy - bare soils, roads, culverts, gullies, washes... anything that helps water start flowing. Once the water starts flowing into those drainages and washes, most of that water is gone – it has left the ranch. You have to try to capture it where it falls.

Oh, and just a warning.. once you start capturing rain, you won't have as much runoff to fill those dirt tanks anymore. You may need to plan to use wells, springs, or catchments with storage tanks, pipelines and troughs to provide reliable livestock water.

## **PRINCIPLE NUMBER 3: PREVENT SOIL EROSION**

Another reason to capture every drop of rainfall where it lands is to prevent soil erosion. When you see soil erosion, it means either your rainfall is running off. You do not enough plant cover to

protect the soil from water or wind erosion, or both. Again, good healthy plant and litter cover with good healthy root systems is the key.

When water infiltrates into the soil surface, the water dissolves some of the minerals in the soil surface, and it picks very small soil particles (mostly clay), and carries the minerals and soil particles down deeper into the soil. Over very long periods of time, those minerals and clay particles get deposited as layers (horizons) in the soil profile. Minerals and clay particles at the soil surface will also get carried away in runoff water.

As the clay is removed from of the soil surface, the very top of the soil surface may become a little sandier – which helps that soil capture rainfall. Sometimes just an inch of sandier textured surface can make a huge difference in the plant production. That sandy surface just a couple inches thick can help capture that rain storm. You don't want to lose that soil surface.

With soil erosion, you not only lose the sandier surface but you can also lose the organic matter which holds nutrients, and helps water infiltrate into the soil and helps the soil hold more moisture. If you lose enough soil, you may expose the horizons deeper in the soil where all of the clay and/or minerals accumulated. When the clay and mineral horizon are closer to the surface, they limit the available water holding capacity of the soil, and the rooting depth of your plants. The areas where these clay and mineral horizons have been exposed by erosion are some of the most difficult areas to reestablish any vegetation.

Wind and water erosion also carries away your seeds, and the plant litter cover you need to help you capture rainfall. That litter contains nutrients that were carried up from the deep root systems into the leaves, which were then deposited on the soil surface. Prevent soil erosion. It is important.

#### **Principle Number 4: Grow Deep Roots**

It only makes sense to manage for the deepest possible root systems. Plants that have access to deeper soil moisture will not only produce more forage, but the plants will stay green longer – extending the growing season. That increases overall forage quality and quantity. Deeper roots allow the plant to access nutrients from deeper down in the soil. That improves the quantity and quality of forage available for your livestock. Deeper root systems also help your forage plants survive dry periods and droughts.

What you might not know is that plants need to continuously grow new roots during the growing season. The green leaves above ground provide the food needed to grow new roots below ground. The more leaves produced during the growing season, the deeper and denser the root systems will be.



Obviously capturing as much rain as possible is part of this strategy too. Maximizing leaf and root production during the growing season, and capturing rain where it falls are core principles of managing grazing lands.

## **PRINCIPLE NUMBER 5: DORMANT SEASONS ARE FOR HARVESTING**

Photosynthesis only happens in green leaves. In the winter and during dry periods when plants go dormant, the perennial plants live off carbohydrates (mostly starch) stored in roots, crowns, stems and other storage structures like bulbs and tubers. Harvesting the dormant leaves has no real effect on the plants.

But remember, those dead leaves fall on the ground as litter, and they are extremely important for creating barriers to capture precipitation. Dormant season grazing management is focused on harvesting the crop of leaves you grew, while maintaining enough plant and litter cover to capture the next storm on each acre.

## **PRINCIPLE NUMBER 6: PLANT SEEDS EVERY YEAR**



It is important to manage your grazing so that your desirable plants put out a seed crop in every pasture at least every other year. With continuous grazing, the seeds of the desirable species are regularly consumed by livestock, because they are the most nutritious part of the plant. While some of the seeds from the forage species may pass through the digestive system of grazing animals and still be viable, the amount of desirable seed is reduced.

It is also important to allow seedlings a chance to get established before they are grazed as often as possible.

There are thousands of plants species on our rangelands. Each of them evolved different adaptations that help them to compete with the other plant species for water and space. Some produce new plants from seed, and some can produce new plants vegetatively – using stolons, rhizomes, or bulbs.

Sod grasses are better adapted to heavy grazing pressure than tall bunchgrasses. Sodgrasses will increase on a continuously grazed site where the bunchgrasses do not have enough opportunities to put out seed. The sodgrasses can spread across the site using stolons and underground rhizomes, instead of needing to produce seed.

## PRINCIPLE NUMBER 7: UNDERSTAND HOW GRAZING AFFECTS THE PLANT COMMUNITIES

Grazing management systems are designed to control the:

- Timing (time of year the pasture is grazed)
- Duration (how long the pasture is grazed)
- Intensity (how much forage is removed)
- Frequency (how often the pasture get re-grazed)
- Distribution (how the grazing use is distributed)

Plants that are never grazed – the undesirable species - are able to put out lots of green leaves and produce all the food they need. They can grow good deep root systems, and produce plenty of seed. They will stay healthy, and grow and reproduce vigorously.

When grazing animals remove green leaves from the desirable forage species during the growing season, those species cannot produce as much food, so they have shallower root systems, and some or all of the seed crop will be consumed by the grazing animals.

Over time the undesirable plants simply out-compete the grazed plants for water and nutrients. And when space opens up for a new plant to germinate, the seeds from the undesirable plants significantly outnumber the seeds from the desirable plants. That is how grazing can change a plant community. You simply need a reasonable grazing rotation that allows the desirable species to put out a crop of seed on a regular basis.

Let's look at how a simple three pasture deferred grazing rotation system accomplishes this.

	Spring			Early Summer			Late Summer -Fall			Winter (Dormant)		
Year	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
1	Graze Pasture 1			Graze Pasture 2			Graze Pasture 3			Graze Pasture 1		
2	Graze Pasture 2			Graze Pasture 3			Graze Pasture 1			Graze Pasture 2		
3	Graze Pasture 3			Graze Pasture 1			Graze Pasture 2			Graze Pasture 3		
4	Start Over at Year 1											

In this example of a simple 3 pasture rotation, every pasture gets grazed during the spring growing season one year, and then it gets rested during the spring growing season for the next 2 years in a row. Every pasture gets grazed in the late summer growing season one year, and then rested during the late summer growing season for the next 2 years in a row.

During those 2 year periods of spring and summer growing season deferment, all of the preferred forage plants get to put out as many leaves as they want, build good deep root systems, and put out seeds. They are providing good cover to capture rainfall where it falls.

If you do not want to move that often, (or you are in a lower rainfall area that needs longer rest times between grazing), a three pasture rest rotation may work better for you. In a rest rotation



grazing system, each pasture gets grazed for 6 months, and then rested for a full year. During the 3 year rotation, each pasture gets grazed once during the growing season, and once during the dormant season. The rest of the time, the desirable forage plants are growing leaves, putting out seed, covering the soil and competing for space. Because the grazing periods are longer, the preferred areas of the pasture will be grazed heavier using this system. But the pasture gets back to back spring and summer rest two out of three years.

Note: For any examples, you should adjust the months in your grazing plan to fit your growing seasons.

	Spring			Summer			Fall			Winter		
Year	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
1	Graze Pasture 1						Graze Pasture 2					
2	Graze Pasture 3						Graze Pasture 1					
3	Graze Pasture 2						Graze Pasture 3					
4	Start Over at Year 1											

## PRINCIPLE NUMBER 8: DISTURBANCES CREATE CHANGES IN PLANT COMMUNITIES

If the available soil moisture is being fully utilized by a healthy stand of perennial plants, then only a significant disturbance will cause that plant community to change. It is important to understand that grazing management is not going to cause a juniper thicket into a grassland. Many of the undesirable plants that have increased on our rangelands are very long lived. And they are fully utilizing any soil moisture that gets into the soil. A fully occupied perennial plant community is pretty stable, and hard to change.



Fire and drought are the two primary natural disturbances that can open up the plant community to change. In many cases, our conservation plans are designed to set everything up so that if a fire or drought opens up the plant community, our desirable species have a chance to occupy the space that is created.

We can also introduce disturbances as part of the conservation plan, using

prescribed fire and mechanical or chemical brush control, to force the plant community to open up. The key is to not create any disturbance until you know that there is a reasonably good chance that the disturbance will cause a desirable change.

For example, consider that juniper thicket again. If the only species that has been growing in that thicket for the last 30 years is juniper, then most of the seed available on the ground that can respond to a disturbance is... juniper seed. So, after you spend thousands of dollars to remove all of the juniper trees, there is a reasonably good chance that you will just get a new stand of juniper.

The better plan might be thin the juniper first, to open up some space, and apply some good grazing management for a few years to let some perennial grasses establish in those openings. Then, after you have built up a seed bank of perennial grass species for a few years, you could treat the rest of the juniper, - maybe even using regular prescribed burning, with a reasonably good chance to increase and maintain the perennial grasses on the site.



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# APPENDIX B: SOME COMMON CONSERVATION PRACTICES FOR SOLVING CONSERVATION PROBLEMS

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## RESOURCE PROBLEM: SOIL EROSION - SHEET, RILL, & WIND EROSION

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Detachment and transportation of soil particles caused by rainfall runoff/splash, irrigation runoff or wind that degrades soil quality

### COMMON CONSERVATION PRACTICES USED

#### **614 Watering Facility**

Provide well distributed, reliable water to facilitate Prescribed Grazing to maintain or improve the plant productivity on the ecological site to protect the soil from wind and water erosion.

#### **642 Water Well**

Install a well to provide livestock water to facilitate Prescribed Grazing to maintain or improve the plant productivity on the ecological site to protect the soil from wind and water erosion.

#### **460 Land Clearing**

This facilitating practice can be used to remove trees, stumps, and other vegetation on wooded areas as part of installing another conservation practices or to achieve a conservation objective.

#### **548 Grazing Land Mechanical Treatment**

Use mechanical treatments such as pitting, contour furrowing, and ripping to improve the capture and infiltration of precipitation and increase plant productivity and vigor to protect the soil from erosion.

#### **382 Fence**

This may be needed as a facilitating practice to apply Prescribed Grazing.

#### **528 Prescribed Grazing**

Manage the frequency, timing, duration, and intensity of grazing to maintain a healthy and productive plant community and litter cover to protect the soil from erosion.

#### **338 Prescribed Burning**

Use controlled fire to restore the quality and productivity of vegetation to protect the soil from erosion.

#### **516 Pipeline**

This may be needed as a facilitating practice to distribute water for applying Prescribed Grazing.

#### **472 Access Control**

Control livestock and vehicle access following treatments such as brush management and range

planting to obtain maximum benefits.

### **550 Range Planting**

Reestablish native species to restore the plant productivity on the ecological site to protect the soil from wind and water erosion.

### **314 Brush Management**

Control invasive woody vegetation to allow increased production, vigor and quality of grasses and forbs to protect the soil from erosion.

### **342 Critical Area Planting**

Establish vegetation on highly erosive soils or construction areas to increase vegetation cover and protect the

## **RESOURCE PROBLEM: SOIL EROSION - CONCENTRATED FLOW EROSION**

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Untreated classic gullies may enlarge progressively by head cutting and/or lateral widening. Ephemeral gullies occur in the same flow area and are obscured by tillage. This includes concentrated flow erosion caused by runoff from rainfall, snowmelt or irrigation water.

### **COMMON CONSERVATION PRACTICES USED**

#### **314 Brush Management**

Control invasive woody vegetation to allow increased production, vigor and quality of grasses and forbs to protect the soil from erosion.

#### **468 Lined Waterway or Outlet**

Install a waterway or outlet having an erosion resistant lining of concrete, stone, synthetic fabric or other permanent material to stabilize existing or future roadway caused erosion.

#### **460 Land Clearing**

This facilitating practice can be used to remove trees, stumps, and other vegetation on wooded areas as part of installing another conservation practices or to achieve a conservation objective.

#### **410 Grade Stabilization Structure**

Install structures in flow channels that stabilize grades to prevent head cutting or the advance of gullies into your cropland

#### **468 Lined Waterway or Outlet**

Install a waterway or outlet having an erosion resistant lining of concrete, stone, synthetic fabric or other permanent material to stabilize existing or future roadway caused erosion.

#### **575 Animal Trails and Walkways**

Establishing trails or travel ways that divert livestock away from erosion prone areas.

#### **382 Fence**

This may be needed as a facilitating practice to apply Prescribed Grazing.

#### **410 Grade Stabilization Structure**

Build structures made of rock, soil, timber, woven wire, etc. to stabilize grades, control runoff and prevent the formation or advance of gullies.

#### **560 Access Road**

Renovate an existing road to provide proper alignment and runoff control measures to prevent concentrated flow erosion.

#### **548 Grazing Land Mechanical Treatment**

Use mechanical treatments such as pitting, contour furrowing, and ripping to improve the capture and infiltration of precipitation and increase plant productivity and vigor to protect the soil from erosion.

#### **528 Prescribed Grazing**

Manage the frequency, timing, duration, and intensity of grazing to maintain a healthy and productive plant

#### **550 Range Planting**

Reestablish native species to restore the plant productivity on the ecological site to protect the soil from erosion.

#### **342 Critical Area Planting**

Establish vegetation on highly erosive soils or construction areas to increase vegetation cover and protect the soil from wind and water erosion.

#### **362 Diversion**

Build water bars on roads to divert water and prevent concentrated flow erosion.

#### **338 Prescribed Burning**

Use controlled fire to restore the quality and productivity of vegetation to protect the soil from erosion.

#### **640 Waterspreading**

Divert runoff with a system of dams and dikes and spreading it over relatively flat areas to prevent concentrated flow erosion.

#### **472 Access Control**

Control livestock and vehicle access to treated areas during the growing season for at least two years following treatments such as brush management and range planting to obtain maximum benefits. Longer periods of Access Control may be needed if precipitation is below normal.

## **RESOURCE PROBLEM: SOIL EROSION - EXCESSIVE BANK EROSION FROM STREAMS SHORELINES OR WATER CONVEYANCE CHANNELS**

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Sediment from banks or shorelines threatens to degrade water quality and limit use for intended purposes.

### **COMMON CONSERVATION PRACTICES USED**

#### **584 Channel Bed Stabilization**

Stabilize the channel of a stream with suitable structures to control aggradation or degradation in a stream

#### **580 Streambank and Shoreline Protection**

Provide erosion protection to streambanks and shorelines using structural and/or vegetative measures.

#### **460 Land Clearing**

This facilitating practice can be used to remove trees, stumps, and other vegetation on wooded areas as part of installing another conservation practices or to achieve a conservation objective.

#### **326 Clearing and Snagging**

Remove vegetation, snags, and other debris to restore flow capacity in stream channels and prevent bank erosion by eddies or redirection of flow.

## **RESOURCE PROBLEM: EXCESS WATER - PONDING, FLOODING, SEASONAL HIGH WATER TABLE, SEEPS, AND DRIFTED SNOW**

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Surface water or poor subsurface drainage restricts land use and management goals. Wind-blown snow accumulates around and over surface structures, restricting access to humans and animals.

### **COMMON CONSERVATION PRACTICES USED**

#### **382 Fence**

Install snow fences to reduce wind-blown snow accumulations.

#### **460 Land Clearing**

This facilitating practice can be used to remove trees, stumps, and other vegetation on wooded areas as part of installing another conservation practices or to achieve a conservation objective.

#### **528 Prescribed Grazing**

Manage the livestock grazing to maintain a uniform cover of herbaceous vegetative and litter. This will help capture and infiltrate rainfall more uniformly, and minimize rapid runoff after storm events.

## **RESOURCE PROBLEM: INSUFFICIENT WATER - INEFFICIENT MOISTURE MANAGEMENT**

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Natural precipitation is not optimally managed to support desired land use goals or ecological processes.

### **COMMON CONSERVATION PRACTICES USED**

#### **528 Prescribed Grazing**

Manage the frequency, timing, duration, and intensity of grazing to maintain a healthy and productive plant community and litter cover help capture rain where it falls, and hold it until it can infiltrate into the soil. This will help capture and infiltrate rainfall more uniformly, and minimize losses from evaporation and runoff.

#### **472 Access Control**

Control livestock and vehicle access to treated areas during the growing season for at least two years following treatments such as brush management and range planting to obtain maximum benefits. Longer periods of Access Control may be needed if precipitation is below normal.

#### **548 Grazing Land Mechanical Treatment**

Use mechanical treatments such as pitting, contour furrowing, and ripping to improve the capture and infiltration of precipitation and increase plant productivity and vigor to protect the soil from erosion.

#### **642 Water Well**

Install a well to provide livestock water to facilitate Prescribed Grazing.

#### **550 Range Planting**

Plant grasses and forbs to restore the cover of herbaceous vegetative and litter. This will help to improve the capture and infiltration of precipitation and increase plant productivity and vigor to protect the soil from erosion.

#### **614 Watering Facility**

Provide well distributed, reliable water to facilitate Prescribed Grazing.

#### **382 Fence**

This may be needed as a facilitating practice to apply Prescribed Grazing.

#### **338 Prescribed Burning**

Use prescribed burning to restore the cover of herbaceous vegetative and litter. This will help capture and infiltrate rainfall more uniformly, and minimize losses from evaporation and runoff.

#### **314 Brush Management**

Use chemical or mechanical methods to control woody vegetation and restore a more uniform cover of herbaceous vegetative and litter. This will help capture and infiltrate rainfall more uniformly, and minimize losses from evaporation and runoff.

## 516 Pipeline

This may be needed as a facilitating practice to distribute water for applying Prescribed Grazing.

### **RESOURCE PROBLEM: WATER QUALITY DEGRADATION - EXCESS NUTRIENTS IN SURFACE AND GROUND WATERS**

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Nutrients (organics and inorganics) are transported to receiving waters through surface runoff and/or leaching into shallow ground waters in quantities that degrade water quality and limit use for intended purposes

#### COMMON CONSERVATION PRACTICES USED

##### **351 Water Well Decommissioning**

Permanently close and seal off a water well that is no longer in use. Prevent the chance for nutrients or organics to contact the water table.

##### **528 Prescribed Grazing**

Manage the location, timing and intensity of livestock grazing to maintain adequate vegetative cover to reduce runoff and protect water quality. Manage grazing near surface water to maintain water quality.

### **RESOURCE PROBLEM: WATER QUALITY DEGRADATION - PETROLEUM, HEAVY METALS AND OTHER POLLUTANTS TRANSPORTED TO RECEIVING WATER SOURCES**

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Heavy metals, petroleum and other pollutants are transported to receiving water sources in quantities that degrade water quality and limit use for intended purposes.

#### COMMON CONSERVATION PRACTICES USED

##### **309 Agrichemical Handling Facility**

Install a facility with an impervious surface to provide an environmentally safe area for the handling of on-farm agrichemicals.

### **RESOURCE PROBLEM: WATER QUALITY DEGRADATION - EXCESSIVE SEDIMENT IN SURFACE WATERS**

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Off-site transport of sediment from sheet, rill, gully, and wind erosion into surface water that threatens to degrade surface water quality and limit use for intended purposes

#### COMMON CONSERVATION PRACTICES USED

##### **640 Waterspreading**

Divert or collect runoff with a system of dams and dikes and spreading it over relatively flat

vegetated areas to reduce erosion and sedimentation in water bodies of concern.

### **391 Riparian Forest Buffer**

Establish riparian trees and/or shrubs adjacent to and up slope from watercourses or water bodies to provide protection within the floodplain.

### **528 Prescribed Grazing**

Manage the location, timing, duration and intensity of livestock grazing to meet the growth requirements of the forage species to maintain their health and vigor and retain adequate vegetative cover to protect the soil surface from erosion.

### **390 Riparian Herbaceous Cover**

Establish grasses, sedges, rushes, ferns, legumes, and forbs tolerant of intermittent flooding or saturated soils in the transitional zone between upland and aquatic habitats to reduce sediment in water bodies of concern.

### **548 Grazing Land Mechanical Treatment**

Use mechanical treatments such as pitting, contour furrowing, and ripping to improve the capture and infiltration of precipitation and increase plant productivity and vigor to protect the soil from erosion.

### **642 Water Well**

Install a well to provide livestock water away from water bodies of concern.

### **460 Land Clearing**

This facilitating practice can be used to remove trees, stumps, and other vegetation on wooded areas.

### **561 Heavy Use Area Protection**

Stabilize areas frequently and intensively used by people, animals or vehicles by establishing vegetative cover, surfacing with suitable materials, and/or installing needed structures

### **574 Spring Development**

Pipe livestock water away from springs or seeps to minimize or eliminate livestock activity around the spring that is creating excess sediment in the surface water.

### **342 Critical Area Planting**

Planting vegetation on critical sites (highly erosive soils, etc.) in order to increase vegetation cover and improve soil surface stability on areas that contribute runoff and sediment to water bodies of concern.

### **382 Fence**

Use this as a facilitating practice to apply Prescribed Grazing and Access Control.

### **570 Stormwater Runoff Control**

Control stormwater runoff to minimize erosion and sedimentation during and following construction activities, reduce the quantity of stormwater leaving developing or developed sites and improve the quality of stormwater leaving developing or developed sites.



#### **614 Watering Facility**

Install troughs to provide livestock water away from streams to minimize or eliminate livestock activity that is creating excess sediment in the surface water.

#### **472 Access Control**

Control livestock and vehicle access to highly erodible soil areas that contribute runoff and sediment to water bodies of concern.

#### **638 Water and Sediment Control Basin**

Construct an earth embankment to form a sediment trap and water detention basin to trap sediment and improve downstream water quality.

#### **516 Pipeline**

This facilitating practice may be needed to distribute livestock water away from water bodies of concern.

### **RESOURCE PROBLEM: WATER QUALITY DEGRADATION - ELEVATED WATER TEMPERATURE**

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Surface water temperatures exceed State/Federal standards and/or limit use for intended purposes

#### **399 Fishpond Management**

Manage impounded water to improve water temperatures for the production of fish or other aquatic

#### **391 Riparian Forest Buffer**

Develop a forest of trees to shade the surface of the water to reduce water temperature.

#### **395 Stream Habitat Improvement and Management**

Restore physical and biological functions of a stream including riffles and pools that improve water temperatures to provide suitable habitat for desired fish and other aquatic species.

### **RESOURCE PROBLEM: DEGRADED PLANT CONDITION - UNDESIRABLE PLANT PRODUCTIVITY AND HEALTH**

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Plant productivity, vigor and/or quality do not negatively impact other resources or meet yield potential due to improper fertility, management or plants not adapted to site.

#### **COMMON CONSERVATION PRACTICES USED**

#### **550 Range Planting**

Plant native species to restore the structure and composition of the plant community on the ecological site.

### **528 Prescribed Grazing**

Manage the frequency, intensity, duration, and timing of livestock grazing to maintain the health of desirable forage species and allow them to put out a seed crop regularly. Rotate the season of grazing in each pasture to help maintain a diversity of vegetation.

### **382 Fence**

This may be needed as a facilitating practice to apply other conservation practices.

### **548 Grazing Land Mechanical Treatment**

Use mechanical treatments such as pitting, contour furrowing, and ripping to improve the capture and infiltration of precipitation and increase plant productivity and vigor.

### **472 Access Control**

Control livestock and vehicle access to treated areas to help ensure successful treatments. This practice is also a facilitating practice to long term management activities such as Prescribed Grazing and Upland Wildlife Habitat Management.

### **460 Land Clearing**

This facilitating practice can be used to remove trees, stumps, and other vegetation on wooded areas as part of installing another conservation practices or to achieve a conservation objective.

### **314 Brush Management**

Use chemical or mechanical methods to control woody vegetation and restore the desired plant community structure and composition on the ecological site.

### **338 Prescribed Burning**

Use controlled fire to restore the natural balance of trees, shrubs, grasses and forbs on the ecological site.

## **RESOURCE PROBLEM: DEGRADED PLANT CONDITION - INADEQUATE STRUCTURE AND COMPOSITION**

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Plant communities have insufficient composition and structure to achieve ecological functions and management objectives. As an example, this concern addresses loss or degradation of wetland habitat, targeted ecosystems, or unique plant communities.

### **COMMON CONSERVATION PRACTICES USED**

#### **315 Herbaceous Weed Control**

Control noxious weeds and other invasive herbaceous vegetation to help restore the plant community structure and composition on the ecological site.

#### **314 Brush Management**

Use chemical or mechanical methods to control woody vegetation and help restore the desired plant community structure and composition on the ecological site.

### **338 Prescribed Burning**

Use controlled fire to help restore the natural balance of trees, shrubs, grasses and forbs on the ecological

### **472 Access Control**

Control livestock and vehicle access to treated areas during the growing season following treatments such as brush management to obtain maximum benefits.

### **528 Prescribed Grazing**

Manage the frequency, intensity, duration, and timing of livestock grazing to maintain cover for wildlife during critical nesting and fawning periods. Rotate the season of grazing in each pasture to help maintain a diversity of vegetation species for cover.

### **550 Range Planting**

Establish native species to help restore the structure and composition of the plant community on the

### **314 Brush Management**

Use chemical or mechanical methods to control woody vegetation and restore the desired plant community structure and composition on the ecological site.

### **382 Fence**

This may be needed as a facilitating practice to apply Prescribed Grazing.

### **614 Watering Facility**

Provide well distributed, reliable water to facilitate Prescribed Grazing.

### **642 Water Well**

Install a well to provide livestock water to facilitate Prescribed Grazing.

### **516 Pipeline**

This may be needed as a facilitating practice to distribute water for applying Prescribed Grazing.

## **RESOURCE PROBLEM: DEGRADED PLANT CONDITION - EXCESSIVE PLANT PEST PRESSURE**

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Excessive pest damage to plants including that from undesired plants, diseases, animals, soil borne pathogens, and nematodes. As an example, this concern addresses invasive plant, animal and insect species

### **COMMON CONSERVATION PRACTICES USED**

#### **315 Herbaceous Weed Control**

Control noxious weeds and other invasive herbaceous vegetation to restore the desired plant community structure and composition.

## **RESOURCE PROBLEM: DEGRADED PLANT CONDITION - WILDFIRE HAZARD, EXCESSIVE BIOMASS ACCUMULATION**

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The kinds and amounts of fuel loadings (plant biomass) create wildfire hazards that pose risks to human safety, structures, plants, animals, and air resources

### **COMMON CONSERVATION PRACTICES USED**

#### **432 Dry Hydrant**

Install a permanent pipe assembly into a pond or other water source to provide all weather access to an available water source for fire suppression.

#### **394 Firebreak**

Install a permanent strip of bare ground or low herbaceous vegetation to retard fire on forest, range, and headquarter areas. Install a temporary firebreak to control prescribed burns.

#### **338 Prescribed Burning**

Use prescribed burning to reduce fuel loads under controlled conditions and prevent catastrophic wildfire.

#### **314 Brush Management**

Reduce shrub density to reduce fuel loads and wildfire hazards on rangelands where there are wildfire hazards for human safety and structures.

## **RESOURCE PROBLEM: INADEQUATE HABITAT FOR FISH AND WILDLIFE - HABITAT DEGRADATION**

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Quantity, quality or connectivity of food, cover, space, shelter and/or water is inadequate to meet requirements of identified fish, wildlife or invertebrate species

### **COMMON CONSERVATION PRACTICES USED**

#### **644 Wetland Wildlife Habitat Management**

Manage wetland habitats and connectivity within the landscape for wildlife by manipulating vegetation or timing agricultural activities that enable movement and allow wildlife life cycle activities to complete.

#### **314 Brush Management**

Use chemical or mechanical methods to control woody vegetation and restore the desired plant community structure and composition on the ecological site.

#### **460 Land Clearing**

This facilitating practice can be used to remove trees, stumps, and other vegetation on wooded areas as part of installing another conservation practices or to achieve a conservation objective.

### **500 Obstruction Removal**

Remove and dispose of trash and other unwanted obstructions in order to reduce wildlife hazards and habitat fragmentation.

### **516 Pipeline**

This practice may be needed to distribute reliable water for wildlife and to facilitate practices such as Prescribed Grazing.

### **657 Wetland Restoration**

Restore a former or degraded wetland site to a close approximation of its original condition for wildlife.

### **338 Prescribed Burning**

Use controlled fire to restore the natural balance of trees, shrubs, grasses and forbs on the ecological site.

### **636 Water Harvesting Catchment**

Capture precipitation runoff from a natural or artificial impermeable surface and convey it to a storage facility to provide water for wildlife. This may also be needed as a facilitating practice to improve the management of livestock grazing near streams and other critical wildlife habitat.

### **472 Access Control**

Temporarily or permanently exclude animals, people, vehicles, and/or equipment from an area to provide habitat needs for wildlife. Control livestock and vehicle access to treated areas following treatments such as brush management and vegetation planting to help ensure success. Control access to critical wildlife areas during nesting, fawning, and spawning periods.

### **642 Water Well**

Install a well to provide livestock water to provide water for wildlife or as a facilitating practice to improve the management of livestock grazing near streams and other critical wildlife habitat.

### **614 Watering Facility**

Modify existing watering facilities to remove barriers across the water surface, install wildlife escape ramps, and prevent degradation of water quality. Install watering facilities to provide an adequate amount and quality of drinking water for wildlife. This may also be needed as a facilitating practice to improve the management of livestock grazing near streams and other critical wildlife habitat.

### **378 Pond**

Install a water impoundment made by constructing an embankment or by excavating a pit or dugout to provide water for wildlife.

### **734 Fish & Wildlife Structure**

Install a structure designed specifically for wildlife to meet wildlife life cycle needs such as loafing, escape, nesting, rearing, roosting, perching, or basking.

### **528 Prescribed Grazing**

Manage the frequency, intensity, duration, and timing of livestock grazing to maintain cover for wildlife during critical nesting and fawning periods. Rotate the season of grazing in each pasture to help maintain a diversity of vegetation cover across the landscape.

### **342 Critical Area Planting**

Establishing permanent vegetation on sites that have, or are expected to have, high erosion rates, and on sites that have physical, chemical or biological conditions that prevents the establishment of vegetation.

### **315 Herbaceous Weed Control**

Control noxious weeds and other invasive herbaceous vegetation on non-cropped areas to restore the plant community structure and composition and improve wildlife cover or shelter.

### **659 Wetland Enhancement**

Augment wetland functions beyond the original natural conditions for additional wetland function, habitat, diversity, and capacity.

### **391 Riparian Forest Buffer**

Establish trees and/or shrubs in the transitional zone between upland and aquatic habitats to provide cover for wildlife, shade and stabilize streambanks.

### **390 Riparian Herbaceous Cover**

Establish grasses, sedges, rushes, ferns, legumes, and forbs tolerant of intermittent flooding or saturated soils, and manage as the dominant vegetation in the transitional zone between upland and aquatic habitats.

### **646 Shallow Water Development and Management**

Inundate land to provide water and habitat for wildlife by installing dikes, excavating, ditching, and flooding.

### **395 Stream Habitat Improvement and Management**

Maintain, improve or restore physical, chemical and biological functions of a stream to meet the life history requirements of desired aquatic species.

### **645 Upland Wildlife Habitat Management**

Manage upland habitats and connectivity within the landscape for wildlife by establishing or manipulating vegetation to provide species with sufficient space and resources to complete life cycle activities. Plant food plots or leave un-harvested crops for wildlife on cropland.

### **658 Wetland Creation**

Create a wetland for wildlife on a site location that was historically non-wetland.

### **382 Fence**

Modify existing fences to improve wildlife movement or to improve wildlife visibility. This practice may also be needed as a facilitating practice to control livestock, vehicles, or equipment in conjunction with vegetative treatments and other conservation practices.

## **RESOURCE PROBLEM: LIVESTOCK PRODUCTION LIMITATION - INADEQUATE FEED AND FORAGE**

---

Feed and forage quality or quantity is inadequate for nutritional needs and production goals of the kinds and classes of livestock

### **COMMON CONSERVATION PRACTICES USED**

#### **315 Herbaceous Weed Control**

Control noxious weeds and other invasive herbaceous vegetation to restore the production of desirable forage species.

#### **550 Range Planting**

Reestablish native species to restore the plant productivity on the ecological site.

#### **645 Upland Wildlife Habitat Management**

Manage upland habitats and connectivity within the landscape to help balance livestock and wildlife forage needs by manipulating vegetation to change wildlife use areas.

#### **548 Grazing Land Mechanical Treatment**

Use mechanical treatments such as pitting, contour furrowing, and ripping to improve the capture and infiltration of precipitation and increase plant productivity and vigor.

#### **528 Prescribed Grazing**

Manage the timing, duration, intensity and frequency of livestock grazing to provide desirable forage species periods of rest to restore production, vigor, allow seed production and establishment, and restore preferred forage species on the site.

#### **314 Brush Management**

Control invasive woody vegetation to allow increased production, vigor and quality of grasses and forbs.

#### **472 Access Control**

Control livestock and vehicle access to treated areas such as brush management and range planting to obtain maximum benefits.

#### **338 Prescribed Burning**

Use controlled fire to restore the quality and productivity of desirable rangeland vegetation.



## **RESOURCE PROBLEM: LIVESTOCK PRODUCTION LIMITATION - INADEQUATE LIVESTOCK SHELTER**

---

Livestock lack adequate shelter from climatic conditions to maintain health or production goals

### **COMMON CONSERVATION PRACTICES USED**

#### **612 Tree/Shrub Establishment**

Install trees or large shrubs to provide shade and shelter for livestock.

## **RESOURCE PROBLEM: LIVESTOCK PRODUCTION LIMITATION - INADEQUATE LIVESTOCK WATER**

---

Quantity, quality and/or distribution of drinking water are insufficient to maintain health or production goals for the kinds and classes of livestock

### **COMMON CONSERVATION PRACTICES USED**

#### **642 Water Well**

Drill a livestock well to provide water for livestock use.

#### **636 Water Harvesting Catchment**

Capture precipitation runoff from a natural or artificial impermeable surface and convey it to a storage facility to provide water for livestock.

#### **574 Spring Development**

Collecting water from springs or seeps to provide or improve the quantity and/or quality of water for Livestock.

#### **533 Pumping Plant**

Install a pumping facility to deliver water for livestock use. Examples are submersible pumps powered by electricity, generators or solar panels, pump jacks and windmills.

#### **614 Watering Facility**

Install troughs and storage tanks to provide reliable high quality water for livestock.

#### **521A Pond Sealing or Lining, Flexible Membrane**

Install a sealant or liner in the bottom of your ponds to reduce seepage loss.

#### **378 Pond**

Construct a pond as a water source for livestock by excavating soil or creating an earthen embankment to capture runoff water.

#### **516 Pipeline**

Install pipelines to distribute water from a source (well, storage tank, etc.) to watering facilities or ponds.

## **RESOURCE PROBLEM: INEFFICIENCY ENERGY USE - EQUIPMENT AND FACILITIES**

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Inefficient use of energy in the Farm Operation increases dependence on non-renewable energy sources that can be addressed through improved energy efficiency and the use of on-farm renewable energy sources. As an example, this concern addresses inefficient energy use in pumping plants, on-farm processing, drying and storage.

### COMMON CONSERVATION PRACTICES USED

#### **372 Combustion System Improvement**

Replace older inefficient combustion engines with newer, more fuel efficient engines to reduce energy use.

## **RESOURCE PROBLEM: INEFFICIENCY ENERGY USE - FARMING/RANCHING PRACTICES AND FIELD OPERATIONS**

---

Inefficient use of energy in field operations increases dependence on non-renewable energy sources that can be addressed through improved efficiency and the use of on-farm renewable energy sources.

### COMMON CONSERVATION PRACTICES USED

#### **533 Pumping Plant**

Install a new water pump that reduces energy use. Replace pumping plants that rely on non-renewable energy sources with pumping plants that use wind, solar, or other on-farm renewable energy sources.

## **RESOURCE PROBLEM: AIR QUALITY IMPACTS - EMISSIONS OF PARTICULATE MATTER (PM) AND PM PRECURSORS**

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Direct emissions of particulate matter (dust and smoke), as well as the formation of fine particulate matter in the atmosphere from other agricultural emissions (ammonia, NO<sub>x</sub>, and VOCs) cause multiple environmental impacts, such as: - The unintended movement of particulate matter (typically dust or smoke) results in safety or nuisance visibility restriction - The unintended movement of particulate matter and/or chemical droplets results in unwanted deposits on surfaces - Increased atmospheric concentrations of particulate matter can impact human and animal health and degrade regional visibility.

### COMMON CONSERVATION PRACTICES USED

#### **373 Dust Control on Unpaved Roads and Surfaces**

Apply road surface treatments that will reduce dust emissions from vehicular traffic on farms roads.

**342 Critical Area Planting**

Establish vegetation on highly erosive soils that generate excess dust.

**472 Access Control**

Control access of livestock, equipment, and vehicles to highly erosive areas that generate excess dust and other particulate matter.

**528 Prescribed Grazing**

Manage the location, timing, duration, and intensity of livestock grazing to maintain vegetative cover to prevent wind erosion and dust emissions.

**372 Combustion System Improvement**

Replace or retrofit agricultural combustion systems or devices to reduce particulate matter (PM-10, PM-2.5) emissions.

**RESOURCE PROBLEM: AIR QUALITY IMPACTS - EMISSIONS OF GREENHOUSE GASES (GHGs)**

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Emissions increase atmospheric concentrations of greenhouse gases.

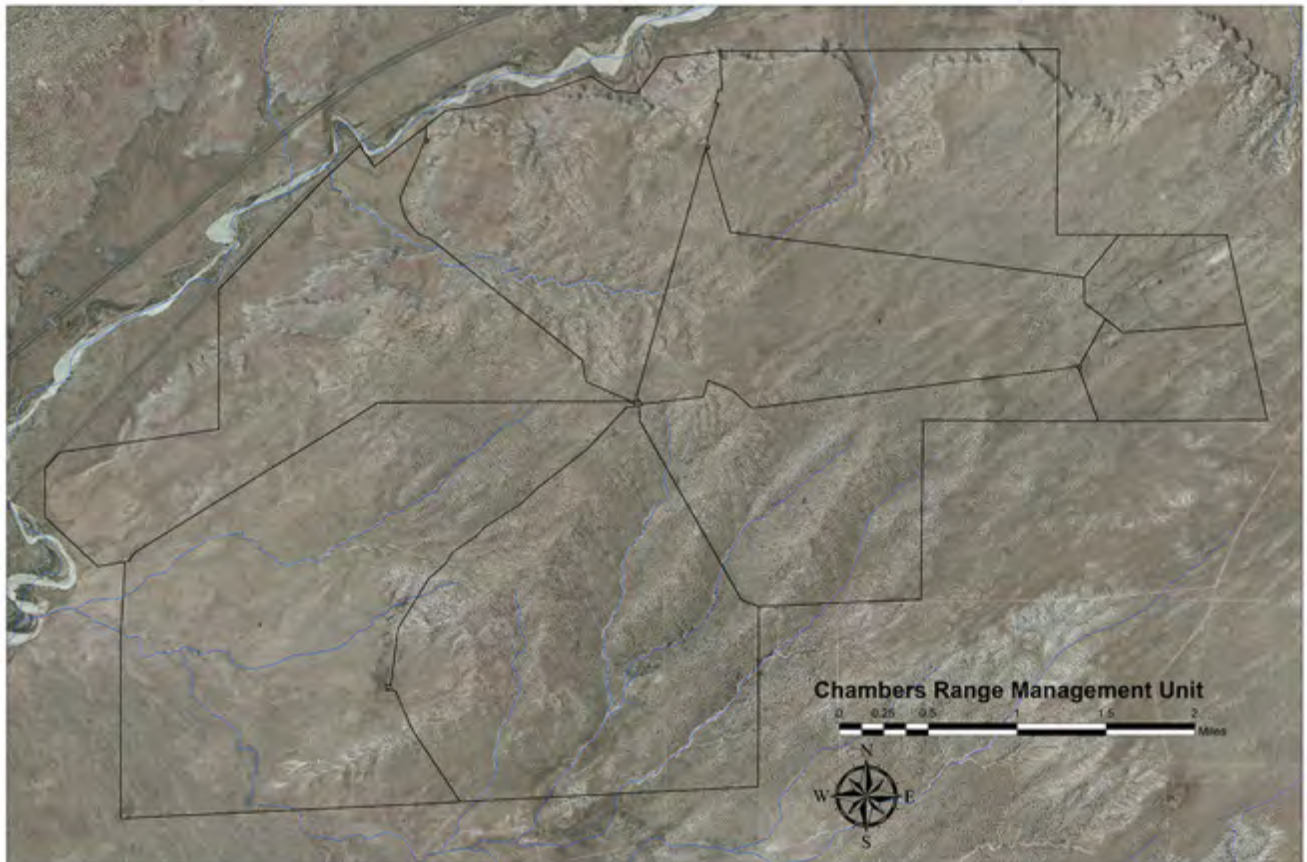
**COMMON CONSERVATION PRACTICES USED****372 Combustion System Improvement**

Replace or retrofit agricultural combustion systems or devices to reduce carbon dioxide emissions.

# CHAMBERS RANGE MANAGEMENT UNIT

## CONSERVATION PLAN

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**2016**

# CONSERVATION PLAN

## CHAMBERS RANGE MANAGEMENT UNIT

### CONTACT INFORMATION

*This is the contact information for the grazing permittees.*

ATTACHED: Ranchers livestock grazing permit and Authorized lead representative letter.

Name	Caroline Nicotine				
Position (Business Owner, Land Owner, Permittee, Manager Etc.)	Permittee (Primary Contact)				
Address	Po Box 753				
City	Sanders	State	AZ	Zip Code	86512
Business Phone	928-688-6223	Home		Cell Phone	505-459-1026
Email Address	<a href="mailto:Nez_lalo@yahoo.com">Nez_lalo@yahoo.com</a>			Tax ID	

Name	Livingston Nez				
Position (Business Owner, Land Owner, Permittee, Manager Etc.)	Permittee				
Address	Po Box 891				
City	Sanders	State	AZ	Zip Code	86512
Business		Home		Cell Phone	928-207-5049
Email Address	bennijet@yahoo.com/bennijetlalo@yahoo.com			Tax ID	

Name	Melvin Nez				
Position (Business Owner, Land Owner, Permittee, Manager Etc.)	Permittee				
Address	Po Box 474				
City	Sanders	State	AZ	Zip Code	86512
Business Phone		Home		Cell Phone	928-245-2909
Email Address					

Name	Marlene Thompson				
Position (Business Owner, Land Owner, Permittee, Manager Etc.)	Permittee				
Address	Po Box 519				
City	Chambers	State	AZ	Zip Code	86502
Business Phone		Home		Cell Phone	928-241-2377
Email Address					

Name	Larry Thompson				
Position (Business Owner, Land Owner, Permittee, Manager Etc.)	Permittee				
Address	Po Box 519				
City	Sanders	State	AZ	Zip Code	86502
Business Phone		Home		Cell Phone	928-206-1661
Email Address					

## BRIEF DESCRIPTION OF THE OPERATION

*This provides a brief description of the farming or ranching operation, including a general description of the land, and the kinds of livestock produced.*



The Chambers Range Management Unit is located near the Sanders, Arizona in what is called “New Lands” or Nahata D’ziil (which means “strength through planning” in Navajo). It is in the Fort Defiance Soil and Water Conservation District. The Chambers RMU is part of the 14R Ranch Inc. - a non-profit organization incorporated on the Navajo Nation. The 14R Ranch includes 360,000-acres of grazing land and 81 permit holders that share the 360,000 acres of grazing lands. 14R Ranch Inc. was incorporated as an instrument to help manage the 14 range units that make up Nahata D’ziil.

The Chambers RMU is approximately 12,148 acres in size, and is fenced with four wire barbed wire fence. It is divided into seven pastures for grazing rotation by the five livestock permittee holders. 80 SUYL are authorized for each permittee. Within these pastures there are four windmills with storage tanks and overflow ponds, one solar windmill with a storage tank and overflow pond; seven water troughs, one natural spring, one operating earth dam and two broken dams, and two rain gages. A monitoring location has been established in each pasture.

Permittees all comply with the livestock grazing management plan, annual forage monitoring, grazing rotation schedule and certified Beef Quality Assurance. Permittees graze healthy herd cattle and produce for commercial and as well as subsistence use, therefore cattle are supplemented with salt block, trace mineral, protein block or tub and meet vaccination protocols.

Wildlife, horses, sheep and goats, and English Black Angus cattle graze on this range land. The land is 30% covered by juniper trees; it has a number of water erosion problems, a patch of Russian thistle and Tamarisk, and areas with snakeweed invasions.



## GOALS

*These include the broad goals for managing the natural resources on the operation, economic goals for the operation, and goals that identify how my conservation plan will benefit my community.*

- Provide new water for livestock and wildlife through installation of new pipelines and troughs to distribute reliable water
- Divide pasture #7 as a facilitating practice to improve grazing management, manage the season and frequency of grazing, and allow for regrowth of desirable forage plants.
- Rotate the season of grazing in each pasture to help maintain a diversity of vegetation cover across the landscape.
- Protect, conserve, utilize the land and maintain valuable wildlife, cultural resources
- Reduce water run-off and minimize soil erosion.
- Provide technical assistance, training and education in conservation practices to other ranchers to promote self-sustaining communities.



## OBJECTIVES

*These are the specific actions or activities that are planned over the next two to five years that are needed to help achieve the overall goals.*

- Install a water trough and new pipeline from Papalotte well 1 to Chambers well for good quality water as the chambers well is contaminated with uranium.
- Install new pipeline from Papalotte well to Paplotte trough due to waterline above ground surface which freezes during cold weather.
- Install new pipeline from Roten House well to northeast corner of Pasture #7 to improve grazing distribution
- Install new pipeline from Waterflow well (Navajo Range Unit) into Pasture #3 to improve grazing distribution and to have reliable water for livestock and wildlife.
- Divide pasture #7 with four wire barbwire fence from Roten House well to Chambers well to control the season of grazing over time.
- Rebuild broken dams in Pastures #7, #3 and #4 and create ponds to improve livestock water and distribution in range pasture.
- Use burning to control snake weed and Russian thistle and other noxious weeds.



- Identify areas for juniper thinning in higher elevation for more forage growth.
- Install rock piles in gullies to slow the flow of water and reduce erosion
- Install water bars on roads to reduce runoff and erosion

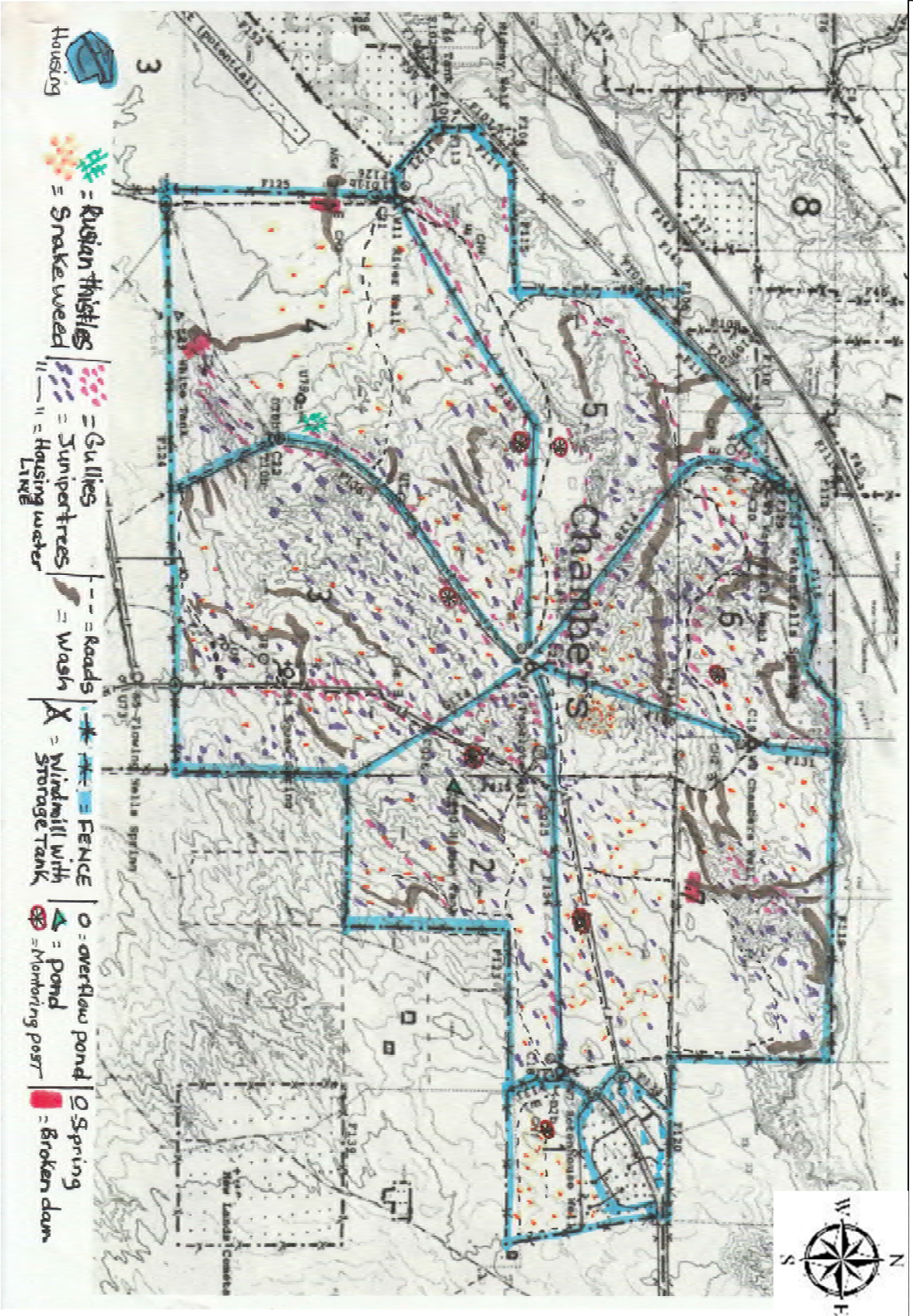


## FIELDS AND PASTURES

*The following table provides information about existing and planned fields and pastures on the operation.*

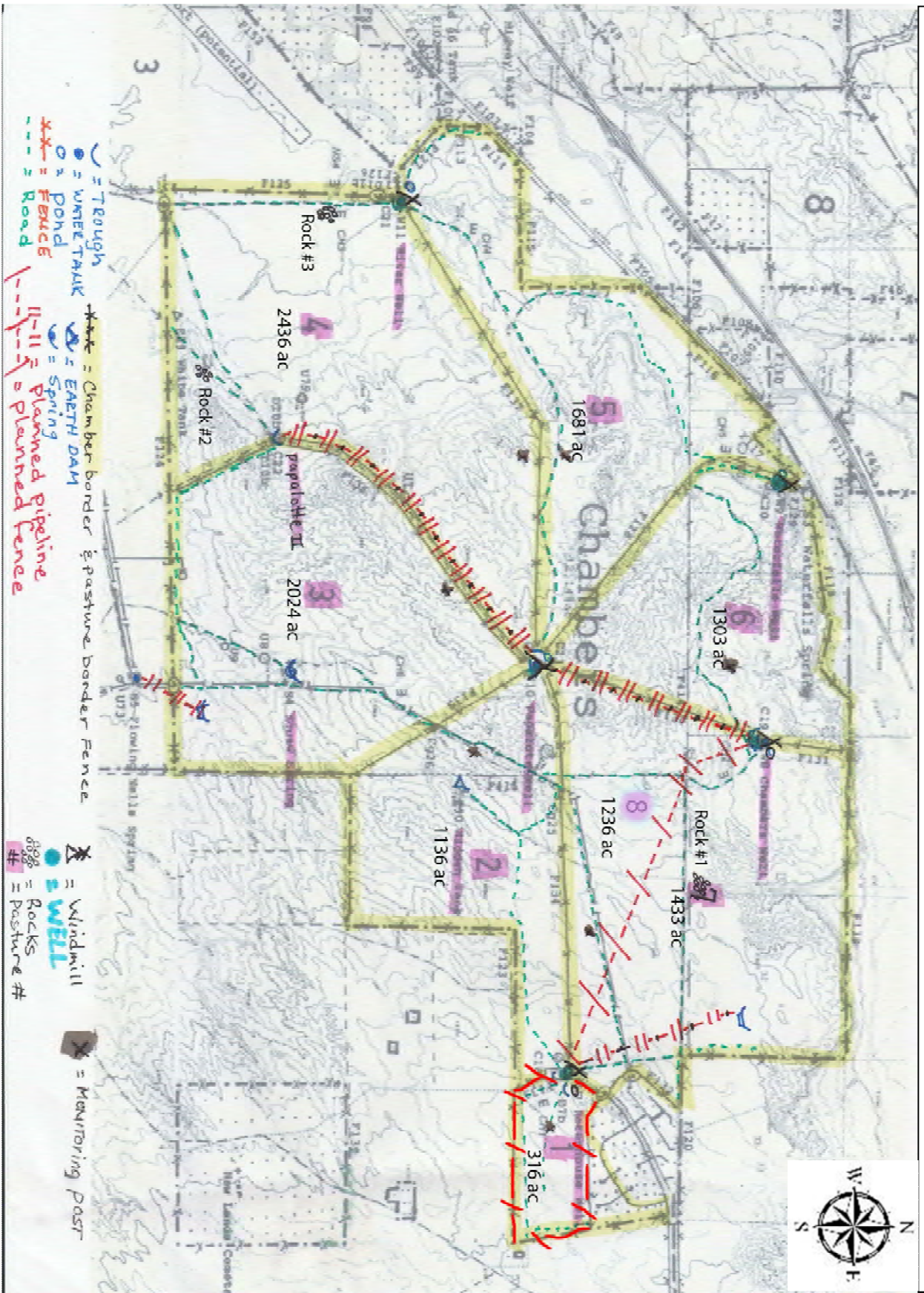
Field or Pasture Number	Existing or Planned	Field or Pasture Name	Land Use	Acres	Land Ownership
1	Existing	Pasture 1	Range	316	Tribal/ ONHIR
2	Existing	Pasture 2	Range	1136	Tribal/ ONHIR
3	Existing	Pasture 3	Range	2024	Tribal/ ONHIR
4	Existing	Pasture 4	Range	2436	Tribal/ ONHIR
5	Existing	Pasture 5	Range	1681	Tribal/ ONHIR
6	Existing	Pasture 6	Range	1303	Tribal/ ONHIR
7	Existing	Pasture 7	Range	1433	Tribal/ ONHIR
8	Planned	Pasture 8	Range	1236	Tribal/ ONHIR

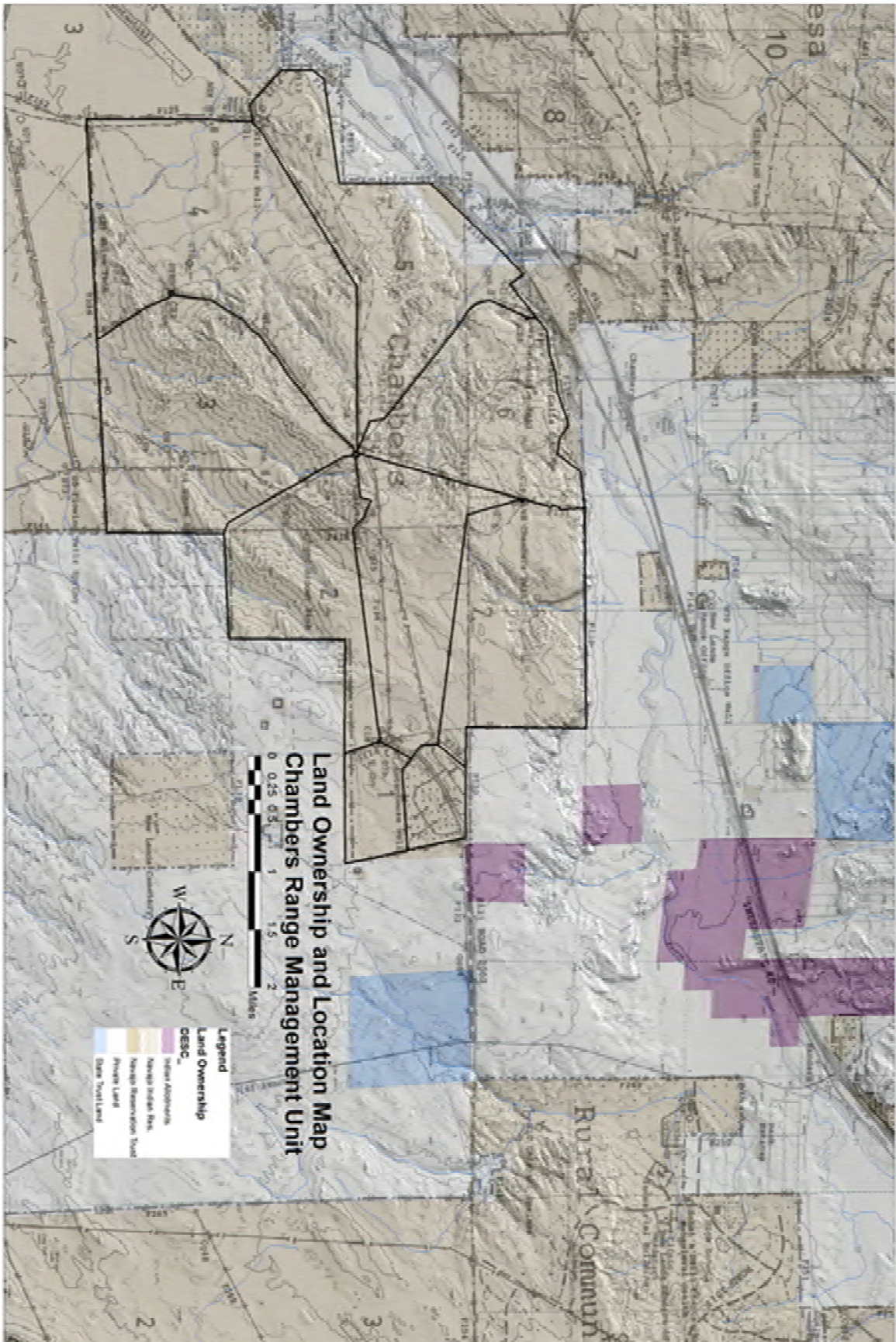
# Chambers Range Management Unit Inventory Map 12,148 Acres





# Chambers Range Management Unit Conservation Plan Map 12,148 Acres





# CONSERVATION PRACTICES

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*Conservation practices include structural improvements like fences, pipelines, and storage tanks; vegetation treatments such as seeding, brush management and noxious weed control; and management activities such as grazing management. The existing and planned conservation practices work together as a Resource Management System to help manage the soil, water, plants, animals and other natural resources on this ranching operation.*

## GRAZING MANAGEMENT

Grazing will be managed to control the timing, frequency, duration, intensity, and distribution of livestock use in each pasture to maintain those portions of the rangeland that support the desired plant community, and to help address identified problems on those portions of the rangeland that have erosion problems, excess runoff, water quality problems, plant productivity and/or diversity problems, noxious or invasive species, forage quality and quantity problems, wildlife habitat concerns or other resource concerns.

### PERMITTED LIVESTOCK

*For lands leased from the Office of Navajo and Hopi Relocation, each permittee is permitted the following animal numbers.*

Agency	Permitted Kind of Animal	Number of Animals	Allowed from	Allowed To	Animal Unit Months (SUYL)	Lease or Permit Expiration Date
Office of Navajo and Hopi Relocation	Sheep	80	Jan 1	Dec 30	80	10/31/2020

### CURRENTLY PERMITTED LIVESTOCK

Agency	Permitted Kind of Animal	Number of Animals	Allowed from	Allowed To	Animal Unit Months (SUYL)	Lease or Permit Expiration Date
Office of Navajo and Hopi Relocation	Sheep	54	Jan 1	Dec 30	54	1/31/2016

### CURRENT KINDS AND NUMBER OF LIVESTOCK

*The following table provides general information about the livestock kinds and numbers for the permittees on the range unit.*

Herd Number	Animal Kind and Class	Current Number of Animals	Average Number of Animals	Registered Livestock	Average Weights	Yearlong or Typical Dates Grazed
1	Cows	50	90	Some	1000	Yearlong
1	Horses	6	10			Yearlong
2	Bulls	4	5	Some	1200	May to Aug

## HISTORICAL GRAZING ROTATION SCHEDULE

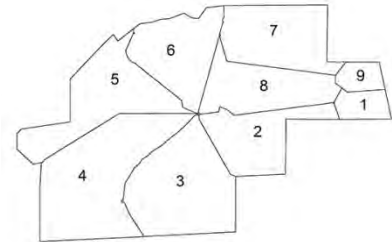
The following table shows the typical grazing rotation that has been followed over the last few years.

C=cow, H=horse, T=stud, W=weaning calf, Y=yearling heifers.

Pasture	Acres	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
1	316							W	W	W	W	W	
2	1136							CHB	BT	BT			
3	2024				CHB	CHB	CHB						
4	2436										CHY	CHY	CHY
5	1681	BT	BT	BT									
6	1303				YT	YT	YT	YT	CHY	CHY			
7	2669	CYH	CYH	CYH							BT	BT	BT

## PLANNED GRAZING MANAGEMENT

The planned grazing rotation balances the current forage production on the soils/ecological sites in each pasture with livestock numbers. The grazing management plan is based on the currently available livestock water in each pasture, and the reliability and distribution of those waters.



### Year 1

Pasture	Acres	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
1	316												
2	1136								W	W	W	W	W
3	2024	CYH	CYH	CYH							BT	BT	BT
4	2436				CHB	CHB	CHB						
5	1681	BT	BT	BT				CHB	CHY	CHY			
6	1303				YT	YT	YT				CHY	CHY	CHY
7	1433							YT	BT	BT			
8	1236												

### Year 2

Pasture	Acres	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
1	316												
2	1136												
3	2024				CHB	CHB	CHB						
4	2436	BT	BT	BT				CHB	CHY	CHY			
5	1681				YT	YT	YT				CHY	CHY	CHY
6	1303							YT	BT	BT			
7	1433	CHY	CYH	CYH							BT	BT	BT
8	1236								W	W	W	W	W

### Year 3

Pasture	Acres	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
1	316												
2	1136								W	W	W	W	W
3	2024	BT	BT	BT				CHB	CHY	CHY			
4	2436				YT	YT	YT				CHY	CHY	CHY
5	1681							YT	BT	BT			
6	1303	CHY	CYH	CYH							BT	BT	BT
7	1433				CHB	CHB	CHB						
8	1236												



## EXISTING WATER DEVELOPMENTS

### WELLS AND SURFACE WATER SOURCES

The following table provides information about the existing wells, streams and springs on the operation. Existing water developments are shown on the Conservation Plan Map.

Label on Map	Water Type	Own Water Right	Pasture Where Located	Pastures it provides water to	Flow Rate gpm	Pump Type (windmill, solar etc)	Water Quality (Excellent, Good, Fair, Poor)	Water Reliability (Excellent, Good, Fair, Poor)	Water Availability (Yearlong or Seasonal)
Rotenhouse	Well	ONHIR	1	1, 2, 7		windmill	good	good	yearlong
Papalote 1	Well	ONHIR	6	All except 1		solar	good	good	yearlong
River Well	Well	ONHIR	4	5, 4		windmill	good	good	yearlong
Chambers Well	Well	ONHIR	8	6, 8		windmill	Uranium contamination	good	yearlong
Waterfall	Well	ONHIR	6	5, 6		windmill	good	good	yearlong
Waterflow	Well	ONHIR	Navajo Springs	3		electric	good	good	yearlong
Squaw Spring	Spring	ONHIR	3	3			good	Poor	winter

### EXISTING PONDS AND WATER HARVESTING CATCHMENTS

The following table provides information about the existing ponds and catchments on the operation.

Label on Map	Water Type (pond,)	Own Water Right	Pasture Where Located	Pastures Served	How many acres drain into this	Storage Capacity (gal)	Reliability (Excellent, Good, Fair, Poor)	Availability (Yearlong or Seasonal)
Pond 1	Pond	ONHIR	2	2	600	720,000	fair	Summer rain
Pond 2	Pond	ONHIR	8	8	600	0	broken	none
Pond 3	Pond	ONHIR	4	4	200	0	broken	none
Pond 4	Pond	ONHIR	4	4	200	0	broken	none

### EXISTING STORAGE TANKS

The following table provides information about the existing storage tanks and troughs on the operation.

Storage Number	Type	Supplied By Water Source Number	Pastures Served	Storage Capacity	Condition of storage tank (Excellent, Good, Fair, Poor)
Rotenhouse	Steel	Rotenhouse	1,2,7	3500	good
Papalote 1	Steel	Papalote 1	All except for 1	3500	good
River Well	Steel	River Well	3,4	3500	good
Chambers Well	Steel	Chambers Well	6,7	3500	good
Waterfall	Steel	Waterfall	5,6	3500	good



## EXISTING WATER TROUGHS

Trough Number	Type	Supplied By Water Source Number	Pastures Served	Storage Capacity (gal)	Wildlife Escape Ramp	Condition (Excellent, Good, Fair, Poor)
Rotenhouse	Two Steel	Rotenhouse	1 / 2 & 7	500	No	good
Papalote 1	Two Steel	Papalote 1	2,3,4 / 5,6,7,	500	no	good
Papalote 2	Steel	Papalote 1	3, 4	500	no	good
River Well	Steel	River Well	3,5	500	no	good
Chambers Well	Steel	Chambers Well	6,7	500	no	fair
Waterfall	Steel	Waterfall	5,6	500	no	good
Squaw Spring	Steel	Squaw Spring	3	300	no	fair



SQUAW SPRING

## PLANNED WATER DEVELOPMENTS

Livestock water developments will be installed or repaired to provide reliable livestock water in each pasture or grazing area that will support the grazing management plan. These livestock water developments are intended to distribute livestock grazing as evenly as possible. The existing and planned water developments are shown on the Conservation Plan Map.

Project No.	Item	Field or Pasture	Planned Year	Planned Type	Planned Number	Planned Amount	Planned Capacity
1	Pipeline from Papalote	7	2016	1.25" PE		7900 ft.	4+ gpm
1	Trough	7	2016	Steel	1		500 gal
2	Pipeline from Flowing Wells	3	2016	1.25" PE		5100 ft.	4+ gpm
2	Trough	3	2016	Steel	1		500 gal
3	Pipeline from Rotenhouse	7	2016	1.25" PE		6200 ft.	4+ gpm
3	Trough	7	2016	Steel	1		500 gal
4	Pipeline from Waterflow (Navajo Springs)	3	2016	1.25" PE		2600 ft.	4+ gpm
4	Trough	3	2016	Steel	1		500 gal

## PLANNED FENCES

Fences will be installed or repaired to help control livestock grazing as part of the grazing management plan. Each planned fence is listed here and shown on the Conservation Plan Map.

Project No.	Between Fields or Pastures	Planned Year	New or Replace	Existing or Planned Fence Type	Planned Amount
Fence 1	7, 8	2017	New	Standard barbed wire, 4 wires	13,300 feet
Fence 2	1,2 and 2 boundary fence	2016	Replace	Standard barbed wire, 4 wires	16,000 feet

## PLANNED ROCK AND BRUSH STRUCTURES

Rock and brush structures will be installed to control gully erosion head cuts using either loose rock structures, or rock and brush structures. Locations for planned rock and brush structures are show on the Conservation Plan Map.

Project No.	Field or Pasture	Planned Year	Size of gully (average depth, width, length)	Estimated acres that drain into the gully	Kind of structures planned	Number of Structures planned at this location
Rock #1	7	2018	20 x 30 x 5000	640	Loose rock	3
Rock #2	4	2018	8 x 20 x 2600	200	Loose rock	3
Rock #3	4	2018	20 x 30 x 15000	1200	Loose rock	5

## PLANNED BRUSH MANAGEMENT

*Woody species will be killed or removed to restore the natural balance of grasses, forbs, shrubs and trees as described in the ecological site description for the desired plant community phase. The location of the brush management projects are shown on the Conservation Plan Map.*

Project No.	Fields or Pastures	Planned Year	Target Species	Planned Method of Treatment	Average Plants Per Acre To Remove	Acres planned for treatment
BM #1	1 & 8	2017	Snakeweed	Burning	200	120 acres

## PLANNED NOXIOUS WEED CONTROL

*Herbaceous noxious or invasive weeds will be treated to restore the natural balance of grasses, forbs, shrubs and trees as described in the ecological site description for the desired plant community phase. The locations of the projects are shown on the Conservation Plan Map.*

Project No.	Fields or Pastures	Planned Year	Target Species	Planned Method of Treatment	Avg Plants Per Acre To Remove	Planned Amount
HWC #1	1 & 7	2017	Russian Thistle	Chemical Spray	1200	10 acres
HWC #2	4	2017	Tamarisk	Chemical Spray/Cleared	800	1 acre

## MONITORING

Flexibility is essential to the grazing management plan to adjust for variability in precipitation, the availability of livestock water, the potential need to adjust for wildfires, poisonous plant concerns, predator issues, and vegetative treatments such as brush management. As the conservation plan is implemented, additional pastures, livestock water or other changes may occur that will initiate changes to the initial grazing management plan.

Monitoring locations were set up in each of the 7 original pastures to document changes in forage production. The monitoring locations are shown on the inventory map. Rainfall information is collect each year. Forage clipping is done at the end of the spring and summer growing season. The following tables show the results from the last two years. The following tables provides a summary of recent results.

### PRECIPITATION

Precipitation is only read quarterly and only documented yearly.

Year	2013	2014	2015
Chambers Range Management Unit	11.25	8.44	11.56

## FORAGE PRODUCTION

### Average Standing Forage (lbs./ac.) From Clipped Frames

Pasture	1	2	3	4	5	6	7
Jun 214	500	90	65	120	155	275	110
Dec 2014	170	295	285	225	185	215	300
Jun 2015	280	260	120	210	260	420	235
Dec 2015	160	170	160	230	150	225	170

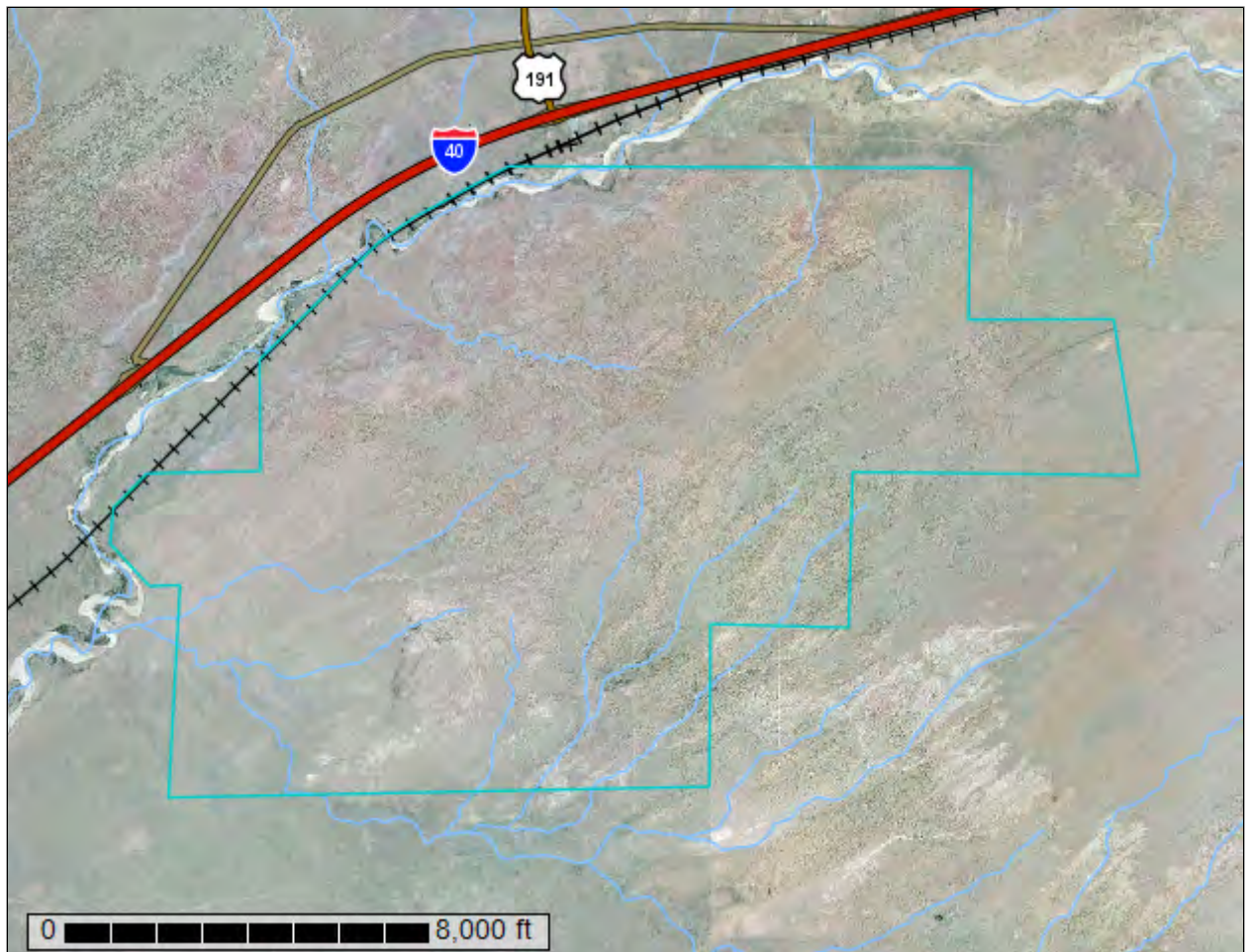
Each year, the rainfall and forage monitoring information will be combined with other considerations to determine if the grazing management plan needs to be adjusted.



A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

# Custom Soil Resource Report for Apache County, Arizona, Central Part

## Chambers Range Management Unit





# Preface

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Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<http://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist ([http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2\\_053951](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951)).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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# **How Soil Surveys Are Made**

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Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

## Custom Soil Resource Report

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

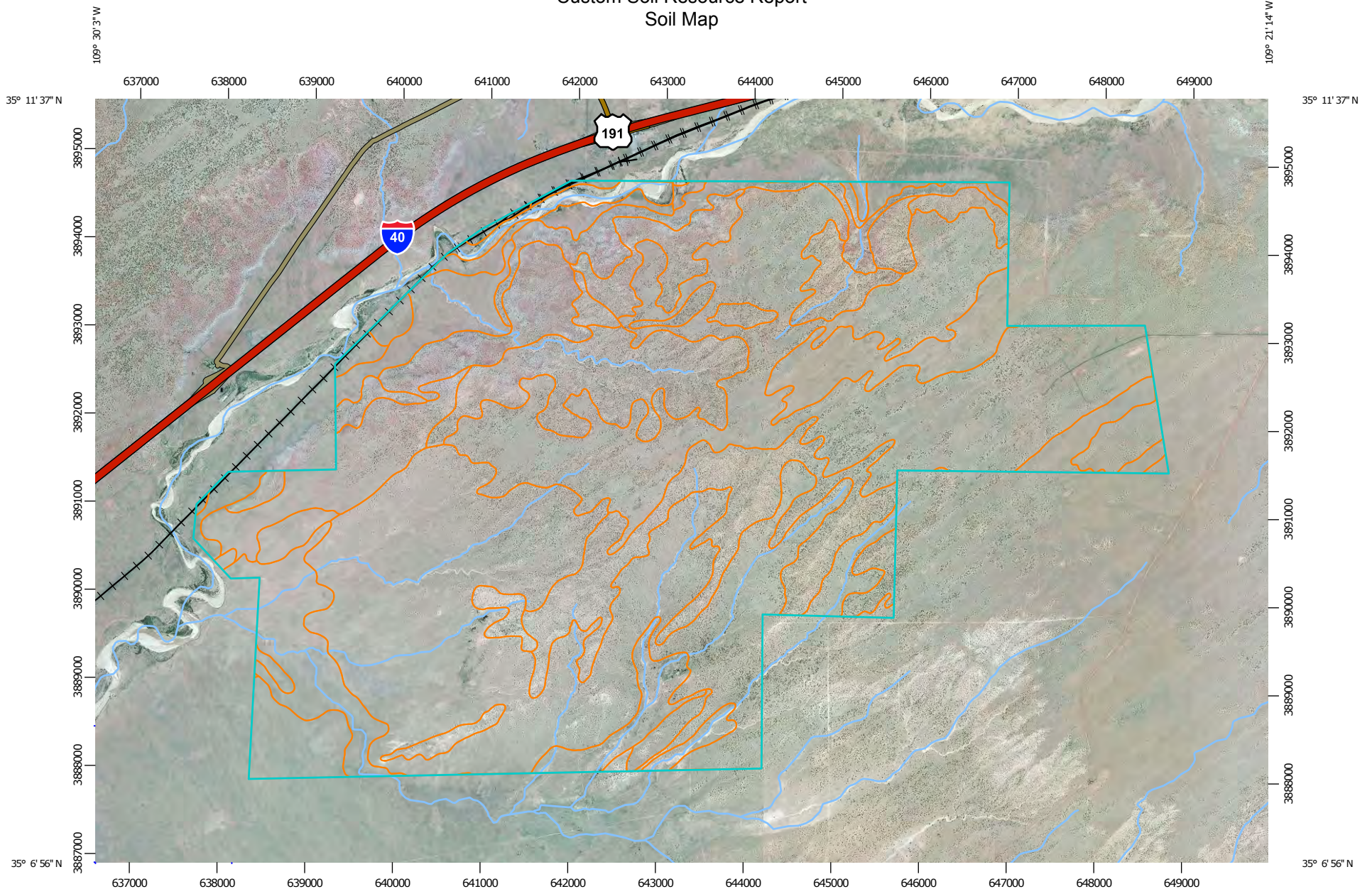
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# Soil Map

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The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

# Custom Soil Resource Report Soil Map



Map Scale: 1:61,100 if printed on A landscape (11" x 8.5") sheet.

0 500 1000 2000 3000 Meters

0 2500 5000 10000 15000 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84







# Custom Soil Resource Report


## MAP LEGEND


### Area of Interest (AOI)

 Area of Interest (AOI)


### Soils


 Soil Map Unit Polygons


 Soil Map Unit Lines


 Soil Map Unit Points

### Special Point Features

 Blowout


 Borrow Pit


 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water


 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot


 Sinkhole

 Slide or Slip


 Sodic Spot

 Spoil Area

 Stony Spot


 Very Stony Spot

 Wet Spot


 Other

 Special Line Features

### Water Features

 Streams and Canals


### Transportation

 Rails


 Interstate Highways

 US Routes

 Major Roads

 Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:31,700.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Apache County, Arizona, Central Part  
 Survey Area Data: Version 10, Sep 20, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

Apache County, Arizona, Central Part (AZ635)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CLB	Clovis loamy sand, 0 to 8 percent slopes	515.9	4.3%
CTB	Clovis-Palma association, undulating	3,472.5	28.7%
ER2	Eroded land	2,132.4	17.6%
FRB	Fruitland sandy loam, 1 to 8 percent slopes	3,277.8	27.1%
GU	Gullied land	120.9	1.0%
LO	Loamy alluvial land	667.4	5.5%
MOD	Moenkopie very rocky loamy sand, 0 to 30 percent slopes	339.3	2.8%
PAB	Palma loamy sand, 0 to 8 percent slopes	257.7	2.1%
RH	Riverwash	110.6	0.9%
RO	Rough broken land	274.9	2.3%
SA	Sandstone rock land	302.0	2.5%
SD	Sandy alluvial land	4.4	0.0%
SMB	Sheppard loamy sand, 0 to 8 percent slopes	24.6	0.2%
TH	Tours sandy loam	223.8	1.9%
TL	Tours loam	321.3	2.7%
TO	Tours clay loam	38.9	0.3%
<b>Totals for Area of Interest</b>		<b>12,084.6</b>	<b>100.0%</b>

## Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas

## Custom Soil Resource Report

for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of

## Custom Soil Resource Report

the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.



## Apache County, Arizona, Central Part

### CLB—Clovis loamy sand, 0 to 8 percent slopes

#### Map Unit Setting

*National map unit symbol:* 1vp6h  
*Elevation:* 5,400 to 7,000 feet  
*Mean annual precipitation:* 12 to 16 inches  
*Mean annual air temperature:* 52 to 55 degrees F  
*Frost-free period:* 130 to 140 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Clovis and similar soils:* 100 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Clovis

##### Setting

*Landform:* Plains  
*Landform position (two-dimensional):* Summit  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Convex  
*Parent material:* Eolian sands and/or gravelly alluvium derived from metamorphic and sedimentary rock

##### Typical profile

*A - 0 to 3 inches:* loamy sand  
*Bw - 3 to 8 inches:* sandy clay loam  
*Bt - 8 to 16 inches:* sandy clay loam  
*Btk - 16 to 24 inches:* sandy clay loam  
*Bk - 24 to 30 inches:* clay loam  
*2C - 30 to 58 inches:* loamy sand  
*3Bk - 58 to 64 inches:* sandy loam

##### Properties and qualities

*Slope:* 0 to 8 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Well drained  
*Runoff class:* Low  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.57 to 1.98 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 20 percent  
*Salinity, maximum in profile:* Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)  
*Available water storage in profile:* Moderate (about 6.1 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 6s  
*Hydrologic Soil Group:* B

## Custom Soil Resource Report

*Ecological site:* Sandy Loam Upland 10-14" p.z. (R035XA117AZ)

### **CTB—Clovis-Palma association, undulating**

#### **Map Unit Setting**

*National map unit symbol:* 1vp6j  
*Elevation:* 5,400 to 7,000 feet  
*Mean annual precipitation:* 10 to 14 inches  
*Mean annual air temperature:* 52 to 55 degrees F  
*Frost-free period:* 130 to 140 days  
*Farmland classification:* Not prime farmland

#### **Map Unit Composition**

*Clovis and similar soils:* 65 percent  
*Palma and similar soils:* 30 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### **Description of Clovis**

##### **Setting**

*Landform:* Terraces  
*Landform position (two-dimensional):* Summit  
*Landform position (three-dimensional):* Tread  
*Down-slope shape:* Linear  
*Across-slope shape:* Convex  
*Parent material:* Eolian sands and/or gravelly alluvium derived from metamorphic and sedimentary rock

##### **Typical profile**

*A - 0 to 3 inches:* loamy sand  
*Bw - 3 to 8 inches:* sandy clay loam  
*Bt - 8 to 16 inches:* sandy clay loam  
*Btk - 16 to 24 inches:* sandy clay loam  
*Bk - 24 to 30 inches:* clay loam  
*2C - 30 to 58 inches:* loamy sand  
*3Bk - 58 to 64 inches:* sandy loam

##### **Properties and qualities**

*Slope:* 0 to 8 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Well drained  
*Runoff class:* Medium  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.57 to 1.98 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 20 percent  
*Salinity, maximum in profile:* Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)  
*Available water storage in profile:* Moderate (about 6.1 inches)

## Custom Soil Resource Report

### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 6e  
*Hydrologic Soil Group:* B  
*Ecological site:* Sandy Loam Upland 10-14" p.z. (R035XA117AZ)

### Description of Palma

#### Setting

*Landform:* Dunes, terraces  
*Landform position (two-dimensional):* Summit  
*Landform position (three-dimensional):* Tread  
*Down-slope shape:* Linear  
*Across-slope shape:* Convex  
*Parent material:* Eolian sands and/or sandy alluvium derived from metamorphic and sedimentary rock

#### Typical profile

*A - 0 to 3 inches:* loamy sand  
*Bw - 3 to 5 inches:* sandy loam  
*Bt - 5 to 12 inches:* sandy loam  
*Bw - 12 to 21 inches:* fine sandy loam  
*Bk - 21 to 41 inches:* fine sandy loam  
*2Bkb1 - 41 to 54 inches:* sandy clay loam  
*2Bkb2 - 54 to 60 inches:* sandy clay loam

#### Properties and qualities

*Slope:* 0 to 8 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Well drained  
*Runoff class:* Low  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 30 percent  
*Salinity, maximum in profile:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)  
*Available water storage in profile:* Moderate (about 8.1 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 6s  
*Hydrologic Soil Group:* A  
*Ecological site:* Sandy Loam Upland 10-14" p.z. (R035XA117AZ)

## ER2—Eroded land

### Map Unit Composition

*Eroded land:* 78 percent

## Custom Soil Resource Report

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Eroded Land

#### Setting

*Landform:* Terraces, escarpments

#### Interpretive groups

*Land capability classification (irrigated):* None specified

*Ecological site:* Sandy Upland 10-14" p.z. (R035XA118AZ)

## FRB—Fruitland sandy loam, 1 to 8 percent slopes

### Map Unit Setting

*National map unit symbol:* 1vp78

*Elevation:* 5,500 to 7,000 feet

*Mean annual precipitation:* 10 to 13 inches

*Mean annual air temperature:* 49 to 53 degrees F

*Frost-free period:* 130 to 140 days

*Farmland classification:* Not prime farmland

### Map Unit Composition

*Fruitland and similar soils:* 79 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Fruitland

#### Setting

*Landform:* Alluvial fans

*Landform position (two-dimensional):* Summit

*Landform position (three-dimensional):* Tread

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Loamy, mixed alluvium

#### Typical profile

*A - 0 to 4 inches:* sandy loam

*C1 - 4 to 20 inches:* sandy loam

*C2 - 20 to 26 inches:* sandy loam

*Bk - 26 to 48 inches:* fine sandy loam

*C3 - 48 to 62 inches:* gravelly sandy loam

#### Properties and qualities

*Slope:* 1 to 8 percent

*Depth to restrictive feature:* More than 80 inches

*Natural drainage class:* Well drained

*Runoff class:* Medium

*Capacity of the most limiting layer to transmit water (Ksat):* High (1.98 to 5.95 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Calcium carbonate, maximum in profile:* 15 percent

*Salinity, maximum in profile:* Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)

*Available water storage in profile:* Moderate (about 6.1 inches)

## Custom Soil Resource Report

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 6e

*Hydrologic Soil Group:* A

*Ecological site:* Sandy Loam Upland 10-14" p.z. (R035XA117AZ)

## GU—Gullied land

### Map Unit Composition

*Gullied land:* 95 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Gullied Land

#### Setting

*Landform:* Escarpments, gullies, ridges

## LO—Loamy alluvial land

### Map Unit Setting

*National map unit symbol:* 1vp7r

*Elevation:* 6,000 to 6,700 feet

*Mean annual precipitation:* 10 to 14 inches

*Mean annual air temperature:* 49 to 52 degrees F

*Frost-free period:* 140 to 158 days

*Farmland classification:* Not prime farmland

### Map Unit Composition

*Loamy alluvial land:* 100 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Loamy Alluvial Land

#### Setting

*Landform:* Flood plains

*Landform position (two-dimensional):* Summit

*Landform position (three-dimensional):* Dip

*Down-slope shape:* Linear

*Across-slope shape:* Linear

#### Typical profile

*C - 0 to 60 inches:* stratified material

#### Properties and qualities

*Slope:* 0 to 3 percent

*Natural drainage class:* Well drained

*Runoff class:* Medium

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)

## Custom Soil Resource Report

*Frequency of flooding:* Occasional

*Available water storage in profile:* High (about 9.6 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 6e

*Ecological site:* Loamy Wash 10-14" p.z. (R035XA112AZ)

## MOD—Moenkopie very rocky loamy sand, 0 to 30 percent slopes

### Map Unit Setting

*National map unit symbol:* 1vp7x

*Elevation:* 5,400 to 6,500 feet

*Mean annual precipitation:* 8 to 12 inches

*Mean annual air temperature:* 52 to 55 degrees F

*Frost-free period:* 130 to 140 days

*Farmland classification:* Not prime farmland

### Map Unit Composition

*Moenkopie and similar soils:* 60 percent

*Rock outcrop, sandstone:* 39 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Moenkopie

#### Setting

*Landform:* Plains, hills, escarpments

*Landform position (two-dimensional):* Summit, backslope

*Landform position (three-dimensional):* Interfluve, side slope, rise

*Down-slope shape:* Linear

*Across-slope shape:* Convex

*Parent material:* Residuum weathered from sandstone

#### Typical profile

*A - 0 to 2 inches:* very stony loamy sand

*C - 2 to 9 inches:* sandy loam

*R - 9 to 13 inches:* unweathered bedrock

#### Properties and qualities

*Slope:* 0 to 30 percent

*Percent of area covered with surface fragments:* 1.6 percent

*Depth to restrictive feature:* 5 to 20 inches to lithic bedrock

*Natural drainage class:* Well drained

*Runoff class:* High

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.60 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Calcium carbonate, maximum in profile:* 15 percent

*Salinity, maximum in profile:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

*Available water storage in profile:* Very low (about 0.9 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 7s  
*Hydrologic Soil Group:* D  
*Ecological site:* Sandstone Upland 10-14" p.z. (R035XA115AZ)

**PAB—Palma loamy sand, 0 to 8 percent slopes**

**Map Unit Setting**

*National map unit symbol:* 1vp8b  
*Elevation:* 5,400 to 7,000 feet  
*Mean annual precipitation:* 8 to 13 inches  
*Mean annual air temperature:* 52 to 55 degrees F  
*Frost-free period:* 130 to 140 days  
*Farmland classification:* Not prime farmland

**Map Unit Composition**

*Palma and similar soils:* 90 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Palma**

**Setting**

*Landform:* Dunes  
*Landform position (two-dimensional):* Summit  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Convex  
*Parent material:* Eolian sands and/or sandy alluvium derived from metamorphic and sedimentary rock

**Typical profile**

*A - 0 to 3 inches:* loamy sand  
*Bw - 3 to 5 inches:* sandy loam  
*Bt - 5 to 12 inches:* sandy loam  
*Bw - 12 to 21 inches:* fine sandy loam  
*Bk - 21 to 41 inches:* fine sandy loam  
*2Bkb1 - 41 to 54 inches:* sandy clay loam  
*2Bkb2 - 54 to 60 inches:* sandy clay loam

**Properties and qualities**

*Slope:* 0 to 8 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Well drained  
*Runoff class:* Low  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 30 percent



## Custom Soil Resource Report

*Salinity, maximum in profile:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)  
*Available water storage in profile:* Moderate (about 8.1 inches)

### **Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 6e  
*Hydrologic Soil Group:* A  
*Ecological site:* Sandy Loam Upland 10-14" p.z. (R035XA117AZ)

## **RH—Riverwash**

### **Map Unit Composition**

*Riverwash:* 90 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Riverwash**

#### **Setting**

*Landform:* Flood plains, channels

#### **Properties and qualities**

*Frequency of flooding:* Frequent

## **RO—Rough broken land**

### **Map Unit Setting**

*National map unit symbol:* 1vp8f  
*Elevation:* 5,400 to 7,000 feet  
*Mean annual precipitation:* 8 to 16 inches  
*Mean annual air temperature:* 48 to 55 degrees F  
*Frost-free period:* 120 to 140 days  
*Farmland classification:* Not prime farmland

### **Map Unit Composition**

*Rough broken land:* 90 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Rough Broken Land**

#### **Setting**

*Landform:* Breaks, terraces

#### **Properties and qualities**

*Slope:* 10 to 60 percent  
*Depth to restrictive feature:* 4 to 20 inches to paralithic bedrock  
*Runoff class:* Very high

### **Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 7e

## Custom Soil Resource Report

*Hydrologic Soil Group:* D

*Ecological site:* Shale Upland 6-10" p.z. (R035XB220AZ)

### **SA—Sandstone rock land**

#### **Map Unit Setting**

*National map unit symbol:* 1vp8k

*Elevation:* 5,400 to 7,000 feet

*Mean annual precipitation:* 10 to 12 inches

*Mean annual air temperature:* 52 to 55 degrees F

*Frost-free period:* 120 to 140 days

*Farmland classification:* Not prime farmland

#### **Map Unit Composition**

*Rock outcrop, sandstone:* 50 percent

*Lithic torriorthents and similar soils:* 35 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### **Description of Rock Outcrop, Sandstone**

##### **Setting**

*Landform:* Mesas, breaks

#### **Description of Lithic Torriorthents**

##### **Setting**

*Landform:* Escarpments, mesas

*Landform position (two-dimensional):* Backslope, summit

*Landform position (three-dimensional):* Side slope, interfluve

*Down-slope shape:* Linear

*Across-slope shape:* Convex

*Parent material:* Alluvium and/or colluvium derived from sandstone

##### **Properties and qualities**

*Slope:* 2 to 8 percent

*Depth to restrictive feature:* 4 to 20 inches to lithic bedrock

*Natural drainage class:* Well drained

*Runoff class:* Medium

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

##### **Interpretive groups**

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 7s

*Hydrologic Soil Group:* D

*Ecological site:* Sandstone Upland 10-14" p.z. (R035XA115AZ)

## **SD—Sandy alluvial land**

### **Map Unit Setting**

*National map unit symbol:* 1vp8l  
*Elevation:* 5,400 to 7,000 feet  
*Mean annual precipitation:* 8 to 12 inches  
*Mean annual air temperature:* 49 to 55 degrees F  
*Frost-free period:* 120 to 140 days  
*Farmland classification:* Not prime farmland

### **Map Unit Composition**

*Sandy alluvial land:* 78 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Sandy Alluvial Land**

#### **Setting**

*Landform:* Flood plains, alluvial fans  
*Landform position (two-dimensional):* Summit  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear

#### **Typical profile**

*C - 0 to 72 inches:* stratified sand to loamy sand to sandy loam

#### **Properties and qualities**

*Slope:* 1 to 3 percent  
*Natural drainage class:* Well drained  
*Runoff class:* Low  
*Capacity of the most limiting layer to transmit water (Ksat):* High (1.98 to 5.95 in/hr)  
*Frequency of flooding:* Frequent  
*Calcium carbonate, maximum in profile:* 5 percent  
*Gypsum, maximum in profile:* 1 percent  
*Salinity, maximum in profile:* Very slightly saline to moderately saline (2.0 to 15.0 mmhos/cm)  
*Sodium adsorption ratio, maximum in profile:* 12.0  
*Available water storage in profile:* Low (about 5.4 inches)

#### **Interpretive groups**

*Land capability classification (irrigated):* 3w  
*Land capability classification (nonirrigated):* 6w  
*Ecological site:* Sandy Wash 6-10" p.z. (R035XB216AZ)

## **SMB—Sheppard loamy sand, 0 to 8 percent slopes**

### **Map Unit Setting**

*National map unit symbol:* 1vp8m  
*Elevation:* 5,400 to 6,600 feet  
*Mean annual precipitation:* 8 to 14 inches  
*Mean annual air temperature:* 52 to 55 degrees F  
*Frost-free period:* 130 to 140 days  
*Farmland classification:* Not prime farmland

### **Map Unit Composition**

*Sheppard and similar soils:* 95 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Sheppard**

#### **Setting**

*Landform:* Dunes, plains  
*Landform position (two-dimensional):* Summit  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Convex  
*Parent material:* Eolian sands

#### **Typical profile**

*A - 0 to 10 inches:* loamy sand  
*C - 10 to 70 inches:* loamy sand

#### **Properties and qualities**

*Slope:* 3 to 8 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Somewhat excessively drained  
*Runoff class:* Low  
*Capacity of the most limiting layer to transmit water (Ksat):* High to very high (5.95 to 19.98 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 5 percent  
*Salinity, maximum in profile:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)  
*Available water storage in profile:* Low (about 4.2 inches)

#### **Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 7e  
*Hydrologic Soil Group:* A  
*Ecological site:* Sandy Upland 10-14" p.z. (R035XA118AZ)

## TH—Tours sandy loam

### Map Unit Setting

*National map unit symbol:* 1vp8t  
*Elevation:* 5,400 to 7,000 feet  
*Mean annual precipitation:* 8 to 12 inches  
*Mean annual air temperature:* 48 to 54 degrees F  
*Frost-free period:* 120 to 140 days  
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Tours and similar soils:* 94 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Tours

#### Setting

*Landform:* Alluvial fans, flood plains  
*Landform position (two-dimensional):* Summit  
*Landform position (three-dimensional):* Tread, dip  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Alluvium derived from sandstone and shale and/or basalt

#### Typical profile

*Ap - 0 to 8 inches:* sandy loam  
*C1 - 8 to 22 inches:* stratified clay loam  
*C2 - 22 to 35 inches:* stratified silt loam  
*C3 - 35 to 56 inches:* stratified loam  
*C4 - 56 to 62 inches:* stratified silt loam

#### Properties and qualities

*Slope:* 0 to 3 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Well drained  
*Runoff class:* Low  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* Occasional  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 10 percent  
*Gypsum, maximum in profile:* 5 percent  
*Salinity, maximum in profile:* Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)  
*Sodium adsorption ratio, maximum in profile:* 6.0  
*Available water storage in profile:* High (about 10.2 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 6c  
*Hydrologic Soil Group:* C

## Custom Soil Resource Report

*Ecological site:* Loamy Wash 10-14" p.z. (R035XA112AZ)

### **TL—Tours loam**

#### **Map Unit Setting**

*National map unit symbol:* 1vp8v  
*Elevation:* 5,400 to 7,000 feet  
*Mean annual precipitation:* 8 to 12 inches  
*Mean annual air temperature:* 48 to 54 degrees F  
*Frost-free period:* 120 to 140 days  
*Farmland classification:* Not prime farmland

#### **Map Unit Composition**

*Tours and similar soils:* 95 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### **Description of Tours**

##### **Setting**

*Landform:* Alluvial fans, flood plains  
*Landform position (two-dimensional):* Summit  
*Landform position (three-dimensional):* Tread, dip  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Alluvium derived from sandstone and shale and/or basalt

##### **Typical profile**

*A - 0 to 8 inches:* loam  
*C1 - 8 to 22 inches:* stratified clay loam  
*C2 - 22 to 35 inches:* stratified silt loam  
*C3 - 35 to 56 inches:* stratified loam  
*C4 - 56 to 62 inches:* stratified silt loam

##### **Properties and qualities**

*Slope:* 1 to 5 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Well drained  
*Runoff class:* Low  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* Occasional  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 10 percent  
*Gypsum, maximum in profile:* 5 percent  
*Salinity, maximum in profile:* Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)  
*Sodium adsorption ratio, maximum in profile:* 6.0  
*Available water storage in profile:* High (about 10.5 inches)

##### **Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 6c

## Custom Soil Resource Report

*Hydrologic Soil Group:* C

*Ecological site:* Loamy Wash 10-14" p.z. (R035XA112AZ)

### TO—Tours clay loam

#### Map Unit Setting

*National map unit symbol:* 1vp8w

*Elevation:* 5,400 to 7,000 feet

*Mean annual precipitation:* 8 to 12 inches

*Mean annual air temperature:* 48 to 54 degrees F

*Frost-free period:* 120 to 140 days

*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Tours and similar soils:* 94 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Tours

##### Setting

*Landform:* Alluvial fans, flood plains

*Landform position (two-dimensional):* Summit

*Landform position (three-dimensional):* Tread, dip

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Alluvium derived from sandstone and shale and/or basalt

##### Typical profile

*A - 0 to 8 inches:* clay loam

*C1 - 8 to 22 inches:* stratified clay loam

*C2 - 22 to 35 inches:* stratified silt loam

*C3 - 35 to 56 inches:* stratified loam

*C4 - 56 to 62 inches:* stratified silt loam

##### Properties and qualities

*Slope:* 0 to 5 percent

*Depth to restrictive feature:* More than 80 inches

*Natural drainage class:* Well drained

*Runoff class:* Low

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* Occasional

*Frequency of ponding:* None

*Calcium carbonate, maximum in profile:* 10 percent

*Gypsum, maximum in profile:* 5 percent

*Salinity, maximum in profile:* Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)

*Sodium adsorption ratio, maximum in profile:* 6.0

*Available water storage in profile:* High (about 10.7 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified



## Custom Soil Resource Report

*Land capability classification (nonirrigated): 6c*

*Hydrologic Soil Group: C*

*Ecological site: Clay Loam Wash 10-14" p.z. (R035XA104AZ)*

# **Soil Information for All Uses**

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## **Ecological Site Assessment**

Individual soil map unit components can be correlated to a particular ecological site. The Ecological Site Assessment section includes ecological site descriptions, plant growth curves, state and transition models, and selected National Plants database information.

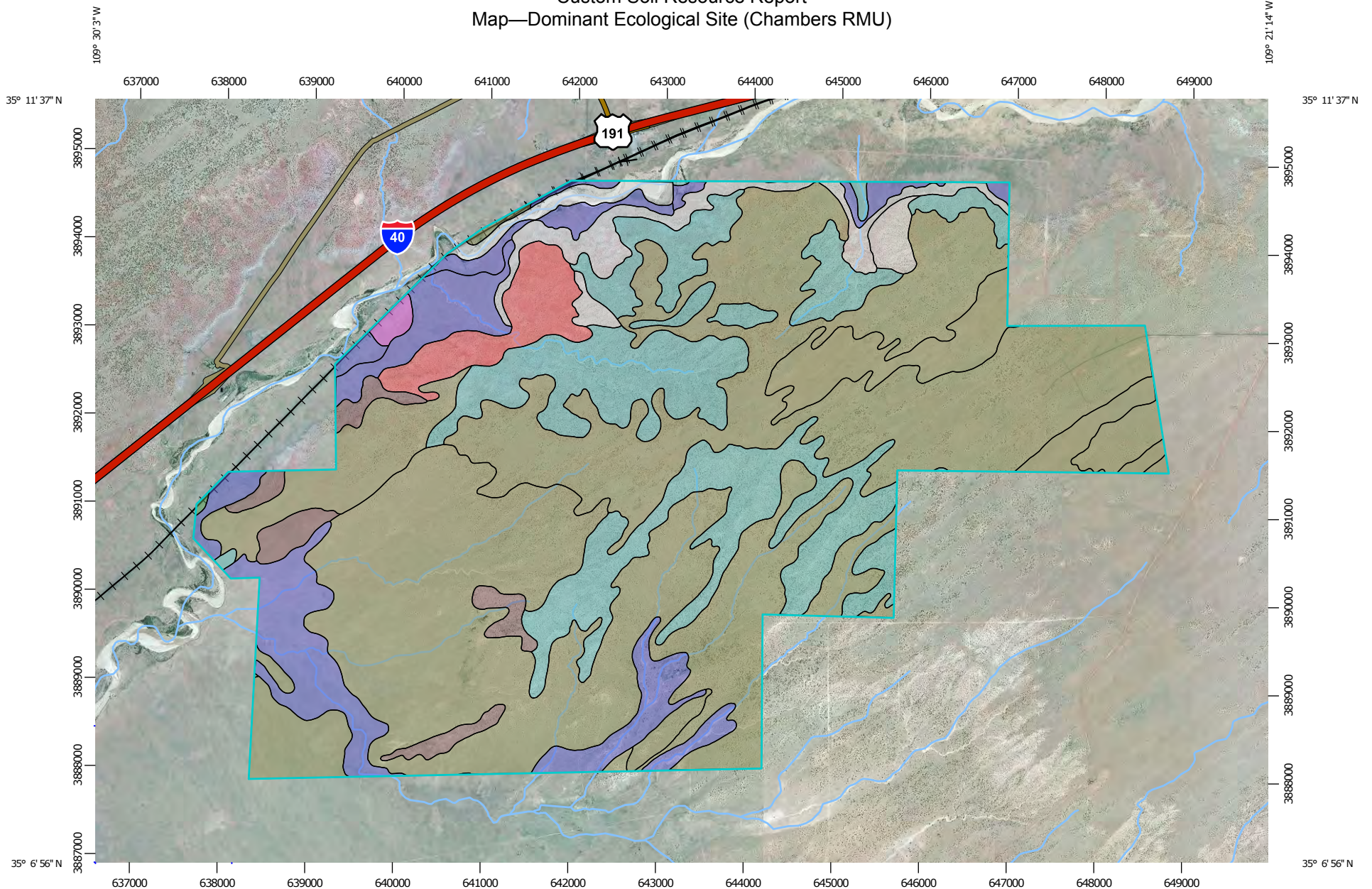
## **All Ecological Sites — Rangeland (Chambers RMU)**

An "ecological site" is the product of all the environmental factors responsible for its development. It has characteristic soils that have developed over time; a characteristic hydrology, particularly infiltration and runoff, that has developed over time; and a characteristic plant community (kind and amount of vegetation). The vegetation, soils, and hydrology are all interrelated. Each is influenced by the others and influences the development of the others. For example, the hydrology of the site is influenced by development of the soil and plant community. The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and/or proportion of species or in total production.

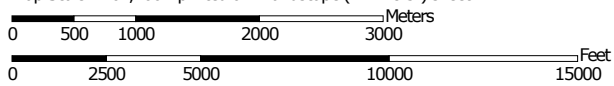
An ecological site name provides a general description of a particular ecological site. For example, "Loamy Upland" is the name of a rangeland ecological site. An "ecological site ID" is the symbol assigned to a particular ecological site.

The map identifies the dominant ecological site for each map unit, aggregated by dominant condition. Other ecological sites may occur within each map unit. Each map unit typically consists of one or more components (soils and/or miscellaneous areas). Each soil component is associated with an ecological site. Miscellaneous areas, such as rock outcrop, sand dunes, and badlands, have little or no soil material and support little or no vegetation and therefore are not linked to an ecological site. The table below the map lists all of the ecological sites for each map unit component in your area of interest.

Custom Soil Resource Report  
Map—Dominant Ecological Site (Chambers RMU)



Map Scale: 1:61,100 if printed on A landscape (11" x 8.5") sheet.




Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

# Custom Soil Resource Report

## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils





#### Soil Rating Polygons





-  R035XA104AZ
-  R035XA112AZ
-  R035XA115AZ
-  R035XA117AZ
-  R035XA118AZ
-  R035XB216AZ
-  R035XB220AZ
-  Not rated or not available

#### Soil Rating Lines


-  R035XA104AZ
-  R035XA112AZ
-  R035XA115AZ
-  R035XA117AZ
-  R035XA118AZ
-  R035XB216AZ
-  R035XB220AZ
-  Not rated or not available

#### Soil Rating Points






-  R035XA104AZ
-  R035XA112AZ
-  R035XA115AZ
-  R035XA117AZ

-  R035XA118AZ
-  R035XB216AZ
-  R035XB220AZ
-  Not rated or not available


### Water Features

 Streams and Canals

### Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:31,700.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Apache County, Arizona, Central Part  
 Survey Area Data: Version 10, Sep 20, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

**Table—Ecological Sites by Map Unit Component  
(Chambers RMU)**

Apache County, Arizona, Central Part					
Map unit symbol	Map unit name	Component name (percent)	Ecological site	Acres in AOI	Percent of AOI
CLB	Clovis loamy sand, 0 to 8 percent slopes	Clovis (100%)	R035XA117AZ — Sandy Loam Upland 10-14" p.z.	515.9	4.3%
CTB	Clovis-Palma association, undulating	Clovis (65%)	R035XA117AZ — Sandy Loam Upland 10-14" p.z.	3,472.5	28.7%
		Palma (30%)	R035XA117AZ — Sandy Loam Upland 10-14" p.z.		
ER2	Eroded land	Eroded land (78%)	R035XA118AZ — Sandy Upland 10-14" p.z.	2,132.4	17.6%
FRB	Fruitland sandy loam, 1 to 8 percent slopes	Fruitland (79%)	R035XA117AZ — Sandy Loam Upland 10-14" p.z.	3,277.8	27.1%
GU	Gullied land	Gullied land (95%)		120.9	1.0%
LO	Loamy alluvial land	Loamy alluvial land (100%)	R035XA112AZ — Loamy Wash 10-14" p.z.	667.4	5.5%
MOD	Moenkopie very rocky loamy sand, 0 to 30 percent slopes	Moenkopie (60%)	R035XA115AZ — Sandstone Upland 10-14" p.z.	339.3	2.8%
		Rock outcrop, sandstone (39%)			
PAB	Palma loamy sand, 0 to 8 percent slopes	Palma (90%)	R035XA117AZ — Sandy Loam Upland 10-14" p.z.	257.7	2.1%
RH	Riverwash	Riverwash (90%)		110.6	0.9%
RO	Rough broken land	Rough broken land (90%)	R035XB220AZ — Shale Upland 6-10" p.z.	274.9	2.3%
SA	Sandstone rock land	Rock outcrop, sandstone (50%)		302.0	2.5%
		Lithic Torriorthents (35%)	R035XA115AZ — Sandstone Upland 10-14" p.z.		
SD	Sandy alluvial land	Sandy alluvial land (78%)	R035XB216AZ — Sandy Wash 6-10" p.z.	4.4	0.0%
SMB	Sheppard loamy sand, 0 to 8 percent slopes	Sheppard (95%)	R035XA118AZ — Sandy Upland 10-14" p.z.	24.6	0.2%
TH	Tours sandy loam	Tours (94%)	R035XA112AZ — Loamy Wash 10-14" p.z.	223.8	1.9%

## Custom Soil Resource Report

Apache County, Arizona, Central Part					
Map unit symbol	Map unit name	Component name (percent)	Ecological site	Acres in AOI	Percent of AOI
TL	Tours loam	Tours (95%)	R035XA112AZ — Loamy Wash 10-14" p.z.	321.3	2.7%
TO	Tours clay loam	Tours (94%)	R035XA104AZ — Clay Loam Wash 10-14" p.z.	38.9	0.3%
<b>Totals for Area of Interest</b>				<b>12,084.6</b>	<b>100.0%</b>



# References

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American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2\\_054262](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262)

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2\\_053577](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577)

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2\\_053580](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580)

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2\\_053374](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374)

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084>



## Custom Soil Resource Report

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2\\_054242](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242)

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2\\_053624](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624)

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. [http://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/nrcs142p2\\_052290.pdf](http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf)