STEWARDING NATIVE LANDS

A Conservation Planning Guide for Native American Ranchers

First Nations Development Institute

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First Nations Development Institute

USDA United States Department of Agriculture

Natural Resources Conservation Service

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Introduction

The goal of this guide is to assist Native American ranchers in the development of conservation plans that will assist in addressing natural resource concerns in addition to increasing their opportunity to participate in USDA programs like USDA-EQIP.

What Is Conservation Planning?

Stewarding the land is an important part of ranching. Native ranchers work with the natural elements from the land, building and sustaining healthy communities, and sharing set responsibilities as the care taker of the land. That means managing the soil, water, air, plants and animals, and energy resources on every acre. That also means taking the necessary actions to address resource problems such as erosion, noxious rangeland weeds, or excess sediment or manure getting into the streams.

Developing and implementing a written conservation plan helps ranchers address such resource problems. A conservation plan provides a vision and identifies the actions needed to get each acre of land as healthy and productive as possible to promote greater longevity.

The NRCS Nine-Step Planning Process

This planning guide follows the three-phase, nine-step conservation planning process utilized by the USDA Natural Resources Conservation Service.

Phase I – Collection and Analysis (Understanding the Problems and Opportunities)

Step 1 – Identify problems and opportunities

Step 2 – Determine objectives

Step 3 – Inventory resources

Step 4 – Analyze resource data

Phase II – Decision Support (Understanding the Solutions)

Step 5 – Formulate alternatives

Step 6 – Evaluate alternatives

Step 7 – Make decisions

Phase III – Application and Evaluation (Understanding the Results)

Step 8 – Implement the plan

Step 9 – Evaluate the plan

There are many components to managing natural resources with three primary keys to success. They are:

1. Understanding the basic principles of range management.
2. Developing a written conservation plan that describes your operation and identifies and prioritizes the conservation work to accomplish your goals and address your natural resource concerns.
3. Engaging and learning in reciprocity – mutual exchange from land stewards who are committed to keeping the land healthy; and from university and agency specialists who are knowledgeable in the area of natural resources.

Some Basic Principles of Range Management

There are a few basic principles of range management that every rancher should understand. They will help develop a sound conservation plan to help accomplish your goals and objectives.

Principle Number 1: Understand Photosynthesis

The most important principle to understand for managing rangeland is that plants make their own food in a process called photosynthesis (Figure 1). The chlorophyll in a plant's green leaves uses sunlight energy to convert carbon dioxide (CO^2) from the air, and water (H^2O) from the soil, into a glucose ($C^6H^{12}O^6$) – the real plant food. This process also releases oxygen (O^2) into the air.

When grazing animals remove green leaves from a plant, they are removing the food producing parts of the plant. If grazing animals continuously remove most of the leaves from a plant, the plant will simply die of starvation.

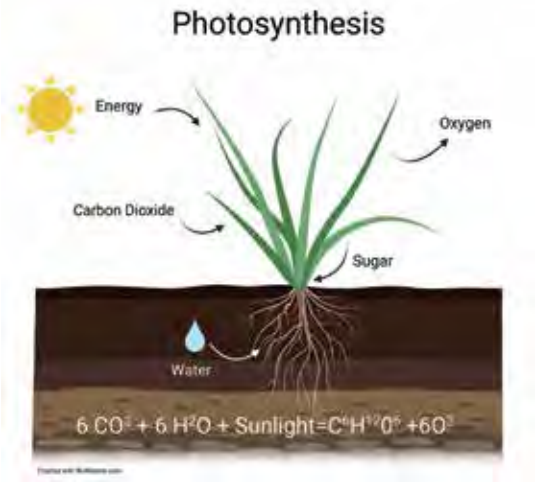


Figure 1: Photosynthesis
Created by Steve Barker using Biorender

What about nitrogen, phosphorus, and other nutrients in the soil? Plants combine the sugar they make during photosynthesis with nutrients from the soil to make important compounds such as starch, protein, fats, lignin, and enzymes that are important for plant growth. An important thing to remember is that plants must first make sugar in green leaves before the nutrients in the soil can be used to make these other compounds.

To maximize plant health and production on grazing lands, a Native rancher needs to come up with a grazing management strategy that will maximize the production of green leaves during the growing season.

Principle Number 2: Grow Deep Roots

Maximizing green leaf production also maximizes root production and rooting depth. Green leaves above ground provide the food needed for root growth. Deep roots allow the plant to access more water and nutrients from deeper in the soil. Growing deep roots increases the quantity and quality of forage, and helps plants survive droughts (Figure 2).

Water and nutrients are only absorbed through tiny root hairs on new young roots. So, plants need to continuously grow new roots during the growing season. If more than half of the green leaves on a grass plant is removed, root growth will stop while the plant uses all its energy reserves to produce new leaves so that it can produce food again.

Photo courtesy of Canadian Research Station.

Figure 2: Clipping to simulate no grazing, moderate grazing, heavy grazing, and very heavy grazing

Principle Number 3: Capture Rain Right Where It Falls

To maximize production on each acre of your ranch, you need to capture every possible drop of rain and snow, and help it infiltrate into the soil right where it falls. If every acre is capturing every possible drop of rain and snow, then every acre will produce the maximum possible amount of vegetation. You cannot control how much rain you get, but you can help control how much of it is captured. Every acre must always be ready to capture the next big storm.

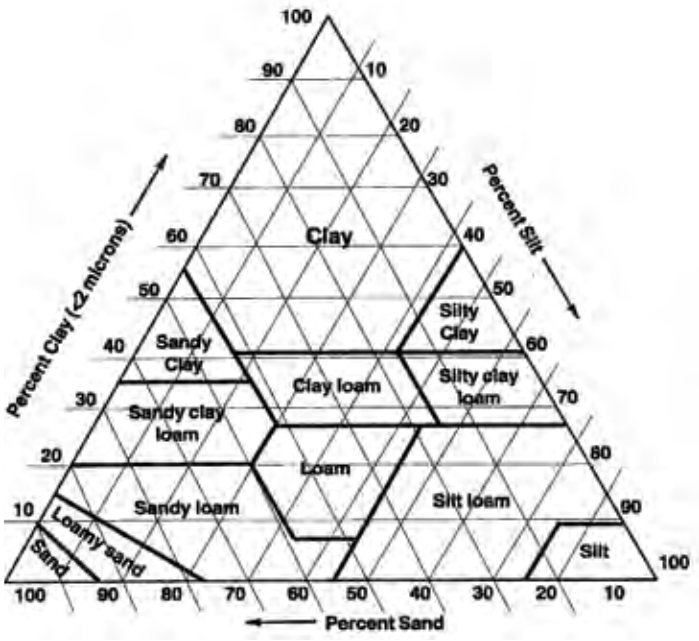


Figure 3: Soil Texture Triangle, Source: NRCS

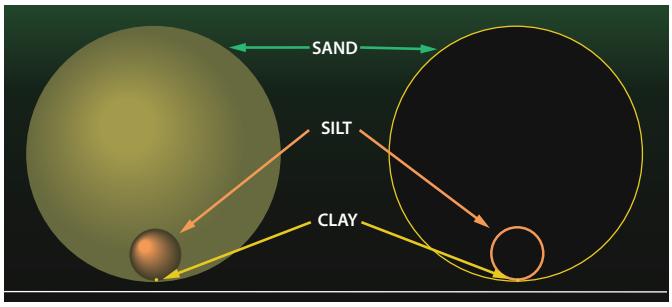


Figure 4: Relative Size of Sand, Silt and Clay, Source: NRCS "From the Surface Down"

The amount of water you can capture from that next big rainstorm depends on your soils (texture, chemistry, depth, and slope), and the amount of cover (rocks, plants, litter) covering the soil that can help slow down any runoff and allow time for the water to infiltrate into the soil.

Soil texture is the proportion of three sizes of the soil particles – sand (2.0-0.05 mm), silt (0.05-0.002 mm), and clay (less than 0.002 mm) (See Figure 4). Sand is the largest soil particle followed by silt and clay. Usually, the soil is 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. If it is more clay, it is called a clay loam (Figure 3). Appendix C provides a method to help you determine the texture of your soils.

The large pore spaces between sand particles allow rain to infiltrate quickly. Sandier soils will generally respond faster to management.

Clay particles are extremely small, so it takes much longer for water to infiltrate and move down through the soil profile. To capture the maximum amount of precipitation on soils with more clay, you must maintain the maximize possible cover of vegetation and litter.

This is where a soil map of your ranch will help. The soil descriptions will help identify 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 when managing your grazing.

Organic matter from decomposing plant litter can help bind soil particles together into larger particles – creating bigger pore spaces that allow water to infiltrate faster. Organic matter also increases the water holding capacity of the soil. Maintain as much vegetation and plant litter cover as possible to create barriers that will help capture rain and snow and allow that water to infiltrate into the soil.

Once water starts running off and collecting in flow channels and drainageways, most of that water is lost – it will just run off the ranch. When you start working on capturing every drop of rainfall, everything that helps water run off will become the enemy – bare soils, roads, culverts, gullies, washes and anything that helps water collect and start flowing off your ranch. Use water bars to divert road runoff back onto your ranch – not bar ditches that carry the water away.

Fair warning: once you start capturing rain, you may not have enough runoff to fill those dirt ponds anymore. You may need to use wells, springs, or water catchments with storage tanks, pipelines and troughs to provide reliable water for livestock and wildlife.

Principle Number 4: Prevent Soil Erosion

Wind and water erosion carries away seeds and plant litter cover that can help to capture rainfall. That plant litter contains nutrients that were carried up into the leaves from the root system – so you lose those nutrients. Erosion then removes any surface organic matter (O horizon in Figure 5), which holds water and nutrients and binds soil particles, which helps water infiltrate into the soil.

As water infiltrates down through the soil profile, the water dissolves some of the minerals (mostly sodium and calcium salts) from the A horizon and leaches them down to the B horizon. It can also carry clay particles. Sometimes just an inch or two of sandier textured A horizon will make a huge difference in capturing precipitation for plant production.

If you lose the A horizon, you expose the B horizon – clays, caliche, and salts. Areas where erosion has exposed the B horizon are the most difficult areas to reestablish any vegetation.

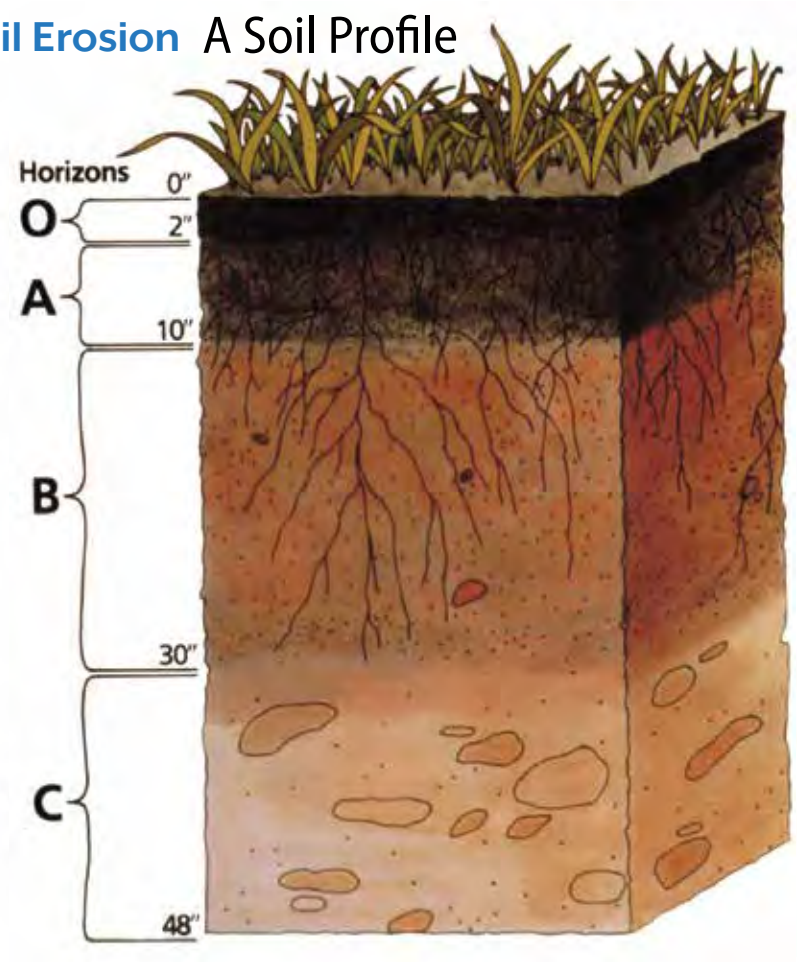


Figure 5: Source USDA Soil Conservation Service

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 effect on plant growth.

The basic idea is to set up a grazing system that will leave as much of the ranch as possible ungrazed during each growing season, to grow the forage crop for the year. Then dormant season grazing management is focused on harvesting the forage crop growth, while maintaining enough plant and litter cover to capture the next storm on each acre.

Principle Number 6: Plant a Seed Crop Every Year

It is important that your desirable forage plants put out a seed crop in every pasture at least every other year. Under continuous grazing, most of the seeds of the desirable forage species are consumed by livestock, because they are the most nutritious part of the plant. Plants that are never grazed – the undesirable species – can 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 (Figure 6). They will stay healthy and reproduce vigorously. Over time the undesirable plants simply out-compete the grazed plants for space, water and nutrients. When space opens for a new plant to germinate, the seeds from the undesirable plants significantly outnumber the seeds from the desirable plants. That is how grazing changes a plant community.

Figure 6: Grass seed

You simply need a grazing rotation that allows the desirable species to put out a crop of seed on a regular basis so they can compete for open spaces, and that allows desirable seedlings a chance to germinate and become established before they are grazed.

There are thousands of plant species on rangelands, each of them evolving different adaptations that help them to compete with the other plant species for water, space, and sunlight. Some plants can reproduce vegetatively – using stolons or rhizomes. Sod grasses are better adapted to continuous heavy grazing pressure than bunchgrasses. Sod grasses will take over a continuously grazed site if the bunchgrasses do not have enough opportunities to put out seed.

Principle Number 7: Understand Grazing Management Systems

Prescribed grazing is the most important conservation practice in your conservation plan. It sets up a prescription to maximize photosynthesis, restore and maintain plant communities, capture rain, grow deep roots, put out seed crops, prevent erosion, and harvest forage on each soil in each pasture.

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 gets re-grazed)
- Distribution (how the grazing use is distributed)

A simple three-pasture grazing rotation system can help you restore and keep the plant communities on your rangeland healthy and productive. You can implement it with just three reliable, properly spaced livestock waters.

Table 1 provides an example of an annual three-pasture rotation schedule. Every pasture gets grazed during the spring growing season one year, and then allowed to rest during the spring growing season for the next two years in a row. Every pasture gets grazed in the summer growing season one year, and then rested during the summer growing season for the next two years in a row.

Table 1

Sample Rotation Schedule	Spring			Summer			Fall			Winter		
Year	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
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		
Start Over at Year 1												

During the two-year periods of spring and summer growing season deferment, all the preferred forage plants get to put out as many leaves as they can with the available precipitation, build good deep root systems, and put out seeds. The vegetation cover and litter help capture rainfall.

You'll need to adjust the months in your grazing plan to fit the local growing seasons. You also need to adjust for your typical rainfall amount and reliability. When coming back to graze a pasture, it should have fully regrown from the last grazing period most of the time. If the pastures have not fully regrown most of the time, then you are rotating too fast, or have too many livestock.

There are many types of grazing systems. Four-pasture systems often use three pastures each year and rest one pasture. Some ranchers prefer high-intensity, low-duration systems that move livestock in and out of pasture quickly (from every few days to every couple of weeks) during the growing season. Those systems have many pastures, which can significantly improve grazing distribution. The higher intensity systems typically require more investment for fencing and to provide reliable water in each pasture. Some ranchers run bulls and/or heifers separate from their cows part of the year. Each separate herd will need pastures to rotate through.

Any grazing systems can work if it follows some basic principles of range management.

Principle Number 8: Balance Livestock Numbers with Forage Production

Over the long term (10-15 years) the average amount of forage removed by grazing animals must be in balance with the average annual production of forage on your ranch. Research shows that this balance is one of the most important factors in keeping rangelands healthy and productive. The long-term average available forage supply on your ranch is often referred to the "carrying capacity."

It is impossible to mathematically calculate the carrying capacity of a ranch. There are far too many variables – water (kind, quality, reliability, and distribution); the arrangement and variability of the ecological site plant communities and kinds of forage species on your ranch; climate pattern; the kind, class and breed of livestock; the arrangement of water, terrain and slopes in each pasture; predators; and poisonous plant problems. It takes learning, experience, monitoring, and observation to determine

the best long-term herd size for your ranch. Photos and monitoring records will help you figure it out.

However, you can estimate an initial long-term stocking rate for your ranch based on the forage being produced on each ecological site plant community today. You need to start in the ballpark.

An old NRCS rule of thumb recommends "take half – leave half." The idea is to leave about half of the leaves for photosynthesis, to protect the soil from erosion and help capture precipitation. The other half can be harvested by the grazing animals.

More recently, many NRCS range specialists across the country began using "harvest efficiency" to determine the initial carrying capacity. NRCS defines harvest efficiency as the total percent of vegetation harvested by a machine or ingested by a grazing animal compared to the total amount of vegetation grown each year. The harvest efficiency concept recognizes that the long-term average amount of available forage that makes it into the stomachs of the grazing animals on well managed rangelands is about 25%.

Estimating an Initial Carrying Capacity

To estimate an initial carrying capacity, go out on the rangeland and clip, dry and weigh the forage currently being produced on a representative area for each different plant community you see on the ranch. You also need a map to estimate the number of acres for each plant community.

In each plant community, clip the current year vegetation growth in 10 frames using a 9.6 square foot frame. (A 9.6 square foot frame can be made by taking an 11-foot piece of wire or tubing and making it into a round hoop.) You can clip and weigh each species separately, or group them (perennial grasses, annuals, shrubs, etc). But be sure to clip and weigh your forage species separate from ungrazed species. Let the vegetation you clipped air dry for a couple of days, and then weigh it in grams. Vegetation production and forage consumption always use air-dry weight. The total air-dry weight of the forage species from all 10 frames (weighed in grams) equals the total available forage pounds per acre.

Multiply the pounds per acre of total available forage times 0.25 (25% harvest efficiency) for grasses and forbs, and times 0.15 (15% harvest efficiency) for palatable shrubs, to get the total pounds per acre of

Steve Barker analyzes soil characteristics. Photos courtesy of Leiloni Begaye, First Nations Development Institute

long-term harvest for each plant community.

Then, multiply the harvestable forage pounds per acre times the grazable acres of the plant community to estimate the total harvestable forage supply from each plant community. Do not include acres that your animals can't graze. Add all of those together to estimate an initial carrying capacity for each pasture and/or for the ranch.

These calculations will get you in the ballpark. They are one point in time estimates. Clipping forage production for several years will give you a better carrying capacity estimate.

Carrying capacity is typically expressed in "animal unit months." One animal unit month is defined as the amount of forage consumed by a 1,000-lb cow and calf per month. Cows consume an average of 2.6% of their body weight per day. So, one Animal Unit Month (AUM) is about 790 lbs of forage – or you can just round to about 800 lbs of forage.

Divide your total available forage supply within each pasture or grazing area by 800 to determine the carrying capacity of each area and for the ranch in AUMs. See the example on the next page.

Animal Units

The table below shows the Animal Unit Equivalents (AUE) used by NRCS for different kinds and classes of animals. Multiply the number of each animal kind/class in your herds times the Animal Unit Equivalent value to determine how many "animal units" you have. Multiply that number times 12 to determine how many Animal Unit Months of forage your herd will need each year.

Animal Kind/Class	Animal Unit Equivalent (AUE)	Forage Consumed (lbs)		
		Day	Month	Year
Cow, dry	0.92	24.00	727	8,730
Cow, with calf	1.00	26.00	790	9,490
Bull, mature	1.35	35.00	1,067	12,811
Cattle, 1 year old	0.60	15.60	474	5,694
Cattle, 2 years old	0.80	20.80	632	7,592
Horse, mature	1.25	32.50	988	11,862
Sheep, mature	0.20	5.20	158	1,898
Lamb, 1 year old	0.15	3.90	118	1,423
Goat, mature	0.15	3.90	118	1,423
Kid, 1 year old	0.10	2.60	79	949
Deer, white-tailed, mature	0.15	3.90	118	1,423
Deer, mule, mature	0.20	5.20	158	1,898
Elk, mature	0.60	15.60	474	5,694
Antelope, mature	0.20	52.00	158	1,898
Bison, mature	1.00	26.00	790	9,490
Sheep, bighorn, mature	0.20	5.20	158	1,898

Source: USDA NRCS National Range and Pasture Handbook

Example for estimating the initial carrying capacity in a pasture:

Pasture 1

Ecological site plant community	Grazable acres in pasture	Clipped air-dry grass /forb production lbs/acre	Planned grass/forb forage (lbs/acre) at 25% harvest efficiency	Clipped air-dry palatable shrub production lbs/acre	Planned shrub forage (lbs/acre) at 15% harvest efficiency	Harvestable forage x grazable acres	AUMs = Total Harvestable Forage/ 800 lbs per AUM
Loamy Upland midgrass-forbs	1000 acre	600 lbs/acre	600 lbs/acre x 0.25 = 150 lbs/acre	0	0	150 lbs/acre x 1000 acres = 150,000 lbs/year	150,000 / 800 lbs per AUM = 187.5 AUMs /Year
Loamy Upland grass-shrub mix	500 acre	400 lbs/acre	400 lbs/acre x 0.25 = 100 lbs/acre	300	300 lbs/acrex 0.15 = 45 lbs/acre	500 acres x 145 lbs/acre (100 grass + 45 shrub) = 72,500 lbs	90.62
Clay Loam Upland shortgrass-annuals	800 acre	250 lbs/acre	250 lbs/acrex 0.25 = 62.5 lbs/acre	0	0	62.5 lbs/acre x 800 acres = 50,000 lbs	62.5
Pasture Totals	2300 acre					272,500 lbs avail forage /year	~340 AUMs per year

One Animal Unit Yearlong (AUYL) = 12 Animal Unit Months (AUMS) per year. This pasture produces about 340 AUMS of harvestable forage per year. So, this pasture will produce enough forage to supply about 28 animal units each year. (340 AUMS / 12 AUMS per animal unit per year = about 28 animal units of forage produced per year.)

Principle Number 9: Invest in The Best

Spend your first dollar on your best country. Set up the most productive, easiest to manage areas of your ranch to be able to support your herd and your grazing strategy. Get good reliable water in place. Install fences if needed. Use your soil map and NRCS ecological site descriptions to help identify the areas with the highest potential. Start your grazing rotation on your best country and monitor things for two or three years to see the benefits of good grazing management, and to figure out what needs adjusting.

Leave the areas that are in poor condition, have bad erosion, or that are steep and hard to gather out of your planned grazing area. Consider resting those areas to benefit wildlife, and for emergency use as part of your prescribed grazing drought mitigation strategy.

Principle Number 10: Disturbances Change 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. Fire and drought are the two primary natural disturbances that can open up the plant community to change.

Many of the undesirable plants that have increased on rangelands are very long lived. And they are fully utilizing any soil moisture that gets into the soil. Grazing management alone cannot change a juniper thicket back into a grassland. A fully occupied perennial plant community is stable and pretty hard to change.

Grazing rotations help set everything up so that if a fire or drought opens up the plant community, the desirable species have a chance to occupy the space that is created. Disturbances can also be part of the conservation plan, using prescribed fire or brush control, to open the plant community. 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 50 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 the juniper trees, there is a good chance that you will just get a new stand of juniper.

Consider thinning the juniper first, to open up some space, and apply some good grazing management for several 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, treat the rest of the juniper. That would at least give you a reasonably good chance of establishing and maintaining perennial grasses on the site.

Brush Management. Open canopy = more grasses and forbs. Photo courtesy of Tohono O'odham, Natural Resources Department

Principle Number 11: Plan for Fire and Drought

It is often said that rangeland is always either in a drought, or recovering from the last drought. That is a good way to remember that planning for drought, wildfires, flooding and other natural events that may occur is important. The NRCS conservation practice standard for prescribed grazing requires that the grazing plan design include a contingency plan for drought and other potential disturbances such as wildfire.

There are three basic impacts from drought or wildfire that you need to plan for.

1. Reduced forage production
2. Lack of water
3. Plant mortality

Capturing every drop of rain, growing deep roots, and leaving most of your ranch ungrazed during the growing season to grow your forage crop for the coming year are all part of a drought mitigation strategy that will maximize forage production with whatever rainfall you do get. A plan that sets aside the less productive areas on your ranch as drought reserve areas can also be part of your strategy. Some Tribal grazing associations have set aside areas for emergency grazing use during droughts or after wildfire.

Keeping long-term livestock numbers in balance with the long-term available forage supply is also part of a drought mitigation strategy. One conservation rancher in southern Arizona decided to base his long-term herd size on the amount of forage his ranch would produce with only 60% of average rainfall. That way he would only be in a drought and need to adjust his herd size one year out of 100. Monitoring will help determine changes in forage production and the amount of plant mortality, to support decisions on adjusting livestock numbers both during and after these events.

During a drought, or after a wildfire, your livestock will need access to as much of the available forage on the grazing area as possible. If you lose access to part of your ranch due to lack of livestock water, then the livestock numbers need to be adjusted to stay in balance with the remaining "accessible" forage. So, you need reliable, well distributed water. That usually means using wells, storage tanks, and pipelines instead of dirt tanks or ponds that will not have water in a drought, or that may get filled with sediment after a fire. Your plan might also include strategies to capture and store runoff from areas that almost always produce some runoff during a rain event, such as rock outcrop, water harvesting catchments, or roads. Reducing water losses by lining dirt ponds and using coverings on storage tanks can also help.

Generally, reducing your livestock numbers earlier in a drought reduces the impact on the animals, your economics, and the rangeland. Most ranchers start by culling lower performing animals, weaning earlier, and keeping fewer replacement animals. Selling livestock while their body condition is still good can help reduce the economic impacts.

Many ranchers spend significant time and money improving the genetics of their herd and want to retain their best animals to protect that long-term investment. Leasing grazing land may be an option to retain those animals. Confining those animals and feeding them is also an option, but both are expensive. You should never provide supplemental feed on any rangeland areas that can no longer provide most of the daily forage for the animals, or that no longer have enough cover to capture rain and protect the soil from erosion. A little alfalfa hay or protein block might be needed to help the animals utilize lower quality forages during the drought. But if you are just feeding them, get them off the rangeland.

Natural disturbances, such as drought, floods, and wildfire, can be beneficial when they help reduce undesirable species on rangeland and open space for desirable species to germinate and establish.

Mitigation planning should consider how these disturbance events might help achieve your long-term plant community goals. Putting out a seed crop of desirable species every year is part of that mitigation strategy. Give your desirable species time to germinate and establish when these events occur. Set up some monitoring sites so you know what is happening.

Developing and Implementing a Conservation Plan

The following section takes you through a logical sequence of steps that will help you develop and implement your conservation plan. Here are some important documents that should be included.

1. Inventory Map
2. Inventory Records
3. Soil and/or Ecological Site Map
4. Vegetation Inventory Records
5. Resource Management System Alternative
6. Conservation Plan Map
7. Conservation Plan and Practice Schedule
8. Conservation Practice Designs
9. Monitoring Records

Conservation Planning Training & Workshop, Tolani Lake Livestock Water Users Association. Photo courtesy of Leiloni Begaye, First Nations Development Institute

Phase 1: Inventory and Assessment

Develop an Inventory Map

To develop a conservation plan, start with a good inventory of the permitted grazing area. That usually starts with a map, showcasing where all the existing water, fencing, and other range improvements are located. Show pasture numbers and/or names and approximate acres on the map (Figure 7).

Existing Improvements

Show the existing range improvements (fences, wells, pipelines, etc) on the inventory map. Appendix B provides some common map symbols you can use. Label each range improvement using names and/or a labeling system so that you can provide information about each improvement in your inventory records. Here is an example you might use for labeling existing improvements on your inventory map.

W1 - Well number 1

TR1 - Trough number 1

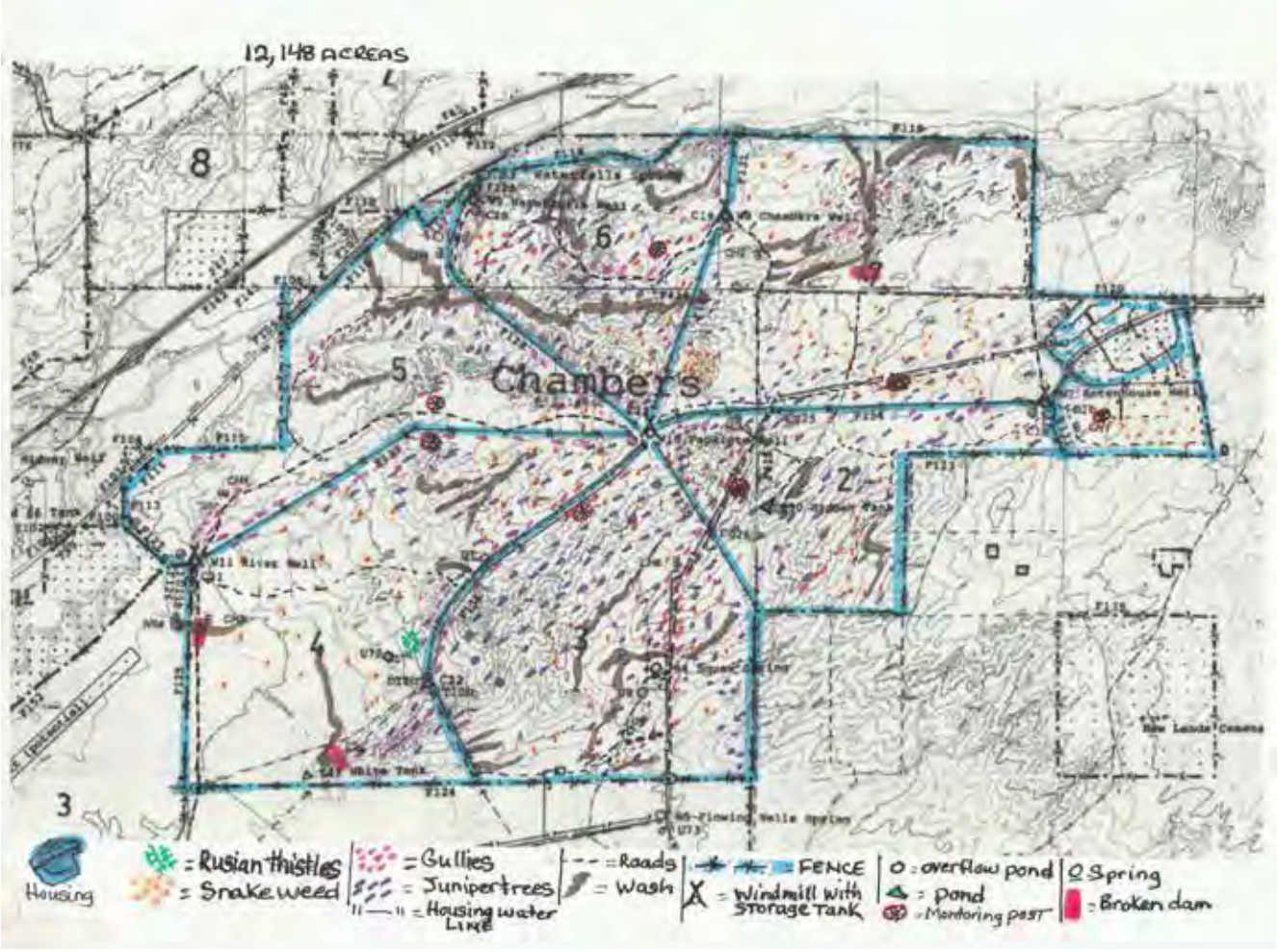


Figure 7: A Resource Inventory Map - Photo courtesy of 14R, Navajo Nation

Past Treatment and Disturbance Areas

Show areas where there have been past treatments such as brush control, seeding, control of noxious weeds, prescribed burning, or mechanical treatments such as ripping or pitting. Also show areas that have been affected by natural disturbances, such as wildfire or excessive flooding. Use a labeling system to identify each treatment and disturbance area on the map so that you can provide more information about that area in your inventory records.

Natural Resource Problem Areas

Show the problem areas on the inventory map such as areas with erosion problems, noxious weeds, shrub invaded areas, areas where grazing is too heavy, off-road vehicle damage, and roads that are eroding or damaged. Here is an example you might use for labeling each problem area in your inventory records.

ER1 - Erosion area 1

NW1 -Noxious weed area 1

SH4 – Shrub invaded area 4

Most Productive Grazing Areas

Identify the most productive, easiest to manage grazing areas on the inventory map. Your initial time and investment should be focused on getting those areas set up so that they are easy to manage and to support your goals and grazing management strategy.

Inventory Records

Inventory records provide important information about your operation, and about the range improvements, past land treatments, and problem areas you identified and labeled on the inventory map. The following examples can be used as a guideline of what to include. Adjust to fit your needs.

Contact Information

Provide contact information for the owners, grazing permittees and/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

Provide information about existing fields and pastures on the ranch.

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

Photo courtesy of White Mountain Apache, Lands Operation Department

Livestock and Current Grazing Management

Permitted Livestock

For lands leased or permitted from a State, Tribal, or Federal government, or a private land owner, provide information about the permitted kinds and numbers of animals.

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 and Classes of Livestock

Provide 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

Current Grazing Rotation

Show the 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

Identify the common kinds of wildlife on the operation. Also identify any known protected species.

Wildlife Species	Approximate Number (for Large Grazing Animals)	Desirable	Undesirable	Activities Being Done to Benefit the Species	Reasons the Species is Undesirable

Existing Livestock Water

Wells and Surface Water Sources

Provide information about the existing wells, streams springs, etc., that you labeled on the inventory map.

Label on Map	Water Type (well, spring, etc.)	Water Right Owner	Grazing Area Where Located	Grazing Areas 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

Provide information about the existing ponds and catchments that you labeled on the inventory map.

Label on Map	Water Type (pond, catchment, etc.)	Water Right Owner	Grazing Area Where Located	Grazing Areas Served	Size of Watershed or Catchment	Storage Capacity (gal)	Reliability (Excellent, Good, Fair, Poor)	Availability (Yearlong or Seasonal)

Storage Tanks and Troughs

Provide information about the existing storage tanks and troughs that you labeled on the inventory map.

Label on Map	Type	Water Source	Grazing Areas Served	Storage Capacity	Condition (Excellent, Good, Fair, Poor)

Past Land Treatments and Other Disturbances

Provide information about past treatments such as range seeding, brush management, etc., that you labeled on the inventory map. Include past disturbances such as wildfire or flooding events.

Label on Map	Treatment / Disturbance Type	Acres	Description	Dates

Precipitation

If you keep rainfall records, show the precipitation measured on the ranch over the last few years. If you don't have records, you can show precipitation for the nearest available weather station.

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

Existing Monitoring

Provide information about any existing monitoring that is being done on the ranch.

Grazing Area	Key Area Number	Type of Monitoring	Year Established	Last Year Monitored

Cultural Resources

Do not include the location of cultural resources on your inventory map or put information about cultural resources in your inventory records unless they are already publicly known (such as those listed on the National Register of Historic Places). As you develop your conservation plan, consider how the planned activities in your conservation plan may affect any cultural resource locations, and try to avoid any disturbance of those areas. If federal or tribal funding is used to help fund some of the conservation work, then the federal and tribal agencies will need to comply with federal and tribal cultural resource laws before they can approve funding. They will typically conduct a survey of the area and evaluate the potential effects of your project on cultural resources they find. In these situations, it is good to share information about any cultural resources near your project area with the agency. The agencies are required by law to keep that information confidential. If any changes or adjustments are needed to minimize the impacts of your project on cultural resources, the federal or tribal agencies will communicate that information with you, so that you can discuss those changes and get approval to proceed with your project. If a cultural resource cannot be avoided, then the agency will need to conduct a more thorough inventory before your project can proceed.

Other Considerations

Provide any other information that should be considered in designing and implementing your conservation plan. These considerations may include underground utilities, existing easements, federal, state, or tribally listed species, poisonous plant invasion, predator problem areas or recreation activities that occur on the ranch.

If you have internet access, free tools like Google Earth will let you zoom in and print pictures of areas with gullies, road erosion, shrub invaded areas and other problems. Google Earth includes a scale on the photo that can be used for estimating distances or acres.

An Inventory of Your Natural Resources

The next step for your inventory is to provide information about the land permitted for conservation efforts. If you have been on your ranch for many years, or many generations, you know that area better than anyone else. Getting your knowledge of your ranch onto an inventory map is very valuable for your conservation plan.

NRCS and most other federal and tribal agencies typically begin with a soil map. The idea is to map the areas on the ranch with different soils, plant communities, and current natural resource conditions. Then, they go out and do an inventory at a representative location within each of those areas, to determine vegetation production and composition, and to identify any resource problems like erosion. You will need to do the same for your conservation plan.

Soil / Ecological Site Map

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, like the one shown in Figure 8. Your ranch may have areas with deep sandy soils, heavy clay soils, shallow rocky soils on steep mountain slopes, salty soils, or limy soils. On larger ranches there may be plant community changes due to significant elevation and rainfall differences across the ranch. 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 if they can provide you with a soil or ecological site map for your ranch.

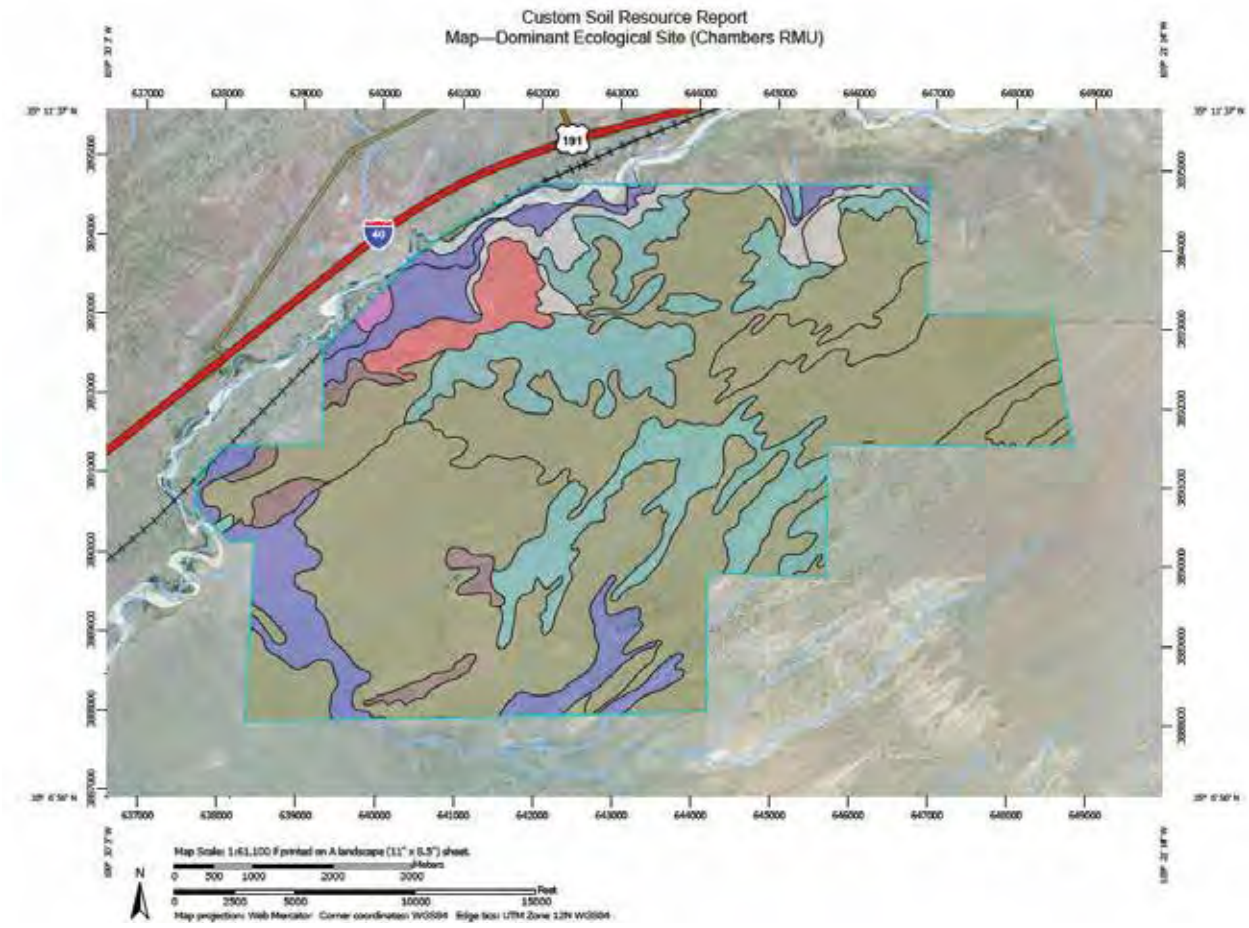


Figure 8: Ecological Site Map - Photo courtesy of 14R, Navajo Nation

Every different soil on your ranch produces different plant communities. You see these different plant communities as you drive or ride across your ranch.

An **ecological site** is a distinctive kind of land that differs from other kinds of land in its ability to produce distinctive kinds and amounts of vegetation and in its ability to respond similarly to management and natural disturbances.

Several similar soils may be grouped together in an ecological site. You can see that in the example soil map above. The black lines are different soils, and the colors are different ecological sites. In the brown areas, you can see there are at least two soils grouped into one ecological site. Soils are differentiated for a variety of planned uses – such as use for roads and buildings, use for septic tanks, or as a source of materials such as clay or gravel. Not all those differences affect the natural plant communities that grow there.

You can also create a soil or ecological site map (Figure 9) yourself using a tool like Google Earth to outline the areas on your ranch that have different plant communities. If you have a smart phone and cell coverage, there is a Web Soil Survey phone app that will give you a description of the soils and identify the ecological site where you are standing at any location with cell service.

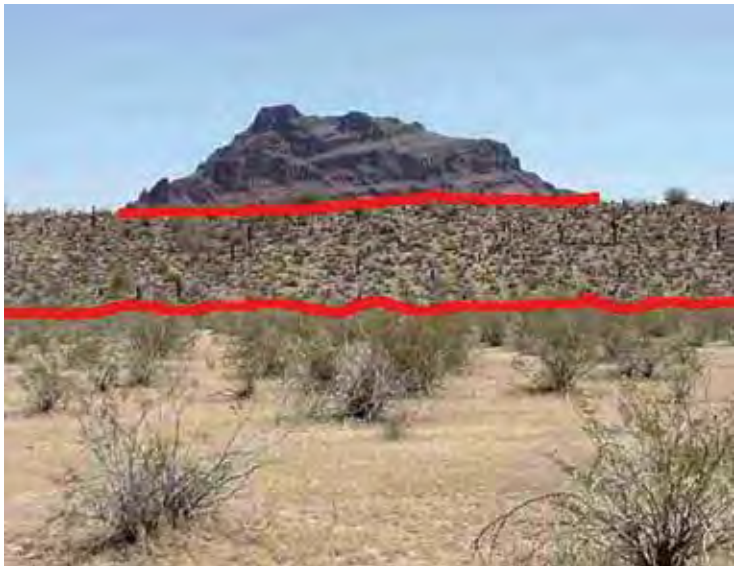


Figure 9: Three different ecological sites

Vegetation Inventory

The next step is to go out and collect information on each of the ecological site plant communities that are important 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.

For each soil or ecological site, you want to choose locations that will represent a typical plant community. The data you collect on each sample site will be used to represent all the acres of that ecological site plant community, including the average amount of forage produced to determine the initial stocking rate. So, choose the location carefully. Some soils or ecological sites may have two or more different plant communities, for example:

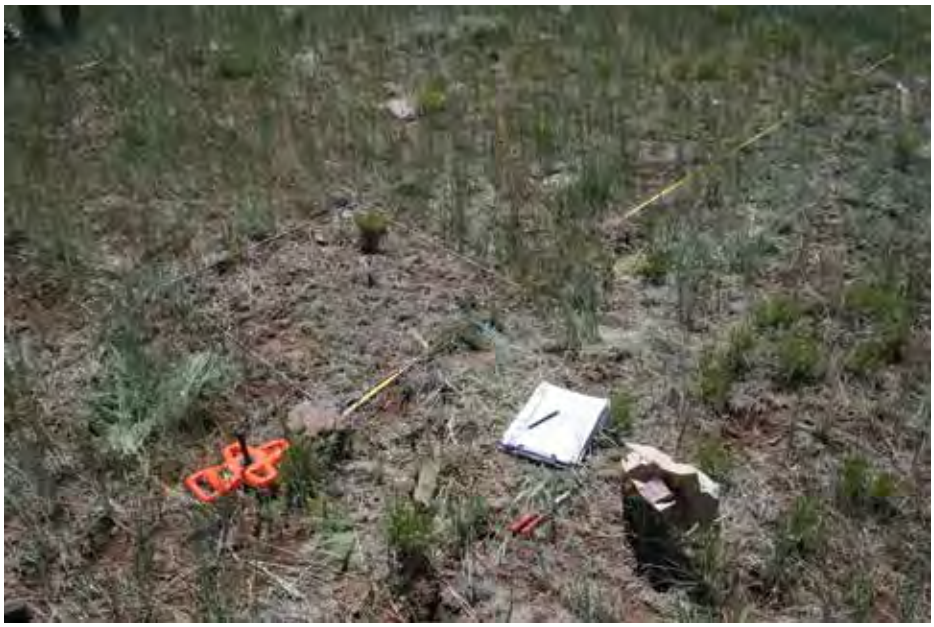
- areas that burned recently and unburned areas on the same ecological site
- areas with significant invasion of woody plants or noxious weeds and areas without those invasive plants
- areas that have been heavily grazed and areas that have not been heavily grazed

Each significantly different plant community on each different soil or ecological site should be inventoried. If there are different plant communities on an ecological site, the boundaries of each plant community type should be drawn on the soil/ecological site map.

Mark the vegetation inventory 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. There are many references available at libraries and on the internet that can provide more information about how to collect vegetation production and composition information.

Many agencies use one of the methods called Sampling Vegetation Attributes, which you can download free from the internet. A link is provided in Appendix D.

Herbaceous plants (grasses and other non-woody plants) can be clipped within 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.



Clipping to Determine Production and Composition
Photo courtesy of Steve Barker

Set out 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 wet or 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, BIA, or 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 adjust your calculations.

If you know the species, you should clip the frames 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, 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. Use a 1/100 acre plot (20.87 ft x 20.87 ft). You can pace out 7 yardstick sized steps in each direction or use a tape to lay out your shrub plots.

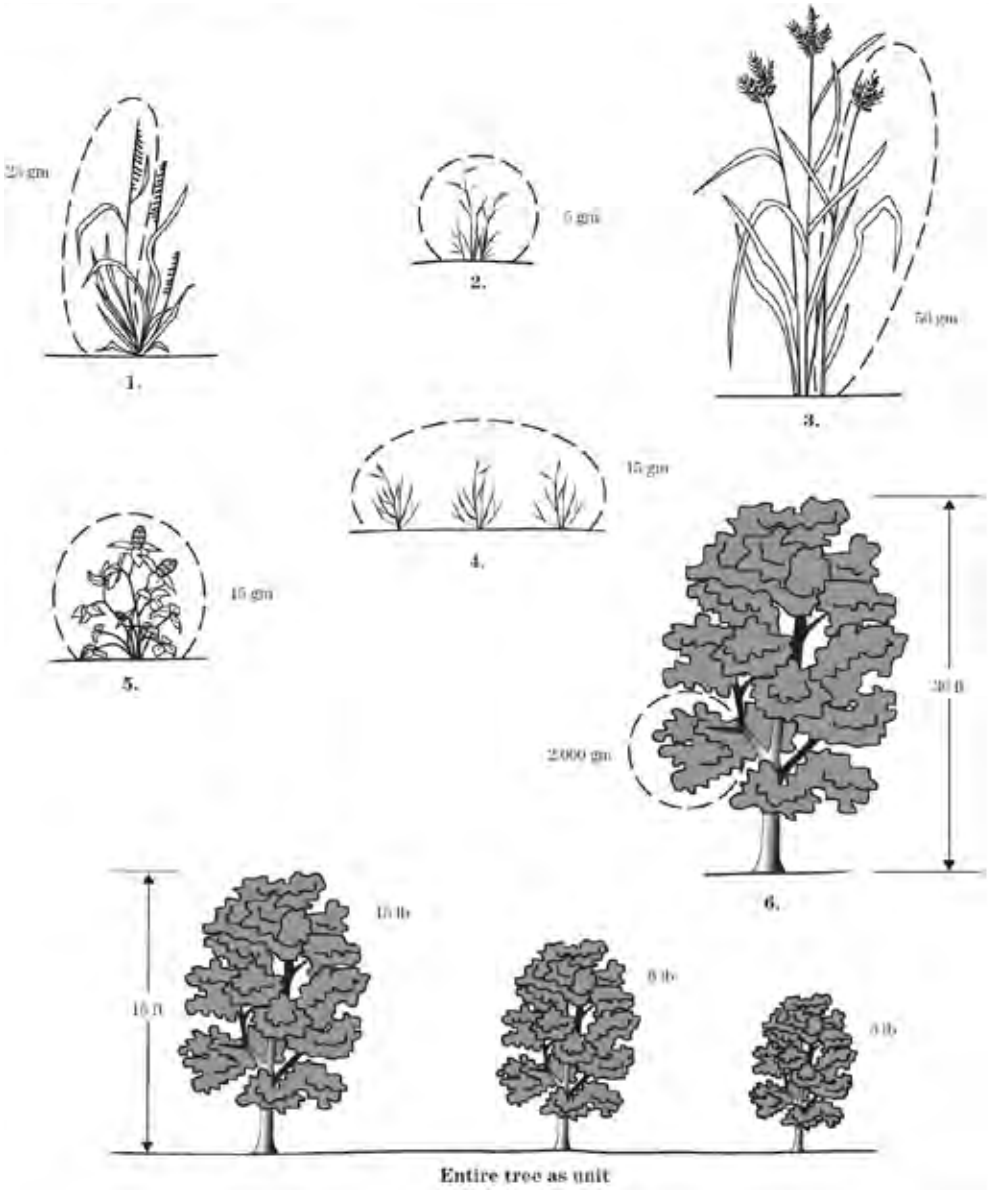


Figure 10: Example Weight Units (Source USDA National Range and Pasture Handbook)

Choose a "weight unit" size for each species. Weight units represent an amount of current year production. For smaller shrubs, the weight unit can be the average sized shrub on the sampling area (average height and canopy diameter). For larger shrubs and trees, it might be easier to use an average branch size.

Count the number of "weight units" for each species in the 1/100 acre plot (Figure 10). Two or three shrubs that are smaller than your average size might be grouped together to be equal to one of your "weight units." Or a very large shrub might be equal to 2 or 3 of your "weight units." Count the number of "weight units" – not plants. Take your shrub weight units home and let them air dry in a bag for a few days until the leaves dry and fall off the branches. Weigh the dry leaves to estimate production for your weight unit. Note that some conifers retain their leaves for 3-5 years so you might need to divide the total needle weight by that number of years.

Inventory about 5 shrub plots at each sampling location. Divide the total production of each species from the 51/100-acre plots by 0.05 to get the estimated pounds per acre for that species. That information, along with herbaceous production, can be used by BIA, NRCS, and others to get a reasonable estimate

of current production and composition of the plant communities. Organize your resource inventory records with the vegetation production and composition data, along with the photos and a map with the location of each sample site.

Other assessments you might want to do while you are at each inventory location include a Rangeland Health Assessment and a Wildlife Habitat Evaluation. You should also identify any resource concerns in that area. The Rangeland Hydrology Erosion Model (RHEM) is a tool that will let you estimate runoff and erosion if you collect canopy cover and ground cover data. A link to the RHEM tool is in Appendix D.

Identify Resource Concerns

On each ecological site plant community area, identify any resource problems that will need to be addressed in your conservation plan. The following tables list the Soil, Water, Air, Plant, Animal, and Energy (SWAPAE) resource concern that are evaluated by the USDA Natural Resource Conservation Service.

	Resource Concern	Resource Concern Component
SOIL	Sheet and rill erosion	
	Wind erosion	
	Classic gully erosion	
	Bank erosion from streams, shorelines or water conveyance channels	
	Subsidence	
	Compaction	
	Organic matter depletion	
	Concentration of salts or other chemicals	
	Soil organism habitat loss or degradation	
	Aggregate instability	
WATER	Ponding and flooding	
	Seasonal high water table	
	Seeps	
	Drifted snow	
	Naturally available moisture use	Moisture management
		Drought susceptibility
	Surface water depletion	
	Groundwater depletion	
	Inefficient irrigation water use	
	Pathogens and chemicals from manure, biosolids or compost applications transported to surface water	Nonpoint pathogen surface loss
		Nonpoint pathogen loss to groundwater
	Sediment transported to surface water	
	Pesticides transported to surface water	Nonpoint pesticide surface loss
		Nonpoint pesticide drift to surface water

	Resource Concern	Resource Concern Component
WATER cont.	Pesticides transported to groundwater	Nonpoint pesticide leaching loss
	Nutrients transported to surface water	Concentrated nutrient and pathogen effluent from domestic animal confinement, including milk house waste and silage leachate
		Concentrated nutrient and pathogen surface loss from domestic animals standing in surface water
		Concentrated nutrient and pathogen surface loss from storage and handling of manure, compost, biosolids or non-ag food waste
	Nutrients transported to groundwater	Concentrated nutrient and pathogen leaching loss from domestic animal confinement, including milkhouse waste and silage leachate
		Concentrated nutrient and pathogen leaching loss from storage and handling of manure, compost, biosolids or non-ag food waste
	Petroleum, heavy metals and other pollutants transported to surface water	Concentrated agrichemical runoff loss from storage and handling of fertilizer and pesticides
		Petroleum and other pollutant containment to surface water
		Mine waste remediation and containment – surface water
	Petroleum, heavy metals and other pollutants transported to groundwater	Concentrated agrichemical leaching loss from storage and handling of fertilizer and pesticides
		Petroleum and other pollutant containment to groundwater
		Mine waste remediation and containment – groundwater
	Salts transported to surface water	
	Salts transported to groundwater	
AIR	Emissions of particulate matter (PM) and PM precursors	PM - diesel engines
		PM - non-engine combustion equipment
		PM - open burning
		PM - pesticide drift
		PM - dust from unpaved roads
		PM - windblown dust
	Emissions of greenhouse gases - GHGs	GHGs - carbon stock
		GHGs - hydric & organic soils
		GHGs - grazing operations
	Emissions of ozone precursors	Ozone - diesel engines
		Ozone - non-engine combustion equipment
		Ozone - open burning
		Ozone – pesticides
	Emissions of airborne reactive nitrogen	Reactive nitrogen - open burning
		Reactive nitrogen - diesel engines
		Reactive nitrogen - non-engine combustion equipment

	Resource Concern	Resource Concern Component
PLANT	Plant pest pressure	Plant pest pressure
		Chemical resistance
		Invasive species
	Plant productivity and health	
	Plant structure and composition	
	Wildfire hazard from biomass accumulation	
ANIMAL	Feed and forage balance	
	Inadequate livestock shelter	
	Inadequate livestock water quantity, quality and distribution	
	Terrestrial habitat for wildlife and invertebrates	
	Aquatic habitat for fish and other organisms	
	Elevated water temperature	Water temperature effects on aquatic habitat
ENERGY	Energy efficiency of equipment and facilities	
	Energy efficiency of farming/ranching practices and field operations	

Definitions of each resource concern, and the method(s) NRCS uses to evaluate the resource concern can be found on their website (see Appendix D).

Participating in USDA NRCS EQIP, Water Development Project. Photos courtesy of Melvin Cody, Cody Ranch, Navajo Nation

Phase 2: Decision Support

Phase 2 of the planning process is evaluating all the benchmark information, developing and evaluating alternatives, finalizing goals and objectives, and identifying the conservation practices needed for your conservation plan.

Resource Management System Alternative

A Resource Management System (RMS) alternative identifies all the goals and all resource concerns that need to be addressed, and then identifies all the conservation practices that would be needed to achieve the goals and address all the resource concerns. The benefit of developing a complete RMS alternative is that each conservation practice can be planned and designed to address as many goals and resource concerns as possible. The following example matrix provides a simple way to outline a complete RMS alternative. The "X" identifies which conservation practices in the left column are needed to help address each resource concern.

Conservation Practices	**Resource Concerns**			
	Soil Erosion	Sediment in Surface Water	Plant Structure and Composition	Inadequate Livestock Water
Prescribed Grazing	x	x	x	
Brush Management	x	x	x	
Well			x	x
Water Development (Storage Tanks and Troughs)			x	x

In the example above, the combination of conservation practices needed to address all the resource concerns has been identified. Improving grazing management using Prescribed Grazing will improve the plant structure and composition, which will reduce soil erosion and reduce sediment in surface waters. Installing a well, storage tanks and troughs is needed to implement the Prescribed Grazing system and improve the distribution and reliability of water for livestock. Brush management will reduce invasive shrubs to restore the structure and composition of the plant community. Prescribed Grazing will improve the effects of the Brush Management treatment, building up a seed crop of desirable species before treatment, and allowing those seed to germinate and become established after brush management.

These Conservation Practices work together as a system. None of the practices would work as well if they were designed and applied individually. The Brush Management would not work as well without the Prescribed Grazing before and after treatment. The Prescribed Grazing would not work as well without a good reliable, well distributed water system for livestock and wildlife. It is always best to develop a complete Resource Management System alternative to help identify priorities and help design each practice to support the complete resource management system.

Identifying the Conservation Practices Needed

The NRCS National Handbook of Conservation Practices identifies all the Conservation Practices that NRCS has developed to address resource concerns on various land uses. It can be found on the NRCS website, along with the NRCS Conservation Practice Standards that establish the definition, purpose(s), and design criteria for each of these conservation practices. A link to the website is in Appendix D.

As you develop your Resource Management System alternative, identify all the conservation practices that you will need. You might want to look at the complete list of NRCS conservation practices to see if there are other conservation practices you would need for other parts of your operation, such as cropland, irrigated pasture, forest land, or other land uses.

NRCS conservation practices include:

- Structural range improvements like fences, pipelines, and storage tanks,
- Vegetation treatments such as seeding, brush management and herbaceous weed treatment, and
- Management activities such as prescribed grazing and wildlife upland habitat management.

The following list of NRCS Conservation Practices are the ones commonly used on rangelands. They have been generally grouped below, but any combination of practices can be used to address any resource concern if it fits one or more of the listed purposes for the practice. Appendix A provides definitions and purposes for the practices listed below.

Developing and Distributing Water for Livestock, Wildlife, Wildfire Control

- Water Well
- Spring Development
- Water Harvesting Catchment
- Pond
- Pond Sealing or Lining
- Pumping Plant
- Livestock Pipeline
- Watering Facility (storage tanks and troughs)
- Structure for Water Control (vents, valves, floats)

Managing the Movement of Animals, People and Vehicles

- Prescribed Grazing
- Fence
- Trails and Walkways
- Access Road
- Stream Crossing
- Access Control
- Livestock Shelter Structure
- Heavy Use Area Protection
- Road/Trail/Landing Closure and Treatment

Managing Vegetation

- Brush Management
- Prescribed Burning

- Herbaceous Weed Treatment
- Forest Stand Improvement
- Critical Area Planting
- Range Planting
- Tree/Shrub Establishment
- Tree/Shrub Site Preparation
- Grazing Land Mechanical Treatment

Developing or Restoring Riparian Areas and Wetlands

- Riparian Herbaceous Cover
- Riparian Forest Buffer
- Wetland Restoration
- Wetland Enhancement
- Streambank and Shoreline Protection

Improving Wildlife Habitat

- Wildlife Habitat Planting
- Restoration of Rare or Declining Natural Habitat
- Wetland Wildlife Habitat Management
- Upland Wildlife Habitat Management
- Early Successional Habitat
- Stream Habitat Improvement and Management
- Structures for Wildlife

Managing Runoff and Reducing Sediment Loss

- Waterspreading
- Diversion
- Grade Stabilization Structure
- Lined Waterway or Outlet
- Underground Outlet

Removing Obstructions, Old Structures, and Dumps, and Clearing Vegetation

- Obstruction Removal
- Land Clearing
- Clearing and Snagging
- Woody Residue Treatment

Reducing Air Pollution

- Dust Control on Unpaved Roads and Surfaces
- Combustion System Improvement
- Field Operations Emissions Reduction

Manage Wildfire Hazards

- Firebreak
- Fuel Break
- Dry Hydrant

Evaluating Your Alternatives and Making Decisions

Your Resource Management System alternative can be your conservation plan. It identifies everything that you know needs to be done to achieve the goals and address all the resource concerns identified. But you may not be ready to schedule, design and implement everything. So, your Conservation Plan should just identify the pasture(s) or grazing area(s) you are ready to work on, what resource concern(s) you are going to address, and the conservation practices you plan to install or apply.

Conservation Plan Map

A conservation plan map shows the location of all planned range improvements and vegetation treatments that are part of your conservation plan. It is useful to show your existing structural improvements (e.g., fences, wells, pipelines) as well.

Develop a Conservation Plan Map (Figure 11) that shows the existing range improvements and then clearly show where the planned structural conservation practices will be installed, and where planned vegetative treatment areas like planned brush management areas will be done. Use a legend and 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. Appendix A has some plan map symbols you can use.

Figure 11: Example Conservation Plan Map - Photo courtesy of 14R, Navajo Nation

Conservation Plan and Practice Schedule

The Conservation Plan and Practice Schedule document identifies the goals and objectives for your Conservation Plan, and describes 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.

Your conservation plan may or may not include everything you identified in your Resource Management System alternative. You can focus on addressing just one or two resource concerns. You may choose to focus on specific pastures. It is your conservation plan, and you are the one who decides what needs to be done first.

The following pages provide a template you can use to develop your Conservation Plan and Practice Schedule document.

Business Name

Provide the business name and contact information that you will use for any financial assistance programs.

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. Include approximate acres in the Conservation Plan.

Goals

These include the broad goals for managing the natural resources on the operation, economic goals for the operation, and goals that identify how your conservation plan will benefit your 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. Identify the specific resource concerns you are trying to address.

Planned Conservation Practices

Use the following section as a template to describe the purposes of applying each conservation practice, and tables that show the kinds of information to include (kinds, amounts, scheduled date). Edit the wording to fit your conservation plan. Remove any conservation practices you do not need and include similar information about other conservation practices you might need on your ranch.

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.

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 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.

Note: Show or describe your planned grazing rotation.

Planned Livestock Water Developments

Livestock water developments will be installed, repaired or replaced 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.

Map Label	**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.

Map Label	**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)

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. The locations are labeled on the Conservation Plan Map.

Map Label	**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. Locations are labeled on the Conservation Plan Map.

Map Label	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.

Map Label	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.

Map Label	Fields or Pastures	Planned Year	Target Species	Planned Method of Treatment	Average Plants Per Acre Being Removed	Planned Amount

Photo courtesy of Melvin Cody, Cody Ranch, Navajo Nation

Phase 3: Application and Evaluation

Conservation Practice Designs

NRCS Conservation Practice Standards outline the design criteria NRCS will use to design your conservation practices. The practice standards identify general design criteria that must be included in all designs. Most practice standards also outline additional criteria that must be met when designing the practice to address one or more of the practice purposes. Here is an example of what is required in an NRCS practice design for Prescribed Grazing.

Prescribed grazing plan will include:

1. Goals and Objectives clearly stated.
2. Resource Inventory that identifies—
    - Existing resource conditions and concerns.
    - Ecological site or forage suitability group.
    - Opportunities to enhance resource conditions.
    - Location and condition of structural improvements, such as fences and water developments, including seasonal availability and quality of watering sites.
3. Forage Inventory of the expected forage quality, quantity, and species in each management unit(s).
4. Forage-Animal Balance developed for the grazing plan that ensures forage produced or available meets forage demand of livestock and/or wildlife.
5. Grazing Plan developed for livestock that identifies periods of grazing and/or browsing, deferment, rest, and/or other treatment activities for each management unit that accommodates the flexibility needed for adaptive management decisions as supported by the contingency plan and monitoring plan in order to meet goals and objectives.
6. Contingency Plan developed that details potential problems (e.g., drought, flooding, wildfire and insects) and serves as a guide for adaptive management decisions in grazing prescription adjustments in order to mitigate resource and economic effects.
7. Monitoring Plan developed with appropriate protocols, records and interpretations that assess progress toward meeting goals and objectives of the grazing strategy. Short-term and long-term monitoring may be needed to determine outcomes and support timely adaptive management decisions. Identify the key areas, key plants, or other monitoring indicators that the manager should evaluate in making grazing management decisions.

Environmental Compliance

On all Tribal, Federal, and State Trust lands, ranchers are required to get approval from the responsible land management agency to install or apply most structural or vegetation related conservation practices. Those agencies all have state or tribal environmental and cultural resource laws that they need to comply with before approving projects.

If federal funding is being applied for, such as with NRCS financial assistance programs, then the federal agency providing the funding must also comply with federal environmental laws such as NEPA, the Endangered Species Act, the National Historic Preservation Act, and many other laws, including Executive Orders and agency policies. It is important to understand that these reviews and approvals take time, and you may be required to adjust your project plans based on their findings. You will need to wait until you have those approvals before you begin your project.

You may also need to obtain any permits that are required for your project. For example, the Clean Water Act requires a section 404 permit if your project involves any earthmoving in a floodplain. NRCS will require you to obtain all agency approvals and required permits for your projects.

It is always best to involve all the decision makers who need to approve your projects early in the development of your conservation plan. In many cases, they are an excellent resource for obtaining maps, technical support, and financial support to help you get your conservation plan implemented.

Monitoring

Sustainability is the basic goal of conservation. The general goal is to achieve and maintain the desired plant communities on each ecological site that will protect the potential productivity of the soil, and provide the desired ecological services (livestock forage, wildlife habitat, soil protection, watershed health) on a sustainable basis.

Clearly stated goals and objectives provide the framework for what to monitor, where to monitor, and how often to monitor. Monitored sites are usually carefully selected to be representative of larger areas (key areas), or are used to evaluate the effectiveness of a treatment such as brush management.

Monitoring provides decision makers with information about changes over time. The goal is to determine whether the general direction of change is toward or away from the desired condition. The emphasis on change distinguishes monitoring from the inventory. Monitored data is collected to help decision makers determine if the current management strategy is meeting the goals and objectives. Repeated measurements or observations are taken over time to establish whether changes in selected resource attributes have occurred.

The attributes being monitored should have demonstrable relationships to the desired resource outputs or processes. Many attributes of rangeland ecosystems can be measured or observed, but unless they can be demonstrated to be reliable indicators of resource protection and/or resource outputs, they are not useful for measuring the achievement of management objectives.

Monitoring data needs to be objective. Data should not incorporate interpretations or value judgments. Data recorded as “good, fair or poor” contains the built-in conclusion of the observer. This kind of data cannot be re-evaluated by another observer later.

Here are some basic things many ranchers monitor.

- Precipitation
- Livestock kinds, classes, and numbers
- Percentage of calf crop and weaning weights
- Grazing periods for each pasture each year
- A photo, taken at each key area, at approximately the same time every year
- Measured ground cover changes over time (bare ground, litter, plant basal density)
- Measured plant community changes over time (production, composition, frequency, and/or cover)

Photos courtesy of Melvin Cody, Cody Ranch, Navajo Nation

Appendix A: NRCS Conservation Practice Definitions and Purposes

This appendix provides more detailed information about some of the common conservation practices used on rangelands. It includes the definition, the purpose(s), and the lifespan in years that you must keep the practice maintained if NRCS financial assistance is used to install the practice. The practices have been generally grouped based on their main purposes, but any of these conservation practices needed to address a resource concern can be included in your conservation plan.

	Units	Code	Life (Yrs)
Access Control	Ac.	472	10

The temporary or permanent exclusion of animals, people, vehicles, and equipment from an area.

PRACTICE PURPOSES

- Achieve and maintain desired resource conditions by monitoring and managing the intensity of use by animals, people, vehicles, and/or equipment in coordination with the application schedule of practices, measures and activities specified in the conservation plan.

	Units	Code	Life (Yrs)
Access Road	Ft.	560	10

An access road is an established route for equipment and vehicles.

PRACTICE PURPOSES

- Provide a fixed route for vehicular travel for resource activities involving the management of timber, livestock, agriculture, wildlife habitat, and other conservation enterprises.

Photo courtesy of Melvin Cody, Cody Ranch, Navajo Nation

	Units	Code	Life (Yrs)
Brush Management	Ac.	314	10

The management or removal of woody (non-herbaceous or succulent) plants including those that are invasive and noxious.

PRACTICE PURPOSES

- Create the desired plant community consistent with the ecological site or a desired state within the site description.
- Restore or release desired vegetative cover to protect soils, control erosion, reduce sediment, improve water quality, or enhance hydrology.
- Maintain, modify, or enhance fish and wildlife habitat.
- Improve forage accessibility, quality, and quantity for livestock and wildlife.
- Manage fuel loads to achieve desired conditions.
- Create or maintain an ecological site description "steady state" addressing the need for forage, wildlife habitat, and/or water quality.

	Units	Code	Life (Yrs)
Clearing and Snagging	Ft.	326	5

Removal of vegetation along the bank (clearing) and selective removal of snags, drifts, or other obstructions (snagging) from natural or improved channels and streams.

PRACTICE PURPOSES

- Restore flow capacity and direction.
- Prevent excessive bank erosion by eddies or redirection of flow.
- Reduce the undesirable formation of bars.
- Minimize blockages by debris and ice.

	Units	Code	Life (Yrs)
Combustion System Improvement	No.	372	10

The replacement, powering, or retrofitting of an agricultural combustion system and related components or devices.

PRACTICE PURPOSES

- Improve air quality by reducing emissions of oxides of nitrogen (Nox).
- Improve air quality by reducing emissions of particulate matter (PM).
- Reduce energy use by increasing the efficiency of the combustion system.

	Units	Code	Life (Yrs)
Critical Area Planting	Ac.	342	10

Establishment of 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 prevent the establishment of vegetation with normal seeding/planting methods.

PRACTICE PURPOSES

- Stabilize areas with existing or expected high rates of soil erosion by wind or water.
- Stabilize streams, channel banks, ponds, and other shorelines and earthen features of structural conservation practices.
- Stabilize areas such as sand dunes and riparian areas.

	Units	Code	Life (Yrs)
Diversion	Ft.	362	10

A channel generally constructed across the slope with a supporting ridge on the lower side.

PRACTICE PURPOSES

- Break up concentrations of water on long slopes on undulating land surfaces and on land that is generally considered too flat or irregular for terracing.
- Divert water away from farmsteads, agricultural waste systems and other improvements.
- Collect or direct water for storage, water-spreading or water-harvesting systems.
- Protect terrace systems by diverting water from the top terrace where topography land use or land ownership prevents terracing the land above.
- Intercept surface and shallow subsurface flow.
- Reduce runoff damages from upland runoff.
- Reduce erosion and runoff on urban or developing areas and at construction or mining sites.
- Divert water away from active gullies or critically eroding areas.
- Supplement water management on conservation cropping or stripcropping systems.

	Units	Code	Life (Yrs)
Dry Hydrant	No.	432	15

A non-pressurized permanent pipe assembly system installed into a water source that permits the withdrawal of water by suction.

PRACTICE PURPOSES

- Apply to provide all weather access to an available water source for fire suppression.

	Units	Code	Life (Yrs)
Dust Control on Unpaved Roads and Surfaces	Sq. Ft.	373	1

The controlling of direct particulate matter emissions produced by vehicle and machinery traffic or wind action from unpaved roads and other surfaces by applying a palliative on the surface.

PRACTICE PURPOSES

- Improve air quality by reducing emissions of particulate matter (PM).
- Improve visibility by reducing emissions of PM.
- Improve plant health and vigor by reducing emissions of PM.

	Units	Code	Life (Yrs)
Early Successional Habitat	Ac.	647	1

Management of plant succession to develop and maintain early successional habitat to benefit desired wildlife and/or natural communities.

PRACTICE PURPOSES

- Provide habitat for species requiring early successional habitat for all or part of their lifecycle.

	Units	Code	Life (Yrs)
Fence	Ft.	382	20

A constructed barrier to animals or people.

PRACTICE PURPOSES

- Provide a means to control movement of animals and people, including vehicles.

	Units	Code	Life (Yrs)
Field Operations Emissions Reduction	Ac.	376	1

The adjustment of field operations and technologies to reduce particulate matter (PM) emissions from field operations.

PRACTICE PURPOSES

- Improve air quality by reducing emissions of particulate matter.

	Units	Code	Life (Yrs)
Firebreak	Ft.	394	5

A permanent or temporary strip of bare or vegetated land planned to retard fire.

PRACTICE PURPOSES

- Reduce the spread of wildfire.
- Contain prescribed burns.

	Units	Code	Life (Yrs)
Forest Stand Improvement	Ac.	666	10

The manipulation of species composition, stand structure, or stand density by cutting or killing selected trees or understory vegetation to achieve desired forest conditions or obtain ecosystem services.

PRACTICE PURPOSES

- Improve and sustain forest health and productivity.
- Reduce damage from pests and moisture stress.
- Initiate forest stand regeneration.
- Reduce fire risk and hazard and facilitate prescribed burning.
- Restore or maintain natural plant communities.
- Improve wildlife and pollinator habitat.
- Alter quantity quality and timing of water yield.
- Increase or maintain carbon storage.

	Units	Code	Life (Yrs)
Fuel Break	Ac.	383	10

A strip or block of land on which the vegetation, debris and detritus have been reduced and/or modified to control or diminish the risk of the spread of fire crossing the strip or block of land.

PRACTICE PURPOSES

- Control and reduce the risk of the spread of fire by treating, removing or modifying vegetation debris and detritus.

	Units	Code	Life (Yrs)
Grade Stabilization Structure	No.	410	15

A grade stabilization structure is a structure used to control the grade in natural or constructed channels.

PRACTICE PURPOSES

- Stabilize grade, reduce erosion, or improve water quality.

	Units	Code	Life (Yrs)
Grazing Land Mechanical Treatment	Ac.	548	1

The modification of physical soil and/or plant conditions with mechanical tools by treatments such as pitting, contour furrowing; and chiseling, ripping, or subsoiling.

PRACTICE PURPOSES

- Fracture compacted soil layers and improve soil permeability.
- Reduce water runoff and increase infiltration.
- Break up root-bound conditions and thatch to increase plant vigor.
- Renovate and stimulate the plant community for greater productivity and yield.

	Units	Code	Life (Yrs)
Heavy Use Area Protection	Sq. Ft.	561	10

Heavy Use Area Protection is used to stabilize a ground surface that is frequently and intensively used by people, animals, or vehicles.

PRACTICE PURPOSES

- Provide a stable, non-eroding surface for areas frequently used by animals, people or vehicles.
- Protect or improve water quality.

	Units	Code	Life (Yrs)
Herbaceous Weed Treatment	Ac.	315	5

The removal or control of herbaceous weeds including invasive, noxious, and prohibited plants.

PRACTICE PURPOSES

- Enhance accessibility quantity and quality of forage and/or browse.
- Restore or release native or create desired plant communities and wildlife habitats consistent with the site potential.
- Protect soils and control erosion.
- Reduce fine-fuels fire hazard and improve air quality.
- Control pervasive plant species to a desired level of treatment that will ultimately contribute to creation or maintenance of an ecological site description "steady state," addressing the need for forage, wildlife habitat, and/or water quality.
- Improve rangeland health.

	Units	Code	Life (Yrs)
Land Clearing	Ac.	460	10

The removal of trees, stumps, and other vegetation from wooded areas to achieve a conservation objective.

PRACTICE PURPOSES

- Facilitate land use adjustments in the interest of natural resource conservation.

	Units	Code	Life (Yrs)
Lined Waterway or Outlet	Ft.	468	15

A waterway or protected outlet section having an erosion-resistant lining of concrete, stone, synthetic turf reinforcement fabrics, or other permanent material.

PRACTICE PURPOSES

- Provide safe conveyance of runoff from conservation practices or other water concentrations without causing erosion or flooding.
- Prevent or stabilize existing gully erosion or scour.
- Protect and improve water quality.

	Units	Code	Life (Yrs)
Livestock Pipeline	Ft.	516	20

A pipeline and appurtenances installed to convey water for livestock or wildlife.

PRACTICE PURPOSES

- Convey water to points of use for livestock or wildlife.
- Reduce energy use.
- Develop renewable energy systems.

	Units	Code	Life (Yrs)
Livestock Shelter Structure	no	576	10

A permanent or portable structure with fewer than four walls and a roof, if needed, to provide for improved utilization of pastureland and rangeland and to shelter livestock from negative environmental factors. This structure is not to be construed to be a building.

PRACTICE PURPOSES

- Provide protection for animals from excessive heat wind cold or snow.
- Protect surface waters from nutrient and pathogen loading.
- Protect wooded areas from accelerated erosion and excessive nutrient deposition by providing alternative livestock shelter/shade location.
- Improve the distribution of grazing livestock to enhance wildlife habitat, reduce overused areas, or correct other resource concerns resulting from improper livestock distribution.

	Units	Code	Life (Yrs)
Mulching	Ac.	484	1

The applying of plant residues or other suitable materials to the land surface.

PRACTICE PURPOSES

- Improve the efficiency of moisture management.
- Reduce irrigation energy used in farming/ranching practices and field operations.
- Improve the efficient use of irrigation water.
- Prevent excessive bank erosion from stream shorelines or water conveyance channels.
- Reduce concentrated flow erosion.
- Reduce sheet rill and wind erosion.
- Improve plant productivity and health.
- Maintain or increase organic matter content.
- Reduce emissions of particulate matter.

	Units	Code	Life (Yrs)
Obstruction Removal	Ac.	500	10

The removal and disposal of buildings, structures, other works of improvement, vegetation, debris or other materials.

PRACTICE PURPOSES

- Safely remove and dispose of unwanted obstructions in order to apply conservation practices or facilitate the planned land use.

	Units	Code	Life (Yrs)
Pond	No.	378	20

A water impoundment made by constructing an embankment, by excavating a dugout, or by a combination of both.

Practice Purposes

- Store water water for livestock, fish and wildlife, recreation, fire control, erosion control, flow detention, and other uses such as improving water quality.

	Units	Code	Life (Yrs)
Pond Sealing or Lining - Geomembrane or Geosynthetic Clay Liner	No.	521	20

A liner for an impoundment constructed using a geomembrane or a geosynthetic clay material.

PRACTICE PURPOSES

- Reduce seepage losses from an impoundment for water conservation.
- Protect soil and water from contaminants.

	Units	Code	Life (Yrs)
Pond Sealing or Lining - Compacted Soil	Ft2	520	15

A liner for an impoundment constructed using compacted soil with or without soil amendments.

PRACTICE PURPOSES

- Reduce seepage losses from impoundments constructed for water conservation and environmental protection.

	Units	Code	Life (Yrs)
Pond Sealing or Lining - Concrete	Ft2	522	20

A liner for an impoundment constructed using reinforced or nonreinforced concrete.

PRACTICE PURPOSES

- Reduce seepage losses from impoundments constructed for water conservation and environmental protection.

Photo courtesy of Melvin Cody, Cody Ranch, Navajo Nation

	Units	Code	Life (Yrs)
Prescribed Burning	Ac.	338	1

Controlled fire applied to a predetermined area.

PRACTICE PURPOSES

- Control undesirable vegetation.
- Prepare sites for harvesting, planting, or seeding.
- Control plant disease.
- Reduce wildfire hazards.
- Improve wildlife habitat.
- Improve plant production quantity and/or quality.
- Remove slash and debris.
- Enhance seed and seedling production.
- Facilitate distribution of grazing and browsing animals.
- Restore and maintain ecological sites.

	Units	Code	Life (Yrs)
Prescribed Grazing	Ac.	528	1

Managing of the harvest of vegetation with grazing and/or browsing animals with the intent to achieve specific ecological, economic, and management objectives.

PRACTICE PURPOSES

- Improve or maintain desired species composition and/or vigor of plant communities.
- Improve or maintain quantity and/or quality of forage for grazing and browsing animals' health and productivity.
- Improve or maintain surface and/or subsurface water quality and quantity.
- Improve or maintain riparian and/or watershed function.
- Reduce soil erosion and maintain or improve soil health.
- Improve or maintain the quantity, quality, or connectivity of food and/or cover available for wildlife.
- Manage fine fuel loads to achieve desired conditions.

	Units	Code	Life (Yrs)
Pumping Plant	No.	533	15

A facility that delivers water at a designed pressure and flow rate. It includes the required pump(s), associated power unit(s), plumbing, and appurtenances, and may include on-site fuel or energy source(s) and protective structures.

PRACTICE PURPOSES

- Deliver water for improved plant condition, livestock, or wetlands.
- Remove excessive subsurface or surface water.
- Provide efficient use of water on irrigated land.
- Transfer livestock waste or liquid byproducts as part of a wastewater transfer system.
- Reduce energy use.

	Units	Code	Life (Yrs)
Range Planting	Ac.	550	5

Establishment of adapted perennial or self-sustaining vegetation such as grasses, forbs, legumes, shrubs and trees.

PRACTICE PURPOSES

- Restore a plant community similar to the ecological site description reference state for the site or the desired plant community.
- Provide or improve forages for livestock.
- Provide or improve forage browse or cover for wildlife.
- Reduce erosion by wind and water.
- Improve water quality and quantity.
- Increase carbon sequestration.

	Units	Code	Life (Yrs)
Restoration of Rare or Declining Natural	Ac.	643	1

Reestablishment of abiotic (physical and chemical) and biotic (biological) conditions necessary to support rare or declining natural assemblages of native plants and animals.

PRACTICE PURPOSES

- Restore the physical conditions and/or unique plant community on sites that partially support or once supported a rare or declining natural community.
- Address resource concerns of degraded plant condition and/or inadequate wildlife habitat.

	Units	Code	Life (Yrs)
Riparian Forest Buffer	Ac.	391	15

An area predominantly of trees and/or shrubs located adjacent to and up-gradient from watercourses or water bodies.

PRACTICE PURPOSES

- Create shade to lower or maintain water temperatures to improve habitat for aquatic organisms.
- Create or improve riparian habitat and provide a source of detritus and large woody debris.
- Reduce excess amounts of sediment, organic material, nutrients, and pesticides in surface runoff and reduce excess nutrients and other chemicals in shallow ground water flow.
- Reduce pesticide drift entering the water body.
- Restore riparian plant communities.
- Increase carbon storage in plant biomass and soils.

	Units	Code	Life (Yrs)
Riparian Herbaceous Cover	Ac.	390	5

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

PRACTICE PURPOSES

- Provide or improve food and cover for fish wildlife and livestock.
- Improve and maintain water quality.
- Establish and maintain habitat corridors.
- Increase water storage on floodplains.
- Reduce erosion and improve stability to stream banks and shorelines.
- Increase net carbon storage in the biomass and soil.
- Enhance pollen nectar and nesting habitat for pollinators.
- Restore improve or maintain the desired plant communities.
- Dissipate stream energy and trap sediment.
- Enhance stream bank protection as part of stream bank soil bioengineering practices.

Photo courtesy of Melvin Cody, Cody Ranch, Navajo Nation

	Units	Code	Life (Yrs)
Road/Trail/Landing Closure and Treatment	Ft.	654	10

The closure, decommissioning, or abandonment of roads, trails, and/or landings and associated treatment to achieve conservation objectives.

PRACTICE PURPOSES

- Control erosion (road, sheet and rill, gully, wind) of chemical residues, and off-site movement of sediment, deposition, and damage accentuated by storm runoff and particulate matter generation.
- Restore land to a productive state by reestablishing adapted plants and habitat (wildlife food, cover, and shelter), reconnecting wildlife habitat and migration corridors including streams and riparian areas and controlling noxious and invasive species.
- Reestablish drainage patterns that existed prior to construction of the road trail or landing to restore the form and integrity of associated hill slopes, channels, and floodplains and their related hydrologic and geomorphic processes.
- Minimize human impacts to the closure area to meet safety, aesthetic, sensitive area protection, or wildlife habitat requirements.

	Units	Code	Life (Yrs)
Stream Habitat Improvement and Management	Ac.	395	5

The improvement, restoration, or maintenance of the ecological functions of a stream and its adjacent floodplain and riparian area.

PRACTICE PURPOSES

- Improve or manage stream habitat by evaluating and addressing factors that impair stream function and structure.

	Units	Code	Life (Yrs)
Structures for Wildlife	No.	649	5

A structure installed to replace or modify a missing or deficient wildlife habitat component.

PRACTICE PURPOSES

- Enhance or sustain non-domesticated wildlife.
- Modify existing structures that pose a hazard to wildlife.

	Units	Code	Life (Yrs)
Spring Development	No.	574	20

Collection of water from springs or seeps to provide for livestock and wildlife.

PRACTICE PURPOSES

- Improve the quantity and/or quality of water for livestock and wildlife.

	Units	Code	Life (Yrs)
Structure for Water Control	No.	587	20

A structure in a water management system that conveys water, controls the direction or rate of flow, maintains a desired water surface elevation, or measures water.

PRACTICE PURPOSES

- Control the stage, discharge, the stage, discharge, distribution, delivery, or direction of water flow.

	Units	Code	Life (Yrs)
Stream Crossing	No.	578	10

A stabilized area or structure constructed across a stream to provide controlled access for people, livestock, equipment, or vehicles.

PRACTICE PURPOSES

- Improve water quality by reducing sediment, nutrient, organic, and inorganic loading of the stream.
- Reduce streambank and streambed erosion.

	Units	Code	Life (Yrs)
Streambank and Shoreline Protection	Ft.	580	20

Treatment(s) used to stabilize and protect banks of streams or constructed channels, and shorelines of lakes, reservoirs, or estuaries.

PRACTICE PURPOSES

- Prevent the loss of land or damage to land uses or facilities adjacent to the banks of streams or constructed channels, shoreline of lakes or reservoirs or estuaries. This includes the protection of known historical archeological and traditional cultural properties.
- Maintain the flow capacity of streams or channels.
- Reduce the offsite or downstream effects of sediment resulting from bank erosion.
- Improve or enhance the stream corridor or shoreline for fish and wildlife habitat, aesthetics or recreation.

	Units	Code	Life (Yrs)
Trails and Walkways	Ft.	575	10

A trail is a constructed path with a vegetated or earthen surface. A walkway is a constructed path with an artificial surface. A trail/walkway is used to facilitate the movement of animals, people, or off-road vehicles.

PRACTICE PURPOSES

- Provide or improve animal access to forage, water, working/handling facilities, or shelter.
- Protect ecologically sensitive erosive or potentially erosive sites.
- Provide pedestrian or off-road vehicle access for agricultural construction or maintenance operations.
- Provide trails/walkways for recreational activities or access to recreation sites.

	Units	Code	Life (Yrs)
Tree/Shrub Establishment	Ac.	612	15

Establishment of woody plants by planting seedlings or cuttings, by direct seeding, and/or through natural regeneration.

PRACTICE PURPOSES

- Maintain or improve desirable plant diversity productivity and health by establishing woody plants.
- Create or improve habitat for desired wildlife species compatible with ecological characteristics of the site.
- Control erosion.
- Reduce excess nutrients and other pollutants in runoff and groundwater.
- Sequester and store carbon.
- Restore or maintain native plant communities.
- Develop renewable energy systems.
- Conserve energy.
- Provide for beneficial organisms and pollinators.

	Units	Code	Life (Yrs)
Tree/Shrub Site Preparation	Ac.	490	1

Treatment of areas to improve site conditions for establishing trees and/or shrubs.

PRACTICE PURPOSES

- Encourage natural regeneration of desirable woody plants.
- Permit artificial establishment of woody plants.

	Units	Code	Life (Yrs)
Underground Outlet	Ft.	620	20

A conduit or system of conduits installed beneath the surface of the ground to convey surface water to a suitable outlet.

PRACTICE PURPOSES

- Carry water to a suitable outlet from terraces, water and sediment control basins, diversions, waterways, surface drains, other similar practices or flow concentrations, without causing damage by erosion or flooding.

	Units	Code	Life (Yrs)
Upland Wildlife Habitat Management	Ac.	645	1

The management of upland habitats and connectivity within the landscape for wildlife.

PRACTICE PURPOSES

- Treat upland wildlife habitat concerns identified during the conservation planning process that enable movement or provide shelter, cover, food in proper amounts, locations and times to sustain wild animals that inhabit uplands during a portion of their life cycle.

	Units	Code	Life (Yrs)
Water Harvesting Catchment	No.	636	20

A facility for collecting and storing runoff from precipitation.

PRACTICE PURPOSES

- Provide water for livestock, fish, wildlife, or other conservation purposes, by creating impervious areas to increase, collect, and store runoff.

	Units	Code	Life (Yrs)
Water and Sediment Control Basin	No.	638	10

An earth embankment or a combination ridge and channel constructed across the slope of a minor drainageway.

PRACTICE PURPOSES

- Reduce gully erosion.
- Trap sediment.
- Reduce and manage runoff.

	Units	Code	Life (Yrs)
Water Well	No.	642	20

A hole drilled, dug, driven, bored, jetted, or otherwise constructed into an aquifer for water supply.

PRACTICE PURPOSES

- Provide access to a groundwater supply suitable for livestock watering, fire control, wildlife, and other agricultural uses.

	Units	Code	Life (Yrs)
Watering Facility	No.	614	10

A watering facility is a means of providing drinking water to livestock or wildlife.

PRACTICE PURPOSES

- Store or provide designated access to drinking water for livestock or wildlife to supply daily water requirements.
- Improve animal distribution.
- Provide a water source that is an alternative to a sensitive resource.

	Units	Code	Life (Yrs)
Waterspreading	Ac.	640	15

A system of dams, dikes, ditches, or other means of diverting or collecting runoff from natural channels, gullies, or streams and spreading it over relatively flat areas.

PRACTICE PURPOSES

- Manage runoff from natural precipitation to support desired land use goals or ecological processes.

	Units	Code	Life (Yrs)
Wetland Creation	Ac.	658	15

The creation of a wetland on a site location that was historically non-wetland.

PRACTICE PURPOSES

- Establish wetland hydrology, vegetation, and wildlife habitat functions on soils capable of supporting those functions.

	Units	Code	Life (Yrs)
Wetland Enhancement	Ac.	659	15

The augmentation of wetland functions beyond the original natural conditions on a former, degraded, or naturally functioning wetland site, sometimes at the expense of other functions.

PRACTICE PURPOSES

- Increase the capacity of specific wetland functions (such as habitat for targeted species, and recreational and educational opportunities) by enhancing hydric soil functions (changing soil hydrodynamic and/or bio-geochemical properties).
- Enhance hydrology (dominant water source, hydroperiod, and hydrodynamics).
- Enhance vegetation (including the removal of undesired species and/or seeding or planting of desired species).
- Enhance plant and animal habitats.

	Units	Code	Life (Yrs)
Wetland Restoration	Ac.	657	15

The return of a wetland and its functions to a close approximation of its original condition as it existed prior to disturbance on a former or degraded wetland site.

PRACTICE PURPOSES

- Restore conditions conducive to hydric soil maintenance.
- Restore wetland hydrology (dominant water source hydroperiods and hydrodynamics).
- Restore native hydrophytic vegetation (including the removal of undesired species and/or seeding or planting of desired species.
- Restore original fish and wildlife habitats.

	Units	Code	Life (Yrs)
Wetland Wildlife Habitat Management	Ac.	644	1

The retaining, developing, or managing wetland habitat for wetland wildlife.

PRACTICE PURPOSES

- Maintain, develop, or improve wetland habitat for waterfowl, shorebirds, fur-bearers, or other wetland dependent or associated flora and fauna.

	Units	Code	Life (Yrs)
Wildlife Habitat Planting	Ac.	420	5

The establishment of wildlife habitat by planting herbaceous vegetation or shrubs.

PRACTICE PURPOSES

- Improve degraded wildlife habitat for the target wildlife species or guild.
- Establish wildlife habitat that resembles the historic desired and reference native plant community.

	Units	Code	Life (Yrs)
Woody Residue Treatment	Ac.	384	10

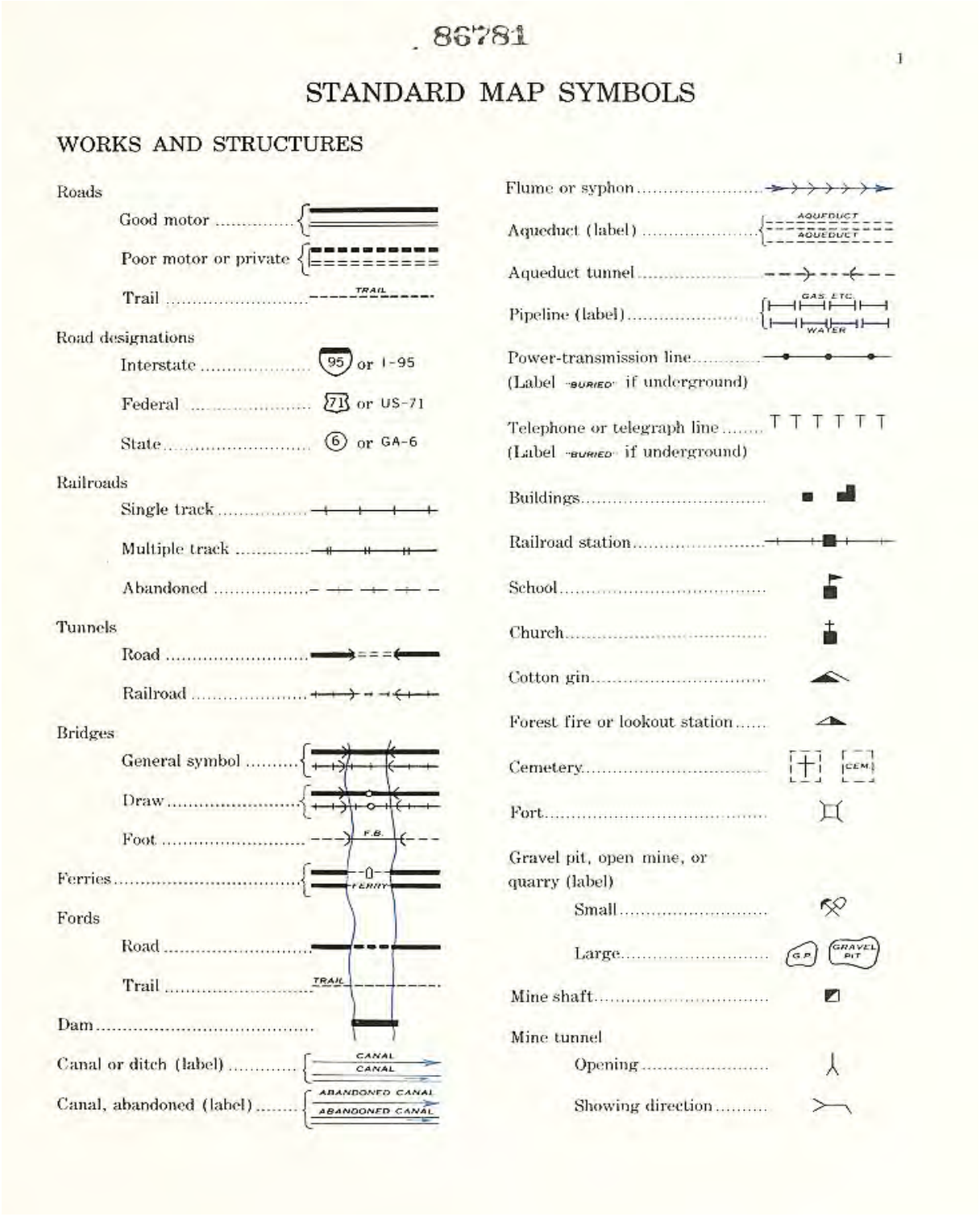
The treatment of residual woody material that is created due to management activities or natural disturbances.

PRACTICE PURPOSES

- Reduce hazardous fuels.
- Reduce the risk of harmful insects and disease.
- Protect/maintain air quality by reducing the risk of wildfire.
- Improve access for management purposes.
- Improve access to forage for livestock and wildlife.
- Develop renewable energy systems.
- Enhance aesthetics.
- Reduce the risk of harm to humans and livestock.
- Improve the soil organic matter.
- Improve the site for natural or artificial regeneration.

Photo courtesy of Melvin Cody, Cody Ranch, Navajo Nation

Appendix B: Map Symbols



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STANDARD MAP SYMBOLS

WORKS AND STRUCTURES

Roads
- Good motor
- Poor motor or private
- Trail ..... TRAIL

Road designations
- Interstate ..... 95 or I-95
- Federal ..... 71 or US-71
- State ..... 6 or GA-6

Railroads
- Single track
- Multiple track
- Abandoned

Tunnels
- Road
- Railroad

Bridges
- General symbol
- Draw
- Foot ..... F.B.

Ferries ..... FERRY

Fords
- Road
- Trail ..... TRAIL

Dam

Canal or ditch (label) ..... CANAL / CANAL

Canal, abandoned (label) ..... ABANDONED CANAL / ABANDONED CANAL

Flume or syphon

Aqueduct (label) ..... AQUEDUCT / AQUEDUCT

Aqueduct tunnel

Pipeline (label) ..... GAS, ETC. / WATER

Power-transmission line
(Label "BURIED" if underground)

Telephone or telegraph line
(Label "BURIED" if underground)

Buildings

Railroad station

School

Church

Cotton gin

Forest fire or lookout station

Cemetery ..... CEM.

Fort

Gravel pit, open mine, or quarry (label)
- Small
- Large ..... G.P. / GRAVEL PIT

Mine shaft

Mine tunnel
- Opening
- Showing direction

STANDARD MAP SYMBOLS

WORKS AND STRUCTURES - Cont'd.

Oil or gas wells

Storage tanks (label)

Airport

Airway beacon

Lighthouse

Breakwater, wharf, dock or jetty

Tide or flood gate

Diversion dam

Small reservoir

Dam and reservoir

Stock pond, tank or charco

Levee

Without road

With road

Stream bank protection

Fence [1]

Corral

Gate or cattle guard (label)

DRAINAGE

Perennial streams

Intermittent streams

Falls and rapids

Lake or pond

Intermittent lake or pond

Closed or tile drain

Drainage ditch (open drain)

Spring

Well

Wet spot

Swamp or marsh (small isolated areas)

Define See Note 2 on Page 8

Swamp or marsh (large areas)

Tidal marsh (salt or fresh water)

RELIEF

Escarpment, other than bedrock (dash unless soil boundary)

Bedrock escarpment (dash unless soil boundary)

Prominent hills or mountain peaks

Small sink holes

Delineable depression (dash unless soil boundary)

Sand wash (riverwash)

Mine dump

Sand dunes (dune land)

[1] *See note 1 on Page 8*

STANDARD MAP SYMBOLS

SPECIAL SYMBOLS - SOIL SURVEY

Rock outcrop

Stoniness

Stony

Very stony

Gravel

Chert fragments

Clay spot

Clay butte

Gumbo or scabby spot
(truncated solodized solonetz)

Sand spot

Lava flow

Made land

Define
See Note 2
on Page 8

Any located station or object
(with explanatory note
on back of sheet)

Blowout

Moderate wind erosion

Severe wind erosion

Severely eroded or gullied area

Wind hummocks

Overblown soil

Define
See Note 2
on Page 8

Saline spot

Gully

Farmstead

Aerial photograph match line

Location of major soil samples
(with number and complete
identification on back of sheet)

S 25

SPECIAL SYMBOLS - CONSERVATION PLAN

Farm, ranch, or other
operations boundary

Ownership boundary

Field or land use boundary

Land capability, range, or
woodland site boundary

Range condition boundary

Range condition EC, GC, FC, PC

Important ridge top

Stack yard

Farmstead

Field number 2

Field acreage 320 Ac.

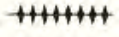
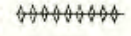
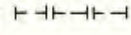
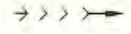
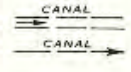
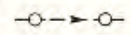
Vegetative waterway

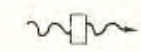
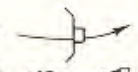
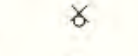
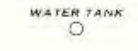
Special purpose plantings
(label)

WILDLIFE

STANDARD MAP SYMBOLS

SPECIAL SYMBOLS - CONSERVATION PLAN

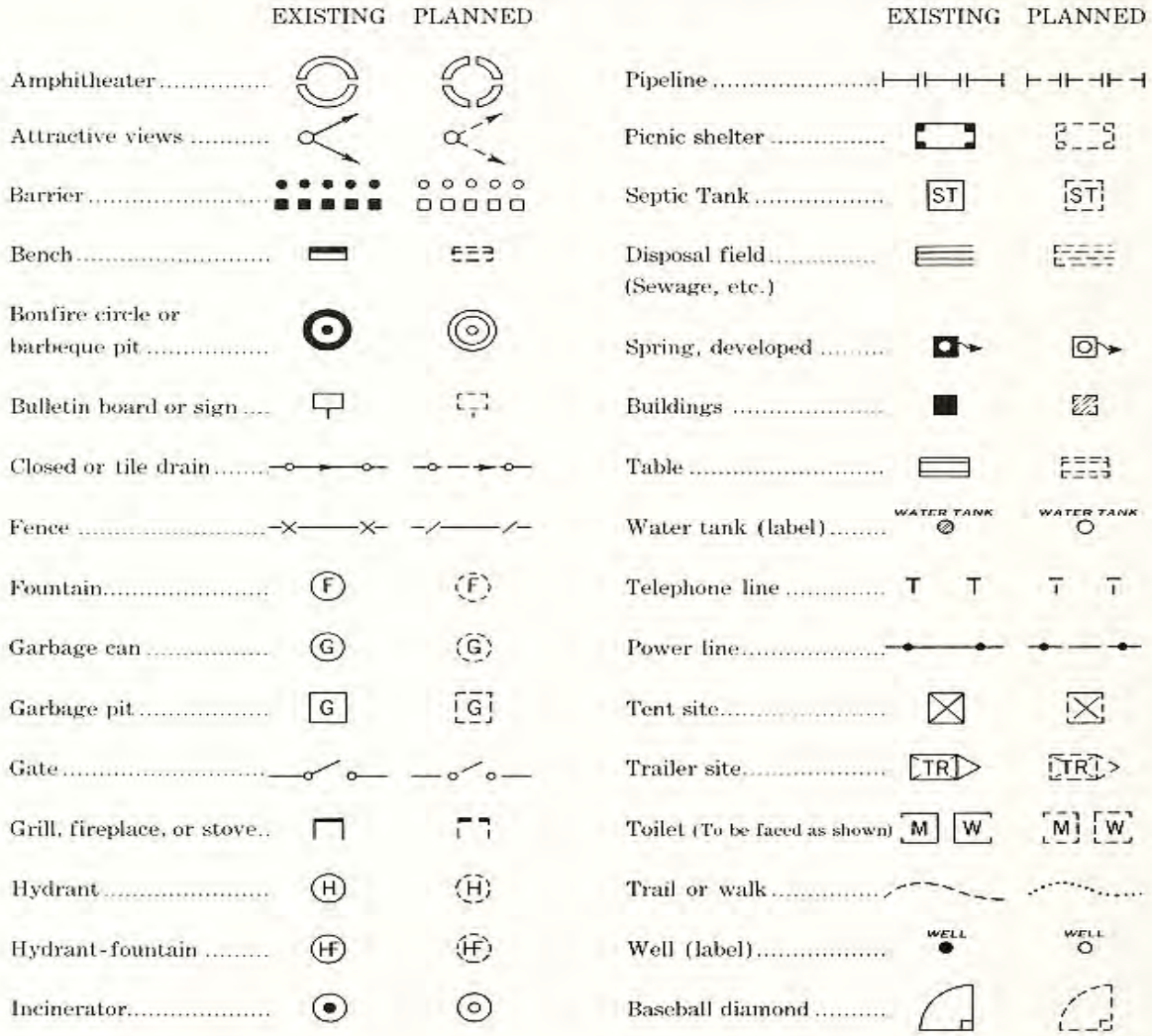
	EXISTING	PLANNED
Fence [1]		
Shelterbelt		
Stream bank protection		
Dike or levee		
Pipeline		
Flume or syphon		
Canal (label)		
Irrigation ditch		
Pickup ditch		
Diversion		
Drainage or open drain		
Closed or tile drain		
Terrace		
Tide or flood gate		
Division box or turnout		
Pipe riser		

	EXISTING	PLANNED
Diversion or spreader dam		
Check dam or gully plug		
Drop structure		
Dam and reservoir		
Stock pond, tank or charco		
Spring development		
Spring and trough		
Trough		
Well (label)		
Windmill		
Windmill and trough		
Water tank (label)		
Pump		
Salt ground		
Small reservoir		

[1] *See note 1 on Page 8*

STANDARD MAP SYMBOLS

SPECIAL SYMBOLS - RECREATION



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STANDARD MAP SYMBOLS

SPECIAL SYMBOLS - WATERSHED PROJECTS

Watershed project boundary.....

Sub watershed or drainage area boundary .....

Drainage area controlled by structure .....

Area benefited.....

Drainage area in acres or square miles .....

D. A. 540 ac.

Damage reach..... RED OR BLACK 3

Project Measures

Floodwater retarding structure...

Water supply structure..... M*

Multiple-purpose structure..... FW*

Stabilization or sediment storage structure.....

Stream channel improvement for:

flood prevention.....

drainage.....

Levee or dike.....

Irrigation canal..... CANAL

* *Indicate purpose of water supply: I - Irrigation, M - Municipal, FW - Fish and wildlife, R - Recreation*

NOTES

[1] *When existing fences are combined with other symbols, they may be shown as follows:*

Fence along both sides of good motor road, etc.

Fence along one side of ditch, etc.

When planned fences are combined with other symbols, they may be shown as follows:

Planned fence along both sides of good motor road, etc.

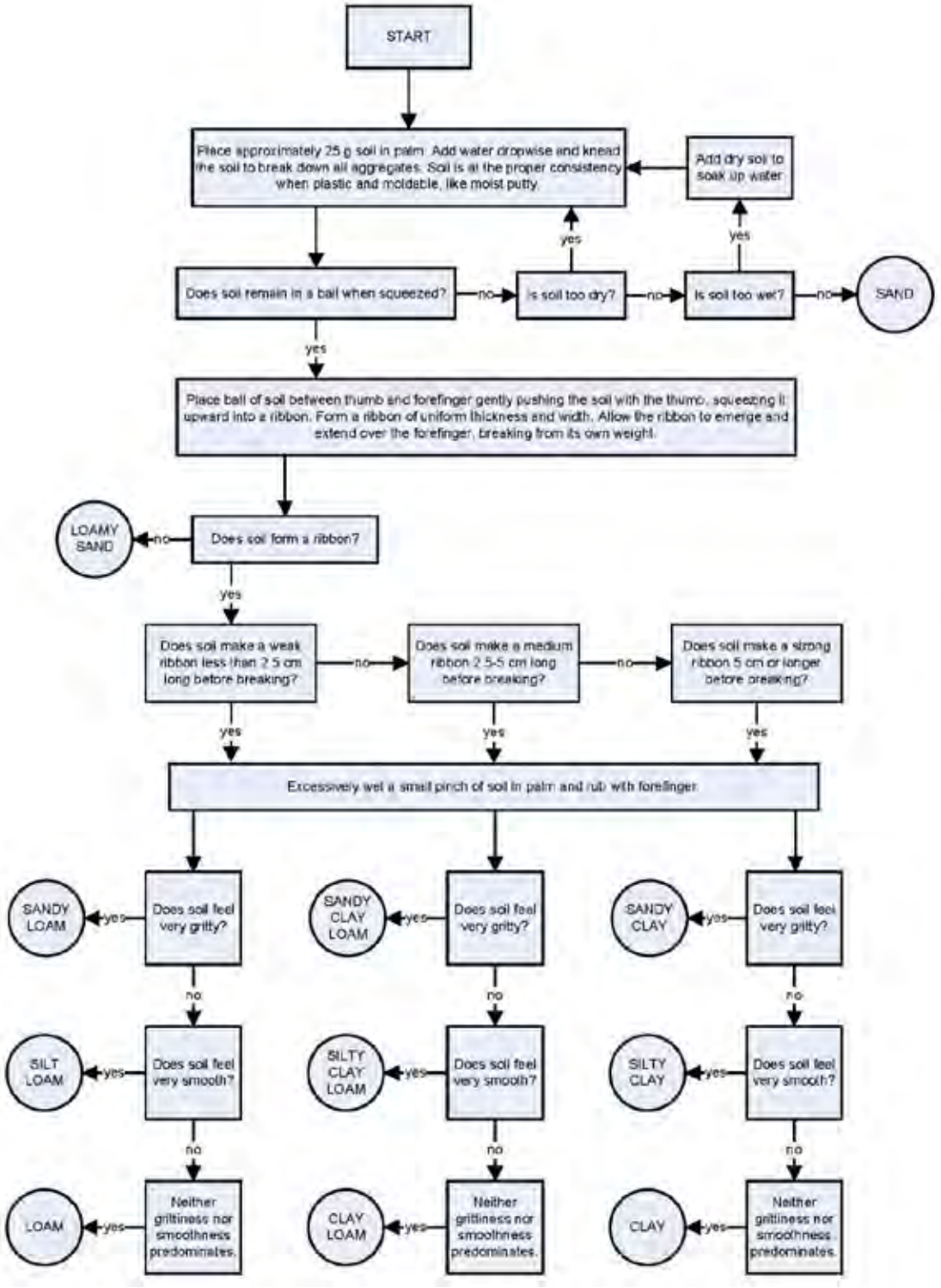
Planned fence along one side of ditch, etc.

When fences or ditches, etc., are to be removed, they may be shown as follows:

[2] *"Define" -- acres represented by each symbol should be specified, as follows:*

up to 2 Acres	✓	5 to 6 Acres	✓✓✓
3 to 4 Acres	✓✓		

Appendix C: Soil Texture Feel Method



Modified from S.J. Thien. 1979. *A flow diagram for teaching texture by feel analysis.* Journal of Agronomic Education. 8:54-55

Appendix D: Useful websites for Conservation Planning

NRCS National Planning Procedures Handbook (NPPH) Amendment 8:
https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=45839.wba

NRCS National Resource Concern List and Planning Criteria:
https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=44299.wba

Complete List of NRCS Conservation Practices (click on "NHCP Index" at the top for the latest):
https://directives.sc.egov.usda.gov/ViewerFS.aspx?hid=22299

NRCS National Range and Pasture Handbook:
https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17734.wba

NRCS Field Office Technical Guide:
https://efotg.sc.egov.usda.gov/#/

Interpreting Indicators of Rangeland Health (version 5):
https://www.blm.gov/sites/blm.gov/files/documents/files/Interpreting%20Indicators%20of%20Rangeland%20Health%20Technical%20Reference%201734-6%20version%205_0.pdf

Web Soil Survey:
https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

Ecological Site Descriptions:
https://edit.jornada.nmsu.edu/catalogs/esd

Google Earth:
https://earth.google.com/web/

Sampling Vegetation Attributes:
https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1044175.pdf

Rangeland Hydrology and Erosion Model:
https://dss.tucson.ars.ag.gov/rhem/

Photo courtesy of Melvin Cody, Cody Ranch, Navajo Nation

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