Chapter 5 – Appendices

Appendix A. – Monitoring Plan

Introduction

The objective of this monitoring plan is to identify monitoring methodology and frequency to determine whether management is being properly implemented and whether the actions are effective at achieving or moving toward desired conditions.

Monitoring is a measure of indicators that detect change and may trigger further detailed analysis of a particular resource. Either monitoring or detailed analysis may trigger adaptive management options on the allotments on a seasonal basis or to verify changes needed in the Allotment Management Plan and permit.

Tables are provided that give an overview of monitoring needs on the allotments, followed by narratives that explain planned monitoring in more detail.

Monitoring Definitions

Monitoring: Monitoring is defined as: the orderly collection, analysis, and interpretation of resource data to evaluate progress toward meeting management goals and objectives. This process must be conducted over time in order to determine whether or not management objectives are being met.

Implementation Monitoring: Determines whether standards and management practices are implemented as detailed in an Allotment Management Plan (AMP), or Annual Operating Instructions (AOI). This short-term monitoring answers the question: was the management implemented as designed? It annually documents several items. Examples include:

1) Were management actions implemented as designed?

2) Did the management actions achieve the annual effect expected?

Items which may be documented through implementation monitoring include, but are not limited to: actual use (livestock numbers and days), condition of range improvements, etc.

Effectiveness Monitoring: Determines whether management practices are effective in moving the allotment toward a desired condition as described in the AMP. This long-term monitoring documents whether management actions are having the expected progress towards achieving resource management objectives. Examples include:

1) Have management practices met resource objectives or corrected problems?
2) Utilization measurements
3) Stubble height measurements
4) Tracking progress of specific PFC elements

Monitoring Summary

The following Tables 1 and 2 summarize the monitoring to be accomplished on the allotments.

Table 1: Summary of Monitoring by Allotment

Monitoring Item	Big Lake Allotment*	Burk	Molina Springs	Bush Creek
Riparian obligate vegetation height	X	X		
Ecological Status/Range Condition (trend, composition, cover)	X	X	X	X
Riparian Condition / Key PFC Elements	X	X		X
Soil Condition	As Needed	As Needed	As Needed	As Needed
Watershed / Soils Problem Areas	As Needed	As Needed	As Needed	As Needed

*** Monitoring will occur when allotment is stocked with livestock. Note: The Big Lake allotment needs monitoring until riparian = PFC in order to make it available to emergency grazing.**

Table 2: Specific Monitoring Items: Who, What, When and Where

Monitoring Item:	Methods	Timing (mid-season)	Frequency (Interval, years)	Where	Critical Triggers	Lead Responsibility
Riparian Obligate Vegetation height	Stubble Height	end of growing season and/or seasonal	Annually	Critical riparian areas	Sat: 6" going into winter Unsat: 8" going into winter	Range
Ecological Status/ Range Condition (trend, composition, ground cover)	Various methods*	late Summer	Year 5 & 10	Permanent transects	Poor or very poor range; Less than USLE Tolerance thresholds conditions	Range
Assess Riparian condition / key PFC elements	PFC	Mid Summer or Later	Unsat: year 5 & 10 Sat: year 10	Critical Areas	Downward or non-apparent trends	Watershed
Soil Condition	Various methods*	Any	As Needed: Onset, yr 5 & 10	Critical Areas	Downward or non-apparent trends	Watershed
Watershed/Soils Problem Areas	Field observation and/or inspection	Any	As Needed: Onset, yr 5 & 10	Gullies, headcuts, rills	Non-apparent or downward trends	Range

***Available from Interagency Interagency Technical,1996, Region 3 Rangeland Analysis and Management Training Guide, Principles of Obtaining and Interpreting Utilization Data on Rangeland, 5/07, and other acceptable methods**.

Monitoring Plan: Range Management

Implementation Monitoring -- Objective: Insure that the action(s) described in the Decision Document (EA) are implemented accordingly, as scheduled and are in compliance with the Forest Plan standards and guidelines.

A. Planning - Decision Implementation Schedule

B. Management – The standards and management practices are being implemented as detailed in an AMPs or AOIs.

C. Range Readiness - Range readiness checks will be conducted in anticipation of livestock entry in seasons when spring growth is delayed. The main objective is to determine whether plants are physiologically capable of being grazed and trampled without causing long term damage to the vegetation or soils.

This monitoring is completed prior to the scheduled turnout date.

1. Soil condition - The soil is firm, at or below field capacity.
   a. Saturated soils are not present. Soil compaction is minimal.

   b. Standing water and ponding from snowmelt is not present.

2. Vegetative development stage. With rest or deferment it may be possible to graze at earlier stages however not on an annual basis. Rangeland is generally ready when cool-season grasses are headed out, forbs are in full bloom, and brush and aspen is leafed out. Range readiness dates will vary between allotments with different resource attributes and management systems.

   Annual monitoring to adjust or evaluate the timing, intensity, frequency and season of use, and livestock numbers will be conducted during the grazing season (seasonal) and/or at the end of the growing season. This practices adaptive management and makes necessary management changes needed for plant development and recovery. The methods to be used may include , but are not limited to:

   1. Stubble Height – To monitor riparian vegetation in critical areas to have adequate stubble height at the end of the growing season in order to protect soil from high spring runoff and snowmelt in East, West and SU pastures of the Burk Allotment; Mandan, Round Cienega and Blanca Cienega pastures of the Big Lake Allotment; Bush and Steeple pastures of the Bush Creek Allotment, and other pastures as needed. A recommended minimum of 8 inches of stubble height of Carex species in satisfactory riparian condition (in PFC) and 8 inches of stubble height of Carex species in unsatisfactory riparian condition (FAR or NF) at the end of the growing season is expected to meet the desired condition.

   2. Utilization (Height Weight, Landscape Appearance, Grazed Class etc.) - To assure that conservative maximum use levels of 30%-40% in key areas are being met.

Along with actual use and climate data, these methods measure short-term effects of grazing activities and are used as a basis for adjusting grazing use.

3. Residual measurements – To assure that adequate standing bunch grasses are left post livestock grazing for antelope fawning hiding cover. Height of un-grazed grasses will be collected at the end of the growing season.

4. Compliance with Annual Operating Instructions (AOI) - The AOI includes pasture rotations, numbers to be grazed, pasture entry and exit dates, improvement maintenance and construction, and general annual allotment operating procedures.

5. Actual Use Information (Number of livestock and Season of Use). The permittee will keep an accurate record of the number of livestock run on the allotment and entry and exit dates of each pasture grazed.

Effectiveness Monitoring -- Objective: Effectiveness monitoring is intended to determine whether management is successful at moving rangeland resources towards desired conditions. The long term-term health of upland and riparian resources will be monitored in key areas or critical areas on each allotments using one or more of the following methods as needed, but not limited to:

A. Ecological Status and/or Range Condition Trend - Range clusters and areas suitable for determining long-term trend in vegetation should be read at 10th year. Emphasis on monitoring ecological status will be made.

    1. Ecological Status (Cover Frequency/Similiarity)

    2. Parker 3 Steps

    3. Paced Transect

B. Cover – The percent of an area that is covered by vegetation, rocks and litter. Ground cover is important to intercept raindrops impact before reaching the soil. An increase in vegetation and litter cover from baseline measures is considered as moving toward Desired Conditions (DC), a decrease is considered as not accomplishing DC.

    1. Point Cover

    2. Cover Frequency

    3. Parker 3 Steps

    4. Paced Transect

C. Forage Production – Forage production surveys for the allotments will validate capacity estimates and may result in further adjustments in stocking rates and season of use at 10th year. Forage production survey will facilitate capacity

determination if the rangeland is found to support more AUMs than the current high end or less than the current low end.

1. Production/Utilization surveys
2. Ocular Estimates

D. Noxious Weeds - The location of any noxious weeds should be noted in the utilization-monitoring write up. During this monitoring any noxious weeds shall be grubbed out or treated and documented regarding the location. Noxious weeds can be tracked from the same data used to collect plant composition and density.

Monitoring will be used to adjust or amend previously described actions in the decision document or AMP. Information on monitoring should be shared with the permittee and others concerned with the decision. If the monitoring data is not achieving or moving toward the Desired Conditions, Forest Service personnel must analyze the problem and decide on a course of action. If necessary, an ID Team may be instituted to determine if the goals and objectives are correct or need to be adjusted. Re-initiation of NEPA may not be necessary if the action is still within the scope of the original decision.

Monitoring Plan: Riparian, Watershed/Hydrology, & Soils

Watershed Hydrology Monitoring Methods

Under "watershed monitoring," most often the concepts of runoff timing, runoff quantity, runoff quality, and sediment yield come to mind. Unless grazing is overbearing and extreme as it was a century ago, these characteristics usually do not produce measurable change resulting from allotment management. Runoff timing and quantity is usually a function of either massive precipitation events such as large rainfalls or rain on snow events, or large-scale ground disturbing activities such as wholesale clear-cut logging or fires that remove all existing overstory and ground cover. Grazing that is even halfway balanced with utilizing around half of the forage production rarely has significant effect on runoff timing and quantity that is recognizable as being outside the normal range of variability. Potentially, grazing activities can be tied to flooding, however it is currently more likely a minor contributing factor, rather than a single causal agent. Runoff quality is difficult to assess as it is a function of when sampling occurs, such as: the start of a flood event, at its peak, or near its end. Dissolved solids usually peak near the start of a runoff event, while sediment flux peaks with discharge. Sediment discharge out of a watershed is not usually recognizable as extreme or out of norm until at the scale of landslides, massive gully formation, or following large area denudations such as following fires. The smaller scale of sediment discharge associated with grazing allotments is best monitored at a local scale, watching for pedestalled plants, surface rill erosion or gully formation within problem areas. Larger basin-scale monitoring of sediment movement is usually studied in relation to river or stream functionality (PFC discussed below) or on even larger scales which aim at geomorphological changes.

As watershed hydrology is intimately related to the health or functionality of its drainage network, monitoring drainage characteristics often pays off. The discussion below pertaining to "Riparian Areas" concerns the proper functioning condition (PFC) of drainage channels, which pertains to watershed monitoring.

There are numerous elements that influence watershed function: soil infiltration rates, ground cover, canopy cover, amount of overstory, soil type, soil condition including compaction, soil structure, slope, etc. Many of these factors have been combined into what are known as "runoff curves" in standard methods of calculating potential runoff from different ground cover scenarios such as urban areas, pavement, and agricultural fields, to name a few. These methods can estimate runoff from whole sub-watersheds or basins and are sensitive to gross differences in cover type, like for example an urban area versus an agricultural field. However, they are not designed to be sensitive to minute changes that occur from subtle differences in compaction for example, or slight changes in litter ground cover. Most runoff formulas use soil type as a constant (soil classes A thru D) and subtle differences in soils are not accounted for. Therefore the concept of runoff curve numbers is incapable of tracking allotment management changes and is wholly inadequate as a monitoring tool at smaller scale.

In terms of monitoring "watershed condition," most attention seems to focus on ground cover. This item is covered under "Soils" below. Related characteristics, such as monitoring local rill and gully formation or areas of excessive plant pedestalling are also discussed under "Soils." The condition of drainage channels is discussed under "Riparian Areas" below.

Soils Monitoring Methods

As soil formation is extremely slow, the conservation of soils – the basic resource – is of prime importance. Several attempts at modeling soil erosion have been made, however in order to simplify the countless contributing factors, most of these models were initially designed to simulate erosion from agricultural fields. Later, these models were extrapolated to wildland situations; however their results must be taken at best as gross estimates of actual values. Resulting values serve more as a basis of comparison rather than absolutes.

The most acclaimed of these erosion models is known as USLE, or the Universal Soil Loss Equation. It was developed in the 1950's under Walter Wishmeier at Purdue University. The USLE is the most comprehensive technique available for field use in estimating cropland erosion. It involves six major factors that affect upland soil erosion in terms of water: rainfall erosiveness, soil erodibility, slope length, slope steepness, cropping management techniques, and supporting conservation practices. Four values are commonly derived from USLE, including erosion rates and corresponding ground cover for: potential soil loss, natural soil loss, current soil loss and tolerance soil loss. These are further defined in the Apache-Sitgreaves Terrestrial Ecosystem Survey. Briefly, they are defined as follows. Natural soil loss is the rate of soil loss expected under climax conditions, potential soil loss is the loss rate expected under complete removal of ground cover, tolerance soil loss is the loss rate that can occur while sustaining inherent productivity, and current soil loss is the loss rate under existing conditions of effective ground cover.

The most important element in controlling erosion, according to the USLE model is **ground cover**. Data regarding effective ground cover is collected in numerous ways. It is collected from permanent range transects (Parker 3-Step), from Daubenmire transects, from pace transects, or even from ocular estimates. This ground cover data is sufficient to track changes in ground cover, which relates to watershed condition as well as soils.

If more detailed information is desired regarding soils, then the standard Region-3 protocol for **soil condition** is used which more closely looks at numerous site factors that enter into soil function. This may be of use in areas as small as a pasture, in order to assess what elements of soil condition may be at risk the most and it may also yield some answers regarding what needs to change for a better soil condition score.

In specific local instances, **problem areas** with obvious signs of erosion such as **rills, gullies, headcuts, or pedestalled plants** may be found. If documentation of this is desired, it is recommended to take photographs, roughly describe conditions and mark locations on maps so they can easily be relocated. It is advised to seek help from SO watershed specialists regarding restoration plans. If needed, conduct a soil condition assessment in order to help determine causes of accelerated erosion that can then be used to change livestock management or to seek other means of helping to correct the situation. In cases of large headcuts or gullies, different livestock management may help the healing process, but active restoration will be needed to reshape affected areas and to provide effective means of stabilization.

Riparian Area Monitoring Methods

The standard assessment protocol for riparian and wetland areas is the **PFC** procedure (Proper Functioning Condition). This assessment is established for lentic (wetlands) and lotic (streams) areas, and a separate procedure is used for each respective type of riparian area. The lotic procedure uses 17 key questions, while the lentic procedure uses 20 questions. During the assessment, it is encouraged to answer each question as detailed as possible. I cases of “no” answers, these items then become the focus for future monitoring to determine whether positive change has occurred. In this regard, monitoring of riparian areas becomes very simple, using established procedures, and being able to focus on changing only specific elements to obtain satisfactory conditions.

If needed, each of the individual **PFC elements can be quantified** by separate procedures on an as-needed basis. For example, if information is desired regarding species composition, a separate line transect can be established, or random transects can be read to establish current conditions so that future repeat data can be compared to establish trends. Similarly, methods to quantify any site characteristic can be found to help answer specific questions. Under normal circumstances, quantification of PFC elements is not necessary, and field conditions can be photographed and adequately described to serve the purpose of documenting current or improving conditions.

Lentic Area Stubble Height of sedges can be measured at onset of seed-set to help gage whether a minimum of 6 inches will be present going into winter in functioning areas, and whether a minimum of 8 inches will be present in non-functional and functioning-at-risk areas before going into winter. The purpose is to keep sedge roots healthy and abundant to protect soils, to cover bare ground or raw banks with vegetation to keep soils in place during

spring runoff and to encourage maximum growth of sedges needed for riparian / wetland function.

Riparian Condition – This monitoring tracks the effectiveness in improving or maintaining riparian condition.

1. Full PFC assessments of lentic or lotic areas
2. Assessment of key elements needing improvement

Monitoring Plan: Wildlife & Fisheries

Monitoring described for range, watershed, riparian and soils will meet the needs of wildlife and fisheries.

Monitoring of important wildlife habitat parameters (i.e. MSO and NOGO prey base, antelope fawn hiding cover) have been incorporated into the range monitoring planned for these allotments.

Fisheries desired conditions focus on maintenance of healthy watersheds, including riparian areas, in order to minimize downstream adverse effects to aquatic species from allotment generated sedimentation effects. Monitoring identified for soils, watershed and riparian are also crucial for aquatic resources.

Documentation of Monitoring

Monitoring will be documented and retained in District files.

Appendix B – Best Management Practices

A Best Management Practice (BMP) is a practice or combination of practices that are determined (by a state or designated area-wide planning agency) through problem assessment, examination of alternative practices, and appropriate public participation to be the most effective, practicable (including technological, economic, and institutional considerations) means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with water quality goals.

BMPs from various sources have been incorporated into the authorization, monitoring, adaptive management options and mitigation measures for the proposal. These sources include Arizona Department of Environmental Quality, Apache-Sitgreaves Land Management Plan, Forest Service Handbook 2509.22 (R3 Soil and Watershed Conservation Practices Handbook), and other sources listed in the Specialist Report for Watershed, Hydrology, Riparian and Soils.

The following are examples of BMPs incorporated into project design:

1. The **location, timing and intensity of livestock grazing** activities shall be implemented with objectives of achieving soil cover to prevent accelerated erosion and to protect water quality.

2. Planned grazing systems shall be implemented to maintain or improve plant cover while properly using the forage available, increasing efficiency by uniformly using all suitable parts of each grazing unit, reducing erosion and improve water quality, insuring a supply of forage throughout the grazing season, increasing production with improved quality of forage, enhancing wildlife habitat, promoting flexibility in the grazing program and buffer the adverse effects of drought. Proper stocking and improved distribution of cattle will be major considerations for evaluating effects of implementing a system.

3. Grazing shall be at an **intensity** that will maintain enough cover to protect the soil or improve the quantity and quality of desirable vegetation. Utilization guidelines may be adjusted by soil condition and other resource concerns. Key grazing areas will be monitored to determine when cattle should be moved to prevent over use. Riparian areas shall be identified as critical areas.

4. Utilize **salt** to improve livestock distribution. Salt a reasonable distance away from water or natural congregating areas such as roads, trails, and saddles in hills, and avoid key areas. Move salt when distribution objectives are not being met or to correct localized overuse problems.

5. **Structural range improvements**, when determined necessary to meet desired conditions, such as fences, water developments, trails and corrals, will be planned, constructed and utilized in a manner to enhance or maintain water quality.