Monitoring Plan 5

Introduction

The purpose of monitoring and evaluating the implementation of the Forest Plan is to inform the decision-maker of the progress toward achieving the goals, objectives, and standards and guidelines.

Monitoring will determine:

- If the management prescriptions is applied as directed.
- If standards are being followed.
- If the Forest is achieving the objectives of the Forest Plan.
- If the application of management prescriptions is responding to public issues and management concerns.
- If the effects of implementing the Forest Plan are occurring as predicted.
- If the costs of implementing the Forest Plan are as predicted and are acceptable.
- If management practices on adjacent or intermingled non-Forest lands are affecting the Forest Plan goals and objectives.

A detailed annual monitoring action program will be prepared as part of the total forest annual program of work. This annual monitoring program will include the details on the amount and location of monitoring to be accomplished based on the approved program of work and funds available for monitoring. Specific locations, intensity of sampling, person-days required, and costs, will be identified in the annual monitoring program. The activities to be monitored will be selected from this list in the rest of this chapter as outlined in Table 14.

Table 14

Monitoring Plan Activities and Costs for the First Decade – Columns Show Costs by Years One through Ten

	1	2	3	4	5	6	7	8	9	10
Watershed Condition									25,000	
Water Yield	200	200	200	200	200	200	200	200	200	200
Protection 1 (Insect & Disease)	200	200	200	200	200	200	200	200	200	200
Protection 2 (Visibility Condition)	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Grazing Capacity & Condition	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000
Wild Burro Monitoring		3,000		3,000		3,000		3,000		3,000
Riparian Condition	8,200	7,200				8,200	7,200			
Wildlife Habitat	6,000					6,000				
Indicator Species (Pinyon-juniper / Grassland)			11,000	8,000				11,000	8,000	
Indicator Species (Forest)					8,500					8,500
Cultural Resources	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800
Visual Quality	300	300	300	300	300	300	300	300	300	300
Timber 1 (Prescription Compliance)					100					100
Timber 2 (Saw timber Offered)	100	100	100	100	100	100	100	100	100	100
Timber 3 (Harvest Area Size)			200		200		200			
Timber 4 (Restocking of Lands)	200	200	200	200	200	200	200	200	200	200
Timber 5 (Unsuitable Lands)										1,000
Standard Guidelines				300				300		
Cost 1, 2, and 3	300	300	300	300	300	300	300	300	300	300
Outputs	100	100	100	100	100	100	100	100	100	100
TOTAL COST::	77,400	73,400	74,400	74,500	72,000	80,400	70,600	77,500	96,200	75,800

Watershed Condition

Expected Future Condition

There will be 2.8 million acres in satisfactory or better condition by end of Period 5. Presently, 2.2 million acres are in unsatisfactory condition. Projected rate of improvement by decade is to have the following acreage in satisfactory or better condition.

Period 1	Period 2	Period 3	Period 4	Period 5
0.8 MM Acres	1.0 MM Acres	2.0 MM Acres	2.6 MM Acres	2.8 MM Acres

Monitoring Method

Measure percent existing ground cover by vegetation strata by watershed. Ten 50-pace transects per vegetative strata per watershed (a total of 1000 transects). Monitor all watersheds once per decade in the ninth year. Reference Hydrology Note 14, June 1981, and Terrestrial Ecosystem Survey Handbook Chapter 8, both published by the Southwestern Region, U.S. Forest Service.

Cost

Twenty-five dollars per transect; total Forest cost = $25,000.

Reliability

Moderate

Evaluation

Estimated improvement acres must be at least 80% of the predicted values at the end of the ninth year or the ID Team will evaluate and plan modifications may be recommended.

Estimated Water Yield

Expected Future Condition

Projected average annual water yield *

Period 1	Period 2
357 M Acre Feet	375 M Acre Feet

* Based on ten year moving average at the end of the second decade, water yield projections will be re-evaluated.

Estimated Water Yield (continued)

Monitoring Method

Every decade in the ninth year, re-compute a ten-year running average of water yield utilizing stream gauge data.

Cost

Two thousand dollars ($2,000) per decade.

Reliability

Moderate.

Evaluation

Departure of 10% below the projected water yield at the end of the ninth year will require ID Team evaluation, and Plan modification may be necessary.

Protection 1 – Insect and Disease

Expected Future Condition

Through various silvicultural activities, slash treatment, and various control methods, insect and disease are not expected to have serious adverse effects on the Forest. Insect populations on the grasslands are cyclic and can be controlled as needed. Monitoring of insect and disease levels will provide information necessary to determine future impacts.

Monitoring Method

Determine that destructive insect and disease organisms do not increase to potentially damaging levels following management activities.

Periodic aerial surveys and ground checks on an opportunity basis will be used.

Cost

Two hundred dollars ($200) annually.

Reliability

Moderate.

Protection 1 – Insect and Disease (continued)

Evaluation

Aerial surveys will be evaluated to determine if a buildup results from a management practice. If a buildup occurs, an evaluation of significance will be made by the ID Team. If potentially damaging, the ID Team will modify management prescriptions.

Protection 2 – Visibility Condition

Expected Future Condition

Class 1 areas will retain good visibility to meet Class 1 standards. Visibility will be retained in form, line, feature, and color of characteristic landscapes.

Monitoring Method

Automated camera system and opportunity basis particulate sampling to determine visibility conditions in Class 1 wilderness areas, the purpose being to gather baseline condition information on visibility and determine if degradation is occurring in Class 1 areas.

Cost

Three thousand dollars ($3,000) annually per site - two sites planned.

Reliability

± 18%

Evaluation

Baseline data will be evaluated by the ID Team to determine if degradation is occurring as a result of a management practice. If potentially damaging, the ID Team will modify management prescriptions.

Monitoring Plan

Grazing Capacity and Range Condition

Expected Future Condition

Grazing capacity of 278,000 AUM's in thirty years and permitted use at the same level. The 1980 situation is grazing capacity of 259,425 AUM's and permitted use of 428,189 AUM's. Projected trend is as follows:

	Period 1	Period 2	Period 3	Period 4	Period 5
Capacity	247	251	272	275	278
Permitted	397	251	272	275	278

Monitoring Method

Production/utilization surveys on allotments where current permitted use exceeds estimated capacity and on allotments where improved management has been initiated during the decade. Estimate three new analysis starts per year and nine production/utilization surveys per year average on allotments where use exceeds capacity and to monitor recently initiated improved management practices. Reference FSH 2209.21 R-3 for range analysis and production/utilization survey instructions.

Grazing allotment inspections to determine if percent utilization of plants is within limits set by management plans. Inspections will provide verification of capacity estimates. Estimate 30 inspections per year.

Every five years work up Forest summary from completed analyses, production/utilization surveys, and inspections at midpoint and end of each decade.

Cost

$6,000 per range analysis; $2,000 per production/utilization survey, after implementation of an approved allotment management plan.

Inspections: $500 per inspection.

Forest total cost per year = $51,000

Reliability

Moderate.

Evaluation

Evaluate at year intervals to determine rate in meeting expected capacity. If below anticipated capacity or more than 5% above anticipated capacity, the ID Team will evaluate and Plan modification may be necessary.

Wild Burro Population

Expected Future Condition

Maximum population of 25. Population in 1980 was 31. Population located within existing range.

Monitoring Method

Helicopter survey in early spring on even-number years; site revisit method.

Cost

Three thousand dollars ($3,000) per count.

Reliability

High

Evaluation

When herd size exceeds population of 25, initiate capture activities.

Riparian Condition

Expected Future Condition

Riparian areas will be managed to achieve the following conditions:

1. Annual growth by volume in woody species will not be browsed more than 20 percent per year.
2. Crown cover of overstory species will be enhanced to 80 percent of potential for each vegetative type.
3. Fifty percent of cottonwood-willow and mix broadleaf acreage will be in structural Type1 in fifty years with the objective that 25 percent will be in structural Type IV in ten years and 50 percent in structural Type IV in 20 years.

Achievement of the above conditions will be indicated by the increased occurrence and density of management indictor species: bald eagle, Bell's vireo, summer tanager, hooded oriole, hairy woodpecker, Arizona gray squirrel, warbling vireo, western wood pewee, black hawk, and macro-invertebrates.

Riparian Condition (continued)

Monitoring Method

Establish 20 aquatic sample stations and do biotic condition index survey. Sample each station three times per year every five years in conjunction with Emlen survey transects (10 with low and 10 with high elevations).

Continue 10 existing Emlen survey transects on lower Verde and Salt Rivers and establish 10 additional transects in main tributaries under 3,500' elevation.

Establish 20 additional transects in riparian communities above 3,500' elevation.

Transects will be read three times per year in May, June, and July every fifth year, with low elevation transects being read in years 6 and 1 (i.e., the 6th and 1st years of decade, etc.), and with high elevation transects being read in 7 and 2.

Record occurrences of management indicators species, percent crown cover (with spherical densiometer), ocular estimates of percent browsing, and acreage of cottonwood-willow and mixed broadleaf reproduction.

Cost

Aquatic samples - $4,400 every fifth year.

Emlen transect - Low elevation, $6,000 every fifth year.
High elevation, $5,000 every fifth year.

Reliability

Moderate.

Evaluation

Compare trend of indicator species composition and density with baseline data at 5-year intervals. Static or downward trend will require ID Team evaluation, and Plan modification may be necessary.

Aquatic samples will be rated in accordance with Biotic Condition Index Values. An index value of less than 70 will require ID Team evaluation, and Plan modification may be necessary.

Management Indicator Species In Pinyon-Juniper, Chaparral, And Grassland/Desert

Expected Future Condition

Decreased occurrence and density of gray vireo, Townsend's solitaire, and plain titmouse in pinyon-juniper. Increased occurrence and density of ash throated flycatcher, common flicker, and rufous-sided towhee in pinyon-juniper. Increased occurrence and density of rufous-sided towhee and black-chinned sparrow in chaparral. Increased occurrence and density of savannah sparrow and horned lark in the desert grassland. Increased densities of black-throated sparrow and brown towhee in the desertscrub type.

Monitoring Method

Sample once every five years (in the years 8 and 3) in the pinyon-juniper and chaparral, in years 9 and 4 in the desertscrub and desert grassland. Take random samples of 25 cluster plots in pinyon-juniper, 20 cluster plots in chaparral, and 30 plots per cluster will be used to record occurrences of the species listed above for each vegetative type.

Cost

Pinyon-juniper and chaparral - $ 11,000 every fifth year.
Desert/semi-desert grassland - $ 8,000 every fifth year.

Reliability

Moderate.

Evaluation

Compare trend of the indicator species composition and density with baseline data at 5-year intervals. Static or downward trend will require ID Team evaluation, and Plan modification may be necessary.

Wildlife Habitat Diversity In Analysis Areas 5512, 5530, 5536, and 5542

Expected Condition

Horizontal and vertical diversity provided by:

% Of Tentatively Suitable Acres	% Of Suitable Acres	Stand Age Class (Years)	Class	Cover Class	Management Indicator Species
(EIS Table 80) 8%			Permanent Opening	Forage	Elk, turkey, western bluebird, violet-green swallow
	13.3	0-20	Regenerated/ Seedling	Forage	Elk, turkey
	13.3	21-40	Saplings/Poles	Forage/Hiding	Elk, turkey
	13.3	41-60	Poles*	Hiding/Forage	Elk
	13.3	61-80	Poles/ Sawtimber*	Hiding/Forage/ Thermal	Elk, Abert's squirrel
	13.3	81-100	Sawtimber	Thermal	Abert's squirrel, elk, hairy woodpecker, western bluebird
	13.3	101-120	Sawtimber	Thermal	Abert's squirrel, hairy woodpecker, western bluebird, violet-green swallow, elk
	10	121-180**	Sawtimber/ Vertical Diversity	Thermal/ Forage	Hairy woodpecker, western bluebird, violet-green swallow, Abert's squirrel, pygmy nuthatch, elk
	10	181-240**	Sawtimber/ Vertical Diversity	Thermal/ Forage	Pygmy nuthatch, goshawk, turkey, hairy woodpecker, violet-green swallow, elk
	100				

* These two age classes comprise the pole age class in the suitable forest land. Thirty eight percent of the pole acreage in each management unit will be manage at 120+ BA meet special wildlife habitat needs (i.e. Abert's squirrel).

** These are represented by mistletoe free stands.

Monitoring Method

Monitoring will be done every five years.

Vegetation (Habitat)

On a five-year cycle a 5,000-acre management unit, selected at random, will be subjected to a modified silvicultural exam to show the existing age class diversity. The resultant change in age class diversity over time will be compared to the expected condition. This will be used as a sample to indicate age class diversity within the pine/mixed conifer type.

Cost

Six thousand dollars ($6,000) every fifth year.

Reliability

High

Evaluation

Review by the ID Team will confirm the desired trend or identify the need for modification of the Plan.

Management Indicator Species

Expected Future Condition

Indicator species will show trend of increase in population. Habitat conditions should be improved and age class distributions of trees in the forested ecosystems should be improved.

Monitoring Method

On a five cycle on the same management unit as above, Management Indicator Species will be monitored. Population trends for elk, turkey and Abert's squirrel will be established using Arizona Game and Fish Department harvest data records, hunter questionnaires and supplemented by currently acceptable field sampling techniques as necessary. Western bluebird, violet-green swallow, hairy woodpecker, pygmy nuthatch and goshawk population trends will be established using variable plot sampling. Sixty points will be established at random throughout the management unit or on transect lines on at least 350-foot intervals. Points will be sampled times (May, June, July) as described in GTR RM-89 by Szaro and Balda. Relative species frequencies, species composition and relative densities will be used to infer or indicate desired condition or trend of habitat within the ponderosa pine/mixed conifer type.

Management Indicator Species (continued)

Cost

Eighty-five hundred dollars ($8,500) every fifth year.

Reliability

Moderate.

Evaluation

Compare trend of indicator species composition and density with baseline data at 5-year intervals. Static or downward trend will require ID Team evaluation, and Plan modification may be necessary.

Degree of Protection Of Cultural Resources

Expected Future Condition

All National Register eligible resources protected from project-derived ground-disturbing activities and from willful or negligent damage, including vandalism and recreation.

Monitoring Method

Conduct sample inspections of project areas for ten percent of all in-service projects, ten percent of all out-service projects less than 100 acres in size and all out service projects over 100 acres in size.

Identify recreation impacts to cultural properties and establish test sites and inspection schedules to monitor site conditions.

In cooperation with Forest and Zone law enforcement, identify areas and properties with high probability for vandalism. Provide support to law enforcement as required.

Cost

Forty-eight hundred dollars ($4,800) per year.

Reliability

Moderate.

Evaluation

No ground disturbing resource activities will be permitted until archeological clearance survey is completed and mitigating requirements developed. Protective actions will be undertaken if vandalism or recreational activities threaten site integrity.

Visual Quality Level

Expected Future Condition

All analysis areas will be at specified visual quality level or better.

Monitoring Method

Annual random sample of areas having specified quality levels of retention and partial retention. One hundred points will be randomly selected from mile points on roads and trails providing viewer positions for these areas.

Cost

Three hundred dollars ($300) per year.

Reliability

Moderate.

Evaluation

Failure to meet the following visual quality level acres will require ID Team evaluation, and Plan modification may be necessary:

1. 20% or more of visual quality levels acres in “Retention” is reduced. The duration of visual impact should be accomplished either during operation or immediately after.
2. 20% or more of visual quality level acres in “Partial Retention” is reduced. The duration of visual impact should be accomplished as soon after project completion or at a minimum within the first year.

Timber 1 - Prescription Compliance

Expected Future Condition

Achieve a more balanced age class distribution, appropriate growing stock levels, appropriate rotations, and provide wildlife habitat needs.

Monitoring Method

Timber Management Information System (TMIS); staff field reviews of 5% of treatment projects.

Timber 1 (continued)

Cost

One hundred dollars ($100) each report in years 5 and 10.

Reliability

High

Evaluation

If planned treatment varies ± 25% from schedule at 5 year intervals, ID Team will evaluate, and Plan modification may be necessary.

Timber 2 – Sawtimber Offered

Expected Future Condition

Annual sale offerings will be made on a sustained yield basis.

Monitoring Method

PAMARS (MAR 17.1) reported on an annual basis.

Cost

One hundred dollars ($100) annually.

Reliability

Moderate.

Evaluation

Evaluations will be made at 3rd and 6th years of the decade to insure that cumulative deviation for the decade does not exceed ± 10%. Noncompliance will require evaluation by the ID Team, and Plan modification may be necessary.

Timber 3 – Harvest Area Size

Expected Future Condition

Wildlife habitat will be improved through timber harvest by manipulation of stand sizes, methods of cut, and juxtaposition of stands.

Monitoring Method

Review maximum size limits for harvest areas to determine whether such size limits should be continued. A sample of stands will be checked to see if reason may exist to change the size of stands. The ID Team will be the sampling team. Ten percent (10%) of stands treated per year will be sampled.

Cost

Two hundred dollars ($200) per report in years 3, 5, and 7.

Reliability

Moderate.

Evaluation

Reports will be prepared every third year. The ID Team will determine if integrated stand management practices are meeting wildlife habitat objectives.

Timber 4 – Restocking of Lands

Expected Future Condition

All lands harvested for timber production as part of the allowable sale quantity are adequately restocked within 5 years after final harvest. Adequately restocked means 80% of the timber sale area has at least a minimum of trees commensurate with site quality by forest type and management objectives.

Monitoring Method

Each timber sale area will be considered a population. To be considered adequately stocked 80% of the areas would have to have the prescribed number of trees. Samples will be taken randomly within each timber sale area using stand exams and reforestation handbook procedures and enter results in stand record system. Once 2 years after final harvest and once the 4th year following year following harvest. If problem are indicated, more frequent samples will be made.

Timber 4_ Restocking of Lands (continued)

Cost

Two hundred dollars ($200) annually.

Reliability

High

Evaluation

If samples indicate inadequate stocking, i.e. less than minimum stocking on 80% of the sample areas, an evaluation by the ID Team will be made, and Plan modification may be necessary.

Timber 5 – Unsuitable Lands

Expected Future Condition

Better define those areas that may be unsuitable for sustained yield timber production.

Monitoring Methods

1. Review new or updated soil survey data.
2. Development of better technology for regeneration establishment.
3. Stand exams.
4. Timber inventory results.

Cost

One thousand dollars ($1,000) in the year of evaluation.

Reliability

High

Evaluation

The data monitored will be used as the basis for an evaluation to determine which lands are suited to timber production. This evaluation will be made with revision of the Forest Plan or the tenth year of the decade.

Standards and Guidelines

Expected Future Condition

Application of standards and guidelines will assure achievement of planned management direction.

Monitoring Method

Every four years review District General Management Reviews, Program Reviews, Activities Reviews, and public comments. Reporting will be done in the 4th and 8th years of the decade period.

Cost

Three hundred dollars ($300) for each report in years 4 and 8.

Reliability

High.

Evaluation

If specific monitoring items in this Monitoring Plan do not meet established evaluation criteria, the ID Team will evaluate and Forest Plan modification may be necessary.

If standards and guidelines not specifically monitored in the Monitoring Plan are not accomplished to the level of acceptance as recommended by the ID Team and established by the Forest Supervisor, the Forest Plan will be evaluated and Plan modification may be necessary.

Monitoring Plan

Costs 1

1. **Item Monitored:**

   Unit costs

2. **Purpose:**

   Federal regulation

3. **Monitoring Method:**

   Annual PAMARS reporting system

4. **Frequency:**

   At the end of each fiscal year.

5. **Expected Precision/Reliability:**

   ±5%/±20%

6. **Time For Reporting:**

   Annually at close of each fiscal year.

7. **Cost:**

   $100 annually

8. **Evaluation:**

   If unit costs vary more than ± 20%, an evaluation will be made

Costs 2

1. **Item Monitored:**

   Total annual budget

2. **Purpose:**

   Verify ability to implement Forest Plan

3. **Monitoring Method:**

   Annual PAMARS reporting system and Regional Forester's Program, Budgeting and Information System

4. **Frequency:**

   At end of each fiscal year.

5. **Expected Precision/Reliability:**

   ±5%/±5%

6. **Time For Reporting:**

   3rd, 6th, and 9th year

7. **Cost:**

   $100 per report

8. **Evaluation**

   If budget varies more than – 10% or + 15% from an average annual over 3 years, an evaluation will be made by the ID Team, and Plan modifications may be necessary.

Costs 3

1. **Item Monitored:**

   Budget by program component

2. **Purpose:**

   Verify ability to implement Forest Plan

3. **Monitoring Method:**

   Annual PAMARS reporting system and Regional Forester's Program and Budgeting and Information System.

4. **Frequency:**

   At each of each fiscal year

5. **Expected Precision/Reliability**

   ±5%/±5%

6. **Time For Reporting:**

   3rd, 6th, and 9th year.

7. **Cost:**

   $100 annually

8. **Evaluation:**

   If program components vary more than --10% or +15% from an average annual over 3 years, the ID Team will make an evaluation, and Plan modification may be necessary.

Monitoring Plan

Outputs

1. **Item Monitored:**

   Management attainment report items

2. **Purpose:**

   Verify achievement of output targets

3. **Monitoring Method:**

   Management Attainment Report

4. **Frequency:**

   Once per year

5. **Expected Precision/Reliability**

   ±5% / ±5%

6. **Time For Reporting:**

   End of fiscal year

7. **Cost:**

   $100 per year

8. **Evaluation:**

   If outputs fall outside the scheduled range of implementation, the ID Team will make an evaluation, and Plan modifications may be necessary.