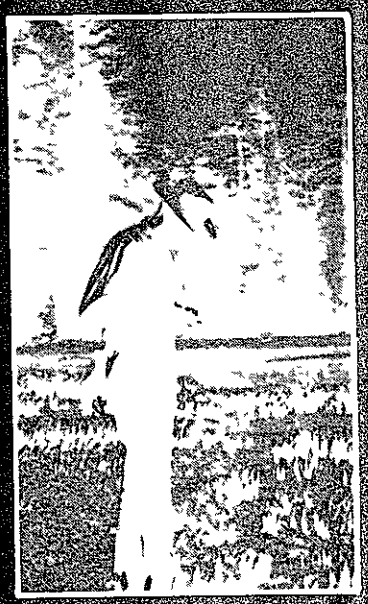
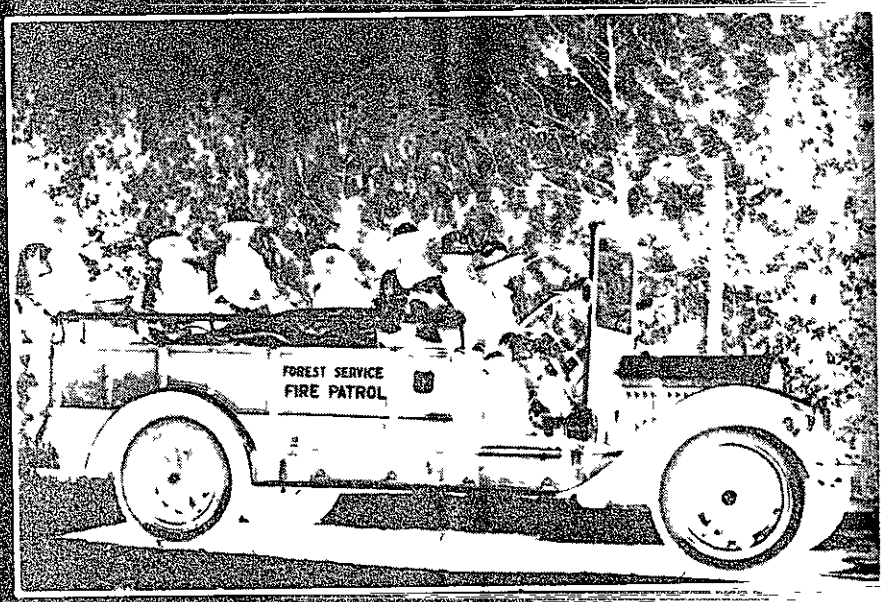
Chapter 5. Monitoring and Evaluation





Ch. 5 Monitoring and Evaluation

Monitoring and Evaluation

Purpose

The purpose of monitoring and evaluating this Plan is to:

1. determine compliance of management activity with the Management Direction.
2. assess adequacy of the Management Direction to achieve desired results.
3. determine propriety of assumptions and projections employed in Plan formulation.

Process

Monitoring of the resources and management activities and effects as prescribed in the following Monitoring Plan by Resource will be performed by appropriate individuals throughout the Forest as follows:

1. Forest Staff. Each Staff Officer is responsible for a) preparing a more detailed resource monitoring plan for his/her respective function, with assistance from the District Rangers; b) providing technical advice and support in implementing the monitoring plan; c) periodically reviewing activities to ensure implementation of monitoring plans; and d) assembling the monitoring results at the close of each fiscal year.

2. District Rangers. Each District Ranger is responsible for a) assisting the Forest Staff Officers to prepare monitoring plans for each resource; b) including monitoring in the annual work plans of resource specialists reporting to him/her; c) ensuring that monitoring is carried out according to the plans, and d) submitting the results of monitoring to the appropriate Staff Officer.

3. Land Management Planning Staff Officer. At the close of each calendar year, the Land Management Planning Staff Officer will gather together all monitoring information, evaluate the results with the Forest Staff, and formally report the findings and recommendations to the Forest Supervisor. The decision-making process is shown on Figure 5-1.

Monitoring Plan by Resource

The following tables describe the monitoring to be performed. The meaning of the various columns is as follows:

1. Activity, Effect, or Resource to be Measured. A statement of what will be examined.

2. Monitoring Objective. A statement of the purpose of the monitoring activity.

3. Monitoring Techniques; Sample Size. A description of the methods of data gathering; an indication of the extent of sampling which will be assumed to represent the entire activity, effect, or resource.

4. Expected Precision. The accuracy with which data is collected, rated low, moderate, or high according to whether the maximum measurement is within 50%, 33%, or 10% of the sample mean, respectively.

5. Expected Reliability. Based on the ratio of sample size to population, a measure of how accurately the observed data reflects the total situation. Rated qualitatively low, moderate, or high.

6. Minimum Monitoring Frequency. The frequency with which observations will be taken.

7. Standard of Comparison. The anticipated result, level, or status of the action, effect, or resource to be monitored.

8. Variation from Standard Requiring Further Action. The expected variation of observations in relation to the standard. When this limit is exceeded, the cause must be rectified or the monitoring process modified, as appropriate. (See process chart, figure 5-1.)

9. Responsible Staff. The management position responsible for the periodic monitoring.

10. Average Annual Cost. The PNF's best estimate of the additional cost of the prescribed data collection beyond the current monitoring activity.

11. Priority. The following ranking will be used as a guide in establising monitoring priorities: 1-Legal Requirement; 2-Regional/Forest Requirement; 3-Information Need.

Figure 5-1

Monitoring Process Flow Chart

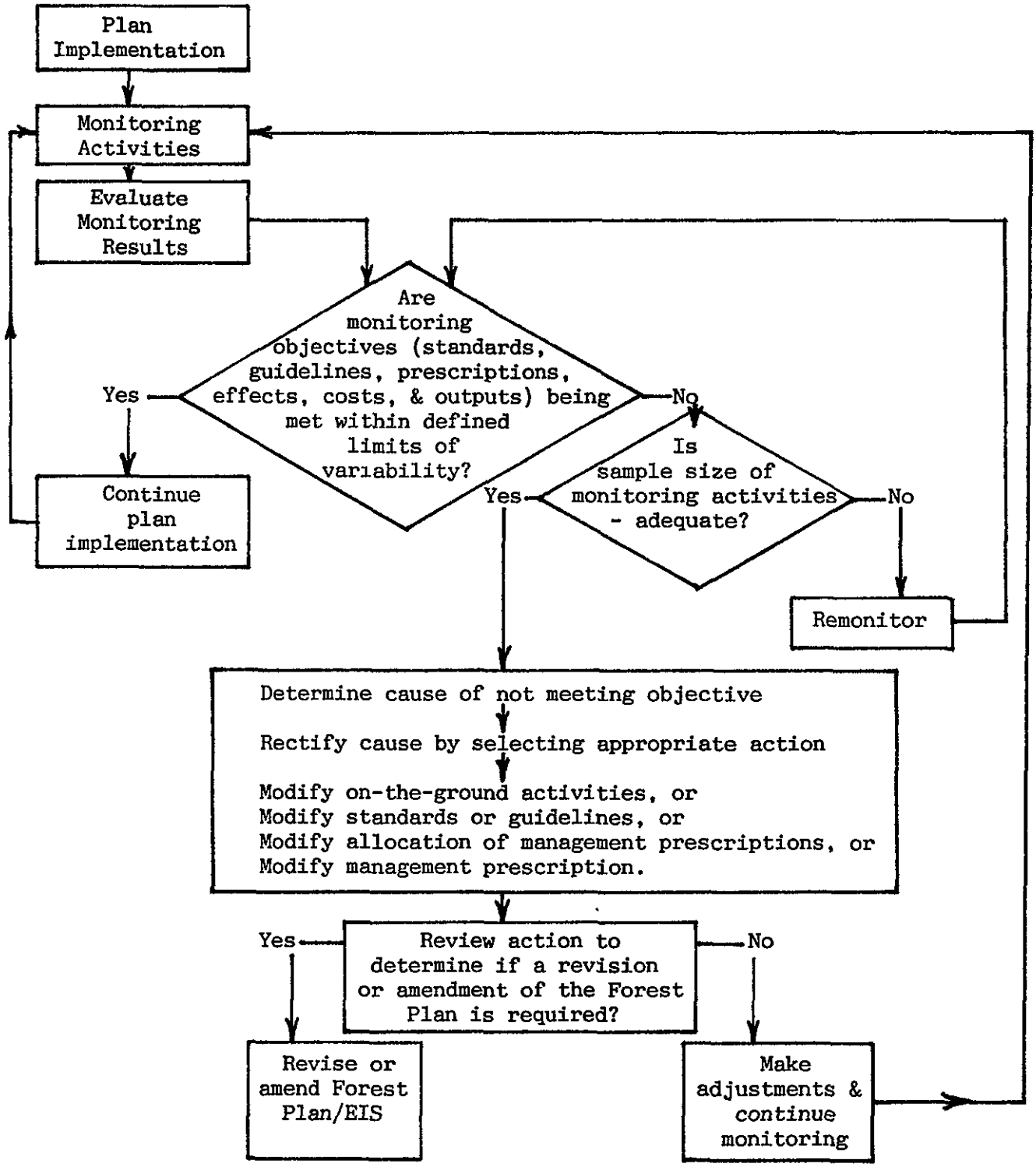


Table 5-1 (1 of 17)

Monitoring Plan by Resource

ACTION, EFFECT, OR RESOURCE TO BE MEASURED	MONITORING OBJECTIVE	MONITORING TECHNIQUES; SAMPLE SIZE	EXPECTED PRECISION	EXPECTED RELIABILITY	MINIMUM MONITORING FREQUENCY	STANDARD OF COMPARISON	VARIATION FROM STANDARD REQUIRING FURTHER ACTION	RESPONSIBLE STAFF	AVERAGE ANNUAL COST	PRIORITY NUMBER
ECONOMICS										
Units Costs	Improve cost estimates for planning purposes.	Examine expenditure and allocation reports; as needed for reliable accuracy.	High	High	Yearly	Costs assumed in plan formulation.	10% variance from standard.	Planning Officer	$2,000	3
1. RECREATION										
Recreation Opportunity Spectrum status.	Determine integrity of ROS class acreages.	Project plan review; all projects.	Moderate	Moderate	Yearly	ROS delineation guidelines.	More than 500 acre change from current classification.	Recreation Officer	$2,100	2
"	Compare actual to compatible use and capacity.	RIM data; all areas.	Moderate	Moderate	Yearly	ROS class setting and capacity guidelines.	20% variance from standard.	Recreation Officer	$2,100	3
Middle Fork Feather River Recreation Zone character.	Determine if Recreation Zone objectives are being met.	Determine if provisions of scenic easements are being complied with.	Moderate	Moderate	Every two years	Compliance with easement provisions.	Any deviation from easement provisions.	Recreation Officer	$1,200	2
Off-road vehicle effects.	Determine effect of ORV's on critical soils, vegetation, cultural and visual resources, fish and wildlife, and other uses.	Visual evaluation; as needed.	Low	Moderate	Yearly	FSM 2355	Unacceptable soil or other resource damage, or conflicts with other users.	Recreation Officer	$2,100	3
Wilderness Area use.	Determine capacity; determine if use exceeds capacity.	Trail and camping area inspection; throughout heavy use areas.	Moderate	Moderate	Every 5 years	Wilderness Management Plan.	Overuse causing reduction in wilderness values.	Recreation Officer	Current program costs.	1

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Monitoring Plan by Resource

ACTION, EFFECT, OR RESOURCE TO BE MEASURED	MONITORING OBJECTIVE	MONITORING TECHNIQUES; SAMPLE SIZE	EXPECTED PRECISION	EXPECTED RELIABILITY	MINIMUM MONITORING FREQUENCY	STANDARD OF COMPARISON	VARIATION FROM STANDARD REQUIRING FURTHER ACTION	RESPONSIBLE STAFF	AVERAGE ANNUAL COST	PRIORITY NUMBER
2. VISUAL RESOURCES										
Visual quality.	Determine compliance with Visual Quality Objectives.	Project plan and field review; all projects in Retention, 1/2 projects in Partial Retention, spot checks of projects in Modification.	Moderate	Moderate	Each project	Forest Plan Visual Quality Objectives	More than 10% decline of 1 and 2 sensitivity level acreages and 33% decline of others.	Recreation Officer	$2,000	2
Visual resource restoration.	Determine need for & success of visual quality restoration.	Field reviews and photo points; all new degraded sites that may not meet VQO's.	Moderate	Moderate	Yearly	Forest-wide Standards & Guidelines for degraded sites.	Less than 50% restoration success.	Recreation Officer	$500	3
3. CULTURAL RESOURCES										
Site integrity in project areas.	Maintain site integrity.	Site inspection; all timber sales over 1 MMBF with sites and 10% of other projects with sites.	High	High	Yearly	FSM 2361, TSC 2400-6	Any loss of integrity.	Recreation Officer	$7,000	1
Vandalism in non-project areas.	Determine protection needs.	Site inspection/ surveillance; as needed.	High	Low	Yearly	FSM 2361; developed Protection Action Plans (P.A.P.)	Any continued loss of integrity.	Recreation Officer	$3,000	1
4. WILDLIFE, FISH, AND SENSITIVE PLANTS										
Wildlife populations	In cooperation with the Calif. Dept. of Fish & Game, determine effectiveness of management direction for viability of:									

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Monitoring Plan by Resource

ACTION, EFFECT, OR RESOURCE TO BE MEASURED	MONITORING OBJECTIVE	MONITORING TECHNIQUES; SAMPLE SIZE	EXPECTED PRECISION	EXPECTED RELIABILITY	MINIMUM MONITORING FREQUENCY	STANDARD OF COMPARISON	VARIATION FROM STANDARD REQUIRING FURTHER ACTION	RESPONSIBLE STAFF	AVERAGE ANNUAL COST	PRIORITY NUMBER
	Bald Eagle Breeding Population 1) Determine trends of breeding population. 2) Evaluate trends in nesting and wintering habitat designation to meet Plan objectives.	1) Reproductive surveys of occupied and potential sites. 2) Number of territory plans; survey of habitat capability of occupied and potential habitat.	High	High	1) Annually at known sites. 2) Specific project review.	1) Plan objectives and Management Area Direction; Pacific States Bald Eagle Recovery Plan. 2) Bald Eagle Rx, Bald Eagle habitat Capability Model; Management Area	1) Any change in breeding population; any reduction in wintering population unexplained by regional shifts as determined by Statewide surveys. 2) Any loss of habitat capability as a result of management activity.	Range/Wildlife Officer	$400 a pair	1
	Goshawk 1) Insure project compliance with regional standards and guidelines and Forest objectives for goshawks. 2) Determine population and habitat trends in designated areas.	1) Nest grove designation; documentation of habitat characteristics of nest groves. 2) Survey of designated habitat to determine occupancy and reproductive success.	High	High	1) All major habitat modification projects planned in areas designated in Plan for goshawks; nest groves established per year according to Plan targets. 2) Survey for occupancy in 25% of established nest groves annually; post project evaluation.	1) Goshawk Rx., Goshawk Habitat Capability Model, Regional MMF's, Management Area Direction.	1) No deviation from S&G's established for goshawk nest groves. Establishment of less than six nest groves per year; project planning without establishment of nest groves where targets exist. 2) No decline in 5 year trend for territory occupancy and reproductive success as compared to WHR zones.	Range/Wildlife Officer	$2,000	2
	Spotted Owl 1) Ensure project compliance	1) Field review of project planning and implementation;	High	High	Annually	1) Regional Standard and Guidelines, Spotted Owl Rx;	1) Decline in spotted owl network territory	Range/Wildlife Officer	$2,000 per SOHA	2

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Monitoring Plan by Resource

ACTION EFFECT, OR RESOURCE TO BE MEASURED	MONITORING OBJECTIVE	MONITORING TECHNIQUES; SAMPLE SIZE	EXPECTED PRECISION	EXPECTED RELIABILITY	MINIMUM MONITORING FREQUENCY	STANDARD OF COMPARISON	VARIATION FROM STANDARD REQUIRING FURTHER ACTION	RESPONSIBLE STAFF	AVERAGE ANNUAL COST	PRIORITY NUMBER
	with Regional Standards and Guidelines; and Spotted Owl Rx. 2) Determine population and habitat trend in network territories. 3) Validate Regional Standards and Guidelines for maintaining viable populations.	counts of established spotted owl territory plans 2) Quantify habitat characteristics and conduct direct counts of breeding pairs and reproductive success in a sample of network territories using techniques identified in the Spotted Owl Monitoring Handbook (currently under development). Sample sites will be coordinated with California Department of Fish and Game. 3) Same as (2) above but conduct counts in a sample of sites containing a variety of habitats.				Establishment of less than the required number of SOT's as specified in the Management Area Direction. 2) Change in rate of occupancy and reproductive success in network territories; habitat capability objective in Plan. 3) Comparison standards set by the Spotted Owl Research, Development, and Application program in conjunction with State agencies.	habitat conditions below levels in Regional S&G's, the Spotted Owl Rx., or as specified in territory management plans. 2) Decline in habitat capability from the level specified in the Forest Plan. 3) Significant deviation from Regional S&G's; occupancy of "unsuitable habitat" by reproductively successful pairs of owls; rates of territory occupancy and reproductive success significantly decline when management activities occur in network territories.			
	Peregrine Falcon Verify nest and reproductive success of peregrine falcons.	Field surveys old adults and young; all existing occupied and high potential sites.	Moderate	High	Annual	Success rates of other similar sites.	Greater loss of peregrines than average statewide program.	Range/Wildlife Officer	1 site in current program cost; surveys of high potential areas estimated at $200 to $400 a site.	1

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Monitoring Plan by Resource

ACTION, EFFECT, OR RESOURCE TO BE MEASURED	MONITORING OBJECTIVE	MONITORING TECHNIQUES; SAMPLE SIZE	EXPECTED PRECISION	EXPECTED RELIABILITY	MINIMUM MONITORING FREQUENCY	STANDARD OF COMPARISON	VARIATION FROM STANDARD REQUIRING FURTHER ACTION	RESPONSIBLE STAFF	AVERAGE ANNUAL COST	PRIORITY NUMBER
	Golden Eagle, Prairie Falcon Documentation of occupancy of nest sites and habitat trends in designated areas.	Field review of project planning and implementation; direct counts of adults and young at selected nest sites.	Moderate	Moderate	Report on territory occupancy and reproductive success at selected sites annually.	Project specific mitigation measures.	Any decline in habitat capability or reproductive success due to management activity; failure to implement project specific mitigation measures.	Range/Wildlife Officer	$500	2
	Goose Determine trends in nesting population.	Counts of adults and young on selected sites.	Moderate	Moderate		Nesting/production records.	Trend of decline in numbers of nesting adults.	Range/Wildlife Officer	Part of program management.	
	Woodpecker Group Ensure project compliance with Forest Standards and Guidelines for snags.	Sample counts of snags on project areas.	High	Moderate	Annually on selected projects.	Forestwide S&G for snags; recommended project specific mitigation measures.	Snag numbers and distribution below S&G or project specific recommendations; failure to develop plan and timetable to correct deficiency.	Range/Wildlife Officer	Part of program management.	2
	Trout and Largemouth Bass Determine population and habitat trends in relationship to management activities.	1) Verify trend in habitat quantity, quality, population size and distribution of key populations. 2) Assess management impacts on selected populations. 3) Evaluate effectiveness of Wild Trout plans; and fish habitat improvement projects.	Low	Moderate	1) As required by Wild Trout Plans and project plans. 2) 20% of identified monitoring sites annually and 5 year trend analysis.	Forest Plan Standards and Guidelines, Wild Trout Plans, baseline data, Habitat Capability Models for trout license, flow releases for FERC hydroelectric projects.	Identified negative trends in population and habitat. Failure to implement BMP's on projects that impact water bodies. Flow releases are less than license releases.	Range/Wildlife Staff in cooperation with California Department of Fish and Game.	$10,000	3

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Monitoring Plan by Resource

ACTION, EFFECT, OR RESOURCE TO BE MEASURED	MONITORING OBJECTIVE	MONITORING TECHNIQUES; SAMPLE SIZE	EXPECTED PRECISION	EXPECTED RELIABILITY	MINIMUM MONITORING FREQUENCY	STANDARD OF COMPARISON	VARIATION FROM STANDARD REQUIRING FURTHER ACTION	RESPONSIBLE STAFF	AVERAGE ANNUAL COST	PRIORITY NUMBER
	Deer Determine population trends in relation to management activities; ensure project compliance with recommended mitigation measures.	Comparison of predicted habitat capacity with population estimates from California Department of Fish and Game; measurement of deer response to management practices on selected projects.	High	Low to Moderate	5 year population trend analysis; specific intervals on selected projects to determine habitat capacity.	Deer herd plans; project specific recommendations; predicted deer populations in FEIS.	Populations below predicted levels; failure to fully implement project specific recommendations.	Range/Wildlife Officer	Costs for project compliance are in program management or project costs; $6,000 annually to determine habitat capacity in relation to management activity.	2
	Marten Monitor changes in habitat capability and distribution of martens.	An analysis of habitat capability will be completed when the Forest database is updated. On projects where martens occur, specific mitigation measures will be developed. Marten distribution will be monitored through information provided by California Department of Fish and Game, surveys, and incidental sightings of animals and sign.	Low	Low	Sightings of marten will be reported annually.	Project specific checks on implementation of mitigation measures; Marten Rx.	Any decline from Plan objectives.	Range/Wildlife Officer	$1,000/ site specific survey	2

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Monitoring Plan by Resource

ACTION, EFFECT, OR RESOURCE TO BE MEASURED	MONITORING OBJECTIVE	MONITORING TECHNIQUES; SAMPLE SIZE	EXPECTED PRECISION	EXPECTED RELIABILITY	MINIMUM MONITORING FREQUENCY	STANDARD OF COMPARISON	VARIATION FROM STANDARD REQUIRING FURTHER ACTION	RESPONSIBLE STAFF	AVERAGE ANNUAL COST	PRIORITY NUMBER
	Gray Squirrel Determine trends of selected habitat components, especially hardwoods.	Summarize acreage, species composition, existing and desired basal area of hardwoods in stands being managed to meet the hardwood standards as planned on a compartment basis.	Moderate	Moderate	Annually	Project specific mitigation measures; Management Area Direction for amounts of hardwoods.	Hardwoods in amount or distribution less than amounts listed in Management Area Direction or levels recommended on project specific basis.	Range/Wildlife Officer	Included in program management or project cost.	2
	Willow Alder Community Determine project compliance with BMP's and effects on structure and distribution of riparian vegetation.	Field review of project planning and implementation.	Moderate	High	Report on project implementation annually.	Specific project mitigation and improvement recommendations.	Failure to fully implement BMP's; loss in distribution, structure, or amount of riparian vegetation.	Range/Wildlife Officer in cooperation with Watershed Officer and California Department of Fish and Game.	Included in program management or project cost.	1
	Sensitive Plants Species Habitat 1) Maintain viable populations of sensitive and special interest plant species distributed throughout their range in the Forest. 2) Detect changes in key populations. 3) Assess management impacts on selected populations.	Use applicable techniques identified in interim or existing mgt. guides.	High	High	Annually. All data gathered on new populations discovered and information on the viability of species to be forwarded to the Calif. Natural Diversity Base (CNDDB) and FWS, Sacramento.	FSM 2670 Forest Plan S&G's, Individual plant species mgt. guides. Sensitive plant handbook schedule for completion of species management guides and botanical investigations.	Any significant decreases in population, vigor, abundance, and distribution that effects long-term viability of the species, or increases the potential for formal federal listing under the ESA.	Range/Wildlife Officer		2

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Monitoring Plan by Resource

ACTION, EFFECT, OR RESOURCE TO BE MEASURED	MONITORING OBJECTIVE	MONITORING TECHNIQUES; SAMPLE SIZE	EXPECTED PRECISION	EXPECTED RELIABILITY	MINIMUM MONITORING FREQUENCY	STANDARD OF COMPARISON	VARIATION FROM STANDARD REQUIRING FURTHER ACTION	RESPONSIBLE STAFF	AVERAGE ANNUAL COST	PRIORITY NUMBER
Wildlife habitat maintenance	Determine compliance with the plan direction for Management Indicator Species (MIS) habitat.	Summarize acres of suitable habitat for each MIS by Mgmt. Area using timber inventory data; all MIS.	Moderate	Moderate	Every ten years or whenever timber inventory is conducted.	As specified in Management Area Direction.	Quantity and suitability of habitats less than minimum standards.	Range/Wildlife Officer	$2,000	2
Snags and downed logs.	Determine compliance with Forest-wide Standards and Guidelines.	Inventory during timber sale planning, compartment exams, or fuel reduction programs; all projects.	Moderate	Moderate	Annual	Minimums specified in Forest-wide Standards.	Density and distribution less than minimum standard.	Range/Wildlife Officer	$6,000	2
Habitat improvements.	Determine compliance with planned habitat improvement program.	Compare accomplishments with Forest-wide and Management Area direction; all planned improvements.	High	High	Annually	Forest-wide and Management Area direction.	+/- 5% of attainment targets.	Range/Wildlife Officer	Costs are part of program	2
Habitat improvement success.	Determine effectiveness of habitat improvements.	Pre and post project sampling of wildlife use; selected improvements.	Moderate	Moderate	Yearly up to ten years if necessary after project completion.	Forest-wide and Management Area Direction.	Absence of intended habitat development or use.	Range/Wildlife Officer	$8,000	3
5. DIVERSITY										
Diversity of vegetation types and seral stages.	Determine compliance with seral stage targets.	Determine acreage of each type stage using timber inventory data; all types and stages.	Moderate	Moderate	Every ten years or whenever timber inventory is conducted.	Management area seral stage targets.	Acreage less than minimum targets.	Range/Wildlife Officer	$2,000	3

Monitoring Plan by Resource

ACTION, EFFECT, OR RESOURCE TO BE MEASURED	MONITORING OBJECTIVE	MONITORING TECHNIQUES; SAMPLE SIZE	EXPECTED PRECISION	EXPECTED RELIABILITY	MINIMUM MONITORING FREQUENCY	STANDARD OF COMPARISON	VARIATION FROM STANDARD REQUIRING FURTHER ACTION	RESPONSIBLE STAFF	AVERAGE ANNUAL COST	PRIORITY NUMBER
6. RANGE										
Permitted AUM's	Compare permitted to planned AUM's.	Compile annual grazing statistical report.	High	High	Yearly	Forest Objectives	Permitted AUM's do not meet objective for 3 consecutive years.	Range/Wildlife Officer	Current Program	2
Range condition and trend.	Evaluate stocking rates to ensure sustained yield.	Determine from established C&T plots and photo plots; according to allotment plans.	Moderate	Moderate	5 years	FSH 2209.21 and Forest-wide Standards.	Downward trend.	Range/Wildlife Officer	$2,000	2
All new range improvements.	Evaluate effectiveness of range improvements.	Survey improvements for intended result.	High	High	Yearly	Intended results.	Improvement not effective.	Range/Wildlife Officer	$1,000	2
7. TIMBER										
Land suitability for timber production.	Determine if lands classed as suited for timber production are not suitable, and vice versa.	Project land evaluation; all timber sales.	High	High	Each project (& at least every 10 years for all lands for Plan revision).	Plan Appendix D	Reclassification of more than 5% of the current suited lands (47,000 acres).	Timber Management Officer	Included in all project costs.	2
Reforestation and timber stand improvements.	Maintain accurate record of accomplishments for Silviculture and Management Attainment Reports	Record data; all projects.	High	High	Quarterly	Described in SAR and MAR Reports.	N/A	Timber Management Officer	$4,000	2

Table 5-1 (10 of 17)

Monitoring Plan by Resource

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Annual sale quantity and acreage.	Ensure consistency of the timber sale program with the Forest Plan.	Record sale quantity and acreage by forest type, and prescription; all sales.	High	High	Yearly	Forest-wide and Management Area direction.	A 10% deviation in volume/acre, total acreage, or sale volume for each prescription or forest type, in any decade.	Timber Management Officer	$5,000	3
Size of harvest openings.	Ensure openings meet policy.	Review Timber Sale EA's, project plans, and Reports all.	High	High	Each project.	Forest-wide direction.	None (process for larger opening approval already established).	Timber Management Officer	Included in project costs.	1
Dispersal of harvests	Ensure that spacing of harvest openings conforms to policy.	Review timber sale EA's, project plans, and reports, all.	High	High	Each project.	Openings nearly surrounded by stands ½5 acres (15% of periphery may be in common with other openings).	Any variation.	Timber Management Officer	Included in project costs.	1
Reforestation survival.	Determine success of regeneration practices.	Described in FSM 2472; all projects.	High	High	1st & 3rd year and thereafter until certified as established.	Described in FSM 2472.	More than 10% of the acreage is not reforested to standard.	Timber Management Officer	Included in project costs.	3
Timber stand improvements.	Determine success of release and stand improvement practices.	Systematic and/or random samples of all plantations.	High	High	Within 6 months of project completion.	Plantation meets Regional stocking standards. TSI treatments are done to standards.	More than 10% of the plantation acreage treated to standard.	Timber Management Officer.	$10,000	3

Monitoring Plan by Resource

ACTION, EFFECT, OR RESOURCE TO BE MEASURED	MONITORING OBJECTIVE	MONITORING TECHNIQUES; SAMPLE SIZE	EXPECTED PRECISION	EXPECTED RELIABILITY	MINIMUM MONITORING FREQUENCY	STANDARD OF COMPARISON	VARIATION FROM STANDARD REQUIRING FURTHER ACTION	RESPONSIBLE STAFF	AVERAGE ANNUAL COST	PRIORITY NUMBER
8. RIPARIAN AREAS										
Condition of riparian areas (including wetlands).	Evaluate compliance with plan policy and effectiveness of S&G's in protecting riparian-dependent resources.	1. Field inspection of BMP and S&G implementation; most projects. 2. Field evaluation of channel and riparian conditions after BMP implementation; at least one project per district.	Moderate	Moderate	Annually	1. Full implementation of S&G's. 2. Objective effectiveness levels of S&G's (to be established). 3. Maintenance or improvement of preproject channel and riparian conditions.	1. Non-compliance. 2. Less than 90% effectiveness. 3. A 10% reduction in channel and riparian conditions.	Watershed Officer	$4,000	1
9. WATER										
Water quality management during activities.	Evaluate compliance with plan policy and effectiveness of S&G's, and compliance with BMP direction.	1. Review EA's, and contract provisions, and field inspection of BMP and S&B implementation on most projects. 2. Evaluation of water quality after BMP implementation; at least one project per district.	High	High	Ongoing as part of EA & contract review process. Annual activity review and analysis as specified in project plans.	1. Full implementation of BMP's and S&G's. 2. Maintenance or improvement of pre-project water quality.	1. Non-compliance. 2. A 10% reduction in water quality, both short- and long-term.	Watershed Officer	$5,000	1
Changes in water quality.	Establish baseline and trend of major drainage water quality.	Sample and evaluate water quality indicators; 3 major drainages.	Moderate	Moderate	Quarterly for 5 years, then once every 5 years during critical seasons.	Maintenance or improvement of water quality.	A 10% reduction in water quality.	Watershed Officer	$5,000	3

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Monitoring Plan by Resource

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Changes in watershed condition.	Determine existing watershed conditions and provide basis for watershed restoration program.	Field evaluation of watershed conditions; at least 1 NFS watershed and 3 subwatersheds.	Moderate to high	Moderate to high	Annually	Stable condition.	Deteriorating condition.	Watershed Officer	$20,000	2
Effectiveness of erosion control measures.	Evaluate erosion control measures for stability and effectiveness in protecting soil and water resources.	Field inspection of all project areas.	High	High	Annually	Stable and effective erosion control measures.	Unstable or non-working erosion control measures.	Watershed Officer	$2,000	1
Water quality for domestic uses.	Insure compliance with State and Federal drinking water standards.	Measure water quality parameters for which standards are established.	High	High	As required by law.	State and Federal drinking water standards.	Non-compliance	Watershed Officer	$3,000	1
10. SOILS										
Soil productivity.	Evaluate techniques for maintaining or enhancing soil productivity.	Field investigations of soil compaction, soil loss, and site class and/or range trend; 3 projects having high probability of adverse effect per year on a 10-year cycle.	Moderate	Moderate	Annually	Maintenance or improvement of productivity. For compaction, a 10% decrease in total soil porosity of the surface soil over natural conditions on a minimum of 80% of an activity area (timber harvest unit or range allotment.	One timber site class reduction or a sustained downward range trend.	Watershed Officer	$4,000	2

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Monitoring Plan by Resource

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11. AIR QUALITY										
Air quality.	Determine prescribed fire program compliance with air quality regulations.	Visual (Ag. Burn Report to State ARB); all projects.	Moderate	High	Each project.	R5 Smoke Management Plan; Local ARB Regulations; individual Burn Plan.	Any variation from the burn plan that allows significant smoke in populated areas, or causes significant air quality deterioration.	Fire Management Officer	$2,100	1
12. MINERALS & MATERIALS										
Availability or accessibility of mineralized lands.	Determine compliance with planned availability and accessibility.	Examine changes in land status and road system access.	High	High	Yearly	Forest-wide and *Management Area* Direction.	Any significant *variance.*	Lands Officer	$1,000	3
Level of mining activity.	Determine administration need for minerals supervision.	Record scope and numbers of operations; all.	High	High	Yearly	Past relationship of mining to administration.	Significant increase in Plans of *Operation.*	Lands Officer	$500	3
Mining operations.	Assure surface resources are protected.	Review all E.A.'s and Plans of Operation and field review of implementation; one operation per district per year.	Moderate	Moderate	Yearly	Forest-wide direction.	Any variation from the authorized operating plan or insufficiently mitigated effects.	Lands Officer	$2,100	2
Mineral withdrawal implementation.	Compare planned to actual withdrawals	Observe Secretary of Interior renewal and implementation; all.	High	High	As notified, scheduled completion by 10/21/91.	Forest-wide Standards and Guidelines: mineral withdrawal direction.	More than 10% of planned withdrawals do not occur.	Lands Officer	$500	2

Monitoring Plan by Resource

ACTION, EFFECT, OR RESOURCE TO MEASURED	MONITORING OBJECTIVE	MONITORING TECHNIQUES; SAMPLE SIZE	EXPECTED PRECISION	EXPECTED RELIABILITY	MINIMUM MONITORING FREQUENCY	STANDARD OF COMPARISON	VARIATION FROM STANDARD REQUIRING FURTHER ACTION	RESPONSIBLE STAFF	AVERAGE ANNUAL COST	PRIORITYBE NUMBER
Effect of management prescriptions on mineral resources.	Assure mineral exploration and development is not unreasonably impaired.	Record requirements and effects imposed on exploration and development operations.	High	High	Yearly	Past records (which need to be collected).	Any unjustified impairment of exploration and development operations.	Lands Officer	$1,000	2
13. GEOLOGY - HAZARDS										
Extremely unstable land.	Validate land and update instability mapping.	EA and field review.	Moderate	Moderate	Yearly	Forest Plan mapped data and Risk Classification System.	More than 33% of areas are misclassified.	Watershed Officer	$1,000	1
Management activities on unstable lands.	Ascertain effectiveness of standards and guidelines.	Field review.	Moderate	Moderate	Yearly	Forest-wide direction and predicted consequences.	Less than 67% compliance with direction or more than 33% variation from predicted consequences.	Watershed Officer	$1,000	2
14. ENERGY										
Fuelwood quantities available.	Determine relation of supply to demand.	Compile permit data and survey Districts fuelwood programs; all available data.	Moderate	Moderate	Yearly	Forest-wide S&G for biomass and fuelwood.	Inability to meet current local demand.	Timber Management Officer	Current program cost.	3
15. LANDS										
Forest land-use by others.	Improve administration of permits, licenses, and easements.	Land Use Report (LUR). Determine compliance of 10% of S.U.P.'s per year.	High	High	Yearly	FSM 2790	N/A	Lands Officer	Included in SCP budget.	2
Property boundary status.	Measure progress of land-line program.	Management Attainment Report (MAR)	High	High	6 months	As required in MAR direction.	N/A	Lands Officer	Included in LLL budget.	3

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Monitoring Plan by Resource

ACTION, EFFECT, OR RESOURCE TO BE MEASURED	MONITORING OBJECTIVE	MONITORING TECHNIQUES; SAMPLE SIZE	EXPECTED PRECISION	EXPECTED RELIABILITY	MINIMUM MONITORING FREQUENCY	STANDARD OF COMPARISON	VARIATION FROM STANDARD REQUIRING FURTHER ACTION	RESPONSIBLE STAFF	AVERAGE ANNUAL COST	PRIORITY NUMBER
Land exchanges.	Determine effectiveness in consolidating ownership.	Management Attainment Report (MAR).	High	High	6 months	Land ownership adjustment plan.	N/A	Lands Officer	Included in land exchange budget.	3
16. FACILITIES										
Road and trail use.	Determine use in relation to capacity; evaluate capacity.	Traffic counters; 12 roads/zone and 2 trails/zone.	Moderate	Moderate	Yearly	Forest-wide direction.	Constraint to needed management use.	Forest Engineer	$5,000	3
Road Safety	Determine adequacy of road design and management.	Compile CHP, County, and Forest accident records, all accidents.	High	Moderate	Yearly	Forest-wide direction.	Accident frequency indicates need for design or signing change.	Forest Engineer	$600	1
Road and trail maintenance	Evaluate appropreateness of maintenance levels to resource management needs.	Field review; 2% of inventoried roads/zone and 2 trails/zone.	Moderate	Moderate	Yearly	Maintenance levels commensurate with management needs.	Resource management needs exceed maintenance level.	Forest Engineer and Recreation Officer.	$2,000	2
Road stability.	Ascertain effectiveness of design and maintenance in promoting stability.	Field review; 3 investigations/zone.	Low to Moderate	Moderate to High	Yearly	Adequate water quality and acceptable road maintenance costs.	More than 15% show ineffective stabilization.	Forest Engineer	$4,000	2
Building, utility, bridge, and dam functioning	Evaluate facility maintenance and replacement needs and energy consumption.	Field and office review; all bridges and dams and 20% of bldgs/ zone per 2 years.	High	High	Every 2 years.	Adequate facilities and energy conservation for effective Forest management.	Inadequate facilities or excessive energy consumption for effective management.	Forest Engineer	$3,000	2

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Monitoring Plan by Resource

ACTION, EFFECT, OR RESOURCE TO BE MEASURED	MONITORING OBJECTIVE	MONITORING TECHNIQUES; SAMPLE SIZE	EXPECTED PRECISION	EXPECTED RELIABILITY	MINIMUM MONITORING FREQUENCY	STANDARD OF COMPARISON	VARIATION FROM STANDARD REQUIRING FURTHER ACTION	RESPONSIBLE STAFF	AVERAGE ANNUAL COST	PRIORITY NUMBER
17. FIRE AND FUELS										
Burned acreages, by fire intensity class.	Compare actual and predicted burned acres.	Fire report review; all reports.	High	High	Yearly	FSH 5109.19 Analysis Level II	More than 20% discrepancy within a 5-year period.	Fire Management Officer	$3,000	2
Fuels.	Track the changing acreages of various fuel types.	Field and office review; at least 20% of prescribed fire projects.	Moderate	Moderate	Yearly	Predicted trend.	More than 10% deviance from predicted trend.	Fire Management Officer	$2,000	2
Prescribed burning.	Track broadcast burn acreages and ascertain problems in attaining targets.	Review UTS Prescribed Burn Plans and Annual Fuel Treatment Accomplishment Reports and field inspections; at least 20% of projects.	Moderate	Moderate	Yearly	Prescribed Burn Plan Summary	More than 10% variance between planned and actual acreages.	Fire Management Officer	$4,000	2
18. FOREST PESTS										
Forest pest conditions.	Detect and evaluate pest related problems.	Aerial and ground surveys; wherever warranted.	Moderate	Moderate	Yearly	Insect and disease problems are maintained at endemic levels.	Pest-created salvage volume exceeding 1 year planned sale quantity.	Timber Management Officer and FPM-RO	$5,000	2
19. SPECIAL AREAS										
Condition of special areas.	Assure maintenance of special area values.	Field inspection; 1/4 of areas.	Moderate	Moderate	Yearly	Current condition.	Significant loss loss of value.	Recreation Officer	$500	2
Research Natural Areas	Inventory for potential RNA's not represented in the Northern Sierra province.	Forestwide inventory	High	High	Complete	RNA guidelines	Non-Compliance	Range/wildlife Officer	$500	2

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Monitoring Plan by Resource

TOTAL ADDITIONAL AVERAGE ANNUAL MONITORING COSTS

Resource	Average Annual Cost
Economics	$ 2,000
Recreation	7,500
Visual Resources	2,500
Cultural Resources	10,000
Wildlife, Fish, and Sensitive Plants	152,700
Diversity	2,000
Range	3,000
Timber	19,000
Riparian Areas	4,000
Water	35,000
Soils	4,000
Air Quality	2,100
Minerals and Materials	5,100
Geology - Hazards	2,000
Energy	0
Lands	0
Facilities	14,600
Fire and Fuels	9,000
Forest Pests	5,000
Special Areas	1,000
TOTAL	$280,500