

# CHAPTER FIVE - MONITORING AND EVALUATION

The purpose of monitoring and evaluation is to evaluate, document and report how well the forest plan is applied, how well it works, and if the purpose and direction remain appropriate. Monitoring determines actual conditions and circumstances and compares them with assumptions and desired results. Evaluation examines conditions as a result of management, identifies the reason desired conditions are not met and proposes alternative solutions.

Adaptive management allows the use of alternative solutions to meet desired conditions. It includes defining measurable objectives, monitoring, learning and making changes, and recognizing uncertainties of outcomes. Monitoring and evaluating the effects of forest plan implementation is critical to adaptive management. Other components include inventory, assessment, planning, and implementation.

## Monitoring and Evaluation Strategy

Forest plan monitoring and evaluation strategy is straightforward and tightly focused on critical goals and objectives laid out in the plan. Elements will include requirements from the National Forest Management Act, as well as other pertinent laws and regulations.

Through monitoring and evaluation requirements in past forest plans it became apparent that budgets constrain the amount of monitoring and data collection accomplished. As a result a secondary goal was developed to keep requirements within current budget and workforce limitations. Monitoring and evaluation questions were further refined using the following criteria to establish priority items. Each of the questions responds to at least one of the following drivers.

1. New untested management assumptions (implementation of new concepts like key watersheds).
2. Large gap identified between existing and desired conditions (aspen cover is currently less than 20% of the low end of the historic range of variation for aspen).
3. Critical system components could be affected (riparian function).
4. Unacceptable consequences from lack of information (occupation of habitats by invasive species).
5. Key issue for the public (travel management and specifically, motorized closures).
6. Legal compliance (sufficient stocking of suitable timber lands).
7. National strategic plan component (Goals & Objectives as described in Fiscal Years 2004 through 2008).

Performance measures and methodologies were selected with the following principles in mind.

- Keep it simple and relevant to the purpose.
- Keep it adaptive. Systems are always in a state of flux, as is the imprint of management on such systems
- Keep it affordable. Use corporate data and standardized national protocols when available, (FIA, NVUM, Region 1 Aquatic Monitoring, etc).
- Recognize that systems are interrelated. Select components of systems that can tell more than one story.
- Look for trends over long periods, not snapshots in time. The goal of resource management is resilience. The intent is to maintain the capacity of systems to renew themselves and thrive, not just survive for a time.
- Describe what to measure but don't prescribe a specific technique unless it is tied to corporate data or standardized national protocols. Science improves, methodologies change.

Additional screening considerations for methodologies include: availability of baseline data, availability of protocols/methods, scale and extent, precision and reliability, sufficiency to address the indicator, availability of partners, utility for analysis and evaluation, appropriateness of scale, frequency of measurement, and technical requirements

Monitoring identified in this section does not include monitoring conducted in compliance with other laws, policies, and site-specific decisions. Examples are compliance with the Environmental Management Systems (EMS), Biological Opinion for bull trout, the Settlement Agreement for the Beaverhead Riparian Grazing Lawsuit, progress toward removing streams from the State's 303D list, and project implementation monitoring.

## **Forest Plan Evaluation and Reports**

Forest plan evaluation uses information gathered during monitoring to judge how decisions have been applied and how effective they have been. It describes what's been learned along the way and how valid the assumptions are that led to those decisions.

The Forest Supervisor will maintain monitoring information for public review and will evaluate it on a periodic basis to determine, among other things, the need for amendment or revision of the forest plan. Implementation of objectives and standards will be tracked and reported annually. Effectiveness of goals will be measured and reported every five years, unless the Beaverhead-Deerlodge Forest Supervisor determines a shorter timeframe is warranted for some evaluations. It is difficult to discern trends in forestwide conditions in less than five years. A formal five year comprehensive evaluation report will provide a review of monitoring questions and regulatory review requirements, including any recommendations for changes.

If the Five Year Comprehensive Evaluation Report concludes monitoring questions are not being answered by the performance measure, or the desired trend is not being achieved, further action will be taken. The results of the evaluation will lead to a decision about further action of the following types:

- Continue the management practice but re-evaluate the performance measure;
- Refer the problem to the appropriate line officer for improvement of the application of the management practice;
- Modify the management practice as a forest plan amendment;
- Modify the land management prescription as a forest plan amendment;
- Modify the performance measure so it better answers the question;
- Revise the projected outputs;
- Revise the cost/unit projection, or
- Initiate revision of the forest plan.

Monitoring will be adaptive. The Five-Year Comprehensive Evaluation Report may conclude new information, such as science, technology, or legal requirements, requires addition or modification of monitoring questions. Recommendations for changing monitoring elements will meet the criteria and principles outlined in the previous section of this chapter.

## MONITORING ELEMENTS

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The following table displays the monitoring plan for the Beaverhead-Deerlodge Forest Plan. This monitoring plan reflects important forest plan decisions. It includes nine areas of focus linking key goals and objectives to elements of the National Monitoring and Evaluation Framework and Northern Region Monitoring Framework. The intent is to answer regional and national monitoring questions as well as forest plan questions.

For each area questions are posed along with one or more performance measures. The table addresses requirements from the 36 CFR 219.12(k) (4) of 1982, and includes:

- The actions, effects or resources to be measured, and the frequency of measurements;
- Expected precision and reliability of the monitoring process
- Timeframes for evaluation and reporting.

Because data precision and reliability are tied to specific procedures and methods that change, updates of the Forest Monitoring Section will be made to take that into account.

Monitoring and evaluation is planned for each area described in the table, but actual budget levels, funding emphasis, and emergence of new issues may affect accomplishment. Even with changes in funding tied to current issues, monitoring and evaluation are expected to show some movement toward objectives in each focus area. Partnerships will be developed to accomplish more monitoring and evaluation.

**Table 15. Forest Monitoring and Evaluation Format**

| Plan Component                         | Monitoring Question   | Performance Measure  | Possible Data Sources   | Measurement and Reporting Frequency | Data Precision, d& Reliability |
|--|---|--|---|-------------------------------------|--------------------------------|
| <b>Soil Water and Air Resources</b>    | <b>Watershed Health</b>   |  |   |                                     |                                |
| 1<br>GOAL (watersheds)                 | Is the ecological condition of watersheds improving on the forest?  | Percent of watersheds in functioning status or improving trend, measured by changes in key characteristics identified in Plan objectives, by 6 <sup>th</sup> code HUC              | R1 Aquatic Monitoring and analysis. 30 <i>random response reach</i> sample points reread every 6 <sup>th</sup> year - NRIS data base monitored by RMRS                            | M – 5 years<br>R - 5 years          | High                           |
| 2<br>GOAL (key restoration watersheds) | Have restoration activities identified through watershed assessment resulted in improved watershed condition? | Percent of restoration watersheds in functioning status or improving trend, measured by changes in key characteristics identified in Plan objectives, by 6 <sup>th</sup> code HUCs | Intensify R1 Aquatic Monitoring and analyses by adding sample points in the <i>lowest response reach of each watershed with a completed assessment</i> and project list.          | M – 5 years<br>R – 5 years          | High                           |
| 3<br>OBJECTIVE (watershed analysis)    | Are restoration and conservation activities focused in priority (key) watersheds?                             | Number of watershed plans completed, number and type of projects completed in key watershed vs. other watersheds.  | Report annual accomplishments of Plans and Projects.  | M - Annual<br>R - Annual            | High                           |
| 4<br>GOAL (stream channels)            | Are stream and riparian conditions improving?   | Percent of stream channels functioning or in upward trend.   | Reread stream and riparian transects at 5-year intervals, representing key watersheds and management activities. Allotment inspection notes on compliance with grazing standards. | M – 5 years<br>R - 5 years          | High                           |

| Plan Component  | Monitoring Question   | Performance Measure  | Possible Data Sources   | Measurement and Reporting Frequency                                    | Data Precision, d& Reliability |
|---|---|--|---|--|--------------------------------|
| 5<br>GOAL (watersheds)                                    | Are management activities effectively maintaining conditions for native species reproduction?   | Changes in abundance of populations of the mayfly ( <i>drunella dodsii</i> ) as an indication of changing sediment levels.   | Sampling points on response reaches of sub-watersheds selected to represent potential sediment producing activities or restoration activities.  | M – Annual<br>R - Annual   | Moderate                       |
| 6<br>LEGAL (land productivity, 1982 36 CFR 219.12 (k)(2)) | Are soil and water conservation practices (BMPs) being implemented during project work and are they resulting in protection of water quality and beneficial uses? | BMPs implemented and percent rated effective   | Annual review of at least one project, including fuels reduction, timber harvest, minerals and grazing. Compare BMPs prescribed by EA, EIS or contract, to see if BMPs were followed and were effective | M- Annual<br>R - Annual  | Moderate to High               |
| 7<br>GOAL (Soil productivity)                             | How are management actions maintaining soil quality?  | Effects of treatments on areas treated.  | Inspection reports, daily diaries resource compliance monitoring, BMP monitoring and evaluation   | M- 5 years<br>R- 5 years   |                                |
| <b>Biological Diversity</b>                               | <b>Ecosystem Diversity</b>  |  |   |  |                                |
| 8<br>GOAL (Biodiversity)                                  | What is the current condition and trend for key characteristics of vegetation diversity identified in the forest plan?  | Changes and trends in vegetation composition and structure by landscape. Measure by changes in key characteristics described in Plan objectives (dominance types by size class, percent of old growth, number of snags, and tons of coarse woody debris).<br><br>Broad scale overall change for key characteristics. | Inventory based on FIA national inventory and/or other local Forestwide or project level inventories<br><br>Region 15 year monitoring summaries compiled by section or province.                        | M - 5 years or sooner<br>R - 5 years<br><br>M – 5 years<br>R – 5 years | High                           |

| Plan Component   | Monitoring Question  | Performance Measure  | Possible Data Sources  | Measurement and Reporting Frequency                  | Data Precision, d& Reliability |
|--|--|--|--|--|--------------------------------|
| 9<br>OBJECTIVE (Forested vegetation)                     | Are management activities restoring aspen at the rate projected in the forest plan?  | Acres of aspen treated (all methods) and acres converted by wildfire.  | Acres treated from accomplishment reports (FACTS), acres converted from FIA  | M - Annual<br>R - Annual                             | Moderate to High.              |
| 10<br>OBJECTIVE (Grassland/Shrubland)                    | Are management activities restoring grassland/shrublands at the rate projected in the forest plan?   | Acres of encroachment species treated (all methods) or converted by wildfire   | Acres treated annually from accomplishment reports (FACTS), acres converted using post burn surveys or FIA   | M - Annual.<br>R - Annual                            | High                           |
|  | <b>Species Diversity</b>   |  |  |  |                                |
| 11<br>OBJECTIVE (Reference populations sensitive plants) | Are we maintaining static or upward trends in globally designated 1, 2 & 3 sensitive plants (downward trend drives Conservation Strategy)? | Change in cover or number of plants.   | Plant survey.  | M - 5 years<br>R - 5 years                           | High                           |
| 12<br>Goal (Elk Habitat)                                 | How are populations of elk changing?   | Population data for elk from Montana Fish Wildlife & Parks   | Annual MTFWP reports on animal numbers and licenses issued.  | M – Annual<br>R – Annual                             | High                           |
| 13<br>Goal (Wildlife Security)                           | Are management activities effectively protecting high elevation winter habitats for mountain goats and wolverines?                         | Populations of mountain goats from MT Fish Wildlife & Parks.<br>Number of snowmobile entries into non-motorized high elevation units protected for wolverines and mountain goats.<br>Presence or absence of wolverines in high elevation habitats. | Annual MTFWP reports on animal numbers and licenses issued.<br>Results of aerial observation flights and field observations.<br>Bait stations, DNA testing, and track surveys obtained from MT FWP and other partners. | M – Annual<br>R - Annual<br>M – Annual<br>R - Annual | Moderate to High               |

| Plan Component   | Monitoring Question  | Performance Measure   | Possible Data Sources  | Measurement and Reporting Frequency | Data Precision, d& Reliability |
|--|--|---|--|-------------------------------------|--------------------------------|
| 14<br>GOAL (secure habitat)                                      | Are road and trail densities trending toward goals described by landscape?                           | Change in open motorized road and trail density for both seasons by landscape.                    | Forest Road and Trail inventory (GIS)  | M - 5 years<br>R - 5 years          |                                |
| <b>Land Health and Vitality</b>                                  | <b>Invasive Species</b>  |   |  |                                     |                                |
| 15<br>OBJECTIVE – (noxious weeds)                                | Are management actions preventing or controlling new and existing infestations of weeds?             | Change in acres of known noxious weed infestations.<br>Number of sites of new species and extent. | Forest data base FACTS, NRIS, eventually FIA.<br>Annual review of reports of known species and locations             | M - Annual<br>R - Annual            | Moderate to                    |
|  | <b>Native Insects and Pathogens</b>  |   |  |                                     |                                |
| 16<br>LEGAL (insects and disease , 1982 36 CFR 219.12(k)(5)(iv)) | Are levels of insect and disease increasing to damaging levels as a result of management activities? | Changes in acres infested by landscape, % change on the forest compared to the Region.            | Results of Regional Forest Health Program  | M - Annual<br>R - Annual            | Moderate                       |
|  | <b>Resilience to Fire Disturbance</b>  |   |  |                                     |                                |
| 17<br>OBJECTIVE (Wildland Urban Interface)                       | Are fuels reduction projects being implemented in high risk urban interface areas?                   | Acres in wildland urban interface areas (WUI) of reduced fuel loadings and crown fire risk.       | Acres of WUI acres treated based on targets and accomplishments  | M - Annual<br>R - Annual            | High                           |
| <b>Social Benefits</b>   | <b>Recreation opportunities and settings</b>   |   |  |                                     |                                |
| 18<br>GOALS (allocations, opportunities)                         | Is the BDNF providing desired recreation opportunities?  | Change in visitor numbers, activities, demographics, and satisfaction.                            | Compare 5 year National Visitor Use Monitoring survey and report data for the forest.<br>Available 2005, 2010, 2015) | M - 5 years<br>R - 5 years          | High                           |

| Plan Component                 | Monitoring Question   | Performance Measure  | Possible Data Sources   | Measurement and Reporting Frequency | Data Precision, d& Reliability |
|--------------------------------|---|--|---|-------------------------------------|--------------------------------|
| 19<br>GOAL (opportunities)     | Are management actions resulting in the desired recreation settings?  | Change in percent of Forest in each recreation allocation and ROS class.                     | Map and tabulate current ROS, compare to 2005 baseline ROS and FEIS predicted ROS for selected alternative. Compare ROS to allocations. | M – 10 years<br>R – 10 years        | High                           |
|                                | <b>Emerging Issues</b>  |  |   |                                     |                                |
| 20<br>ALL PLAN COMPONENTS      | How is new information (science, technology, requirements) changing monitoring or the Plan?   | Research and science findings, monitoring evaluation findings, legal and other requirements. | RMRS, Universities, Annual Monitoring Reports, Regional/National Monitoring and Evaluation.   | M – 5 years<br>R - 5 years          | High                           |
|                                | <b>Heritage Resources</b>   |  |   |                                     |                                |
| 21<br>STANDARDS (Heritage 1-4) | Are cultural resources being protected as the forest plan is implemented? Are mitigation measures sufficient to prevent damage to cultural resources from projects? | Number of projects that protect cultural resources.  | Review up to 10% of projects in the field.  | M - Annual<br>R - Annual            | High                           |
| <b>Economic Benefits</b>       | <b>Provision of good and services</b>   |  |   |                                     |                                |

| Plan Component                                    | Monitoring Question   | Performance Measure  | Possible Data Sources  | Measurement and Reporting Frequency       | Data Precision, d& Reliability |
|---|---|--|--|---|--------------------------------|
| 22<br>GOAL (economy contribution)                 | What is the status and trend of goods and services provided from the forest?                                      | Quantities of goods and services and the cost of producing them compared to Plan predictions.                                      | Report outputs (i.e. AUMs, Board Feet, visitor use, oil and gas or minerals), payments to counties and budget expenditures using FACTS, INFRA and other corporate databases.<br>Model estimated employment and labor income using outputs, revenues, expenditures above (IMPLAN) | M -5 years<br>R - 5 years                 | High                           |
|   |   | Contribution of employment and labor income to the 8-county impact area attributable to goods and services provided by the forest. |  | M -5 years<br>R - 5 years                 | High                           |
|   | <b>Timber Production</b>  |  |  |   |                                |
| 23<br>GOAL (Lands Suitable for Timber Production) | Are we maintaining the productivity of suitable timber lands?   | Acres of suitable timber lands under management compared to acres projected by SPECTRUM to keep lands in rotation.                 | Acres harvested, regenerated, and thinned on suitable lands- Annual accomplishments from FACTS data base   | M -5 years<br>R - 5 years                 | High                           |
| <b>Infrastructure Capacity</b>                    | <b>Facilities</b>   |  |  |   |                                |
| 24<br>OBJECTIVE (Recreation Facilities)           | Are we maintaining and reconstructing campgrounds and developed sites on schedule? (30% over the planning period) | Number of developed sites reconstructed.   | Report based on accomplishment data base   | M- Annual<br>R - Annual                   | High                           |
|   | <b>NFMA compliance</b>  |  |  |   |                                |
| 26<br>LEGAL (1982 36 CFR ((k)(5))                 | Are we complying with appropriate NFMA requirements?  | Stocking of lands  | Trees/acre, over percent of area treated by tree species.  | M - 5 years from treatment<br>R - 5 years | High                           |

| Plan Component | Monitoring Question | Performance Measure                | Possible Data Sources  | Measurement and Reporting Frequency   | Data Precision, d& Reliability |
|----------------|---------------------|------------------------------------|--|---------------------------------------|--------------------------------|
|                |                     | Lands suited for timber production | Lands identified as not suited for timber production examined to determine if they have become suited.     | M 5 years<br>R 5 years                | High                           |
|                |                     | Harvest Unit size limits           | Maximum size limits for harvest areas evaluated to determine whether such size limits should be continued. | M - 10 years from ROD<br>R - 10 years | High                           |