United States
Department of
Agriculture

Forest Service

Beaverhead-
Deerlodge
National Forest

BEAVERHEAD-DEERLODGE

FOREST PLAN MONITORING AND EVALUATION REPORT

Fiscal Year 2008

Cover Photo: Shively Ridge post burn treatment of Wyman II wildfire, Pintler District, Cameron Rasor, 2008

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Forest Plan Monitoring & Evaluation Report

Fiscal Year 2008

INTRODUCTION

This Annual Forest Plan Monitoring Report provides an account of management activities and conditions on the Beaverhead-Deerlodge National Forest (BDNF) for Fiscal Year 2008 (October 2007-September 2008). The Beaverhead and Deerlodge Forest Plans were approved in 1986 and 1987 respectively. Monitoring and Evaluation Reports over the last 20 years accounted for both the implementation and the effectiveness of the Plans and provided the basis for revising long term management of the Forest. The Revised Forest Plan is scheduled to be distributed in 2009.

This final report under the old Plans links the current monitoring items which annually track i***mplementation*** of goals, objectives and standards with items in the Revised Forest Plan. Five years from implementation, a Comprehensive Evaluation Report will answer monitoring questions related to ***effectiveness*** of the Revised Plan in reaching goals. Two other types of monitoring are presented for some resources. ***Baseline*** monitoring establishes a basis for assessing change from current conditions, making comparison to future conditions possible. ***Tracking*** is useful to report on the additional activities we are engaged in, such as numbers of wildfire ignitions or lawsuits. We include a section called "Highlights" which shares information about other relevant topics not required by any Plan monitoring item.

The table below provides a cross reference between the existing plans and the Revised Forest Plan for monitoring items included in this report.

Table 1. Crosswalk for Forest Plan Monitoring Items reported on in FY06

Monitoring Topic	Beaverhead Item #	Deerlodge Item #	Draft Revised Plan Item #
A. Forest Outputs and Accomplishments			
Watershed Assessments	-	-	3
Watershed Restoration	2-1	6-2	3
Noxious Weed Treatment	6-3	7-3	16
Aspen Treated			9
Encroachment into sage/grass Treated			10
Timber sold/harvested	7-1,7-2	8-1	23
AUMs grazed	6-1	7-1b	23
Fuel Reduction	-	11-3,11-4	18
B. Insects and disease	9-1	11-1	16
C. Wildlife Management Indicator Species			
Elk	1-3	4-3	13
Goat	1-3	4-3	14(a)
Sagegrouse	1-6	-	12
Wolverine	-	-	14(c)
D. Riparian and Stream Function	2-3	6-1	4
E. Soil Productivity	4-1	9-3-	7
F. Invasive Species (Noxious Weeds)	-	7-3	16
G. Economic effects Budgets, Jobs and Income	10-3, 11-1	14-1	23

MONITORING AND ACTIVITY HIGHLIGHTS in FY08

The following monitoring information is likely of interest to the public and Forest employees though it is not required by any Plan monitoring item.

A. Sustainable Operations

Under the Energy Policy Act of 2005 and the 2007 Executive Order 13423, "Strengthening Federal Environmental, Energy and Transportation Management", all government agencies are required to meet goals in the areas of energy efficiency and renewable energy. These policies are a reflection of general interest government wide in reducing costs, dependence on petroleum, and reducing greenhouse gas emissions. The BDNF tackled two projects in 2008 to reduce our energy costs and contribute to renewable energy sources.

(1) Fleet Fuel Reduction

In compliance with National direction the Beaverhead-Deerlodge National Forest set a target of reducing fuel consumption in its fleet by 2%. The Forest Supervisor approved a Fleet Action Plan which encouraged employees to save fuel through car-pooling, conservative driving techniques (eco-driving), setting a Forest speed limit, improved vehicle maintenance and changes in type and number of fleet vehicles.

Results:

A review of our success in meeting the Fleet Action Plan, *(*available in Forest records at *J:\fsfiles\office\ems\4.6_Management_Review.doc*) noted the following:

Fuel use on the B-D dropped 8% based on 3rd quarter results as reported by Washington Office records. This data was calculated using miles driven and average cost/gallon of fuel for "green fleet". It did not include GSA vehicles.

The Forest Fleet Manager also collected data for fuel consumption. His information was based on individual vehicle miles driven divided by the EPA miles/gallon rating. That data showed a 1.8% reduction forest-wide for the whole year. Use increased on some Districts and in some Staff groups. Reports of participation and compliance with requirements of the Fleect Action Plan varied between Districts and Staffs. Targets on some Districts were achieved because of vacant positions and unused vehicles. Miles driven by wild fire response vehicles were high for 2008, some vehicles made more than one trip to Arizona fires.

Eighty-seven percent of Forest employees were trained in their obligation to meet the 2% target and how to accomplish that.

Evaluation:

Not being able to track actual gallons consumed through credit card records presented a problem in accurate reporting of our accomplishment. The Forest sent a formal request (Finding Notice) to the Regional Office to correct this obstacle in meeting the 2% fuel reduction target.

Improvement in miles/gallon performance of individual vehicles as a result of eco-driving

practices was also difficult to monitor because the credit card records ofactual fuel used were unavailable The Forest Fleet Manager distributed log book forms so drivers could track their own fuel consumption but not many drivers did this. Those drivers tracking actual mpg performance showed an improvement over EPA mileage ratings of 3-5 mpg.

(2) Renewable Energy Production and Energy Conservation

The Madison Ranger District (MRD) contributes to the National goal by using renewable energy from the sun and conserving energy. The District installed a 4 kilowatt (kW) photovoltaic (PV) power system at its Ennis office during the 2007 calendar year (Figure 1). The initial seed funding was provided through a $4,000 Greater Yellowstone Coordinating Committee grant that helped to attract an additional $19,332 in the form of a Challenge Cost Share agreement with Northwestern Energy (NWE), the district's electric utility provider. The NWE grant was made under its authority to distribute funds under the state's Universal Systems Benefit program (USB), which was legislated as result of energy deregulation in Montana during the 1990's. This project will help the Forest Service meet Executive Order 13423 which directs federal agencies to reduce energy consumption and associated pollution.

Figure 1. Two PV arrays along the south facing side of the MRD office, October 2007.

These two grants paid for the equipment and installation of the first 2 kW array, installed in late July, and included a battery system that is kept continuously charged by the array. This battery system is part of a specific grant package that NWE targets for rural communities as

an emergency power supply for maintaining essential activities (primarily communications) in the event of a natural disaster. This system is intended to be net-metered, so that excess power produced but not used on the district will be fed into the grid, crediting the district's account. A net-metering permit was approved in 2008 by NWE and is currently operating.

The second 2 kW array was paid for out of end-of-year engineering funds at the cost of about $15,000, and was installed during the first week of October. The original array included an inverter capable of handling a 4 kW system, and since no battery back up was included, the overall cost was about $8,000 less than the first array.

Maintenance requirements of the PV system are very light. Four times annually, a crew of 4 employees adjusts the angle of the panels to seasonal shifts in sun angle. Following heavy snows, an employee sweeps off the panels. In Ennis, snows are generally accompanied by wind so this is not an issue.

Results:

MRD personnel monitored power consumption at the office both pre-installation and following installation, see Table 1 below. Interestingly, the power being produced by the PV system, when summed with the use reported by NWE for the last six months show that the power decrease is *larger* than the quantity of PV-produced energy (Table 1). The wide fluctuations between years in power use for any given month may be one possible explanation for the discrepancies; however these decreases are too consistent to be explained by inter-annual climate differences. It is likely that the decreases are a combination of changes. Besides the augmented production of the PV system, district staff has implemented a number of energy conservation actions to help reduce consumption. These actions are part of a larger district "Green Plan" to reduce overall consumption and pollution. One such action was reduction of plug-in radiant space heaters many employees use. The district warehouse, where a fire engine is kept ready for use over-winter, was recently upgraded with additional insulation, reducing the need for a radiant heater there. Shutting window blinds at night, turning off lights when rooms are not in use, turning off computers, printers and copiers when not needed are other easy to employ conservation measures the district has been working toward that may help explain the greater reductions. The Green Plan includes additional measures yet to be implemented.

Table 1. Difference in PV power produced (kilowatts) and power savings, post installation. Pre-installation mean power use is computed from 2004-2007.

Month	Mean power use before installation	Power use after installation	PV power produced	Power reduction attributed to conservation
August '07	5288	3871	319*	1098
September '07	5049	3057	277*	1715
October '07	4977	3397	446	1134
November '07	6430	3340	384	2706
December '07	8306	5916	281	2109
January '08	8641	4920	284	3437

February '08	8066	3498	402	4166
March '08	6599	3486	408	2705
April '08	5668	2706	522	2440
May '08	4494	3156	516	822
June '08	4642	3005	640	997
July '08	5937	4366	741	830
Total	74,098	44,718	**5,860**	**23,329**

* - denotes months when only the first 2 kW array was in operation

Evaluation:

Power use was reduced by 29,380 kW's. Twenty percent of that decrease was produced by the PV system. The remaining reduction in 23,329 kW was generated by conservation practices in the office along with some relatively less expensive facility improvements. With the success of this project, the Forest Facilities Engineer has begun to expand the use of PV systems to augment power production at a variety of federally owned facilities across the forest. This effort has potential to expand to recreational facilities forest wide.

For those considering a PV installation at their facility, some learning points to consider include:

- Plan the location of array:
  - Avoid shadows from trees wires, etc.
  - Protect from exposed northern wind directions
- Plan the route of wiring from panels to the inverter; its best to have the inverter as close to the array as possible. Consider the inverter location for your site – consider security. Such planning is best done onsite with the contractor.
- Installation during fire season is not best (phone/communications hook-up)
- It is beneficial to have at least one employee at the facility, and hopefully your forest facilities engineer, with good understanding alternative energy systems, inverters, wiring of the building, etc...
- The utility company agreement (NW Energy; CCS) required the FS to complete [sty of the project (dig the trench, install the foundation and frame) at our cost.
- Adjustment of the panel slope every seasonal midpoint between the equinox (March 20th and September 22nd) and solstice (June 21st and December 21st) dates.
  -Spring adjustment = May 5th -Summer adjustment = August 6th
  -Fall adjustment = November 7th -Winter adjustment = February 4th
- Permit requiring a master electrician inspection is only for the point connection of the PV system to the grid

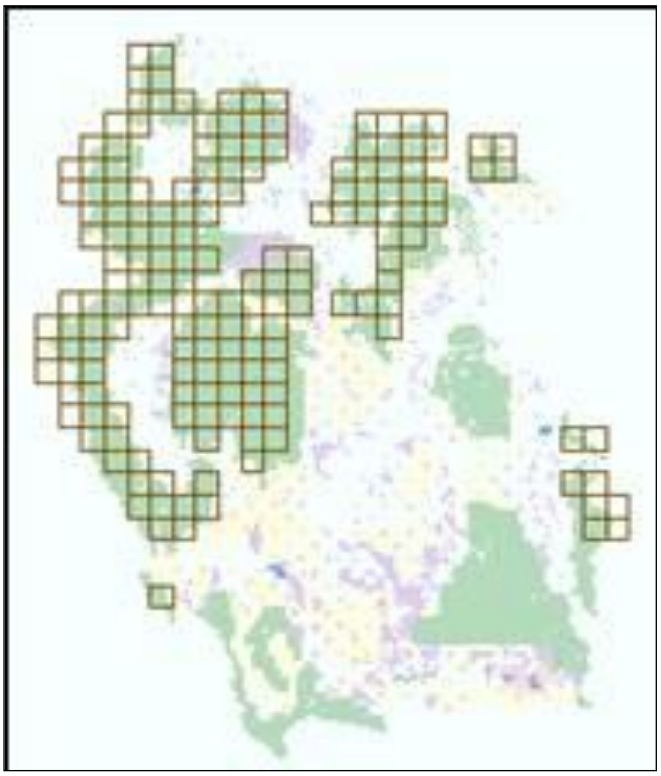
In conclusion, installation and monitoring of the renewable energy generated by the photo-voltaic power system helped generate an attitude of energy conservation amongst employees in the MRD. Energy conserving habits developed by employees, along with some relatively inexpensive facility modifications resulted in energy and cost savings 4 times greater than the power generated by the PV system itself.

B. Fisher Hair Snare Survey

The Rocky Mountain Research Station (RMRS) initiated a region wide fisher hair snare survey[1] in 2007. This is the second year the B-D has participated in this effort. The following is a brief description of the RMRS effort:

The goals of this effort are; 1) delineate the geographic range of fisher within the Rocky Mountains; 2) determine which Rocky Mountain fisher populations have native genes and which fisher populations are comprised of reintroduced individuals; 3) index the abundance of fisher (e.g., minimum number of individuals alive) in each population through the use of DNA

Results: Based on preliminary data from the Rocky Mountain Research Station, where hair-snares were placed in known fisher locations for 21 days, single snare detectability was 0.39. That is, 39% of snares in known fisher locations detected a single fisher in a single session. Thus, running 4 sessions in a survey unit or placing 4 snares in a survey unit for one session is could provide a 97.7% probability of detecting a fisher, if fishers are present. To spread effort within the survey block snares were set 0.5 miles from each other.



Map 1. Fisher grid on the B-D NF

A five square mile grid was developed based on local fisher biology. The goals of the survey are not to detect all individual fishers, but rather to detect populations of fisher. Assuming a non-overlapping home range, a small fisher population consisting of 3 females would occupy approximately 5 square miles. Only grids with 50% habitat were considered in order maximize survey efficiency and prevent surveying areas with a low probability of containing fishers. The B-D contains 136 potential survey grids (map 1).

[1] Schwartz, M. K., T. Ulizio, B. Jimenez. 2006. U.S. Rocky Mountain Fisher Survey. USFS Rocky Mountain Research Station, Missoula MT. http://www.fs.fed.us/rm/wildlife/genetics/pdfs/Fisher_Survey_Protocol.pdf

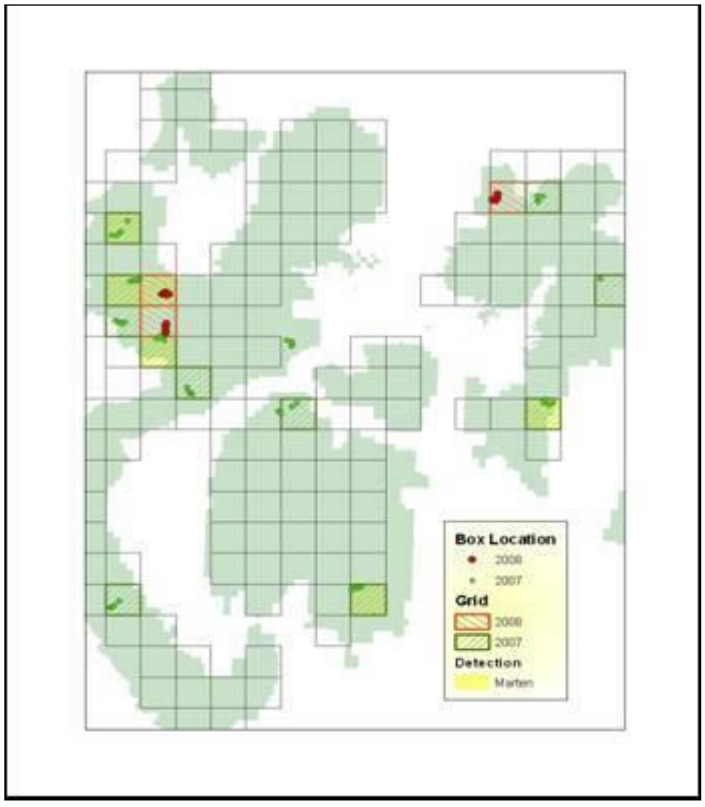
Figure 2. Fisher hair snare

A hair snare consists of baited snare boxes (figure 2) that lure a fisher into the box and capture tufts of hair on wire brushes. Species and individuals are identified from the DNA from collected hairs.

Hair snares were deployed for approximately 21 days on the B-D during the summer and fall. Snares were placed in microhabitat appropriate for fisher (structure, cover, riparian etc.). Survey grids were not randomly selected; rather grids were selected by the area biologist responsible for deployment. A total of 12 snares on 3 grids were deployed on the Pintlar (8) and Butte (4) districts (map 2). Samples were then sent to the Rocky Mountain Research Station Genetics Lab for analysis. Each hair snare deployed was considered to have a survey effort of 120 acres.

Evaluation: Of the twelve hair snares deployed in 2008, eight yielded hair, with two marten in the same grid and no confirmed fisher. Snares deployed in 2007 yielded marten detections in 5 grids (map 2). No fisher were detected in 2007.

Map 2. Hair snares deployed on the B-D in 2007 and 2008



C. Grizzly Bear Habitat Monitoring

The Greater Yellowstone population of Grizzly Bear was removed from the Threatened and Endangered Species list effective April of 2007 *(Final Rule: Removing the Yellowstone Distinct Population Segment of Grizzly Bears From the Federal List of Endangered and Threatened Wildlife. Federal Register / Vol. 72, No. 60 / Thursday, March 29, 2007).*

Federal agencies in the Greater Yellowstone Area are required to monitor Grizzly Bear Habitat for five years following the decision to delist. Agencies report on changes in secure habitat (road density), number of developed recreation sites, number of active livestock allotments within the primary conservation area (PCA) and those allotments with recurring conflicts with grizzly bears in and out of the PCA. The BDNF includes lands within and outside the PCA.

Results:

Secure Habitat Outside the Primary Conservation Area The BDNF established 12 analysis units outside of the PCA in 2003. These analysis units approximated the size of bear management subunits in the Yellowstone Recovery Zone. The Beaverhead-Deerlodge NF added one additional analysis unit in 2008 so that the Tobacco Root Mountains were not artificially divided by a biologically unsupportable line between administrative units, specifically the line between the former Beaverhead and Deerlodge national forests.

The 2008 monitoring analysis for areas outside of the PCA used a route data layer developed for revision of the Beaverhead-Deerlodge Forest Plan, completed in 2009. This data layer was used to derive secure habitat values for analysis units for comparison with the 2003 data. The 2008 route data layer represents the most up to date information on motorized routes on the Forest. Table 2 displays secure habitat values for the 12 analysis units for the 2003 baseline and 13 analysis units for 2008 and future monitoring.

Table 2. Beaverhead-Deerlodge NF Outside PCA secure habitat, 2003 to 2008

Analysis Unit		2003 baseline Secure Habitat	2008 Secure Habitat	Difference
Baldy		57.4	46.2	-11.2
Bear Creek		38.6	60.8	+22.2
Beaver		52.9	48.6	-4.3
Garfield		54.1	65.7	+11.6
Gravelly		64.0	62.1	-1.9
Madison		97.1	100	+2.9
Pintler		62.4	59.2	-3.2
Pioneer		62.3	53.0	-9.3
Snowcrest		66.0	71.0	+5
Sourdough		47.8	40.1	-7.7
Starlight		51.6	40.0	-11.6
Tobacco Root N			52.8	
Tobacco Root S		46.7	47	0.3

Note that Table 2 identifies substantial differences in secure habitat values between 2003 and 2008. In 2003, the BDNF trails layer had not yet been attributed with the motorized status of all individual routes, and consequently many were labeled "status unknown". Routes labeled "status unknown" were not included in the 2003 baseline data provided to the Grizzly Bear Habitat Modeling Team.

Since 2003, site specific information has been assembled for forest plan revision. Most motorized trails have been attributed with their appropriate motorized status. Trail attributing resulted in a large difference in secure habitat (as modeled in this effort) in some analysis units. For example, in the Pioneer Mountains, there were no routes in the West Pioneers WSA identified as 'motorized' in 2003. In 2008, nearly 81 miles of motorized trail were identified in the Pioneer Mountains WSA. For the 2008 Outside the PCA Monitoring Report, each analysis unit was reviewed and all changes in secure habitat between 2003 and 2008 are a result of this updated data information, and not a result of a change in motorized access management. Motorized routes that are physically on the landscape in 2008 were also there in 2003, but were not identified as such in the 2003 baseline.

Table 2 identifies an increase in secure habitat in the Bear Creek analysis unit of 22 percent between 2003 and 2008. In 2003, the BDNF identified many routes as open to motorized use, when in actuality most motorized routes identified were closed level-one roads.

Data from the Beaverhead-Deerlodge road accomplishment reports (the official reporting mechanism for road management activities) for FY2003 through FY2008 supports this. Table 3 identifies new road construction (system roads) and decommissioning (system and unauthorized roads) during the 2003 through 2008 period for the entire Beaverhead-Deerlodge NF, not just that portion of the Forest monitored for changes in secure habitat.

Table 3. Road construction and decommissioning 2003 through 2008.

Fiscal Year	New road construction (miles)	Decommissioning (miles)		
		System roads	Unauthorized roads	Total
2003	0.5	1.5	1.5	3.0
2004	0	0.9	9.5	10.4
2005	0	3.5	0	3.5
2006	0	0	0	0
2007	0	0	0.5	0.5
2008	0	3.0	0	3.0
Totals	*0.5*	*8.9*	*11.5*	*20.4*

Table 3 identifies a net loss of system roads of 19.9 miles between 2003 and 2008. The new construction in FY03 was at administrative or recreation sites, specifically the Pintler Ranger Station parking lot (0.1 mi) in Philipsburg, MT and Lemhi Pass (0.4 mi).

Substantial changes in motorized route densities are underway on the BDNF. Revision of the Forest Plan is anticipated to lead to closure of approximately 295 miles of motorized routes

forest-wide. Each of the seven Districts of the BDFNF will be completing an inventory of motorized routes that will lead to Motor Vehicle Use Maps (MVUM). The Madison RD, which includes all of the currently occupied grizzly bear habitat on the BDNF, is expecting to complete a MVUM in 2009. Completion of the MVUM process will likely lead reduced motorized access Forest-wide, and when complete will provide a stable motorized route baseline the Outside PCA Secure Habitat Monitoring.

Data management -Moving windows analysis for the 2003 baseline of secure habitat outside of the PCA was conducted in the fall of 2007 and repeated in March 2008. These data are archived on the Shoshone National Forest and at j/fsfiles/office/wildlife/2670/grizzly bear.

Developed Sites There have been no changes in developed sites on the BDNF since 2007. NFS lands administered by the Beaverhead-Deerlodge NF within the PCA are entirely within BMU subunit Hilgard #1. The Beaverhead-Deerlodge NF has no open motorized routes or ongoing/proposed projects within the PCA. Our analysis indicates slight improvements in habitat security within the Beaverhead-Deerlodge NF portion of the Hilgard #1 BMU based on proposed/actual road closures on the Gallatin NF.

Livestock No conflicts were recorded on the BDNF in 2008.
The Jeffers On/Off cattle/horse allotment was inadvertently included in the VACANT Cattle Allotment list in the 1998 baseline. The Jeffers On/Off has been in use by the same permittee for about 50 years. About 125 acres of this active allotment are within the PCA. Indian Creek and Shedhorn Allotments were identified as VACANT cattle allotments in the 1998 baseline. These Allotments are now CLOSED.

There are currently 148 active allotments on the Beaverhead portion of the Forest, 10 are inactive (vacant) and 22 are closed. Nine of the active allotments are sheep allotments. Seven of these are on the Gravelly Mountains; two are in the Tendoy Mountains.

Of the 22 closed allotments, four were sheep allotments in the Gravelly Mountains. These remained available for grazing and two were held as grass banks for approximately 15 years. In 2008, the Selway, West Creek, Clover Creek and Cascade-Lobo sheep allotments

Evaluation:

Secure habitat as influenced by motorized travel has the greatest potential to change both in and out of the PCAs. Substantial changes in motorized route densities are underway on the BDNF. Revision of the Forest Plan will lead to reductions in motorized routes forest-wide. Secure habitat for all wildlife will increase with reductions in open motorized roads and trails. Each of the seven Districts of the BDNF will be completing an inventory of motorized routes that will lead to Motor Vehicle Use Maps (MVUM). The Madison RD, which includes all currently occupied grizzly bear habitat on the BDNF, is expecting to complete a MVUM in 2010. Completion of the MVUM process will likely lead reduced motorized access Forest-wide, and when complete will provide a stable motorized route baseline to monitor changes in secure habitat for grizzly bears.

D. Ten Year Aspen Surveys

In 1999 the BDNF surveyed the effectiveness of aspen treatments across the forest. Field personnel located treatment sites, established permanent photo points, and recorded sprout height and density, browse levels, site descriptions and treatment type. In 2008 the same personnel revisited these sites. New photos were taken and information concerning the treatments was re-measured. Sites were rated for effectiveness of treatments over time. It should be noted that these are not all of the aspen treatments on the forest. The sites were originally selected for a variety of reasons including a comparison of treatment types. The treatments are now a minimum of 10 years old with the oldest in excess of 30 years.

Methods

With one exception, all the 1999 sites were located. New photos were taken from the original photo points, photo points were re-established where necessary and UTM coordinates were recorded. Records include estimates of sprout or tree density, sprout or tree height, browse intensity, and a narrative describing the area. For sprout density, ocular estimates were often sufficient, but occasionally transects using 1/300 ac. plots were run. Browse intensity and sprout or tree height was estimated in the same manner as the 1999 survey. Complete site data for 1999 and 2008 is available in Appendix A.

Specialists developed a treatment rating system based upon four categories. This rating was subjective and based upon visual observations at the site which include:

Sprout Height - Has there been any noticeable increase in sprout or tree height since the last monitoring?

Sprout Condition-Has browse condition changed visibly since the last monitoring?

Sprout Density Is the sprout or tree density on an acceptable trajectory given the density and condition of the parent clone to replace what was on the site before treatment?

Condition of the Parent Clone Can the parent clone continue to sprout if no further action is taken?

Given the above questions, the four following ratings were developed:

*Successful -T*he majority of the sapling canopy is above the browse line (4.5-5'). Overall browse is low on trees taller than 5'. Little basal scarring from chews or rubs is occurring. Tree forms are good and don't continue to exhibit a shrub appearance. The parent clone may or may not be present but the clonal root system is capable of continued sprouting.

Progressing -The sprout height shows visible increase since the last monitoring. Some sprouts or saplings may have grown past the browse line. The overall browse is currently less than at the time of the last monitoring. The clonal root system continues to sprout. The stand or clone can reasonable be expected to replace the parent clone.

Static Aspen presence has been reduced in terms of mature aspen but sprouts persist on the site. Sprouts may be expected to grow if further action is taken (an effective fence usually). Other than heavy browse, sprouts are in fair condition and exhibit sufficient density to eventually develop into mature aspen in the range of 250-500 trees per acre.

Failed Aspen has either been eliminated from the site or reduced to the point where it cannot be reasonably expected to replace the clone prior to treatment. Any sprouts are heavily browsed, less than 5' tall and number less than 200 trees per acre.

These ratings were grouped to assess whether the treatment had a positive or negative effect. Treatments that were progressing or successful had a positive effect. Mostly aspen presence has been maintained at the site and aspen regeneration has occurred.

Treatments rated static in 2008 have had a negative effect upon the site. Aspen presence has been reduced in terms of the potential for mature trees to eventually occupy the site. In addition costs were incurred to perform the treatment and benefits have not been realized. However, there is still the potential for the area to recover if additional action is taken.

Failed treatments mean that aspen has been eliminated or reduced to the point that it is not practical to take further action.

Results:

Across the forest, 41% of the sites rated positively in the years following treatment. Of this 41%, 18% were successes and 23% were progressing. The remaining 59% were static or failed. Forty one of these treatments (42%) rated static and may yet have some potential. Seventeen of the treatments (17%) have failed. See Appendix A for the complete data set.

The southern portion of the Madison Ranger District has the most successful aspen treatments. For this survey, the sites are located in West Fork of the Madison and Antelope Basin. Eight three percent of the treatments on the southern Madison R.D. rated progressing or successful. Excluding the Madison R.D. only 30% of the sites on the Forest rated progressing or successful. The 1999 survey is not random and there is an introduced bias on the way the sites were chosen based on accessibility, but this observation does demonstrate that some geographic areas are more prone to success, notably the southern portion of the Madison.

Table 4. Status of Aspen Treatments on the Forest

Area	Successful or Progressing	Static or Failed
BDNF (Excluding Madison R.D.)	30%	70%
Madison R.D.	83%	17%
Entire BDNF	41%	59%

Fences
Twenty eight percent of the sites that initially had fences were rated as successful or progressing. In 1999, 25 sites had been fenced to exclude livestock or wildlife. In 2008 only 8 sites remained effectively fenced. Of the 25 sites 7 were rated successful or progressing. Of these 7, only 1 had a fence remaining.

Treatments in Riparian Areas Including Stream Terraces
In total 29 of the 88 sites were classified as riparian areas or stream terraces exhibiting riparian vegetation, namely blue joint or willow. Of these 29 sites only 3 were rated as successful or progressing.

Slash as a Deterrent
None of the areas retained slash in sufficient height to deter browse. Photos show slash concentrations 5-6' tall in places in 1999 and in 2008 these same concentrations are on the ground. The individual logs remain but the branches are gone and in all cases the logs are lying directly on the ground.

Evaluation:

- **Stand replacement treatments without effective long term fencing should be avoided except on the southern portion of the Madison district.**

Stand replacement treatments failed in eleven of 15 or 73% locations. All but one of the failures occurred in areas other than the southern portion of the Madison district. The southern portion of the Madison is more productive for than other places on the forest. Mature aspen is abundant, clones sprout and grow well and the landscapes are more open offering browsers other places to go.

- **Non-stand replacement treatments such as conifer clearing from adjacent to and within the stand of aspen is effective in stimulating long term sprouting even if browse continues to limit growth.**

One of the most surprising observations in this survey is the persistence of aspen. Some of these treatment areas after 25 years still exhibit dense sprouting even though the sprouts never get more than about 18" tall due to heavy browse.

- **Slash should not be used as a cheap alternative to fencing.**

Slash concentrations have been ineffective on all sites where it has been employed either indirectly or intentionally. Slash will not stay far enough off the ground long enough to allow sprouts to grow above the browse line. Wherever the sprouts exit the slash is how tall they will remain because they just get browsed off at that point. Rather than spend money arranging slash, fence a smaller area.

- **Wildlife fencing is an effective treatment often with no other activity.**

When wildlife is excluded it often allows the sprouts to get above the browse line fairly rapidly, before the fence falls down due to lack of maintenance.

- **Keep track of new treatment locations.**

There has been no centralized collection or storage of aspen treatment information of activity since 1999.

- **Monitor effects of wildfire on aspen**

The Revised Forest Plan establishes aggressive goals for aspen restoration that rely on wildfire burning through remnant aspen clones in lodgepole pine to regenerate stands. The BDNF has little data on the success of wildfire in regenerating aspen, or the scale of browse effects on landscape scale conversions. Eighteen plots were established in potential aspen stands in the Mussigbrod (2000) and Rat Creek (2005) wildfires during the 2008 field season. Data for those sites is included in Appendix A. New sites will be selected for monitoring in 2009, including newer treatment approaches and any new wildfires.

Figure 3. Aspen Sprouting on Mussigbrod Fire, Site ID 364, Schulz Creek

Further information and detailed recommendations are available in the 1998 Vegetation Monitoring Report available on the web under Land and Resource Management Activities, Planning, Forest Monitoring and Evaluation Reports at www.fs.fed.us/r1/b-d/

E. Conifer Encroachment Reduction

Sagebrush/grasslands are a vegetation community at risk on the BDNF (Land and Resource Management Plan, DEIS, 2008, page 464-465). These shrublands are threatened largely by colonizing conifers. Several small scale projects in 2008 treated the encroaching trees by cutting down them down and either letting them lay or following treatment with a prescribed fire.

In the Dry Gulch area, 3 miles southwest of the town of Divide on the Wise River Ranger District, Douglas-fir seedlings and saplings colonized approximately 100 acres of the sagebrush plant community. This area serves as critical winter range habitat for mule deer and elk. Forest Service crews hand cut the area to eliminate Douglas-fir in the sagebrush stands. This will allow the sagebrush to remain on the site for another 25 years or so before being shaded out by the Douglas-fir again. This project was paid for by the Forest Service and Montana Fish Wildlife and Parks through the Sikes Act. It cost $4,000.

Figure 4. Dry Gulch Conifer Encroachment Project Before and After Treatment

Before

After

Before

After

F. Beaverhead Settlement Agreement

The Beaverhead-Deerlodge National Forest amended riparian management direction within the Beaverhead Forest Plan in October of 1997. A subsequent lawsuit sponsored by the National Wildlife Federation was settled in collaboration with several parties. As part of the Beaverhead Livestock Grazing Settlement Agreement, compliance with grazing standards are monitored and reported annually. Actions taken to implement the Settlement Agreement have only applied to the Beaverhead Districts (South Zone) of the Beaverhead-Deerlodge National Forest. The 2008 grazing season was the eleventh year that allotments were monitored for compliance with the Beaverhead Forest Plan standards and guidelines as amended in October of 1997.

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Results:

Most allotments on the Beaverhead zone were inspected (135 of 156 allotments). Most allotments were inspected numerous times prior to, during, and after the grazing season.

Table 5. Compliance with Grazing Standards by District

District	Total Allotments	Allotments That Met Standards	Allotments That Did Not Met Standards	Unknown
Dillon	60	44	9	7
Wise River	18	10	3	5
Wisdom	20	19	0	1
Madison	58*	48	2	1
				8
Total	156	121	14	21

*Madison Ranger District has 68 alotments in their data base. Of these, 52 are active, 6 are vacant, and 10 are closed. Compliance reports were done for 58 allotments. Compliance reports were not done for closed allotments.

Table 6. Forest Plan Standards Exceeded on Noncompliance Allotments

Forest Plan Standards Exceeded	Number of Allotments Exceeding Standard From Total of 14 Allotments
Management. System	5
Streambank Vegetation and Structural Damage	12
Upland Utilization	3
Riparian, Fisheries	12
Winter Range	0
Transitory Range	0

Evaluation:

Of the 14 allotments where Forest Plan standards were exceeded, five were non-compliant in 2007. The remaining 9 allotments were non-compliant for the first time in the last 3 years. As reported in the "2008 Forest Plan Compliance Summary" (file code 2210/2230), the 2008

grazing season was an average to above average year for forage production on most of the Forest. Upland forage utilization was generally acceptable. As with most years, the majority of our non-compliance was from impacts on riparian areas. Some permittees turned onto their allotments late or removed livestock from the Forest allotments early or went on with less livestock in an attempt to comply with Forest Plan utilization standards.

Enforcement - Forest Plan compliance forms were completed for 166 of the 166 allotments. Ten allotments are closed. Some of the closed allotments were checked for unauthorized use, but they were not inspected for compliance with the Forest Plan. The compliance forms were made available to all affected permittees. Permittees on allotments judged to be out of compliance with Forest Plan standards during the 2008 grazing season have been contacted by District Rangers and corrective actions to resolve non-compliance problems have been developed. These corrective actions will be outlined in annual operating instructions for the 2009 grazing season. In some instances, corrective actions have meant that adjustments of grazing permits be made to resolve chronic non-compliance problems. In other cases, permittees have voluntarily reduced livestock numbers or seasons of use in an attempt to remain in compliance. Any adverse actions taken by the Forest Service are within the guidelines in the Beaverhead-Deerlodge Supplement to the Grazing Permit Administration Handbook.

Season of Use, Livestock Movement - This item is dealt with on an allotment by allotment basis. Projected livestock move dates are outlined in annual operating instructions for each allotment. In many cases actual move dates varied to some degree depending on resource conditions.

Education – Ranger District Rangeland Management Specialists continued to train permittees on utilization standards. This year training was done when permittees were with Forest Service allotment administrators during allotment inspections.

G. Wildfire Suppression or Management:

Cool temperatures and moisture early in the summer of 2008 led to a quiet year for wildfires. Forest personnel directed or participated in 2 large fires under direct protection agreements (Pumpstation and, Cactus Fires) and 1 large fire in assistance to Fish and Wildlife Service (Red Rocks Fire). No Forest Service acres were involved in these 3 fires. Wildfires on BDNF lands are summarized below.

Fire	Ranger District	# Fires	Acres
Fires > 10 acres*		0	0
Fires <10 acres	All Districts	70	36.3

H. Project Decisions - National Environmental Protection Act (NEPA)

Decision makers on the BDNF issued no Record of Decision, 2 Decision Notices, 18 Decision Memos and had 55 project analyses underway to meet the National Environmental Protection Act (NEPA) in FY08. Table 8 below compares the projects analysis and decisions made for the last three years, 2006 – 2008.

Table 8. Number of Decisions Made and Projects Underway 2006-2008

Fiscal Year	Record of Decision #	Decision Notice #	Decision Memo #	Project Analysis Underway
2006	1	0	31	40
2007	1	6	20	28
2008	0	2	18	55

The 75 individual project decisions and project analysis for FY 2008 are listed in the table below. The following Acronyms are used in Table 9.

AMP	Allotment Management Plan
CDNST	Continental Divide National Scenic Trail
CDTS	Continental Divide Trail Society
CE	Categorical Exclusion
DEIS	Draft Environmental Impact Statement
DM	Decision Memo
DN	Decision Notice
EA	Environmental Assessment
FEIS	Final Environmental Impact Statement
NOI	Notice of Intent
POO	Plan of Operation
SUP	Special Use Permit

Table 9. Projects in various planning stages in FY08

PROJECT NAME	DISTRICT	Stage of completion by the end of FY08
Designation of Energy Corridors on Federal Land in 11 Western States	Multi-Forest	NOI 9/2008
Geothermal Leasing Programmatic EIS	Multi-Forest	DEIS 6/13/08
Beaverhead-Deerlodge Forest Plan Revision	Forest	FEIS published 01/08 without a Record of Decision
Roadside Safety Tree Removal CE	**Butte**	**DM COMPLETED 01/08**
Roadside #2 Hazard Removal CE	Butte	Legal Notice 08/08
North Butte Salvage and Restoration EA	Butte	Legal Notice 08/08
Norton Creek Trail Construction CE	Butte	Legal Notice 09/07
Thompson Park Recreation and Trail Rehab EA	Butte	Scoping 11/07
Thompson Park Salvage Sale EA	Butte	EA *ON HOLD*
Bear Creek and Lemhi Pass AMPs	Dillon	EA underway
Brays Canyon Fish Barrier EA	Dillon	Legal Notice 06/08
Crystal Park Withdrawal Addition EA	Dillon	Notice 05/25/07
Green River Energy Resources CE	Dillon	Legal Notice 05/08
Sawtooth Lake Trail CE	Dillon	Scoping
Westside AMPs EA	Dillon	EA comment period legal notice 08/07
Homestake Pass Salvage and Restoration EA	Jefferson	Legal Notice 08/08
Lockhart Meadows Post and Pole CE	**Jefferson**	**DM COMPLETED 10/07**
Toll Mt Salvage CE	Jefferson	Scoping 09/30/05
South Arm Whitetail Restoration Project EA	**Jefferson**	**DN COMPLETED 05/08**
Whitetail Pipestone Travel Management EIS	Jefferson	DEIS 04/07/06, FEIS underway
DPT Productions Endurance Race	**Madison**	**DM COMPLETED 04/08**
FY08 Outfitter/Guide CE	**Madison**	**DM COMPLETED 02/08**
FY08 Special Use permit CE	Madison	Scoping 02/08
Gravellys Aspen Release CE	**Madison**	**DM COMPLETED 06/08**
Madison Motor Vehicle Use Map EA	Madison	Scoping 07/07
Red Bird Special Use Permit CE	**Madison**	**DM COMPLETED 02/08**
Smuggler Mine Plan of Operation CE	**Madison**	**DM COMPLETED 06/08**
Snowcrest III Trail Reconstruction DM	Madison	Scoping 07/20/06
Wade lake Bench Well & Pipeline CE	Madison	Scoping 12/07
West Fork Madison River Habitat Restoration CE	**Madison**	**DM COMPLETED 03/08**
West Fork Madison Trail Reconstruction CE	**Madison**	**DM COMPLETED 02/08**

Wigwam Creek Exclosure CE	Madison	Scoping 02/08
Anaconda Job Corp WUI Fuels Abatement CE	Pintler	Scoping initiated 03/26/07
Barton Spring Commercial Thinning CE	**Pintler**	**DM COMPLETED 02/08**
Bartlett Creek Outfitter SUP Renewal CE	**Pintler**	**DM COMPLETED 04/08**
City of Philipsburg SUP Reissuance CE	Pintler	Scoping 02/08
Clearcut Springs Development EA	Pintler	Legal Notice 06/08
Crystal Creek Culvert Replacement CE	Pintler	Scoping 04/08
Denton's Point Marina SUP CE	Pintler	Scoping 03/08
East Deerlodge Valley Landscape Restoration EIS	Pintler	Notice of Intent 06/08
East Fork Post and Pole Sales EA	Pintler	Scoping initiated 2001
Fidelity National Timber Resources access CE	Pintler	Scoping 04/08
Fred Burr Pass Warming Shelter SUP CE	Pintler	Scoping 02/08
Holsten Minerals Exploration CE	**Pintler**	**DM COMPLETED 09/07**
Lakeside at Georgetown SUP CE	Pintler	Scoping 04/08
Maywood Ridge Communications Line Installation DM	Pintler	Scoping 03/07/06
Middle Fork Toilet Replacement CE	Pintler	Scoping 02/08
Ram Mountain Outfitter SUP Renewal CE	**Pintler**	**DM COMPLETED 04/08**
Rocking J & KPK Ranches Water Pipeline CE	**Pintler**	**DM COMPLETED 06/08**
Royal Tine Outfitters SUP CE	Pintler	Scoping 04/08
Sand Basin Conifer Slashing/willow planting CE	Pintler	Estimated Scoping 09/06
Skalkaho Snowmobile Trailhead CE	Pintler	Scoping 02/08
Storm Lake Culvert Replacements CE	Pintler	Scoping 03/08
Storm Lake Snowmobile Trailhead CE	Pintler	Scoping 02/08
Storm Lake Wilderness Trailhead CE	Pintler	Scoping 02/08
Upper Maywood Water Development CE	Pintler	Legal Notice 07/08
West Fork Slashing and Willow Planting CE	Pintler	Scoping 02/08
Wild Skies Outfitters SUP CE	Pintler	Scoping 04/08
Willow Creek Minerals Exploration EA	Pintler	Legal Notice 08/08
Battle Mt Hazardous Fuels Reduction EA.	Wisdom	Scoping 09/06
Hauseman Mine Plan of Operations CE	Wisdom	Scoping 01/08
Rat Creek Roadside Hazard Reduction CE	**Wisdom**	**DM COMPLETED 05/08**
Southwest Montana Telephone Fiber Optic Cable Installation CE	Wisdom	Scoping 04/08
CDNST – Berry to Goldstone	Wisdom	Scoping 03/03/04
CDNST – Gibbons Pass to AP Wilderness	Wisdom	Scoping 07/07
Cannivan Gulch Exploratory DrillingCE	**Wise River**	**DM COMPLETED 08/07**

Cannivan Mineral Exploration EA	**Wise River**	**DN COMPLETED 04/08**
Elkhorn Exploratory Drilling Plan of Operations CE	Wise River	Scoping 01/08
Jackpine Savages Snowmobile Club Permit Reissuance CE.	**Wise River**	**DM COMPLETED 01/08**
Jerry Creek Allotment Fence Reconstruction CE	Wise River	Scoping 03/08
North Big Hole AMPs	Wise River	Scoping 02/18/04
Placer Creek Mining Exploration CE	Wise River	Scoping 04/12/07
Southern MT Telephone Co. Fiber Optic Cable Installation CE	Wise River	Scoping 04/08
Sawmill Riparian Fence Modification CE	**Wise River**	**DM COMPLETED 06/07**
Trapper Creek Restoration EA	Wise River	Legal Notice 07/08

Source: BDNF Schedule of Proposed Actions http://www.fs.fed.us/sopa/forest-level.php?110102. Projects "On Hold" throughout the fiscal year were not included.

I. Appeals and Litigation

Decision makers on the BDNF approved 10 projects that were subject to appeal in FY08. Of these, one decision was appealed. It was affirmed in favor of the Forest Service. Since 1997, 66 of the 128 appeal-able decisions were appealed. Fifty one of those were affirmed or dismissed.

Table 10. Projects Appealed or Litigated in FY08

Project Name	Project Type	Appeal Decision	Appellant	Litigation
Barton Springs	Tree Thinning Categorical Exclusion	Affirmed	Alliance for the Wild Rockies, Native Ecosystem Council	None

REPORT BY MONITORING ITEM

A. Forest Outputs and Accomplishments

Monitoring Question: Are Forest Outputs meeting targets and plan predictions?

Performance Measure: Number of plans, acres of treatment, board feet sold, AUMs grazed, acres burned or treated.

We have summarized accomplishment reporting required by a number of separate monitoring items to simplify tracking. The brief discussion compares FY06 accomplishments to the forest target, if there was one, and evaluates the trend.

Table 11. Summary of Forest Outputs and Actual Accomplishments for Fiscal Years 2005-2008

Forest Outputs and Accomplishments	2005	2006	2007	2008*
Watershed Assessments (each)	0	0	1	2
Watershed Restoration (miles)	14	21	8	16
Noxious Weed Treatment (acres)	7,636	6,017	5,001	8,570
Timber offered for sale (MMBF)	21.7	7.24	10.8	14.13
Timber Harvested (Acres)	950	309	920	1,358
Livestock grazing (AUMs)	185,601	226,461	161,129	204,561
Fuel Reduction- WUI Acres only	1,840	2,195	1,038	1,586
-TOTAL Acres Treated	5,273	4,898	12,360	6,101

*Source: Beaverhead-Deerlodge National Forest Final Accomplishment Certification Report for 2008.

Results:

The following information comparing targets to accomplishments was extracted from the report "FY08_Final_Targets_as_of_111008".

(1) Watershed assessments

- Two ecosystem assessments were completed on the Forest in 2008. Dillon Ranger District completed the Birch/Willow/Lost Creek Watershed Assessment of three 6th code hydrologic units allocated as key restoration watersheds in the January 2008 version of the Revised Forest Plan. The Watershed Assessment is posted on the BDNF Forest web at www.fs.fed.us/r1/b-d/ under Land and Resource Management, Planning.

  The East Deerlodge Valley Landscape Assessment was prepared in cooperation between the Pintler Ranger District and the East Deer lodge Valley Forest Stewardship Partners, a consortium of stakeholders in the EDLV landscape including the United States Forest

Service (USFS) BDNF, Powell County Commissioners, the Montana Wilderness Association (MWA), Montana Trout Unlimited, Sun Mountain Lumber, Headwaters Resource Conservation and Development (RC&D), Rocky Mountain Elk Foundation, Clark Fork Coalition, and the Montana Department of Fish, Wildlife and Parks (FWP). This assessment area covered a number of 6th code hydrologic units including the Fred Creek (Cottonwood Creek) fish key watershed and Girard Gulch key restoration watershed identified in the January 2008 version of the Revised Forest Plan. The assessment is available at www.fs.fed.us/r1/b-d/ under Land and Resource Management, Planning

- The Forest's FY08 target of 2 ecosystem scale assessments was accomplished.

(2) Watershed Restoration

- Sixteen miles of stream were enhanced for fisheries in FY08 out of the targeted 19 miles. In addition, projects done for the purpose of improving stream habitat included riparian projects on 16 acres. There was no target for stream habitat improvement.
- The target of 19 miles was 94% accomplished.
- The trend is upward from 2007.

(3) Noxious weed treatment

- Noxious weed treatments amounted to 8,570 acres which included spray projects funded with assistance from Rocky Mountain Elk Foundation or Fish Wildlife and Parks in the Fleecer Mountains, German Gulch, Greenhorn Range, North Meadow Creek, Norton Creek, Pintler and Jefferson District winter range as well as annual District weed maintenance work.

Figure 7. Knapweed aerial spray project on winter range, Ham Gulch, Pintler RD

Figure 8. Knapweed "Land Tamer" spray project on Horse Pasture, Pintler RD

- This was 153% of the Forest target of 5,583 acres. The trend is up considerably from acres treated in FY07 in part because wildlife funding contributed to weed spraying accomplishments on big game winter range.

(4) Timber Offered and Sold

- The volume of Timber Offered and Sold was 14.13 MMBF or 31,400 CCF. The Forest target was to sell 25.9 MMBF or 57,565 CCF. Five projects expected to generate timber sales in FY08 did not make it through the environmental analysis process for a number of reasons. These included North Butte, Homestake, Thompson Park, Lime Kiln (all on Butte District) and Toll Mountain (Jefferson District). One project, Barton Gulch (Pintler District) was tied up in litigation. Of the 14.13 MMBF sold, 6 MMBF came from posts, poles, and firewood. The remainder came from small roadside salvage projects designed to provide public safety.

- Volume of Timber Harvested =14.3 MMBF or 32,161 CCF. *(*6.12 MMBF or 15,589 CCF of that volume was in permitted harvest such as Personal Use Post and Poles, Fuel wood Permits, Shrubs and Transplants). No target is assigned to timber harvest.

- There were 1,358 acres of timber harvested in 2008. The ten year harvest record 1999-2008 is 6,280 acres (source is USFS FACTS data base, query of all 18 harvest activity codes).

- The trend is up from 10.8 MMBF offered in FY08 and above the ten year average.

(5) Livestock Grazing, Actual Use in 2007, in Animal Unit Months

- Actual use by livestock on the Forest was 204,561 animal unit months.

Table 12. Actual livestock use in 2008 in Animal Unit Months

Type of Use	FY05	FY06	FY07	FY08
Cattle and Bison	173,937	217,917	153,710	198,136
Horses	838	917	457	324
Sheep	10,826	7,627	6,962	6,101
TOTAL	185,601	226,461	161,129	204,561

Source: USFS, INFRA data base, actual use by District

- Trend in actual use is up from FY07. As reported in the "2008 Forest Plan Compliance Summary" (file code 2210/2230), the 2008 grazing season was an average to above average year for forage production on most of the Forest. Upland forage utilization was generally acceptable.

(6) Fuel Reduction

- Acres of Wildland Urban Interface (WUI) fuels treated = 1,586

  Acres non-WUI high priority hazardous fuels treated =4,515

  TOTAL = 6,101

- The data base of record (NFPORS) indicates a target of 5,269 acres of Forest Protection fuel treatments for both units of the BDNF. This includes brush disposal, hazardous fuels and other fuels treatments. The Forest exceeded the fuel reduction target by 115%. This is in part due to integrated projects which also provide wildlife habitat benefits.

- While this number is down from last year, it is consistent with the last four years.

(7) Road Maintenance and Obliteration

- There were 934.4 miles of Forest roads maintained in FY08 compared to 961 miles in FY07. This includes roads maintained with FS fund and with non-FS funds (such as by counties, permittees, timber purchasers, and other commercial operators).

- Three miles of road were decommissioned (unauthorized roads).

- The Forest road maintenance target was 806 miles. The target was exceeded by 16%.

Evaluation:

BDNF target accomplishment was variable in FY08. Targets for fuel reduction and noxious weed treatment were again exceeded. Economies of scale for both targets were achieved by integrating wildlife habitat targets on big game winter range with noxious weed targets and wildlife habitat improvement with fuel reduction targets.

Targets for timber offered and sold were not met. Environmental analysis was not completed on projects anticipated to generate FY08 sales. One project which made it through environmental analysis was involved in litigation. .

B. Insects and Disease

Monitoring Question: Are levels of insect and disease increasing to damaging levels as a result of management activities.

Performance Measure: Changes in acres infested by landscape, % change on the Forest compared to the Region

Results:

Insect and disease conditions are monitored by the Forest Health Protection branch of USDA Forest Service State and Private Forestry and the Montana Department of Natural Resources Forestry Division using aerial flights. The aerial flight detection data for several species of insects, including mountain pine beetle and Douglas-fir bark beetle, has been made available to Forest specialists and the public on the website http://www.fs.fed.us/r1-r4/spf/fhp/aerial/maps/montana_map.html#mt. The figure below presents the draft 2008 flight data in dark red. This can be compared to previous year detections to assess the movement and growth of the insect populations on the Forest. Areas mapped show current sign of insect effects. Once a tree dies, it no longer shows up in the mapping. More than one year of insect effect effects are included in each year mapping as trees can take more than one year to die after showing visible effects.

As of this writing, a forest health condition report for the State of Montana has not been prepared from that data. It will be posted at http://www.fs.fed.us/r1-r4/spf/fhp/conditions/entry1.html.

Evaluation:

Since no data on acres infested by primary insects of concern is available from the State and private Forestry Branch at this point, there are no definitive results to evaluate. We do know that up through 2007 BDNF trends generally follow regional trends for increasing insect outbreak and outbreaks are spreading outward from the core infestation areas prior to 2003. Watch the website noted in the paragraph above for the 2008 report.

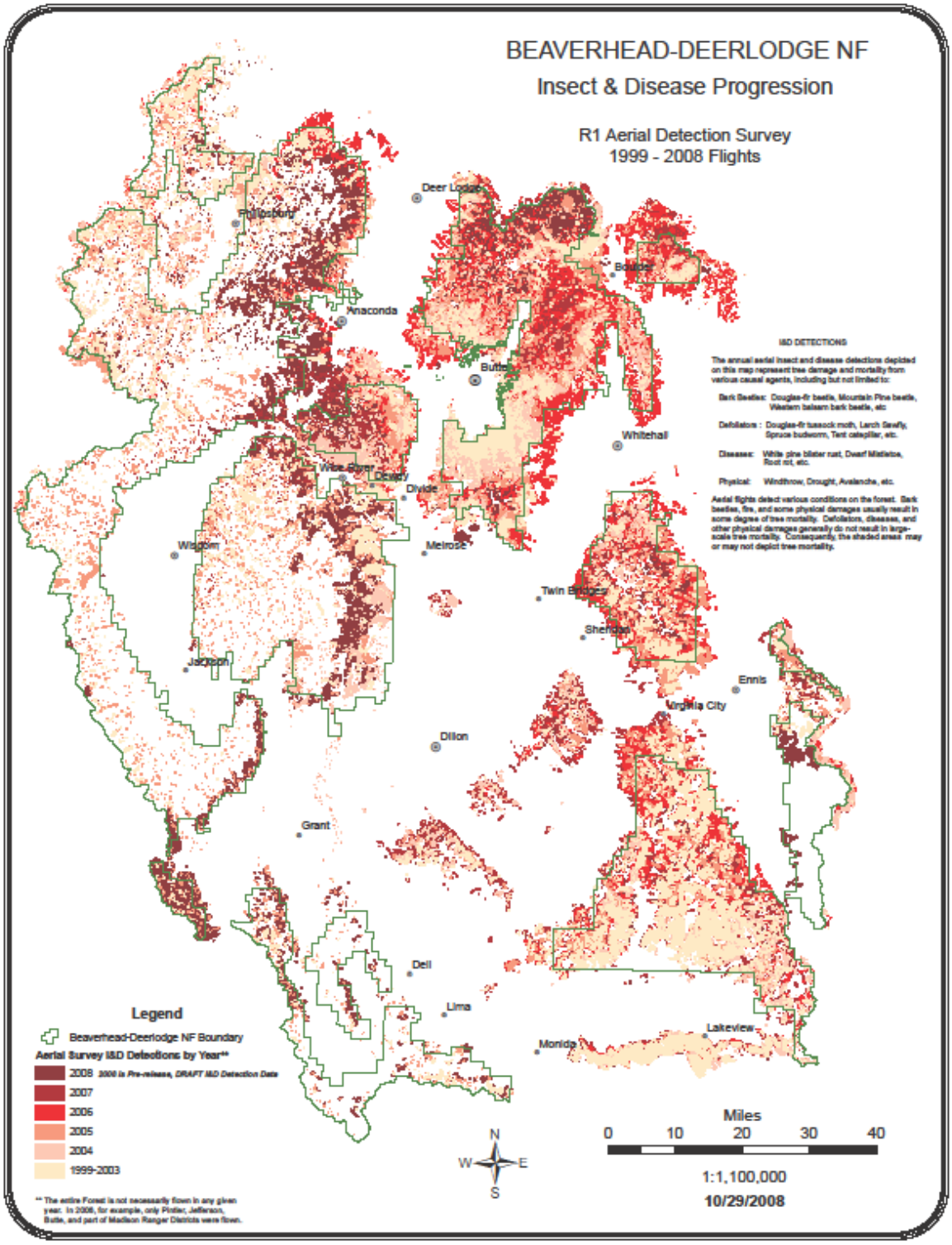

Figure 9. Insect and Disease Progression on the BDNF 1999-2008

C. Wildlife management indicator species

(1) Elk

Monitoring Question: How are populations of elk changing?

Performance Measure: Population data for elk from Montana Fish Wildlife & Parks

Results: Data in Table 13 below comes from the Montana Fish, Wildlife and Parks (FWP) website and State Elk Plan. No updates were made by FWP to the 2008 data.

Table 13. Montana Fish Wildlife and Parks Elk Objectives compared to Population Estimates

BDNF Hunting Districts	2005 FWP State Elk Plan Objective ± 20%	FWP 2003 Population Estimates ± 10%	FWP 2006 Population Estimates ± 10%	FWP 2007 Population Estimates ± 10%
210	2500	1043	952	1020
211	600	679	485	262
212	850	1100	1074	1494
213	650	401	689	484
214	200	309	270	284
215	1000	736	1144	1234
216	325 %	457	288	473
300	700-900%	615	1137	1450
302	550-700	399	736	956
311	2700	2096	3100	3000
318	500	366	383	535
319	1100 Max	1515	936	819
320 333	1000 for both	1130 549	942 470	745 477
321	None	No winter elk	No winter elk	No winter elk
323 324 327 330 Total	 Gravelly EMU Total = 7000	3119 3114 No winter elk 1830 (8063)	2682 2500 No winter elk 1132 (6314)	2265 1928 No winter elk 1116 (5309)
328	550-700	574	650	635
329	900 Max	582	683	727
331	1400 Max	1250	896	1085
332	900 Max	506	600	376
 340 350 370	 1600 combined for all	219 602 330 (1151)	557 268 192 (1017)	839 500 (1339)
341	600 Max	669	494	272
360	2200	4555	1914	1661
362	2500	1159	3629	3845
TOTAL	30,575	28,074	28,803 stable	28,482 stable

Evaluation: No 2008 data was available from Montana Fish Wildlife and Parks as of printing date for this report.

(2) Mountain Goat

Monitoring Question: Are management activities effectively protecting high elevation winter habitats for mountain goats (From Revised Forest Plan, published 1/2008)?

Performance Measure: Population data for goats from Montana Fish Wildlife & Parks and number of snowmobile entries into non-motorized high elevation units protected for goats.

Results: Data in the table below comes from the Montana Fish, Wildlife and Parks (FWP) website. No updates were made by FWP in 2008..

Table 14. Montana Fish Wildlife and Parks Mountain Goat Population Estimates

BDNF Mountain Goat Hunting Districts	FWP 2003 Population Estimates + 10% all ownerships	FWP 2006 Population Estimates + 10% all ownerships	FWP 2007 Population Estimates + 10% all ownerships
212	66 stable	45	30
222	25	25	7
223	44	40	40
312	150	150	80
320	100	100	80
321	75	75	10
322	60	60	15
324	**300** Madison Herd	**300** Madison Herd	**365** 70
325	"	'	70
326	"	'	80
327	"	'	55
328	"	'	40
331	80	80	50
Total	2100 stable - increasing	2075 stable	627 decreasing

Evaluation: Data was not available from Montana Fish Wildlife and Parks for 2008.

(3) Wolverine

Monitoring Question: Are management activities effectively protecting high elevation winter habitats for wolverines? (Revised Beaverhead-Deerlodge Plan Draft Monitoring Item 13, no item in 1986/87 Plans)

Performance Measure: Population data for wolverine from Montana Fish Wildlife & Parks and other partners. Presence or absence of wolverines in high elevation habitats, number of snowmobile entries into non-motorized high elevation units protected for wolverines.

Results:

The Greater Yellowstone Wolverine program was initiated in 2001 as a collaborative effort by the Hornocker Wildlife Institute, the Wildlife Conservation Society, Grand Teton National Park,

Montana Dept. of Fish, Wildlife and Parks (MtFWP), Idaho Dept. of Fish and Game, Wyoming Dept. of Game and Fish, the Caribou-Targhee National Forest, Beaverhead-Deerlodge national Forest, Gallatin National Forest (NF) and Bridger-Teton National Forest. The program operates under the direction of Robert M. Inman and the Wildlife Conservation Society (WCS).

Initial data from the WCS Wolverine Program answered fundamental questions about 1) the geographic scale over which management strategies must be designed in order to be successful (Inman et al. 2007) and 2) where wolverine habitat exists at that scale (Brock et al. 2007). We know as a result of these studies that the Madison, Gravelly, Henrys Lake (Gallatin NF) and Snowcrest Ranges of southwestern Montana appear to contain 3 adult male and 6 adult female territories. Annual home range size averaged 400 km² for adult female wolverines and 1,200 km² for adult male wolverines. Wolverine density was estimated to be 1 wolverine/212 km² of primary habitat in the Madison, Gravelly, and Centennial Ranges of southwestern Montana (Inman et al. 2007a). Together, these local populations, or "demes" make up a metapopulation whose viability depends upon successful dispersal among the mountain ranges of Montana, Idaho and Wyoming.

In 2008, WCS began testing methodology for documenting the presence or reproductive den sites (for distribution and monitoring purposes) and capturing family groups at those sites (for dispersal and demographic data). During March and April of 2008, WCS used a fixed-wing aircraft to search for wolverine tracks and potential den sites in 9 mountain ranges, four of which are on the Beaverhead-Deerlodge National Forest (BDNF). The areas searched were identified as potential wolverine habitat with a habitat model produced by Brock et al. (2007). The search pattern as a complete search of all open, snow-covered areas above or near alpine timberline (Greater Yellowstone Wolverine Program, Progress Report – November 2008, p. 15 at http://www.wolverinefoundation.org/research/WCS%20WP%20Update%20Nov%202008.pdf.

Table 15. Area of Modeled Wolverine Denning Habitat* on the BDNF and for the Metapopulation as a Whole

Metapopulation Unit	Mountain Ranges	BDNF Area (km2) of Modeled Wolverine Habitat	Total Area (km2) of Modeled Wolverine Habitat
Anaconda	*Anaconda-Pintler, Pioneer, North Beaverhead, Fleecer, Flint, Sapphires*	2,648	5,389
Lemhi	*Beaverhead Mountains, Tendoy Range*	451	4,474
Elkhorn	*Highlands, Boulder River, Elkhorns*	459	1,212
Gravelly	*Gravelly, Tobacco Roots, Centennial*	1,001	2,388
Yellowstone	*Madison*	352	1,904
TOTAL		4,911	

*Brock et al. (2007).

Wolverine tracks spotted from the airplane were marked by GPS, followed, and searched for den sites. Sites where there was a hole in the snow and indications of extensive wolverine use were noted and inspected several times during subsequent weeks. Sites indicating prolonged use were visited on the ground at which time the entrance location was recorded, any available genetic samples were obtained, and in one case, a remote camera was placed near a potential den. Tracks classified as wolverine were observed in 5 of the 9 mountain ranges, including 3 potential den sites, one in the Beaverhead Range, one in the northern Anaconda Range (Anaconda Pintler Wilderness) and another in the southern Anaconda Range. Aerial follow-up visits suggested wolverine were using each of the 3 den sites regularly over an extended period.

Table 16. Wolverine den-survey results, fixed-wing, spring 2008, Beaverhead-Deerlodge NF

Mountain Range	Area (km2) of Wolverine Habitat	Wolverine Tracks Observed	Potential Dens	New Wolverines Identified
Anaconda	1,131	Yes	2	5
North Beaverhead	674	Yes	1	4
Snowcrest	404	Yes	0	1
Tobacco Root	495	No	0	0

Two wolverine cubs were captured in the end of the Beaverhead Range and fit with a radio-implant for tracking.

Evaluation:

WCS reports the following conclusions from their 2008 work pertinent to the BDNF ("Greater Yellowstone Wolverine Program Progress Report – November 2008" Inman et al 2007b).

Wolverines of the Rocky Mountain States exist as a metapopulation whose persistence depends on successful dispersal. There are four major demes or areas with the potential for their individual wolverine "population" to consist of 50 animals: these are Yellowstone, Salmon, Bitterroot and Northern Continental Divide. These 4 areas likely function as cores or "Regional Population Centers". In order for wolverines to disperse successfully among these Regional Population Centers, the areas in-between must function appropriately. It is these areas in-between that compose a "Central Linkage Ecosystem (Anaconda, Gravelly, Elkhorn, Lemhi, Belt and Mission demes,). All of the BDNF except for the Madison Range (Yellowstone population) lies within this Central Linkage Ecosystem. Here, a significant amount of primary wolverine habitat is in public ownership, and successful reproductive females are present. Successful reproduction within these island mountain ranges is the most likely means of achieving successful dispersal among the Regional Population Centers. WCS proposes to focus their new phase of work on research efforts in the Central Linkage Ecosystem and western Yellowstone demes.

Estimated costs of conducting fixed-wing, spring den surveys are approximately $3,000 per 1,000 km2 of primary wolverine habitat and 7 person-days. WCS seeks funding support and recommends pooling survey efforts across ownerships because jurisdictional borders are often located at the crest of a mountain range while the wolverine home range extends down both slopes.

D. Riparian Stream Function

Monitoring Question: Are stream and riparian conditions improving?

Performance Measure: Percent of stream channels functioning or in upward trend.

In 2008 the Forest implemented an integrated stream monitoring program to answer the following specific monitoring questions:

1) What is the condition of riparian systems within suitable range forestwide regardless of whether livestock is present? A representative sample using a random selection protocol determines new candidate survey reaches that receive final field verification.
2) The second facet determines trend, and utilizes a random selection of existing stream survey sites established since 1996. How do various livestock management systems affect riparian function in grazed areas across the forest?

Over a five year period, a total of 250 riparian sites distributed normally across the forest on riparian areas with Rosgen C and E potential stream types will be sampled. Sixty percent of these sites will address the first facet of the monitoring question (30 sites per year), and 40% will address the second facet (20 sites per year). Fifty sites will be measured annually, with a measurement frequency every 5 years. Both stream channel characteristics and riparian vegetation will be measured. After 5 years time, the 150 condition surveys will also contribute trend data. If trend is not evident after 5 years, the cycle of repetition may be extended and more condition surveys completed.

Fifty stream sites were measured in July through September FY2008. These were located in the Big Hole and Upper Clark Fork watersheds. Data will be entered in the Natural Resource Inventory Systems data base and analyzed in 2009

In addition to the integrated stream monitoring program, several stream and riparian improvement projects were monitored. The results for three projects on the Madison Ranger District are presented immediately below.

Results:

(1) Arasta Creek Restoration monitoring

Arasta Creek on the Madison Ranger District, originates on the northeast flank of the Gravelly Mountains, and flows into the Madison River near Cameron, Montana. Beaver removal from this drainage, combined with historic overgrazing by livestock, resulted in considerable down cutting and over-widening of the stream channel, along with an elevated fine sediment load. The pasture which Arasta Creek flows through includes both FS (treated) and BLM (untreated) landownership. This pasture is currently being rested from livestock grazing and riparian vegetation, particularly sedges, appear to be responding well. Arasta Creek supports a population of WCT upstream of a cascade barrier. Molecular analysis of this population indicates genetic integrity varies from 95-82%.

The goal of channel restoration in Arasta Creek is to reverse patterns of over-widened and/or downcut channel geometry. The means to accomplishing this objective is to influence natural processes such as sinuosity, fine sediment deposition, stream bank formation, and floodplain connectivity to accelerate the rate of channel recovery. Secondary objectives include improved pool habitat and watershed function with reduced fine sediment load being exported downstream into the Madison River system, an impaired water body on the Montana Department of Environmental Quality's 303d list.

To accomplish this goal, a crew installed low-head riffles and baffles using native rock and wooden stakes to influence deposition of fine sediments during springtime high flows. The elevated load of fine sediment in Arasta Creek, normally interpreted as a negative, actually provides the natural material to rebuild point bars and stream banks. Wooden stakes are pounded into the streambed in a dot-grid matrix, leaving roughly 10-50 cm of the stake protruding above the streambed surface in tributary-scale channels. The spaces between stakes are then filled with native cobbles and smaller materials to form the riffle or baffle. Stakes provide the integrity to the structure to endure high flows and influence sediment deposition. Riffles span the channel and are aligned to allow for upstream fish passage. Baffles are not intended to span the channel, instead acting to form point bars and increase sinuosity in the channel. Riffles and baffles typically exhibit an elevation gradient across the channel, influencing flow against one bank and deposition against the other bank, particularly in the downstream backwater area.

Riffle and baffles were initially installed in September 2005, with work continuing during the summer of 2008. This project received considerable funding support from PPL-Montana in each year under the authority of Article 409 of the PPL FERC license on the Madison River. The Madison-Beaverhead Counties Resource Advisory Committee (RAC) also provided funds toward the purchase of supplies in 2005-7; funding and volunteer labor have been provided by the Madison River Foundation and the Madison-Gallatin chapter of Trout Unlimited. Restoration efforts in this treatment reach are close to complete; additional restoration opportunities upstream could be addressed in future years.

Monitoring morphological parameters indicates this restoration technique has been successful in narrowing bankfull width in the treated channel (FS), while the untreated reach (BLM) has actually increased in bankfull width (Table 17). Both reaches have been rested from grazing since 2006 (three seasons). Pool frequency has increased in the treated reach, but actually decreased in the untreated reach, whereas residual depth has increased very slightly in both reaches. Pools are expected to scour deeper in future years as structures continue to mature and additional high flow events influence scouring.

Table 17. Channel characteristics, Arasta Creek, 2004-2008

Channel characteristic	2004	2008
Arasta meadow reach (BLM & FS)		
Total channel length (km)	1.24	1.38
Mean bankfull width (m)	1.33	1.21
Pool frequency (pools / km)	33.9	34.1
Pool spacing	22.2	24.3

Mean residual pool depth (m)	0.29	0.31
BLM reach (untreated)		
Total channel length (km)	0.500	0.516
Mean bankfull width (m)	1.25	1.39
Pool frequency (pools / km)	28.0	21.3
Pool spacing	28.6	33.8
Mean residual pool depth (m)	0.22	0.24
FS reach (treated)		
Total channel length (km)	0.740	0.864
Mean bankfull width (m)	1.39	1.11
Pool frequency (pools / km)	37.8	41.7
Pool spacing	19.0	21.6
Mean residual pool depth (m)	0.33	0.34

From 2005 to 2008, the treated reach increased in length by a considerable amount (17%), indicating that stream narrowing has been accompanied by increased sinuosity. Channel length increased in the untreated reach over this same period; however this change was relatively small compared to the overall reach length (3%).

Structures installed in Arasta Creek have been very successful influencing sediment deposition, particularly in the downstream eddy areas of baffles, and upstream of riffles (Figure 1). In 2006 and 2007, we purchased sedge plugs and planted them in these areas of deposition to help stabilize these unconsolidated sediments. Sedges appear to thrive in these environments, and continued monitoring will be needed to determine how effective they are in sediment stabilization.

All of the structures in Arasta Creek survived the high duration spring runoff of 2008 without need of any maintenance, and additional sediments were deposited (Figure 12).

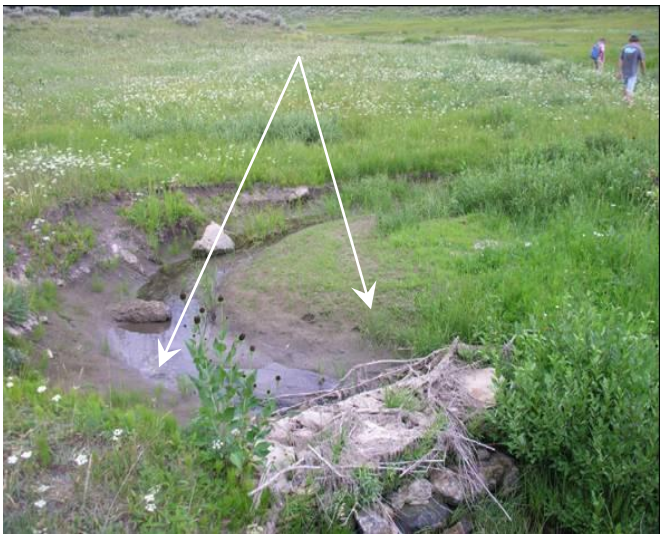

Figure 10. Riffle structure trapping fine sediments upstream (arrows), 2007.

Figure 11. Same structure adapted for fish passage, 2007

Figure 12. Same structure following long duration spring runoff, July 2008.

Figure 13. Riffle with fish passage at left, raising water surface elevation about 2 feet, 2007.

(2) Tepee Creek Restoration Monitoring

Tepee Creek on the Madison Ranger District, originates on the east flank of the Gravelly Mountains as a tributary to Horse Creek, flowing into the Madison River near Cameron, Montana. Historic trapping of beaver and over grazing have caused the stream channel to down cut and over-widen; this system currently experiences a high fine sediment load. Although livestock grazing ceased 25 years ago, the channel had yet to restore itself. Tepee Creek still experiences light to moderate trampling and heavy browsing by elk. Tepee Creek in the project area is fishless due to a natural cascade barrier located just downstream of the treatment area. Molecular analysis of westslope cutthroat trout (WCT) downstream in Horse Creek indicates that this population is greater than 90% pure. Once habitat has been restored to acceptable levels in Tepee Creek, there is an opportunity to introduce pure WCT into this headwater tributary.

The goal of restoration in Tepee Creek is to influence natural stream processes, particularly fine sediment deposition, to restore channel morphology. A secondary objective is improved watershed function by reducing fine sediment loads transported to the Madison River, an impaired water body on the MT Dept. of Environmental Quality's 303d list.
Installation of willow weirs - channel spanning dams constructed of wooden stakes, woven willow, and sedge clumps - has trapped fine sediments and built point bars and stream banks, particularly where sedges have expanded as they respond to increased water storage and soil moisture. Weirs are particularly effective as they mimic beaver dams, trapping fine sediment and increasing stream bed elevation (Figure 14). Baffles, where wooden stakes are pounded into the stream bed in a triangle dot-grid and the interstices are filled with cobble, willow, and sedge plugs to direct flow against the opposite bank and induce stream meandering (Figure 15). Sediment also deposits on top of and in the back eddy created by these baffles, but not as effectively as the weirs. By creating a series of baffles and weirs, the stream bed elevation is raised and a meander-pool-point bar morphology is created.

Figure 14. Channel spanning weirs composed of wood stakes, willow, rock, and sedge plugs, September 2006.

Figure 15. View Looking Downstream At A Series Of Baffles Built In 2006 That Induced Meandering, July 2007.

Figure 16. A weir trapping large amounts of sediment and raising the surface water level, July 2008. Sedge recruitment is already occurring on the point bars, and spawning gravel has been sorted in the thalweg below the weir.

Riffle and baffles were initially installed in September 2004, with monitoring and further construction continuing through 2008. In 2005 all structures survived winter ice jams and spring flows intact while trapping fine sediment. Channel cross sections were established in order to monitor channel morphology and supplemented with photographs. Cross sections and associated data are available in the original report, on file at the Madison Ranger District. The cross sections in 2005 showed an increase in stream bed elevation, indicating successful sediment deposition. While the structures did survive the 2006 season, little increase in stream bed elevation occurred, indicating no further sediment deposition. It appeared that the structures had reached their capacity to trap sediment in the first year. In 2006 weir structures were installed in an effort to increase the amount of sediment deposition; monitoring results from subsequent years indicate that these structures have been quite effective in this regard.

In 2008, some weirs incurred small water breaches as a result of the long duration of spring runoff. This resulted in lowered water surface elevations upstream of the structures. Breached weirs were sealed with bio-degradable sandbags and sedge chunks that blocked upstream flow. The cross sections from 2008

indicate another year of sediment deposition, in addition to evidence of channel. Photographs indicate that large quantities of sediment deposited upstream of weirs, creating bars, recruiting sedges, and narrowing the channel (Figure 16).

While large amounts of sediment have been deposited, it is generally fine and highly mobile. In order to stabilize this sediment sedge plugs were planted in 2007 and 2008. As these plugs mature, their root masses will stabilize the point bars. Also, baffle and weir construction continued upstream, expanding the restoration reach. Further monitoring, construction, and maintenance will continue into the near future. However, someday, through sediment deposition and vegetation recruitment Tepee Creek should return to historic conditions and support a native population of WCT.

This project received considerable funding support from PPL-Montana in each year under the authority of Article 409 of the PPL FERC license on the Madison River, specifically part (3) "fish habitat enhancement both in the main stem and tributary streams, including enhancement for all life stages of fishes" and part (9) "riparian habitat restoration". The Madison-Beaverhead Counties RAC also provided funds toward the purchase of supplies in 2005-6.

(3) Wigwam Creek restoration monitoring

Wigwam Creek on the Madison Ranger District, originates on the east flank of the Gravelly Mountains and flows into the Madison River near Cameron, Montana. The removal of beaver from this drainage, combined with failed water diversions and historic overgrazing by livestock, has resulted in considerable down cutting and over-widening of the stream channel, along with an elevated fine sediment load. Wigwam Creek is currently grazed by livestock under Beaverhead Forest Plan riparian standards. The treatment segment of Wigwam Creek supports a population of WCT; molecular analysis indicates that the genetic integrity of this population varies from 95-82%.

The goal of channel restoration in Wigwam Creek is to reverse its over-widened channel geometry. The means to accomplishing this objective is to influence natural processes such as sinuosity, fine sediment deposition, stream bank formation, and floodplain connectivity to accelerate the rate of channel recovery. Secondary objectives include improved watershed function with reduced fine sediment load being exported downstream into the Madison River system.

Riffle and baffles were initially installed in September 2004, with work continuing during the summer of 2007. Low-head riffles and baffles using native rock and wooden stakes are designed to influence deposition of fine sediments during springtime high flows. Elevated fine sediment loads in Wigwam Creek, normally interpreted as a negative, actually provide the natural material to rebuild point bars and stream banks. Riffles are constructed as channel-spanning features to influence upstream sediment deposition. Baffles are not intended to span the channel, instead acting to form point bars and increase sinuosity in the channel. Riffles and baffles typically exhibit an elevation gradient across the channel, influencing flow against one bank and deposition against the other bank, particularly in the downstream backwater area.

This project received considerable funding support from PPL-Montana in each year under the authority of Article 409 of the PPL FERC license on the Madison River, specifically part (3) "fish habitat enhancement both in the main stem and tributary streams, including enhancement for all life stages of fishes" and part (9) "riparian habitat restoration". In the past, the Madison-Beaverhead Counties Resource Advisory Committee provided funds for supplies and funding and volunteer labor have been provided by the Madison River Foundation and the Madison-Gallatin Chapter of Trout Unlimited. Restoration efforts in this treatment reach are close to complete; in 2008 only limited maintenance was performed.

Figure 17. Wigwam Creek immediately downstream of the FS Road 290 bridge; previous to baffle installation (July 2005) on the left, and after baffle installation (October 2005) on the right.

In 2008, spring runoff was average to above average, but its duration was extended, resulting in greater channel scouring. Early season review of the channel and structures indicated relatively little new sediment deposition had occurred and that in some instances, sediment had been lost from structures during the extended high flow. Early season livestock trailing resulted in heavy trampling of a 50 meter long reach of the restored channel shortly upstream of the bridge, impacts five structures. More importantly, late season grazing in the restored channel reach was considerably above past levels, resulting in sediment loss around the structures and physical damage to some structures. During, Forest Service hydrologists from the Greater Yellowstone area (Regions 1 and 4), questioned the value of these structures as restoration tools in grazed systems. Wigwam Creek is scheduled to be excluded from livestock grazing by the implementation of exclosures and improved water facilities in 2009.

None the less, quantitative monitoring of morphological parameters in 2008 indicates the channel continues to adjust and improve. Bankfull width increased slightly, likely due to grazing impacts, but possibly confounded by the elevated water levels still present in July from extended spring runoff. Sinuosity and length of channel did not change (Table 18), which may be a clue that the channel has reached its potential under its current alignment and valley morphology.

Table 18. Channel characteristics, Wigwam Creek, 2004-2008

Channel characteristic	2004	2005	2006	2007	2008
Channel length (m)	405	440	437	489	490
Stream bed gradient (%)	2.45	2.25	2.28	2.03	2.03
Sinuosity	1.02	1.11	1.10	1.23	1.23
Mean bankfull width (m)	2.65	2.51	2.29	2.04	2.18
Pool frequency (pools / km)	24.7	34.1	34.3	49.1	59.2
Pool spacing	15.3	11.7	12.7	10.0	7.8
Mean residual pool depth (m)	0.23	0.21	0.22	0.21	0.26

Most interesting is how pool habitat improved in 2008 after remaining static the last three years. Pool frequency and residual depth both increased considerably, with a concurrent reduction in pool spacing, all likely a function of the extended spring runoff (Table 18). However, 2006 experienced an above average extended spring runoff, but without improvement in pool habitat characteristics. This result suggests that this restoration technique is successful in initially influencing the narrowing and sinuosity of a degraded channel, after which channel geometry and scouring flows allow pool development.

This conclusion also points out the importance of long term monitoring in following the various changes in channel response, and in making useful management decisions adaptively.

Evaluation (Summarized for each of three projects):

- **Arasta Creek** - Structures installed in Arasta Creek have been successful influencing sediment deposition, particularly in the downstream eddy areas of baffles, and upstream of riffles.

- **Tepee Creek** - The cross section measurements in 2005 show increased stream bed elevation, indicating successful sediment deposition behind structures. No further sediment deposition took place in 2006. It appeared the structures had reached their capacity to trap sediment in the first year. In 2006 weir structures were installed in an effort to increase the amount of sediment deposition; monitoring results in 2008 years indicate that these structures have been quite effective in this regard.

- **Wigwam Creek** - In 2008, duration of spring runoff was extended. This resulted in greater scouring of the channel. Early season review of the channels and structures indicated that relatively little new sediment deposition had occurred and that in some instances, fine sediments had been lost from structures during the extended high flow. Early season trailing on livestock through the allotment and late season grazing in the restored channel reach resulted in further loss of sediment associated with structures and in some cases, impacts to the structures themselves. A late season field review raised questions as to whether these structures have benefit as a restoration tool in grazed systems. We will continue to evaluate this.

E. Best Management Practices

Monitoring Question: Are best management practices being implemented during project work and are they resulting in protection of water quality and beneficial uses?

Performance Measure: Implementation of best management practices and percent rated effective

Soil and water mitigation measures are established to comply with the Forest Service Soil and Water Conservation Practices (SWCP) Handbook 2509.22. Those SWCPs are comparable to "best management practices" or BMPs. During environmental analysis, interdisciplinary teams select appropriate soil and water conservation practices based on water quality objectives, soils, topography, geology, vegetation and climate. Environmental impacts and water quality protection options are evaluated and a mix of practices is selected to not only protect water quality but meet other resource needs. These final selected practices are translated into project plan specifications, contract clauses, and other tools. In 2008, the BDNF monitored implementation and success of BMPs on the South Butte Timber Sale and reclamation work on 17 abandoned mine and mill sites under the Comprehensive Environmental Response and Liability Act (CERCLA) program, also known as the Superfund.

Results:

(1) South Butte Timber Sale

The BDNF annually conducts an integrated review of one project on the Forest. The purpose of the review is to determine if mitigation measures (which include the BMPs) identified during environmental analysis are implemented on the ground and if those measures are effective in accomplishing the intended land management objective. In June, 2008, an interdisciplinary team of 17 Forest and District specialists, Staff Officers, and a District Ranger reviewed the South Butte Timber Sale on the Butte District. This sale was an outcome of the Basin Creek Hazardous Fuels Reduction Record of Decision, approved in 2004, implemented beginning in 2006 and active again in 2008. Harvest operations were active during the review.

The following six soil and water protection requirements (BMPs) were listed in the Record of Decision and monitored for the South Butte sale review.

> **(a). Treatments take place over snow or on frozen ground when possible. Non-winter operations take place when soils are dry; assessment of soil moisture is made after major precipitation events (SWCP Practice 14.04).**
>
> **Objective**: minimize soil erosion, sedimentation and loss of soil productivity by limiting periods of operation.
>
> During operations in 2005 and 2007 soil scientists sampled soils in units 7, 14, 66, and 72a to assure that soil was dry enough to operate. Sale administrators used the speedy moisture meters on a routine basis to check soil moisture during questionable periods.

Frozen soil depth was monitored in January and again in March of 2008. In both cases soils were frozen to 12 inches plus.

Post operation disturbance and compaction were also monitored. Units 14, 24, 59, 65, and 70 were monitored in 2006. In 2008, Units 58 and 66 (winter logged with snow and frozen soils) and some of Unit 66 (summer logged with dry soils) were monitored. Units 58, 66, 14, 24, and 59 met soil quality standards. Units 65 and 70 (summer logged with dry soils) were subjected to aggressive operation of tracked skidders and exceeded SQS Monitoring results demonstrate that both soil conditions are effective methods to mitigate soil disturbance. However, good sale administration is still necessary, especially for summer logging, and would have prevented much of the disturbance in units 65 and 70. These were the first units harvested and problems were resolved quickly by sale administrators.

(b). Landings are recontoured and revegetated (SWCP Practice 14.11, 14.14).

Objective: reduce the impacts of erosion and subsequent sedimentation from log landings through the use of mitigating measures.

Excavation was not necessary on the landings reviewed. The combination of slash and vegetation was adequate to protect the soil until additional vegetation filled in the areas not vegetated. A landing near the stop at unit 25a was discussed by the review team. This landing is representative of the other landings reviewed on the sale. It appeared that disturbance at this landing would heal without additional treatment except for the skid trails within it. The skid trails in the landing should be rehabilitated by ripping, tilling, slash cover and seeding, as needed.

(c). Main skid trails are designated, slash is laid on trails to protect soil during skidding. Skid trails are broken every 200 feet with slope breaks, water bars or large woody debris to reduce buildup of overland flow in trail. Water bars are installed across designated skid trails on project completion. Logs and debris are placed to discourage off-road use. Tilling and ripping main skid trails is applied when needed to maintain soil quality standards or fix existing problems. (SWCP Practice 14.15)

Objective: protect water quality by minimizing erosion and sedimentation derived from skid trails.

Main skid trails reviewed by the team were designated and appeared to be adequately spaced at 85 feet +/-. Slash was not apparent on the active skid trails. However, skid trails in completed units 58, 65, and 66 had adequate slash placed on them for erosion control. Some segments of the trails had little or no slash. Where this occurred, trail grade was flat enough erosion risk did not justify the disturbance and effort needed to place slash on them.

In 2005, soil scientists recommended that water bars were not necessary on skid trails due to skid trail slope and/or length. Slash would be adequate to protect them. skid trail slope and/or length only required slash to protect them. They suggested that water bars only be used on skid trails steeper than 8 percent that were longer than 150 feet and that slash be placed on all skid trails.

In August, 2007, soil scientists and the sale administrator met in unit 66 to discuss the bunched logs that needed to be re-oriented and skidded away from the draws they had planned to skid on during the winter of 2006 when soils were snow covered and frozen. An injunction prevented skidding logs in 2006. The proposed skidding pattern was not very desirable but alternatives were limited. Close sale administration of this work was recommended to minimize soil disturbance. Results show this was effective. KV funds will be used for subsoiling and additional seeding on landings and spur roads in units 65 and 70 as needed.

(d). Soil moisture limitations (SWCP Practice 13.06)

Objective: minimize soil compaction, puddling, rutting, and gullying which affect soil productivity.

Unit 66, monitored in 2008, was logged and skidded with frozen soils and under dry soil conditions. Units 14, 24, and 59, monitored in 2006 were logged and skidded under dry unfrozen soil conditions. All 4 units had detrimental compaction on some of the plots but they had 88, 86, 90, and 88 percent, respectively, soils in satisfactory condition and met the Soil Quality Standard (SQS). Detrimental soil compaction in Unit 65 contributed to the 18 percent disturbance monitored in this unit which did not meet SQS (see discussion under item (a)). Unit 65 may have met the SQS if the aggressive operation of skidders had been controlled more quickly. On balance it appears that operating on theses soils under dry conditions does reduce the amount of detrimental soil compaction. See more discussion of soil compaction under Section F. Soil Productivity on page 54 of this report.

(e). Temporary road design and maintenance (SWCP Practices 15.15 and 15.21).

Objective: keep temporary roads from unduly damaging streams, channels or fish passage. , protect water resources by minimizing erosion from roadways.

Temporary roads - were observed within units 25, 26, 57, 14, and 58. Road layout, including radius of curvature, grade, and runoff control, was observed. It appears that road layout was adequate in terms of minimizing segments near streams. While one curve within Unit 25 seemed tight, no exacerbation of runoff appeared to be due to this. Excessive grades seemed to be avoided. Drainage features were missing on many temp road segments. Recent road maintenance (grading) removed drainage features (water bars). This information was relayed to the Sale Administrator, and was corrected after the review.

Temporary bridge accessing Unit 25 - The design of the temporary bridge was evaluated for proper span, passage of 100-year flow events, and location. The original location for the crossing, selected by specialists and others, was abandoned and the structure was installed further upstream. The new location is less suitable, and may contribute to the crossing's inability to pass a 100 year flood event. The decision to move the crossing was made by the District Ranger. The contractor chose to install a temporary bridge instead of a culvert; however the span was too short, resulting in more fill near the channel, thus creating more risk of sediment delivery during installation and removal. The bridge stringers on the west side sank from use in the soft soil, eliminating the capacity to pass 100-year flow events.

(f). Residual down woody debris is 10-15 tons/acres (Region 1 Soil Quality Standards, USDA Forest Service 1999).)

Objective: maintain long-term soil productivity by retaining large woody debris and organic litter on the soil surface.

2008 monitoring on unit 65 indicated 0 tons/acre compared to 2006 monitoring showing 2.9 tons/acre. Unit 66S had 5.6 tons/acre in 2008. Units 66N and 58 were not monitored because amounts were very low based on ocular estimates. However, wind throw in many of the observed units were adding volume to downed Coarse Woody Debris (CWD) and will probably continue.

Coarse woody debris was discussed at unit 25a which had a post harvest basal area of 100 to 120 square feet and was supposed to be 60 to 80 sq ft after thinning. There was discussion that 40 sq feet of basal area could be dropped to help meet CWD and thinning requirements. This led to further discussion on ways to increase CWD. Suggestions were to drop residual trees, haul slash from piles, and to take advantage of wind throw of residual trees before taking action. (The contract called for leaving CWD where it was available with a requirement to take all trees to a 3" top. Three inches is the lower limit for CWD so the only wood large enough would be cull logs.) Knutsen Vandenberg (KV) funds are planned in 2009 to pay for dropping trees in the units that need more CWD.

Evaluation:
Evaluation of BMPs is based on (a) was the BMP implemented, (b) was it effective (c) did a departure from the BMP occur, (d) was corrective action needed.

(a). SWCP 14.04 - Limiting periods of operation to frozen or dry ground. This BMP was implemented and effective. Limiting operation during good soil conditions mitigates soil disturbance. Good sale administration is still necessary.

(b). SWCP 14.11, 14.14 - Landings are recontoured and revegetated. SWCP 14.11 was implemented and adequate to reduce impact of erosion. Revegetation was not required for mitigation because the slash and vegetation remaining was adequate to protect soil. This BMP was applied and was effective. No corrective actions are needed.

(c). SWCP 14.15 - Erosion control on skid trails. This BMP was implemented and generally effective. Some mitigation measures were adjusted in field review where they were unnecessary. Mitigations were effective except on some landings and spur roads in Unit 65 and 70 where some corrective action may be required.

(d). SWCP 13.06 - Soil moisture limitations. This BMP was applied and generally effective at limiting soil compaction. Other factors like aggressive operation of skidders can override the effectiveness of operating on dry soils. No corrective action is required.

(e). SWCP 15.15, 15.21 - Temporary; road design and maintenance. These BMPs were implemented and effective at protecting water resources from erosion. However, a departure from the maintenance BMP occurred during sale review, recent grading had reduced the effectiveness of some drainage features. This was corrected by sale administrators requiring the contractor to replace these features immediately.

A departure in procedure (layout) occurred when a temporary bridge was installed in a location not reviewed by the hydrologist or ID Team. At this point in the sale implementation, corrective action would not be effective or necessary.

(f). Regional Soil Quality Standard for residual down woody debris. This BMP was not implemented. Departure from the BMP occurred because the contract clause was modified to address fuel loading concerns. Corrective action is scheduled using KV funds to drop trees and add to the woody debris. Natural wind throw is also increasing down woody debris.

(2) Abandoned Mine Reclamation (SWCP Practice 16.09)

Objective: Reduce erosion and water quality degradation by sediment and toxic substances from abandoned mined lands through reclamation.

In 2008 the BDNF monitored 17 abandoned mine and mill sites reclaimed over the last 10 years under the Comprehensive Environmental Response and Liability Act (CERCLA) program, also known as the Superfund. The objective of this monitoring and assessment work was to determine if reclamation efforts have been successful and if BMPs, regulatory and risk-based cleanup goals are being met. Monitoring inspections were conducted using protocols provided in the Forest Service's Abandoned Mine Lands Post-Remediation Assessment Protocols and Draft Handbook and is provided in detailed.

Results of the comprehensive post-reclamation inspections conducted by Pioneer Technical Services, Inc of Butte Montana are summarized below. Complete reports are available from Mike Brown, Abandoned Mines Specialist, Beaverhead-Deerlodge NF, Butte. The 17 abandoned mine and mill sites that were reclaimed in the last 10 years and monitored in 2008 on the Beaverhead-Deerlodge Forest are listed in the table below. The FY06 Monitoring and Evaluation Report contains detailed descriptions and photographs of the reclamation work for 2005 reclamation work on Jack Creek Tailings, 2006 work on Lady Leith Mine and 2007 work on Vindicator, Morning and North Ada Mines.

Table 7. Monitoring Results Summarized for Abandoned Mine Sites

Site Name and Location	Summary of Monitoring Conclusions
Elkhorn Mill Site T3S, R12W Sect 3,11 Wise River RD	Overall – Reclamation efforts have been effective. Erosion Controls are functioning. No signs of vandalism or unauthorized activity are evident. Vegetation is becoming established on the reclaimed waste rock dump, the tailings removal area, the reconstructed streambank and more slowly at the waste repository location
	Noxious Weeds - None
	Public Safety Concerns – The historic buildings and trestle are structurally unstable and easily accessible by the public from a Forest Service road.
Nonpareil Mill T8N R12W Sect 31,32 Pintler RD	Overall – Reclamation efforts have been effective. Erosion controls are functioning. No signs of vandalism or unauthorized activity are evident. The dam faces and outlet structures were free of cracks or other signs of failure. Vegetation cover ranged from 40-80% except on one small barren area of tailings.
	Noxious weeds – Yes, single plants of thistle and noxious weeds, <1%
	Public Safety – The historic mill building is structurally unstable and easily accessible by the public from a Forest Service road. There are no fences, gates or signs. No open adits and/or shafts or other stability issues were noted. Roads, bridges and culverts are in good condition.
Brooklyn Mill T7N R12W Sect 5 Pintler RD	Overall – Reclamation efforts have generally been effective. Run-off and erosion controls are functioning. Generally the area is only grazed by wildlife but the repository appears to have been grazed by cattle. Total percent cover for seeded and non-seeded plant species indicate successful revegetation.
	Noxious Weeds – Yes, Canada thistle, spotted knapweed and common mullein, <1%.
	Public Safety – One historic building is unstable and appears to be frequented by the public. Fences are in disrepair.
Highland Mill T1N R7W Sect 36 Butte RD	Overall – Reclamation efforts have been effective. Run-off and erosion controls are functioning. Vegetation reclamation generally successful. Some evidence of tailings materials migrating up through the top soil. Vegetation growth on the repository appears to be limited by soil pH or metals. Vegetation present is healthy and vigorous. .
	Noxious weeds – minimal (thistle, dandelion, mustard at repository)
	Public Safety – no concerns
Spring Creek Tailings	Overall - Reclamation efforts have been effective. Erosion Controls are functioning. No signs of vandalism or unauthorized activity are evident. Vegetation cover is estimated to be 60-80% cover (See Figure 5). One small

T7N R8W Sect 11 Pintler RD	barren area of tailings is exposed on the south end of the removal area (See Figure 6 below) with evidence of cattle grazing.
	Noxious Weeds – 6 small patches are dominated by mustard and thistle
	Public Safety – No concerns.
Jack Creek Tailings T7N R8W Sect 13,14 Jefferson RD	Overall – Reclamation efforts have been effective. The diversion ditch is functioning as designed. No sign of vandalism or unauthorized activity is evident. Cattle have grazed along the banks of Jack Creek. Vegetation cover ranges from 40-60% with no significant barren areas.
	Noxious Weeds - None
	Public Safety – No concerns
Buckeye Mine T8N R6W Sect 36 Jefferson RD	Overall - Reclamation efforts have been effective. Erosion Controls are functioning. No signs of vandalism or unauthorized activity are evident. Wetlands are functioning as designed, vegetative cover is 80-100%. Cover on the remaining site averages 40-60% with no notable bare areas.
	Noxious Weeds – Minimal. Dalmatian toadflax on the waste rock removal area, <0.5%.
	Public Safety – Historic mine and mill structures are unsecured, unsigned and appear to be visited by the public.
Bullion Mine T7N R6W Sect 13 Jefferson RD	Overall -Reclamation efforts have been effective. Erosion Controls are functioning. No signs of vandalism or unauthorized activity are evident. The diversion structure is functioning properly. Vegetation is becoming established on the reclaimed waste rock dumps, the waste rock and tailings removal areas, and on the reconstructed streambanks.
	Noxious Weeds - Knapweed and thistle were found on the waste rock dump removal area and smelter site.
	Public Safety – Historic buildings are unstable and unsecured from the easy public access. Water discharging from Adit #1 into the discharge channel is acidic and metal bearing and adjacent to a Forest Service road. This is considered a critical maintenance concern.
Daily West Mine T6N R6W Sect 12 Jefferson RD	Overall – Reclamation efforts have been effective. Vegetation appears healthy and robust with weedy species few and scattered. No sign of vandalism or unauthorized activity was evident but there is evidence of off-road vehicle use.
	Noxious Weeds – Knapweed, thistle, mustard and common mullein in the removal area. Spotted knapweed was 5%, other species <1%.
	Public Safety – No fences or signs marked the area, public has unlimited foot access. Preserving the historical features is a concern.
Hector Mine T6N R5W Sect 7 Jefferson RD	Overall – Reclamation efforts have been effective. Vegetation appears healthy and robust with weedy species few and scattered. Vegetative cover ranges from 40-80%. No sign of vandalism or unauthorized activity was evident
	Noxious Weeds – Isolated single plants on the perimeter, include thistle,

	tansy and houndstongue.
	Public Safety – Site boundaries are unidentified and public foot access is unlimited though there are no stability issues.
Lower Hector Mine T6N R5W Sect 7 Jefferson RD	Overall - Reclamation efforts have been effective. Vegetation appears healthy and robust with weedy species few and scattered. No signs of vandalism or unauthorized activity was evident
	Noxious Weeds – Single scattered thistle plants comprise <1%.
	Public Safety – Site boundaries are unidentified and unprotected from public access but there are no stability issues, open adits or shafts.
Lady Leith Mine T7N R5W Sect 6 Jefferson RD	Overall - Reclamation efforts in 2007 have been effective. Erosion controls are functioning. Considering the short time since reseeding, vegetation appears healthy and robust. No sign of vandalism or unauthorized activity was evident. The passive adit discharge treatment system is not functioning, adit water is bypassing the inlet pipe and entering the creek directly. This is considered a critical maintenance issue to be corrected.
	Noxious Weeds - None
	Public Safety – Site boundaries are unidentified and unprotected from public access but there are no stability issues, open adits or shafts.
Vindicator Mine T7N R6W Sect 12 T7N R5W Sect 7 Jefferson RD	Overall - Reclamation efforts have been effective. Vegetation appears healthy and robust with weedy species few and scattered. No sign of vandalism or unauthorized activity was evident
	Noxious Weeds - None
	Public Safety - Site boundaries are unidentified and unprotected from public access but there are no stability issues, open adits or shafts
Morning Mine T7N R5W Sect 18 Jefferson RD	Overall - Reclamation efforts in 2007 have been effective to date. Considering the short time since seeding of the site, vegetation appears healthy with no dieback. No sign of vandalism or unauthorized activity was evident.
	Noxious Weeds -None
	Public Safety - Site boundaries are unidentified and unprotected from public foot and ATV access but there are no stability issues, open adits or shafts
North Ada Mine T7N R5W Sec 18 Jefferson RD	Overall - Reclamation efforts in 2007 have been effective to date. Minor soil erosion appears to be a temporary effect of vegetation establishment. No sign of vandalism or unauthorized activity was evident. A mud hole has been created by ATVs and vehicles driving through a wet area on the reclaimed area where an old road/trail crosses the site.
	Noxious Weeds - None
	Public Safety - Site boundaries are unidentified and unprotected from public foot and ATV access but there are no stability issues, open adits or shafts
Black Pine Mine and Combination Mill	Overall – Remediated areas are consistent with surrounding native areas as far as vegetation, erosion and quantity of weed. Buildings are in fair condition. Minor erosion issues below the main waste rock area are due to

T8N R14W Sect 16	the steep terrain and lack of vegetation. Vegetation cover at the Combination waste rock area is low. No signs of vandalism or unauthorized activity was evident
	Noxious Weeds – Knapweed, thistle and common mullen were present on and off the site at about 5% total cover.
	Public Safety – Concerns include collapsed shaft at the Tim Smith, downed fencing at the seepage collection pond, lack of fencing and signs around historic features, DANGER EXPLOSIVES signs located at the Tim Smith waste rock dump, access to main mine buildings at the Combination mine.

Figure 5. Overview of Spring Creek Repository Revegetation

Figure 6. Spring Creek Tailings Barren Area

Evaluation:

Evaluation of BMPs is based on (a) was the BMP implemented, (b) was it effective (c) did a departure from the BMP occur, (d) was corrective action needed.

SWCP 16.09 – Abandoned Mine Reclamation. Reclamation efforts have been implemented and effective on all 17 sites. Revegetation has generally been successful and exuding toxic substances have been controlled with minor exceptions. No problems that may inhibit permanence and long-term effectiveness of remediation were identified.

Departures from the BMP application were minor. Reclaimed mine inspection reports include routine concerns and maintenance suggestions for most sites. Fencing the areas from public access and treating noxious weeds were the most common recommendations for corrective action. Critical maintenance issues were identified on the Lady Leith and Bullion Mines. Both issues were related to water drainage from adits reaching a stream or passing near a Forest road.

F. Soil Productivity

Monitoring Question*:* Are management actions maintaining soil quality?

Performance Measure: Effects of treatments on areas treated

Data Source*:* Inspection reports from annual integrated review and resource compliance monitoring of project.

Background*:*
The Basin Fuels project area, Butte Ranger District, is in an area with granitic bedrock. Technically it is quartz monzonite, a coarse grained, light-colored igneous rock. The landforms are mostly low-relief stream dissected mountain slopes with local areas of higher relief and steeper slopes.

Soils in the area have developed from decomposed granitic rock. They are sandy, shallow to moderately deep and are poorly developed, that is, they have not developed strongly contrasting layers with textural, structural, and color differences. They generally store little plant available water and plant nutrients, and bare soil is susceptible to erosion from concentrated runoff. Much of the area has a thick layer of decomposed granitic rock, called grus, sandwiched between the soil and hard bedrock.

On June, 16, 17 and 19, 2008 three BDNF soil scientists monitored units 58, 65, and 66 of the Basin Fuels project (contracted out as the South Butte Timber Sale). On June 16 Meredith Webster, Regional Soil Scientist, accompanied them. The monitoring procedures are described in the March, 2008 draft of the Northern Region Soil Disturbance Monitoring Protocol (Page-Dumroese et al, 2008). The monitoring was in preparation for a Forest review of the sale on June 30, 2008.

Unit 58 was selected because it had been logged during the winter over snow-covered, frozen ground.

Unit 65 was selected because monitoring in 2006 indicated that 17.9 percent of the unit had detrimental soil disturbance from logging during the fall of 2005.

Unit 66 was selected because the unit had been cut during the winter of 2005 but an injunction was placed on the sale before all of the logs could be skidded to the landing from the south end of the unit. The bunched logs had been oriented to skid over a frozen draw. After a court injunction was lifted in 2007 the operator had to wait until after spring breakup to skid the logs. The bunched logs had to be turned away from the draw and skidded on dry soil because the draw was too wet for skidding under unfrozen conditions. Turning the logs and using a different skidding pattern with unfrozen soil had the potential to cause more soil disturbance. The southern part of unit 66 (Unit 66S) was monitored separately from the rest of the unit (Unit 66N) to determine how successfully this was accomplished.

Plot 15 in unit 65 had an argillic horizon, a subsurface horizon with accumulated clay, with more clay than had been observed in any of the other plots. It also appeared more compacted with stronger platy structure than had been observed in the other plots. Three bulk density samples

were obtained by using a coring cylinder driven into the soil with a slide hammer. The bulk density results were not available for the Forest review.

Results:
The results from monitoring are presented in the table below. These results were used for the Forest review of the sale on June 30, 2008.

Table 19. June 2008 soil condition monitoring classification summary by Unit as a Percentage of the Unit (Activity Area). Basin Fuels Project (South Butte Timber Sale).

Unit Number	Plots Total Number	Satisfactory	Unsatisfactory	Unsatisfactory Components		
		%		% Compaction	% Displacement	% Displacement & compaction
58	31	96.8	3.2	0.0	3.2	0.00
65	33	81.8	18.2	12.1	6.1	0.0
66N	30	86.7	13.3	3.3	3.3	6.7
66S*	31	90.0	10.0	10.0	0.0	0.0

**post-injunction skidding: bunched logs had to be reoriented with the potential to cause more soil disturbance.*

Following the review, the bulk density results were calculated for the 3 samples obtained from plot 15 in unit 65. Bulk densities for the 3 samples were 1.54, 1.58, and 1.59 gm/cc, all for the less than 2 mm soil fraction. No undisturbed bulk density data was available for argillic horizons in soils similar to the sale area. Therefore a quantitative percent increase in bulk density could not be calculated but they appeared high and were assumed to meet the criteria for detrimental compaction.

Evaluation:

Three of four units monitored in 2008 meet the Regional Soil Quality Standard (SQS) for detrimental disturbance.

Unit 58, the winter logged unit, had 1 plot with detrimental disturbance. This plot fell on fill from a temporary road which by now has been obliterated. The monitoring results demonstrate that winter logging over snow and frozen ground is effective at preventing detrimental soil disturbance.

Unit 65 was monitored in July, 2006 using the Howe's method (Howes, 2000) and using penetrometers to determine degree of compaction. The percentage of detrimental disturbance in the activity area resulting from this method was 17.9 percent or 2.9 percent higher than the 15 percent threshold in the SQS. The 2005 injunction on the sale prevented rehabilitation of disturbance on this unit until after the injunction was lifted in 2007.

The 2008 detrimental disturbance of 18.2 percent was obtained from application of the new procedure for monitoring (Dumroese et al, 2009). The result is only 0.3 percent higher than the

17.9 percent obtained in 2006 and for all practical purposes is the same as the 2006 value. In this case, both methods produced very similar results.

Some rehabilitation practices had occurred in this unit during 2005, prior to the injunction. The 2006 monitoring reflects the inability to complete rehabilitation measures and the need for more time for completed measures to be reflected in the results, for example vegetation response after seeding. In 2007 a decision was made to drop further repair of displaced soil in this unit because advanced natural vegetative growth and new seedlings would be damaged. Instead, heavily impacted areas on spur roads and in landings will be treated to reduce compaction, establish vegetation, and thus assure that more than 85 percent of the unit has soil in satisfactory condition. The results reflect the need to complete the work on the spur roads and landings when KV funds become available.

The subsurface bulk density samples were collected in unit 65 at plot 15 because platy structure, an indicator of compaction, was more strongly expressed here than in the other subsurface samples that had platy structure. A structural grade of 2, moderate, was used to estimate detrimental soil compaction along with perceived soil strength and other visual indicators. We theorized that other plot data could be assumed to be non-detrimental if the bulk densities were low enough at plot 15. Unfortunately, the bulk density values obtained were too high to make this judgment without undisturbed, subsurface values to use for comparison.

Research associated with the Long Term Soil Productivity study (Powers et al, 2005) has demonstrated that compacted sandy soils actually increased productivity for the 10 years of data that has been collected. Almost all soils in the sale meet that criterion. Therefore, our estimates for compaction may not have a negative effect on long term productivity. However, they met the criteria for a greater than 15 percent increase in bulk density which is the threshold in the present SQS.

The soil effects in this unit are the result of aggressive operation of tracked skidders which caused much of the soil displacement and mixing that took place. This type of disturbance was less widespread once the problem was addressed by sale administrators in units that were harvested later. Units 14, 24, and 59 were harvested after unit 65 and were monitored in 2006. Monitoring results indicate that 86, 90, and 88 percent of these units, respectively, had soils in satisfactory condition and met SQS. This demonstrates the effectiveness of logging unfrozen soil under dry conditions as well as the need for appropriate sale administration to prevent damage from inappropriate operator behavior.

Unit 66 was monitored as unit 66N and 66S because bunched logs in unit 66S had to be turned and skidded with a pattern different than was planned for the winter of 2005/2006. The sale administrator was aware of the potential for additional soil disturbance in 66S and worked closely with the contractor to keep disturbance under control. The 10 percent detrimental disturbance in unit 66S demonstrates that operations on dry soils with good sale administration is effective at preventing unacceptable soil disturbance. Unit 66 as a whole, after combining the data for 66N and 66S, has 88.5 percent soil in satisfactory condition.

G. Economic Effects

Monitoring Question: What is the status and trend of goods and services provided from the Forest?

Performance Measure: (1) Quantities of goods and services and cost of producing them compared to Plan predictions. (2) Contribution of employment and labor income to the 8-county impact area attributable to goods and services provided by the Forest.

Results: Total budget spent was $16,245,000, significantly lower than 2007 primarily due to a reduction in expenditures on unplanned events like fire suppression and one-time costs like fire restoration and land purchase. *Programmed* budget expenditures declined the last three years

Table 20. Beaverhead-Deerlodge Actual Budget Expenditures by Budget Line Item 2006 to 2008

Budget Line Item	DESCRIPTION	2006 Budget Expenditure ($000)	2007 Budget Expenditure ($000)	2008 Budget Expenditure ($000)
BDBD	Brush Disposal	25	21	13
CMFC	Facilities	585	133	27
CWFS	Cooperative Work	30	300	57
CMRD	Rd Construction and Mtce	966	965	1,112
CMTL	Trail Construction & Mtce	1,006	1173	1,160
CWKV	Knudtson/Vanderberg Fund	489	144	38
WFPR	Fire Protection/Preparedness	2,741	2,814	2,984
WFHF	Hazardous Fuels	597	459	1,004
NFIM	Inventory and Monitoring	93	337	357
NFLM	Land Ownership	237	167	211
NFMG	Minerals and Geology	858	634	440
NFPN	Land Mgt Plans (Plan Revision)	439	258	464
NFRG	Grazing Management	826	861	849
NFRW	Recreation, Heritage, Wilderness	1,210	1,108	1,059
NFTM	Timber Sales Management	1,568	1,667	1,248
NFVW	Vegetation and Watershed	801	858	857
NFWF	Wildlife and Fish	592	481	505
RBRB	Range Betterment	112	97	69
SSSS	Timber Salvage	11	3	342
TRTR	Road and Trail Restoration	83	69	30
SPSP	Forest Health Action Programs	49	53	51
NF/WFEX	Grants/Agreements/coop	1,301	310	154
FDFD	Fee Demo	207	169	78
WFSU	Unplanned Wildfire Suppression	2,759	10,567	623
Admin	Administration (Cost pool, computers, facilities)	2,703	2,735	2,513
	TOTAL Programmed Expenditures	$17,618	$15,816	$15,622
	TOTAL Including Fire Suppression	$20,377	$26,383	$16,245

**Source of data: Unit Status of Funds Report, USDA FS, BDNF, 09/2008*)

Calculations of Forest impacts on employment and labor income displayed in the tables below include wildfire suppression costs even though these are not allocated or programmed and are funded at the National level. Fire expenditures still affect the local economies.

Table 21. Employment by Program by Year (Average Annual, Decade 1)

	Total Number of Jobs Contributed					
Resource	FY03	FY04	FY05	FY06	FY07	FY08
Recreation	401	405	351	355	358	362
Wildlife and Fish	382	387	288	291	294	296
Grazing	116	111	126	147	105	133
Timber	231	125	195	133	137	295
Minerals	0	0	0	0	0	0
Payments to States/Counties	20	20	21	21	21	143
Forest Service Expenditures	497	522	564	480	531	404
Total Forest Management	1648	1571	1545	1427	1445	1634

Corrections to built-in calculations for the Forest Service economic model (FEAST) in 2009 result in reduced estimated impacts to timber and wildlife/fish sectors. These tables are not directly comparable to previous monitoring reports. The value of the employment and labor income data is to compare management changes year to year and evaluate trends.

The drop in recreation contributions to employment and labor income between FY04 and FY05 results from updated recreation visitation numbers provided by the 2005 National Visitor Use Monitoring (NVUM) survey on the Beaverhead-Deerlodge Forest. The survey technology was changed between the 2000 and 2005 survey to improve accuracy. We do not believe forest visitation changed, however the data is more accurate. (*USDA Forest Service. 2006. National Visitor Use Monitoring Results for BDNF. USDA, Forest Service, Region One, Missoula, MT. September 2006. 46 pp*.)

Data on payments to states and counties was drawn directly from the website: www.fs.fed.us/srs Report 18-1, based on the Secure Rural Schools Act. The number is considerably larger than previous years.

Table 22. Labor Income by Program by Year (Average Annual, Decade 1; $1,000)

	Total Number of Jobs Contributed					
Resource	FY03	FY04	FY05	FY06	FY07	FY08
Recreation*	$9,259	$9,352	$8,067	$8,147	$8,228	$8,311
Wildlife and Fish*	$7,704	$7,780	$5,795	$5,853	$5,911	$5,971
Grazing	$1,428	$1,389	$1,565	$1,836	$1,304	$1,671
Timber	$6,256	$3,676	$5,263	$3,595	$3,705	$7,984
Minerals	$0.0	$0.0	$0.0	$0.0	$0.0	
Payments to States/Counties	$599	$607	$621	$626	$609	$4,296
Forest Service Expenditures	$12,794	$15,342	$21,500	$15,728	$20,364	$12,539
Total Forest Management	$38,040	$37,846	$42,811	$35,705	$40,121	$40,771

Labor income attributable to BDNF forest management in FY08 comprised 3.0% of labor income in the eight counties of southwest Montana, compared to 2.9% of the $1,324 million dollar economy calculated during the base year of 2003.

Evaluation:

Programmed budgets continue to decline on the BDNF and nation-wide. The absence of unplanned wildfire suppression funding resulted in the lowest BDNF expenditures in several years.

Forest Service contributions to employment and labor income, however, grew in FY08 primarily from increased timber harvest. Timber harvest is a labor intensive industry that generates a high proportion of jobs and local spending relative to some other forest related activities. Grazing contributions grew slightly. Forest Service expenditures in the community dropped due to the lack of wildfire suppression activities in FY08.

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APPENDIX A ASPEN MONITORING 1999-2008

District	Site Name	Treatment Date	Treatment Type	Treatment Acres	Sprout Acres	Sprouts/Acres		Sprout Height.		Browse		Sprout Condition	Site Type	Stand Replaced
						1999	2008	1999	2008	1999	2008			
1	Middle Mountain	1997	Slash burn	8	0.25	100	2000	1	3	H	H	Marginal	U	N
1	M Fork Maiden	1989	slash aspen	0.5	0.1	200	200	2.5	1.5	H	H	C (m-h)	R,ST	Y
1	Swamp Creek	1975	fenced	0.5	0.5	200	1500	2.5	5	H	M	C(m),snow	U	Y
1	Gorge Creek	1997	burn, fence	40	3	700	700	1.5	2.5	H	H	OK	R/U	Y
1	Gorge Creek	1997	burn, fence	40	3	700	100	1.5	1.5	H	H	OK,F	R/U	Y
1	Gorge Creek	1997	burn, fence	40	3	700	700	1.5	1.5	H	H	OK	R/U	Y
1	Black Mt	1991	slash conifer	0.25	0.1	800	1000	1.5	3	M	H	Marginal	U	Y
1	French Creek	1997	slash conifer	?	0.5	900	2500	1	5	L	H	OK	U	Y
1	S Fork Maiden	1991	slash aspen	3	2.5	3500	500	6	14	H	M	C(m-h),F	R	Y
1	S Fork Maiden	1991	slash aspen	2	2	6000	4000	6	5	M	H	C(L)	U	Y
	S Fork Maiden						1800		3.75		H			
1	Willow Divide	1997	slash burn	10	0.25	21,000	3,000	2.5	2	L/M	H	Good	U	Y
2	Pintler Lake	1998	logged	3	0.1	20	1	0.5	1.5	H	H		R	N
2	E Fork Fishtrap	1997	burned	0.1	0	20	20	0.5	1	H	H		U	N
2	Pintler. Lake	1998	logged	1	0.1	50	1	1	2.5	H	H	OK	U	N
2	Pintler. Lake	1998	Slash log	1	0.1	50	1	2	1	H	H		R	N
2	Pintler Lake	1998	logged	2	0.5	150	1	1	2.5	H	H	OK	U	Y
2	Pattengail	1988	logged	5	0.1	300	200	0.8	5	H	M	OK	U	Y
2	Lincoln Park	1998	slash conifer	1	1	300	200	0.8	1.5	L	H	OK	R	Y
2	Crozier Creek	?	logged	3	0.5	400	3.5	0.8	2	H	H	OK	R	Y
2	Panama	1978	logged	1	0.1	500	100	3.5	1.5	H	H	OK	U	Y
2	Adson	1997	logged	10	3	750	150	1.5	2.5	H	H	OK	R,ST	Y
2	Bryant Creek	1998	logged	3	0.1	800	2000	1.5	3.5	M	M	OK,Lt.F	U,R	Y
2	Adson	1997	logged	0.25	0.2	2000		2		M		OK	R	N
2	Pintler Lake	1998	logged	1	0.1	2500		2		L		OK	R	Y
2	Knobby Park	1996	slash conifer	3	3	3000	3000	0.8	2	L	M	OK	R	Y
2	Harriet Lou	?	slash conifer	1	0.1	3500	5000	0.8	1.5	H	H	OK	U,R	Y

District	Site Name	Treatment Date	Treatment Type	Treatment Acres	Sprout Acres	Sprouts/Acres		Sprout Height.		Browse		Sprout Condition	Site Type	Stand Replaced
						1999	2008	1999	2008	1999	2008			
3	Steel Horse Past	1985	slash/burn/fence			100	150	8	12	H	L	Good	R	Y
3	North #5	1997	cut LP	6	0.5	200	100	0.8	0.75	H	H	C(m)	U,R	Y
3	Steel Horse Past	1985	slash fence			400	10	3	5	H	M	M	R	Y
3	Foothills	1994	slash conifer			500	2000	1	3	M	H	G	ST	N
3	Mystic Aspen	1999	slash burn	4	0.1	750	10	0.5	2	H	H	OK	R	Y
3	Big Swamp	1992	cl conifer			800	800	1.5	2	H	H	M	U/R	N
3	Doolittle	1998	slash conifer			1100	1000	0.5	1.25	H	H	M	U	N
3	Steel Creek Ranger Station	1998	slash conifer			1200	3000	1	3	H	H	G	U	N
3	Doolittle	1998	girdled con			1350		1		L/M		G	R	N
3	Isaac Meadows	1992	cl conifer fence			1500	3000	1.5	5	H	M	G	U	N
3	Steel Horse Pasture	1985	slashed			1800	2000	1	18	H	L	M-G	U	Y
3	Doolittle	1998	slash conifer			2000		0.5		H		M	U	N
3	Doolittle	1998	slash conifer			2500		1.5		H		G	U	N
3	Doolittle	1998	slash conifer			2700		1		H		G	U/R	N
3	Doolittle	1998	slash conifer			6700		0.5		H		M	U	N
3	Lower Mussigbrod	2000	Wildfire				900		1.5		L/M	M	ST	Y
3	Plimpton Ridge	2000	Wildfire				9000		1.5		M	G	U	N
3	Bender Cr #1	2000	Wildfire		0.25		100		2.5		H	M	ST	Y
3	Bender Cr #2	2000	Wildfire		1.25		12000		4		M	G	R	Y
3	Johnson Cr #1	2000	Wildfire		1		10		2		M	Poor	U	Y
3	Johnson Cr #2	2000	Wildfire		9.5		110		2		M	M	U	Y
3	Johnson Cr #4	2000	Wildfire		0.25		11400		2		M	G	R	Y
3	Johnson Cr #5	2000	Wildfire		1.5		2400		2		M	G	U	Y
3	Bender Cr #4	2000	Wildfire		0.5		360		2		M	M	U	Y
3	Bender Cr #3	2000	Wildfire		1.25		120		2		M	M	U	Y
3	Bender Cr #5	2000	Wildfire		2.5		54		1		M	P	U	Y
3	Maybee Meadows	2007	Wildfire		0.25		1200		1.5		H	G	U	Y
3	Johnson Cr #7	2000	Wildfire		0.25		700		2		M	M	U	Y

District	Site Name	Treatment Date	Treatment Type	Treatment Acres	Sprout Acres	Sprouts/Acres		Sprout Height.		Browse		Sprout Condition	Site Type	Stand Replaced
						1999	2008	1999	2008	1999	2008			
3	Johnson Cr #6	2000	Wildfire		0.5		4500		4		L	G	U	Y
3	Schultz Cr #1	2000	Wildfire		0.5		25		2		H	P	U	Y
3	Schultz Cr #2	2000	Wildfire		0.5		100		3		M	M	U	Y
3	Johnson Cr #3	2000	Wildfire		0.25		60		2		M	P	U	Y
3	Schultz Cr #3	2000	Wildfire		0.25		50		2		M	P	U	Y
6	Doubtful	1980	burn			400	750	4	8	H	M	M	U	Y
6	Antelope Basin		slash aspen			500	1500	4.5	6	M	L	G	U	Y
6	Bogus Basin	1994	burn			500	900	1.5	3	M	H	G	U	N
6	W Fork Madison	1994	burn			500	200	1	5	M	M	M	U	Y
6	Elk Lake	1994	burn			600	500	2	2	M	H	M	U	Y
6	W Fork Madison	1994	burn			700	100	1	2	M	H	M	U	N
6	Gold Butte	1996	burn			1800	2000	2.5	10	H	L	G	U	N
6	W Fork Madison	1997	burn			1800		1.5		H		M	U	N
6	Antelope Basin		slash aspen			2000	2000	6	12	L	L	G	U	Y
6	Antelope Basin	1993	burn			2500	800	3	4	H	H	G	U	N
6	Doubtful	1980	burn			2800	2500	3	5	H	M	G/snow	U	Y
6	Ant Basin		disease			3200	1500	2	4	M	M	M	U	N
6	W Fork Madison	1997	burn			3400		2		M		M/snow	U	Y
6	Gold Butte	1996	burn			3500	3500	3.5	10	M	L	G	U	Y
6	Ant Basin		slash aspen			3500		4.5		M		G	U	Y
6	Doubtful	1980	burn			3700	2000	7	10	H	L	g/snow	U	Y
6	Doubtful	1980	burn			4000	3500	7	10	M	L	M	U	N
6	W Fork Madison	1997	burn			4800		1		M		G	U	Y
6	Doubtful	1980	burn			5200	2500	5	8	H	L	M/Cyt,snow	U	Y
6	Antelope Basin		slash aspen			6000	3000	5	15	L	L	G	U	Y
6	Antelope Basin	1993	burn			9000	2000	5	12	M	L	G	U	N
7	Delmo Salvage B	1991	burn,fence	1.5	0	0	750		2		H		R	N
7	Delmoe Salvag A	1991	burn,fence	2	0	0	5		2		H		R	N
7	N. 3rd Creek	1995	slash,burn			20	1	1.5	1	H	H	M	R	Y

District	Site Name	Treatment Date	Treatment Type	Treatment Acres	Sprout Acres	Sprouts/Acres		Sprout Height.		Browse		Sprout Condition	Site Type	Stand Replaced
						1999	2008	1999	2008	1999	2008			
7	NW Bull	1995	slash burn			30	1	1	2	H	H	M	R	N
7	So. 3rd Creek	1995	log burn	?	?	100	1	2	1	H	H	M	U	N
7	Delmoe Salv TS	1991	log	2	0.1	100	120	2.5	4	M	H	M	R	N
7	Hells U Ex.	1993	burn fence			300	10	1.5	2	H	M	M	R	Y
7	South Pony	1994	burn fence	1	0.1	300	300	2	2.5	m	M	OK	U	N
7	Hells L Ex	1995	fence			1000	450	2	1.5	H	L	M	R/U/ST	N
8	Jackson Peak	1991	Slash fence	2	0.1	550	50	3	1.5	H	H	M	R/U	N
8	Douglas Creek	1981	Slash fence	3	1	750	300	7	12	M	L	M	R	Y
8	Blum Creek	1993	log	?	?	1800	1500	5	14	M	L	Good	U	Y
8	Crevice Creek	1994	slash aspen, log	?	?	2100	700	2	4	M	H	Good	U	Y
8	Willow Creek	1964	log	?	1	2500		30		H		C(m)	U	Y
9	Happy Creek		slash conifer, fence			500	300	1	1	H	H	M	R	N
9	Happy Creek		burn/fence			600	50	0.5	1	H	H	M	U	Y
9	Happy Creek		slash conifer, fence			700	700	1	1	H	H	M	R	N
9	Happy Creek	1995	slash aspen, burn	?	0.1	1500		0.8		H		OK	U	Y
9	Happy Creek		clear conifer			3200	7200	0.75	1.5	H	H	M	R	N
9	Happy Creek		slash conifer, fence			3600	6800	1	2	H	H	M	R	N
9	Happy Creek		burn, fence			3600	6600	1.5	1.75	H	H	M	U	Y
9	Happy Creek		clear conifer, fence			4600	8100	1	1.1	H	H	M	ST	N
9	Happy Creek		clear conifer			16400	4800	0.5	0.8	H	H	M	R/ST	N