WATER AND SOIL

F-1 Adequacy and Cumulative Effects of Best Management Practices

OUTPUT, MANAGEMENT PRESCRIPTION, EFFECTS TO BE MEASURED	REPORTING PERIOD & FREQUENCY	VARIABILITY WHICH WOULD INITIATE FURTHER EVALUATION
Adequacy and cumulative effects of project Best Management Practices (BMPs)	Annually – 100% Sample	Projected deterioration of soil productivity or water quality

METHODS

Project reviews are conducted by resource specialists, forest and State Best Management Practices (BMP) audit groups, and occasionally by Regional Office crews. These reviews assess whether BMPs were applied as specified in environmental analyses and their effectiveness in mitigating impacts of management actions. State BMPs have been developed for a variety of practices, mostly those associated with timber harvest activities. The audit group or Forest specialists work as a team to assess compliance with and effectiveness of the application of these BMPs. Several treatment units were evaluated during 2004 – 2006 to assess BMP application and effectiveness, and soil quality effects as compared to Regional soil quality standards.

FINDINGS

Best Management Practice Reviews

An internal audit of the **Black Ant Salvage Sale** was conducted in September 2003. The sale comprised 133 acres and harvested 0.448 million board feet of timber and was conducted in 2001 following the Ant Park fire. Logging method included tractor and rubber tired skidder with tree length yarding. Approximately 0.5 to 0.75 miles of temporary roads were constructed. Slash pile disposal was not completed at time of inspection. A small unnamed tributary to the North Fork of the Musselshell was located within 200 feet of the project area. No harvest was conducted within the Streamside Management Zone (SMZ). Natural soil erodibility was determined to be high.

Two minor departures for inadequate road drainage were documented during the inspection. The bottom of a temporary road routed flow across a meadow to a draw below the main road.

The **Dry Wolf Stewardship Project** was inspected in July 2004 as part of a State BMP audit. The interdisciplinary audit team consisted of a fisheries biologist, hydrologist, a representative of a conservation group, a road engineer, a soils scientist, and a non-industrial private forest landowner or logging professional, under the guidance of the Montana Department of Natural Resources and Conservation (DNRC), Forestry Division. The Dry Wolf Stewardship Project included timber harvest of approximately 0.8 million board feet on 145 acres. Method of harvest was tractor yarding of whole trees to landings. Approximately 1.57 miles of specified and temporary roads were constructed. Slash pile disposal was completed by pile landing and burning. Lyon Gulch, a tributary to Dry Wolf Creek, is within 200 feet of the harvest unit. No harvest was conducted within the SMZ. Natural soil erodibility was determined to be medium.

Five minor BMP departures and one major departure were documented during the inspection. Two minor departures involved not having adequate length and size of culverts, as well as inadequate culvert cleaning. Two minor departures were noted for skid trail construction and maintenance. One of these departures was noted for use of tractor skidding on slopes that exceeded 40% where some

rutting due to weak subsoil was noted. A minor departure was given for non-compliance with the 124 permit. The permit called for 2-36 inch arched culverts. Two 18 inch culverts were used. A major departure from BMPs was given where a low spot directed sediment from a 50 foot section of road into Lyons Gulch. The audit team noted this departure could have been avoided by leaving compacted berms at the culvert location and balancing the road elevation. Filter fence or slash filter windrows at this location would also have been effective in controlling sediment to the drainage. Within one week of the inspection, the culvert was removed from this section of temporary road and banks were recontoured and seeded.

The results of the State BMP audits for 2004 in general showed that BMPs were applied correctly 97% of the time (2004 Forestry BMP Audit Report, DNRC Forestry Division). None of the projects exhibited gross neglect of BMPs. Overall, adequate protection (BMP effectiveness) was provided 99% of the time, although of the 1,528 practices evaluated during the entire BMP audit, 22 practice departures resulted in resource impacts. The most prevalent departures were related to road drainage not being adequately filtered before entering live water.

Internal audits were conducted on the **Allan Park Salvage and the Highway 89 Fuels reduction projects** in September 2005. Both operations were in progress to be completed later that fall. The 24 acre Allan Park Salvage was a ground-based operation with whole tree yarding. Jackpot and landing pile burns were planned. Primary drainages in the area of the unit were Allan Creek and Indian Creek. The 8.7 acre Highway 89 Fuels Reduction project was a ground based forwarder operation with construction of approximately half mile of road. Treatment within riparian areas was not planned for either project.

The inspection of Allan Park Salvage revealed four minor departures. Two departures were assessed for road surface drainage and inadequate culvert design and two departures were assessed for road maintenance. The review also determined that while skidding operations were intended to minimize soil compaction and displacement, minor and temporary impacts on soil and water resources were noted, indicating a somewhat reduced level of effectiveness.

Highway 89 Fuels Reduction was assessed only one minor departure for mishandling and storage of hazardous substances. Small spills of oils and lubricants were noted at camp and on the forwarding routes. In one instance, practices on the ground exceeded BMPs where a planned temporary road was reduced to a two-track by use of a forwarder instead of a logging truck. The operation exceeded BMP requirements for use of suitable logging systems for topography, soil type, and season of operation, again due to use of a forwarder.

Soil Quality Standard Reviews

***Soil Impacts from Winter Harvest Following Wildfire*:** Three units were harvested under winter conditions in 2002/2003 following the Ant Park Fire of 2001. No previous harvest was known in the area. Trees were cut with tracked harvesters and whole tree yarded to landings using rubber tired skidders. Slash treatment was complete (slash piles burned) and temporary road rehabilitation had been initiated. Soil impacts were evaluated in July 2005 by a Regional Office crew. Their efforts led to a publication by Page-Dumroese et al (2006) titled “Monitoring Changes in Soil Quality from Post-fire Logging in the Inland Northwest.”

The methods for assessment are drawn from the above referenced publication: “In each post-fire logging unit, a 100 point systematic grid and a 100 point random transect were established from a fixed corner point. At each grid and transect point, we described the soil surface cover (e.g. rill erosion, forest floor, bare mineral soil, rocks etc.) and the presence or absence of platy structure in the underlying mineral soil in 1 meter squared plots. Once the soil surface had been described, we assigned a soil disturbance category to each plot, based on the classification systems of Howes (2001) and Heniger and others (2002). In addition to a visual classification, soil strength was determined at each sampling point using a RIMIK CP40 recording penetrometer…”

The description of the soil condition classes are taken from the Page-Dumroese et al (2006) publication:

Table F-1a. Soil Condition Classes Used in Page-Dumroese et al (2006)

Condition Class	Identifying Features
0	Undisturbed forest floor
1	No evidence of past equipment operation, but records of harvesting. No wheel ruts. Forest floor intact. No mineral soil displacement.
2	Trail used by harvester (ghost trails). Faint wheel tracks and ruts. Forest floor intact. No mineral soil displacement and minimal mixing with forest floor.
3	Trail used by harvester and forwarder. Two track trails created by one or more passes. Wheel track are > 10 cm deep. Forest floor is missing/partially intact.
4	Skid trails existed prior to reentry and reused. Old skid trails from 20th century selective harvest. Recent operation had little impact on old skid trail. Trails have a high level of soil compaction.
5	Evidence of mineral soil displacement from trails. Old and new skid trails present. Mineral soil displacement from area between skid trails. Forest floor missing.

The researchers determined from Region 1 Soil Quality Standards that a harvest unit is considered detrimentally disturbed if more than 15 percent of the unit is in disturbance classes 3, 4 or 5 as defined in the Table F-1a above. The results of the assessment are shown below.

Table F-1b. Summary of Soils Assessment on Black Ant Salvage Units

	Unit 6, SW ¼ Section 35, T12N, R9E (# points on transect in condition class)		**Unit 2, SW ¼ NW ¼ Section 35, T12N, R9E (# points on transect in condition class)**		**Unit 5, NW ¼ Section 35, SW ¼ Section 26, T12N, R9E (# points on transect in condition class)**	
Condition Class	Random Transect	Grid	Random Transect	Grid	Random Transect	Grid
0	0	7	0	1	7	0
1	87	61	91	87	48	71
2	6	26	9	9	28	25
3	1	0	0	2	16	3
4	4	2	0	1	1	1
5	2	0	0	0	0	0
Totals	100	96	100	100	100	100
Percent in Classes 3, 4 or 5	7	2	0	3	17	4

The parent material of the soils of the harvest units is limestone and soil surfaces are silt loams. Much of the vegetative cover had been removed from these soils by the 2001 fire. Winter harvest was successful in minimizing impacts to these sensitive soils with the average percentage of detrimentally impacted soils in the three units being approximately 5.5.

Soil Impacts from Harvest with Dry Soil Conditions: Three recently harvested timber sale units were evaluated for soil impacts in August and September 2006. The Allen Park Salvage unit followed a blowdown event that left a chaotic arrangement of down, broken and standing trees near the divide of the Little Belt Mountains. The Roberts Sanitation units (2 units) were harvest of a low elevation mix of drier, open timber types impacted by disease. Harvest activities occurred during periods of dry soils. Harvest methods were ground based mechanical with whole tree yarding. Harvest activities were completed through slash treatment. The methods used to evaluate soil impacts were a series of 100 feet transects, random compass direction, with starting points approximately 200 feet apart randomly

located across the units. Each linear foot of each transect was assigned a level of disturbance found in Table 3 below, with additional notes taken of soil surfaces and structure. Definitions of levels of disturbance follow Howes (2000), with an important clarification. Even though the disturbance class definitions found below in Table F-1c below were the basis for identifying the levels of disturbance, Region1 Soil Quality Standard (R1 SQS) definitions were woven into the process at several important points. First, detrimental displacement as defined by R-1 SQS is the removal of 1 or more inches (depth) of any surface soil horizon, usually the A horizon, from a continuous area greater than 100 square feet. Because of this definition, the soil displacement portions of Classes 4, 5 and 6 were met when detrimental displacement exceeded this minimum area.

A second important issue with Howes (2000) methods, R1 SQS and Forest Plan Standards is the detrimental soil impacts threshold. R1 Soil Quality Standards state that at lease 85 percent of an activity area (harvest unit in this situation) must have soil that is in satisfactory condition. Forest Plan Standards (Management Standard F-1(1) and F-3(11)) speak to protecting and sustaining soil and site productivity. For the activity area to meet R1 SQS and Forest Plan Standards, the amount of Class 3, 4, 5, and 6 level disturbances must not exceed 15 percent. None of the three units evaluated for harvest under dry soil conditions met R1 SQS or Forest Plan Standards. Most of the detrimental impacts seemed to occur during whole-tree yarding operations. Effects of other harvest methods, such as cut-to-length, will be evaluated where utilized to compare impacts.

Table F-1c. New Soil Disturbance (Howe 2000)

Class	Label	Description
Class 0	Undisturbed	No evidence of past equipment operation. Soils are undisturbed or considered to be a natural state.
Class 1	Slight Disturbance	Site is virtually undisturbed. Litter and duff layers intact. Surface soil (A horizons) intact. Impressions of wheel tracks or slight depressions in surface soils may be present. No exposed surface soils (unless natural). No exposed subsoils.
Class 2	Some Disturbance	Litter and duff layers generally intact. Surface soil (A horizon) intact but may show some evidence of platiness. No evidence of surface soil removal or deposition.
Class 3	Moderate Disturbance	Litter and duff layers only partially intact or missing. Surface soil (A horizon) intact but show evidence of platiness or lack of structure. Equipment tire tracks or cleat marks evident.
Class 4	High Disturbance	Litter and duff layers totally removed. Surface soils (A horizons) partially removed or may be mixed with subsoil material. Surface soil structure destroyed (Large, thick plates instead of granular or crumb structure). Some shiny or slick appearing soil surfaces may be present.
Class 5	Severe Disturbance	Litter and duff layers totally removed. Surface soils (A horizons) nearly all or completely removed. Evidence of topsoil removal and/or gouging. Subsoils partially or totally exposed.
Class 6	Altered Drainage	Alteration of internal soil drainage characteristics by equipment operation. Results in permanently saturated soils of standing water.

A summary of the assessments of the three harvest units is found in the following three tables. The average shown in the tables can be converted to percentage (i.e. 26.3 = 26.3%).

Table F-1d. Allen Park Salvage, Unit A2, 27 acres, NE ¼ NW ¼ Sec PB41, Harvested 2005 (distance (feet) within 100-foot transect in condition class)

Transect	Class 0	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6
1	0	29	11	8	52	0	0
2	0	52	0	16	31	0	0
3	0	4	0	35	61	0	0
4	0	40	0	19	41	0	0
5	0	0	0	29	31	40	0
6	0	30	13	21	36	0	0
7	0	24	0	43	33	0	0
8	0	45	0	55	0	0	0
9	0	51	0	37	12	0	0
10	0	16	0	0	84	0	0
Average	0	29.1	2.4	26.3	38.1	4.0	0

Table F-1e. Roberts Sanitation, Unit 1, 145 ac, S ½ Sec 9, T11N, R14E, Harvested 2004 (distance (feet) within 100-foot transect in condition class)

Transect	Class 0	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6
1	0	51	28	21	0	0	0
2	0	33	36	31	0	0	0
3	0	34	45	21	0	0	0
4	0	46	34	20	0	0	0
5	0	59	28	13	0	0	0
6	0	28	47	25	0	0	0
7	0	42	30	28	0	0	0
8	0	42	58	0	0	0	0
9	0	0	11	89	0	0	0
10	0	47	31	22	0	0	0
Average	0	38.2	34.8	27.0	0	0	0

Table F-1f. Roberts Sanitation, Unit 3, 72 ac, SE ¼ Sec 9, T11N, R14E, Harvested 2004 (distance (feet) within 100-foot transect in condition class)

Transect	Class 0	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6
1	0	24	33	43	0	0	0
2	0	50	35	15	0	0	0
3	0	34	48	18	0	0	0
4	0	50	29	21	0	0	0
5	0	20	30	50	0	0	0
6	0	42	39	19	0	0	0
7	0	54	36	10	0	0	0
8	0	40	44	16	0	0	0
9	0	0	12	8	19	61	0
10	0	27	49	24	0	0	0
Average	0	34.1	35.5	22.4	1.9	6.1	0

Forest Plan standard F-1 calls for utilizing adequate soil and water practices to protect soil productivity and to control non-point water pollution from project development. The relationship of the disturbance classes to the Forest Plan standards and Regional Soil Quality Standards are shown below (Howes 2000).

- Class 0 soil disturbance is undisturbed and therefore represents the condition against which the other categories are compared. This category represents maximum potential productivity.

- Class 1 soil disturbance is when subsoils are intact and not compacted. Infiltration and percolation rates are generally unimpeded except for only small, localized areas. Productivity is unaffected. Soil damaging criteria not met.

- Class 2 soil disturbance is when subsoils are intact but may be slightly compacted. Some localized reduction in infiltration rates may occur, but generally no impact on percolation rates. Restoration work usually not required. Affected areas recover well naturally. Soil damaging criteria are not met.

- Class 3 soil disturbance meets Regional and Forest Plan standards defining soil damage. Subsoils are intact, but may be compacted. Infiltration and percolation rates are reduced. Productivity reductions are below acceptable levels. Restoration work is warranted.

- Class 4 soil disturbance meets Regional and Forest Plan standards defining soil damage. Subsoils are exposed and compacted. Drainage characteristics of soils are affected. Channeling of surface water may occur and cause erosion. Significant productivity reductions are likely. Normal restoration activities are effective in restoring productive potential.

- Class 5 soil disturbance also meets Regional and Forest Plan standards defining soil damage. Subsoils are exposed or may be removed or compacted. Drainage characteristics of soils are affected. Channeling of surface water may occur and cause erosion and gully formation. Significant productivity reductions are highly likely. Restoration measures are difficult yet should be carried out.

- Class 6 soil disturbance should be avoided if at all possible. Permanent standing water or altered internal drainage has resulted. Restoration to natural conditions is impossible or nearly so.

Soil Impacts from Prescribed Burning in Harvest Units and Down Woody Debris Amounts Following Prescribed Burning: Four harvest units were evaluated in June 2004; one in the South Deadman Timber Sale and three in Daniels/Kinney Timber Sale. Treatment units had been broadcast burned in the fall of 2003 and spring of 2004 following earlier harvest under a variety of conditions. The purpose of monitoring was to visually assess the impacts of the broadcast burning on soils and to determine average amounts of down woody debris left following completion of harvest relative to Forest Plan Standard P-2: "Leave approximately 10 tons of fuel per acre, where available. This should be material over four inches in diameter, which is randomly scattered over the area. Material should touch the ground for faster decomposition." This Forest Plan Standard addresses in part the recommended amounts of large down woody debris needed for long term soil productivity (Graham et al 1994).

The percentages of burn severity in the units were estimated as part of a random traverse through the units. All aspects, slope classes and apparent past fuel loadings were considered. Coarse down woody debris (4 inch or greater diameter) amounts were determined using a modified Brown (1974) technique with a number of random 50-foot transects. Transect beginning points were randomly chosen across the units in representative portions and transect directions were random as well. Transect intensity was one for each 1-2 acres.

Table F-1g. Summary of Prescribed Burning Monitoring

Harvest Unit	Size of Unit (acres)	Habitat Type	Burn Severity as Percent of Unit			Recommended Amounts of Large DWD (tons/ac) (Graham et al 1994)	Average Measured Amount of Large DWD (tons/ac)
			Low	Mod	Severe		
South Deadman # 8	7-10	Subalpine fir/pinegrass	65	25	5-10	10+	10
Kinney/Daniels # 18	29	Douglas fir/pinegrass and Douglas fir/twinflower	80	10	5-10	12-25	14.8
Kinney/Daniels # 17	5	Subalpine fir/pinegrass	85	10	5	10+	26.3
Kinney/Daniels # 24	12	Subalpine fir/grouse whortleberry	75-80	10	5-10	7-15	17.7

R1 Soil Quality Standards (FSM 2500-99-1) define detrimentally burned soils: "Physical and biological changes to soil resulting from high-intensity burns of long duration are detrimental." R1 Standards then refer to the Burned-Area Emergency Rehabilitation Handbook (FSH 2509.13) for additional description: white or red colored ashes over two inches deep, consumption of fuels greater than ¾ inch in diameter, nearly complete consumption of litter and baking of the soil surface all indicate severe burning.

Units were evaluated for soil impacts from burning only. None of the units evaluated showed severe or detrimental burning over 10% of their area and therefore would not exceed R1 Soil Quality Standards or Forest Plan Standards on burning alone. All units evaluated did have amounts of coarse woody debris within or exceeding the recommended ranges which meets R1 Soil Quality Standards and Forest Plan Standards.

Soil Impacts from Prescribed Burning of Natural Fuels: Approximately 200 acres of early spring burning was evaluated in late April 2003. Vegetation consists of Rough fescue/Idaho fescue and open canopy Douglas fir on the north edge of the Castle Mountains in the N1/2 Section 8, T9N, R8E. Elevations ranged from 5700 to just over 5800 feet on gentle slopes, mostly less than 35 percent. Recent past use on the area was limited grazing by fewer than 7-10 horses for 1-3 months in a year. The area was burned under cool conditions in mid to late April 2003.

Several traverses were made through the burn on all possible aspects and through the elevation range with general observations made. The severity of the burn was low throughout with mostly black ash, partial consumption of litter and less than ten percent bare soil noted. Several spring snow showers and cold rains had occurred since the burn with very minor erosion noted. The burn had backed to the edge of Fourmile Creek on gentle slopes with no evidence of sediment reaching live water. Under the conditions of spring burning, cool conditions, low severity fire and gentle slope, little impact to soil and water resources occurred from the burn.

F-4 Riparian Area, Floodplains, and Wetlands

OUTPUT, MANAGEMENT PRESCRIPTION, EFFECTS TO BE MEASURED	REPORTING PERIOD & FREQUENCY	VARIABILITY WHICH WOULD INITIATE FURTHER EVALUATION
Activities in riparian areas, floodplains, and wetlands	Annually – 50% of all projects	Unacceptable results of an ID Team review

METHODS

A series of range decisions on the Lewis and Clark National Forest (LCNF) in recent years implemented new standards and monitoring plans for stream bank alteration in grazing allotments with riparian areas. The standards were intended to help range managers and permittees limit livestock impacts and improve conditions in those stream channels rated as non-functioning or at-risk due to grazing. Annual monitoring is a critical component of the adaptive management strategy. The results provide feedback information for annual operating plans as well as insight for related long-term monitoring programs.

The protocols for monitoring bank alteration have evolved with new information and direction from a regional working group tasked with developing a more consistent approach to annual bank monitoring for east-side forests in Montana. A major objective of the regional protocol was to provide a simple and easy way for range staff and permittees to monitor and assess stream impacts during the grazing season so that grazing management adjustments could be made as appropriate. To be accepted, the protocol also needed to minimize variability among observers. Survey teams on the LCNF have adopted the final draft (2005) of the regionally-sponsored protocol in order to move forward with essential monitoring and promote recovery of degraded riparian areas. The regional protocol is a paced point-intercept sampling method, using a minimum transect length of 50 paces (about 250 feet) monitored in the most grazing-influenced section of the stream. However, LCNF teams try to complete four transects in a row (about 1000 feet) whenever time and location allow for it. The intent is to avoid over-estimating impacts due to small problem areas (trail crossings, fence lines, watering holes, etc.) encountered along the monitoring transect.

Traditionally, annual monitoring has been viewed mostly as a tool to assess short-term (e.g., yearly) impacts. When conditions such as forage utilization exceed standards, annual operating plans can be adjusted, with the expectation that range condition will improve or fully recover in the next growing season. However, annual bank alteration monitoring can indicate a level of physical impact to stream channels that can require many years to recover. Trampling that shears off or fractures the stream bank causes long-term damage to water quality and aquatic habitats. Streams are unable to reestablish collapsed undercut banks or flush out excess sediment in a single year. In fact, recovery may require complete rest from grazing for multiple years. Results of bank monitoring can provide critical information on riparian condition and long-term trend.

The Sheep Creek Range Analysis Final EIS and Record of Decision (ROD) (2004) elevated the importance of monitoring to ensure permittees are adjusting livestock management and moving cows to meet new bank alteration standards and improve degraded stream channels. Stream bank standards must be met at least three of five years or adjustments to cattle numbers will be instituted. The responsibility for bank monitoring has fallen largely on Forest and District staff, however. Consequently, only a small portion of the annual riparian monitoring obligations across the Forest have been met in recent years.

In 2006, 75% of the bank monitoring conducted was on the White Sulphur Springs Ranger District, with primary focus on the Sheep Creek allotments because the new adaptive management strategy

adopted in the Sheep Creek ROD. Nineteen sites were monitored in 2006, compared to 25 sites in 2005. Of the 19 sites monitored, one (Lake Creek) was not in a grazing allotment, and only nine were monitored at end of season. This means that the other nine sites were measured before cattle were taken off allotments and may have received additional bank alteration. Seven of these nine sites exceeded bank alteration standards at the time of monitoring.

The Sheep Creek Range Analysis Final EIS identified a number range improvements (tanks, exclosures, and fences) designed to reduce the amount of time cattle spend in riparian areas. Due to reduced budgets and other priority work, a number of these range improvements have not been constructed, making it difficult to meet bank alteration standards in some pastures.

FINDINGS

Bank alteration monitoring was completed on nine allotments. Additionally, four streams of special interest (South Fork Judith, Smith Creek, Allen Gulch and Lake Creek) were monitored to evaluate grazing management or aquatic resource concerns. Results for all 19 sites, listed by ranger district and stream, are presented below. Brief narratives for each site and some example photographs follow the table and graphs.

Table F-4a. 2006 Bank Alteration Monitoring Results

Dist	Stream	EA/EIS Reach No. (Cond. [1])	Date Monitored	Livestock Status on Date Monitored	Fish Species [2] Present	Bank Alteration Standard	Bank Alteration Measurement
4	S Fk Judith, upper	R-8(AR)	11/17/06	Off	WC	30%	**11%**
4	Smith	B-2(NF)	11/17/06	Off	No Fish	30%	**70%**
6	Whitetail, upper	37 (AR)	8/22/06	**On**	EB	20%[3]	**28%**
6	Whitetail, lower	37 (AR)	8/22/06	**On**	EB	20%[3]	**15%**
7	Pole	82 (AR)	8/17/06	**On**	EB	20%	**29%**
7	Indian	92 (NF)	9/7/06	Off	EB	20%	**29%**
7	Smith Meadows Fourmile Spring	62 (NF)	8/3/06	**On**	No Fish	30%	**50%**
7	Daniels, lower	114 (AR)	11/06/06	Off	WC	10%	**40%**
7	Allen Gulch	129 (AR)	11/06/06	Off	No Fish	30%	**21%**
7	Lake	195 (PF)	7/11/06	No Cows	WC	No use	**2%**
7	N Fk Eagle	72 (AR)	8/9/06	**On**	RB/EB	20%	**31%**
7	Spruce	181 (AR)	8/2/06	**On**	EB	20%	**24%**
7	Miller, upper	168 (AR)	8/9/06	Off	No Fish	30%	**49%**
7	Miller, mid	167 (AR)	7/26/06	Off	RB/EB	20%	**47%**
7	Miller, lower	166 (AR)	8/24/06	**On**	RB/EB	20%	**26%**
7	Miller, lower	166 (AR)	10/13/06	Off	RB/EB	20%	**36%**
7	Whitetail	164 (AR)	8/8/06	**On**		30%	**54%**
7	Newlan, lower	175 (AR)	10/13/06	Off	RB/EB	20%	**27%**
7	Studhorse	200 (NF)	9/7/06	**On**	EB	20%	**26%**
7	Geis	206	8/8/06	**On**	EB	20%	**15%**

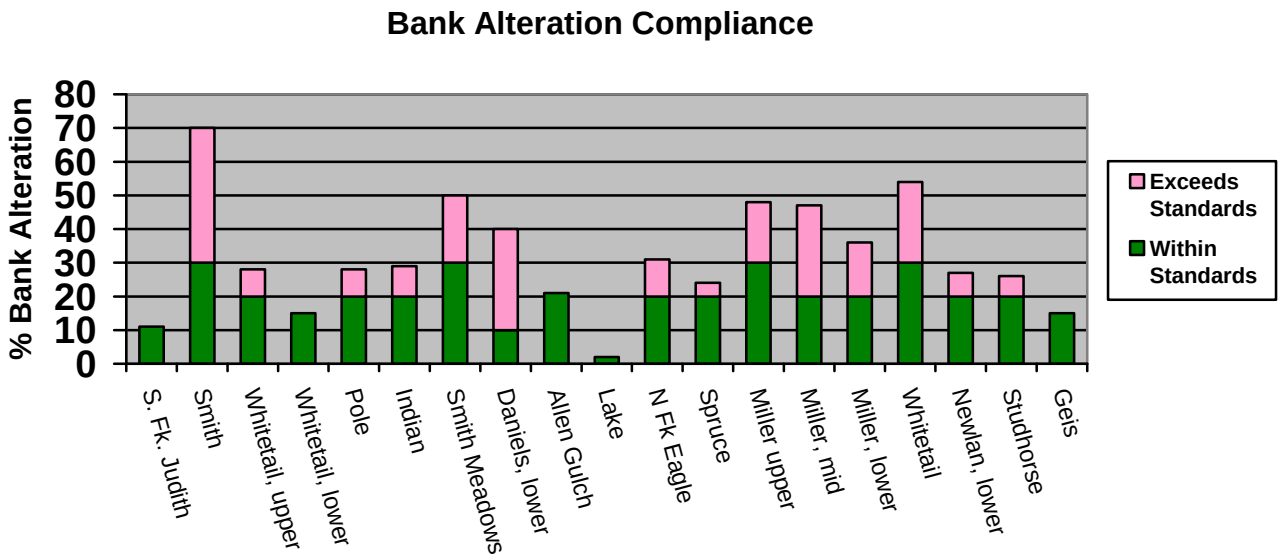
[1] Condition: PF = proper functioning, AR = at-risk, NF = non-functioning
[2] Fish Species: WC = westslope cutthroat trout, EB = eastern brook trout, RB = rainbow trout
[3] Per settlement agreement, bank alteration standard is known as bank alteration "indicator"

Bank alteration standards are set for each site based on several considerations. Recent analyses and decisions for range allotment management established a 10-20-30 system for the LCNF: streams with westslope cutthroat trout in competition with introduced brook trout have a 10% bank alteration standard (i.e. a maximum of 10% of the stream bank transect can exhibit evidence of alteration from grazing impacts); all other fishery streams, including those having only westslope cutthroat trout, have

a 20% standard; fish-less streams have a 30% standard. For those allotments where only Forest Plan riparian standards currently apply, the bank alteration standard is 30%.

Monitoring indicated that grazing impacts at five sites did not exceed the applicable bank standard (green values in table). However, **bank alteration exceeded the nominal standard at the majority (14) of the 19 monitored sites** (red values). When a plus or minus 5% "margin of error" is applied to the monitoring data, 13-15 sites exceeded bank standards. Many sites exceeded standards by 15-40 percentage points. The worst site was Smith Creek with 70% bank alteration, more than twice the standard.

At all monitoring sites hoof print size, trailing patterns, current year cow stools and general lack of elk pellets confirmed that observed bank alteration was due primarily to livestock, not wildlife. Lake Creek (closed to grazing) on the White Sulphur Springs Ranger District showed use by deer and elk, but bank alteration was less than 5%. Permittees (or a representative) participated in bank monitoring on Whitetail and N. Fk. Eagle Creeks, where permittees joined the Forest Service observers. In scheduling monitoring trips and discussing results with District range managers, no indication was given by District staff that either they or permittees were using riparian condition monitoring as the deciding factor in livestock management. Instead, staff and permittees seemed to be focused primarily on authorized AUMs and designated off-dates. The chart below shows the low compliance rate for bank standards in 2006.



Overall, differences between observers conducting monitoring bank alteration transects at the same sites have been small over the last two seasons. Field training that includes examples of the various types of bank alteration and thorough discussion of the methodology can produce a high level of consistency among staff and would facilitate reliable permittee monitoring as well. Once learned, the protocol is fast and can usually be completed in less than 30 minutes per site.

Site Narratives

South Fork Judith River:: Very low utilization, good shrub vigor, snow and ice may have obscured some alteration ("hits"). The lower end of transect four had a higher level of bank disturbance, but this was likely due to the proximity to a drift fence. This area appears to have an improving trend overall. Average bank alteration – 11%; standard – 30%.

Smith Creek: This area was scheduled for a riparian exclosure in 2006 but it was not completed; only the fence right-of-way was cleared. Heavy bank trampling and high grazing impact on this non-functioning reach provides a sharp contrast to the exclosure downstream. The stream suffers from long term cumulative grazing impacts: over-widened channel, very little woody shrub recruitment, high eroding banks, sedimentation and reduced flows. Average bank alteration – 70%; standard – 30%.

Whitetail Creek, Upper Transects: Monitored Reach 37 above Whitetail camp with grazing permittees. Improving trend indicators such as vegetative recovery of raw banks and point bar formation are lacking. The channel is over-widened and the water table appears to be lower than it should be. Observed a 4-5 inch brook trout in the section even though pools are scarce. Average bank alteration – 28%; standard (indicator) – 20%.

Whitetail Creek, Lower Transects: Also monitored Reach 37 below Whitetail camp with permittees. The upper two transects had slightly more bank alteration then the lower two transects. There is some re-colonization of the lower banks by young plants. Transects 1 & 2 were in meadow. Transects 3 & 4 were more forested, with transect 4 showing the least use and lowest bank alteration. Average bank alteration – 15%; standard (indicator) – 20%. (VanSickle, Dobb, Cady, Cole)

Pole Creek: Monitored Reach 82 about ½ mile above the private fence line. This part of Pole Creek has scattered spruce and willow along its banks. The lower portion of the reach above the private land is more open and has a higher average bank alteration. Grass utilization adjacent to monitored reach was 43%. Average bank alteration – 29%; standard – 20%.

Indian Creek: Monitored Reach 92 just above the riparian fence on Reach 91 which was monitored last year. This reach has more willow and spruce than reach 91 but still came in well over standard. Average bank alteration – 29%; standard – 20%.

Smith Meadows/Fourmile Spring: Monitored Reach 62 at the lower end of Smith Meadow across from the gravel pit where Fourmile Creek comes close to the road. 75-80 head of cattle were in the meadow at this time. Grass utilization ran 39% to 41%. Average bank alteration – 50%; standard – 30%.

Daniels Creek, Lower Transects: A 4.5 mile electric fence was built in 2005 to protect Daniels Creek and was expected to be effective for the 2006 grazing season. A high number of trees blew down on the fence during the 2006 grazing season allowing cattle to access the riparian area. Transects 1-3 were linked together in the upper partial canopy/shrub meadow area. Transect four was downstream in the canopied area where major springs join the main channel. The reach overall had many areas of high utilization with abundant cow pies. Monitoring was conducted in November, long after grazing season ended. No elk pellets were noticed. Average bank alteration – 40%; standard – 10%.

Allen Gulch: Utilization appeared to be low overall. Cow pies indicated areas of this year's use. The banks are heavily "post holed" from past years trampling, but there are new willow sprouts and increased vigor of existing shrubs. A trend toward improving condition seems to be occurring. Average bank alteration – 21%; standard – 30%.

Lake Creek: Reach 195 was monitored above beaver ponds. The damage from last year's trespass is still evident. This section appears to be heading towards recovery. Sedges and grasses are re-colonizing damaged areas, and undercut banks are starting to be reestablished. Bank alteration measured this year was caused by wildlife (deer). Average bank alteration – 2%.

North Fork Eagle Creek: This section is Reach 72 downstream from Elmer Hanson's property and is highly vulnerable to trampling. There are some signs of bank recovery (newly formed/untrampled point bars), but the overall condition trend is downward. There is a history of livestock trespass in this area, and it could be a factor in these results. Bank damage is persistent throughout this reach. The stream is over-widened and shallow. Woody shrubs are lacking. Cow stools were common and no elk pellets were observed. Average bank alteration – 31%; standard – 20%.

Spruce Creek: Monitored Reach 181 at the lower end, just above the Studhorse Road. Cattle have trailed along the west edge of the creek. There were still cattle on this pasture but not in this area at the time. Average bank alteration – 24%; standard – 20%.

Miller Gulch, Upper Transects: Transects were monitored in the upper end of Reach 168 where the small tributary springs come together. The uppermost portion of this reach is lined with sedges that appear to be providing some bank stability. The middle and lower portions of the reach contain old shrubs with very large boles. Similar to past years, level of alteration substantially exceeds the standard and there is no evidence of riparian recovery. Average bank alteration – 49%; standard – 30%.

Miller Gulch, Mid Transects: Reach 167 is in a vulnerable and unstable soil type. The upper three transects are located in a long grassy meadow. The lowest transect had a forested canopy, and the road edge was the bank for a fair distance. Without road fill forming the bank in the lowest transect, bank alteration would be higher for this reach. There was no evidence of a recovering trend. Average bank alteration – 47%; standard – 20%.

Miller Gulch, Lower Transects: Monitored Reach 166 at the lower end of the reach across from the junction of the Miller Ridge and Miller Gulch Roads. This reach has a fair amount of willow which helps armor the stream banks. Average bank alteration – 26% midseason, 36% post-season; standard – 20%.

Whitetail Creek: Monitored Reach 164 at its start below the holding pasture in the Copper Creek Allotment. The division fence between Whitetail and Decker Pastures is just South of the creek. Cattle trail along the edge of the creek and a lot of trampling of the spring where the creek starts. The creek dries up within a mile of this transect. Average bank alteration – 54%; standard – 30%.

Newlan Creek, Lower Transects: Started on Reach 175 at the upper end where Newlan Creek enters the Sawmill Pasture. First transect was 49%. The willows got a lot denser and the second transect was 16%. Went to the lower end of the reach and ran two transects going up the creek. The first one was 29% and second was 15% with the willows getting denser further up the creek. Average bank alteration – 27%; standard – 20%.

Studhorse Creek: Reach 200 is the first reach above the new exclosure. I started at the upper end of the reach near where the logging road turns into a jeep trail. Near the end of the fourth transect, the flow started to taper off. The lower ½ of this reach was dry. Average bank alteration – 26%; standard – 20%.

Geis Creek: Started on Reach 206 where a two-track crosses the reach. Surveyed two transects above the crossing and one below. The heaviest use is close to the crossing. The stream is well armored with willows, trees and downfall 100 ft either side of the crossing. Average bank alteration – 15%; standard – 20%.

EVALUATION

As mentioned, range improvements identified in the Sheep Creek range analysis and decision have not yet been fully implemented. 2006 represents the second grazing season following the Sheep Creek decision. It is anticipated that it may take until 2010 until all improvements are in place. Training permittees to conduct monitoring will be an ongoing process as well. Continued monitoring will provide additional data on riparian condition and trends and help determine whether current management is achieving desired conditions.

Photo Appendix (may also depict cumulative effects)

Smith Creek (S. Fk. Judith)

“Post-holing”, bank trampling, bank shearing, loss of woody shrubs, over-widened channel (BA=70%)

Whitetail Creek (Smith River)

Sedimentation, forage over-utilization, bank trampling, “post-holing” (BA=54%)

Newlan Creek, Lower

Bank collapse, loss of shrubs, and over-widened channel (BA=22%)