File Code: 1920

Date: July 11, 2007

Dear Forest User:

I'm pleased to release the Lewis and Clark Forest Monitoring and Evaluation Report for Fiscal Year 2006. This abbreviated report does not contain all 76 monitoring elements contained in the Forest Plan; it focuses on emphasis areas for Forest Plan monitoring. The report contains updates to previous monitoring reports for goshawk and old growth monitoring elements (last published in May 2004) with information collected during FY 2004-2006. It also includes soil and water quality monitoring information collected during FY 2003-2006, monitoring results from sanitation harvest, and information from winter travel plan monitoring collected during the winters of 2006 and early 2007. The reports are viewable on our website at www.fs.fed.us/r1/lewisclark. Click on Projects and Plans and go to the link to Forest Plan Monitoring Report. The 2006 report as well as previous monitoring results for goshawk and old growth are posted there.

A few changes have occurred on the Forest since our last monitoring report. Tina Lanier is District Ranger at the Belt Creek Ranger District. Tina assumed her new role in November 2006. Tim Benedict, District Ranger on the White Sulphur Springs Ranger District, has taken a position with the Eastside Timber Zone. Carol Hatfield, originally from the Helena National Forest, just recently assumed the role of White Sulphur Springs District Ranger. Recent court rulings on the 2005 Planning Rule may affect timeframes for Forest Plan revision for the Lewis and Clark Forest; initiation may be delayed until issues associated with the ruling are resolved. Development of an Environmental Management System (EMS), as part of the revision process, is being addressed at both the Regional and National level.

Thank you for your continued interest in the Lewis and Clark National Forest. We hope to enjoin you in the management of your National Forest System lands.

Sincerely,

/S/ LESLEY THOMPSON
LESLEY W. THOMPSON
Forest Supervisor

RECREATION

A-6 Off-road Vehicle Damage and Travel Plan

OUTPUT, MANAGEMENT PRESCRIPTION, EFFECTS TO BE MEASURED	REPORTING PERIOD & FREQUENCY	VARIABILITY WHICH WOULD INITIATE FURTHER EVALUATION
Off-road vehicle damage	Annually	Conflicts with Forest Management Area goals.
Travel Plan effectiveness	Annually	Increase of 20 or more situations or variances.

METHODS

This monitoring report documents the results of monitoring of a travel plan agreement for winter recreation on portions of the Little Belt Mountains developed through a settlement agreement with parties to an appeal of travel plan decisions in the Big Snowy Mountains. The agreement was the result of extensive dialog with parties to the appeal and called for an interim administrative order to implement the agreement until a final decision was made on travel planning for the Jefferson Division (Little Belt, Castles and north half Crazy Mountains). The agreement specified that the Lewis and Clark Forest would monitor winter use to help insure compliance with the travel plan provisions of the agreement. Monitoring was to consist of at least 6 field visits to verify snowmobile use and contact with snowmobile use groups. Representatives for the Montana Wilderness Association, Great Falls Cross Country Club, and Montana Snowmobile Association were to accompany Forest Service employees on these visits. Authority to implement the agreement was issued under Special Order LC 05-02 A and B signed on March 9th, 2005.

Actual on the ground monitoring of the agreement began February 2006. Although notified of planned monitoring trips, none of the monitoring trips conducted to date have had participation with other parties to the agreement. Neither the District nor Forest has been notified by other parties to the agreement to participate in monitoring they may initiate nor has the Forest been provided any information regarding motorized and non-motorized use in the closure areas by the other parties.

Signs were purchased in March 2006 stating “AREA RESTRICTION/CLOSED TO SNOWMOBILES”. To date, 18 signs have been posted in key locations in the O’Brien Creek, Jefferson Creek, Mizpah and Deadman closure areas. Maps outlining the closure areas and the signed Special Order LC 05-02 are posted at all exiting winter trailhead locations.

Since development of the special order, the Jefferson Division Winter Recreation Technician has conducted a total of 14 monitoring trips, (8 monitoring trips in 2006 and 6 monitoring trips as of February 6, 2007) at various locations around the closure areas. Table A-6a outlines areas monitored and dates on which monitoring took place.

Table A-6a Monitoring Areas and Dates Monitored

Area Name	Deadman	Ranch Creek	O’Brien Creek	Silvercrest	Jefferson Creek	Middle Fork	Big Snowies
2006 Monitoring	2/4, 2/12, 2/19, 2/26, 2/28	2/28, 3/2	2/12, 2/26, 3/2	2/4, 2/25, 2/26	2/19, 2/23, 2/25, 2/26, 3/02	2/26	
2007 Monitoring	1/14	1/14, 1/21	1/14, 1/21, 2/6	1/14, 1/27, 1/28, 2/2, 2/6,	1/14, 1/21, 1/27, 1/28, 2/2, 2/6		

The Belt Creek Ranger District Winter Recreation Technician regularly makes contact with snowmobilers, snowmobile club members, and other users informing them of the area closures. The special order and area closure maps are also posted at trailhead locations and the District Office. These postings include four locations at the Snowmobile Parking Lot off Highway 89, one at the Deadman Trailhead, and at the O’Brien Trailhead.

In the February 2007 Great Falls Snowmobile Club monthly newsletter, the club has advised all users of the existing motorized restrictions and area closures for the Jefferson Zone.

Additional efforts to assist in informing the public of the Winter Recreation Agreement will include an updated 2007 snowmobile user map that will display the restricted areas.

Results of the last two years of monitoring indicated that some snowmobile violations into the non-motorized areas are occurring on a sporadic basis. This may be attributable to lack of signing/education and information of the restrictions in the specific area where the intrusions are occurring. Other noncompliance issues are attributable to variations in topography and vegetation and difficulties in correlating on-the-ground features to the closure boundary map. Areas where meadows and large openings in the forest, which are appealing to snowmobilers, are adjacent to the mapped closure boundary have experienced the greatest number of closure order violations. These are particularly apparent along the headwaters of the O'Brien Creek drainage and adjacent to the boundary of the O'Brien Creek closure and along the northeast boundary of the Deadman closure. The Middle Fork Judith has experienced some closure violations in the Sand Point and Big Deer Point areas where existing roads provide easy access into the Wilderness Study Area (WSA).

Table A-6b summarizes the results of monitoring.

Table A-6b Violations Summary

Closure Area	Violation Location
Deadman	Infractions observed in Sec.'s 11 & 12, T12N, R8E, adjacent to "A" trail and meadow. Snowmobile use evident along first 1/8 mile of Deadman cross-country ski trail.
Ranch Creek	Intrusions have been limited to the access points off Ranch Creek road where the closure area boarders "T" trail in sec's 19 and 20 T12N, R8E
O'Brien Creek	Infractions observed adjacent to "A" trail and large meadow in sec. 29, T13N, R 8E. and adjacent to private land along the southeast boundary of the closure.
Silvercrest	Minor infractions occurring around the Winter Recreation Parking Lot and the Silvercrest Ski Trail System.
Jefferson Creek	No violations observed
Middle Fork	East of Musselshell warming hut into WSA in section 26, T12N, R9E. Violations observed off Sand Point RD 6418 into WSA in sec's 14, 15, and 22, T12N, R9E. and Big Deer Point area in sec's 19 and 20, T13N, R9E.
Big Snowies	No monitoring completed

EVALUATION

Efforts will continue to provide public information on and enforcement of travel management. The Forest anticipates issuing a travel plan decision for the Little Belt, Castles and northern portion of the Crazy Mountains in summer 2007. This decision will essentially supercede the interim administrative order. The Forest will continue to monitor travel plan effectiveness and off-road vehicle damage under the new travel plan. A motor vehicle use map will display routes and areas open to motor vehicle travel and will become the public information map for travel plan enforcement.

WILDLIFE

C-8 Old Growth Habitat for Goshawk

OUTPUT, MANAGEMENT PRESCRIPTION, EFFECTS TO BE MEASURED	REPORTING PERIOD	VARIABILITY (+/-) WHICH WOULD INITIATE FURTHER EVALUATION
Old Growth Habitat (Goshawk): active nesting territories	Annually	Decrease of 10% or more in active nest territories as measured by a 100% annual sample of known goshawk nest territories

The Lewis and Clark National Forest Plan (USDA 1986) identified northern goshawk as a Management Indicator Species (MIS) for old growth habitat. Forest-wide management standard C-5 provides that population levels of MIS be monitored and evaluated as described in the Forest Plan monitoring plan as shown in Chapter V of the Forest Plan. (USDA 1986, page 2-37) The Forest Plan monitoring plan item C-8 provides that for the goshawk "Old Growth Habitat" is monitored by sampling active nesting goshawk territories.

This report is a June 2007 update to the Lewis and Clark National Forest Plan Monitoring for item C-8, as described in Chapter V (USDA 1986, page 5-11. However, in addition to the Forest Plan monitoring item, the Forest Service has conducted many other studies and monitoring related to old growth and the goshawk. As such, this report discusses both old growth and goshawk monitoring information. Among other information, this update includes information from; a Regional Conservation Assessment for northern goshawk (Samson 2006); a habitat estimate for maintaining viable populations (Samson 2006); the results of a northern region survey (Kowalski 2006), 2004, 2005 and 2006 old growth surveys; 2004, 2005 and 2006 goshawk monitoring; and an analysis of Post Fledging Area (PFA) habitat types previously reported in the May 2004 update to this monitoring item.

OLD GROWTH

OLD GROWTH MONITORING METHODS

The Forest continues to use the 1993 "Lewis and Clark National Forest Old Growth Inventory and Allocation Process." Forest Plan direction is old growth "stands will be identified as a part of resource program and project level wildlife inventories and evaluations" (USDA 1986, page 2-16). On the ground inventories are completed for timber compartments encompassing specific projects the Forest undertakes. As projects are planned in uninventoried compartments or stand conditions change, additional inventories are completed and the Forest database (Timber Stand Management Record System, TSMRS) updated. Furthermore, the Forest utilizes information gathered through the Forest Inventory and Analysis (FIA) for a statistically valid estimate of old growth for the Lewis and Clark Forest. This is discussed in more detail below.

DESIGNATION OF COMMERCIAL FOREST LANDS

Forest Plan direction states that a "minimum of 5 percent of the commercial forest land within a timber compartment should be maintained in an old growth forest condition" (USDA 1986, page 2-44, Management Standard E-4 (9)). Commercial forest land is defined in the Forest Plan as "Forest land that is producing or is capable of producing crops of industrial wood and (a) has not been withdrawn by Congress, the Secretary, or the Chief; (b) existing technology and knowledge is available to ensure timber production without irreversible damage to soils, productivity, or watershed conditions; and (c) existing technology and knowledge, as reflected in current research and experience, provides reasonable assurance that adequate restocking can be attained within 5 years after final harvesting (Forest Plan Glossary, p. 3-4). Forest land, on the other hand, includes all lands capable of producing timber, whether industrial or not, and does not have to meet the criteria identified for commercial forest land. In previous monitoring reports the acres of old growth were compared to the acres of forested lands, which include both commercial and non-commercial lands.

Although the Forest Plan identified the number of acres of commercial land, no specific map of these lands was available for project planning. To remedy the lack of a map, the Forest developed a process in 2005 to identify commercial lands. The process is described in "Commercial/Non-commercial Forest Land, Logic and Process," dated August 29, 2005. Since 2005, as projects are planned, commercial lands are identified in the timber compartments in which the project occurs.

FINDINGS – OLD GROWTH COMMERCIAL FOREST LAND BY COMPARTMENT

Table C-8a is a compilation of current old growth inventory data by compartment for the compartments in the Jefferson Division of the Lewis and Clark National Forest where commercial lands are identified and old growth inventories have been completed. This data was obtained from a March 2006 query of TSMRS. The Forest has completed old growth surveys in 49 of the 123 compartments on the Jefferson Division, mostly within the Little Belt Mountains. The Plan notes that there is currently no inventory of all timber stands on the Forest that meets the old growth forest definition. "These stands will be identified as a part of resource program and project level wildlife inventories and evaluations." (Forest Plan Forest-Wide Management Direction page 2-16). Generally, these surveys are completed during project development. Compartments within which no management actions are proposed may not have been surveyed, as no impacts to old growth are anticipated.

Table C-8a. Old Growth Inventory Data by Compartment – Jefferson Division

District	Compartment	NFS Acres in Compartment	Inventoried Old Growth Acres *	Acres of Commercial Lands *	Old Growth Acres in Commercial Lands *	% Old Growth in Commercial Lands
D3	366	3858	498	1300	125	9.7
	367	12182	2420	10013	2352	23.5
	368	15478	1537	10719	1507	14.1
	369	10627	1018	9267	843	9.1
	370	13208	3295	10409	3282	31.5
	371	7253	536	5926	527	8.9
	372	13845	1846	11430	1846	16.2
	373	11331	1994	10281	1982	19.3
	374	5895	952	4344	674	15.5
	375	8480	1722	6668	1671	25.1
	376	13586	2429	11467	2394	20.9
	377	14749	1248	11534	1248	10.8
	380	14029	1499	12114	1499	12.4
	387	8534	1340	7230	1340	18.5
D4	446	4983	978	2751	979	35.6
	449	12749	1692	8460	1648	19.5
	450	11078	1086	10317	1056	10.2
	451	14457	2011	10586	1935	18.3
	452	10390	3667	8264	3122	37.8
	453	11680	1380	7862	1380	17.6
	454	11698	2208	8886	2208	24.9
	455	11456	2470	9129	2434	26.7
	456	14262	4510	13552	4503	33.2
	457	16905	1881	13254	1873	14.1
	458	9645	472	6796	472	7.0
	459	13819	2818	10157	2317	22.8
	460	21029	2279	11547	2049	17.8
	461	9866	1011	6440	577	9.0
	462	11942	1063	6467	850	13.2
D6	601	5836	1476	5443	1446	26.6
	602	5301	616	4554	616	13.5
	603	2369	349	1778	349	19.6
	632	6212	435	3901	317	8.1
	633	9242	860	8172	747	9.1
	634	5110	546	1862	445	23.9

Table C-8a. Old Growth Inventory Data by Compartment – Jefferson Division						
District	**Compartment**	**NFS Acres in Compartment**	**Inventoried Old Growth Acres ***	**Acres of Commercial Lands ***	**Old Growth Acres in Commercial Lands ***	**% Old Growth in Commercial Lands**
	635	10797	950	8758	861	9.8
	636	9054	1917	3586	1460	40.7
	637	5903	878	3964	865	21.8
	646	2190	765	1770	710	40.1
D7	701	12741	685	6548	610	9.3
	702	6712	1025	5255	841	16.0
	703	8454	836	6057	712	11.8
	704	8118	1367	6107	790	12.9
	705	8325	1710	6418	1490	23.2
	706	7332	225	5258	165	3.1
	707	10340	344	7764	344	4.4
	708	7873	133	4919	133	2.7
	709	6830	337	5404	157	2.9
	711	23349	1943	21160	1907	9.0
* Variations in acreages from the May 2004 monitoring report are due to database corrections and/or updated inventories.						

The data show only two compartments with less than 5 % old growth. The mean for percent old growth in commercial forest land in the timber compartments surveyed is 17.4%.

In the Rocky Mountain Division of the Forest (D1), few vegetation treatment projects have occurred. Therefore, old growth inventories have been minimal and commercial lands not yet identified. If vegetation treatment projects are planned on the Rocky Mountain Division, inventories of old growth will proceed and commercial lands will be identified.

FIA – OLD GROWTH

A Region One Estimate of Old Growth for the Northern Region and National Forests was released on November 6, 2006 (Bush et. al) and is attached to this report. The report summarizes analysis conducted using Forest Inventory and Analysis data to estimate percentage of old growth on ***forested*** lands in the Region and on individual National Forests.

FIA provides a statistically-sound representative sample designed to provide unbiased estimates of forest conditions at the broad- and mid- levels. The FIA sampling frame uniformly covers all forested lands, regardless of management emphasis. A difference between estimated means for the forest data from Table C-8a and that of FIA is that FIA is conducted on ***all forested land*** while the data in Table C-8a is by ***commercial forest land*** within a timber compartment.

For the Lewis and Clark Forest, FIA data estimates a mean of 13.3% old growth on forested lands forest-wide: a 90% confidence interval results in an estimate of between 10.6% and 16.2%. Our May 2004 monitoring report on old growth habitat for goshawk (available on the Lewis and Clark website at http://www.fs.fed.us/r1/lewisclark/) provides a breakdown of estimates of old growth by commercial forest land across the Lewis and Clark Forest and by landscape areas. For the Little Belt Mountains, FIA estimates the 90% confidence intervals for old growth by commercial forest land between 6.91% and 17.89%. The estimates calculated with the data from Table C-8a (17.4%) fall within the FIA confidence intervals.

GOSHAWK

CONSERVATION ASSESSMENT AND HABITAT ESTIMATES FOR MAINTAINING VIABLE POPULATIONS OF GOSHAWKS

"A Conservation Assessment of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, and Pileated Woodpecker in the Northern Region, USDA Forest Service" (Samson 2006) is based on peer-reviewed literature, master's degree theses, doctoral dissertations, research reports, and Forest Service data. In this assessment, region-wide estimates of the amount of goshawk habitat were developed using vegetation

information from Forest Inventory and Analysis (FIA) data. Modeled habitat estimates (in hectares (ha)) for the Northern Region as a whole and the Lewis and Clark Forest are shown below:

Table C8-b. Modeled Goshawk Habitat by Region and LCNF

	Nest		Post Fledging Area		Foraging
	Regional	Province[1]	Regional	Province	
Region	829, 526	95,423	933,145	555,830	2,744,925
Lewis and Clark Forest	52,739	5,612	67,643	67,346	196,426

1 The Ecological Province habitat estimates include only National Forest System Lands

Assuming one to five nests are constructed by the northern goshawk within their home range, the Lewis and Clark Forest is estimated to have enough habitat to support between 94 and 468 nesting pairs (10 - 12 ha/nest site). Reynolds estimates the size of an area for post fledging habitat at 120 - 240 ha/pair. Using this estimate, the Lewis and Clark provides enough habitat for 280 - 518 pair.

Samson concluded that, using 2/3 of the median dispersal distance of the bird, there are not isolated populations of goshawk, rather one population exists in the forested portion of the Northern Region that interact and that habitat is well-distributed throughout the Region; not a single nest site is isolated by more than 268 km to another nest.

In Habitat Estimates for Maintaining Viable Populations of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten, and Fisher (Samson, 2006) Samson estimates a critical habitat threshold of 540 km^2 for a minimum viable population for the single population of the northern goshawk in the Northern Region. Total estimated habitat on the Lewis and Clark is 1,276 km^2, certainly adequate alone to support a minimum viable population of northern goshawk. Studies (Hessberg et. al. 2003, Gallant et al. 2004 and Hessberg et al. 2005) have shown that forested systems in the Northern Region are more extensive than in historic times (1800s) and there is no indication that forested ecosystems in the Northern Region is anywhere near a critical threshold of species habitat loss to 20-30% of historic range.

Based on the determination of habitat region-wide the Conservation Assessment concluded the following:

- Habitat for the goshawk is well distributed across the Northern Region and by Forest. There are not isolated populations of goshawk in Region 1, but rather one interconnected population.
- Habitat is abundant for the goshawk in the Northern Region, by Ecological Province, and by National Forest.
- No scientific evidence exists that the northern goshawk is decreasing in numbers.
- Increases in the extent and connectivity of forested habitat have occurred since European settlement.
- Level of timber harvest across the Northern Region does not have a significant effect on the amount of goshawk habitat available.
- Suppression of fire as a natural ecological process continues to allow an increase in the amounts of northern goshawk habitat.

REGIONAL GOSHAWK MONITORING

During the spring and summer of 2005, the Northern Region conducted a field survey of goshawks across accessible portions of the Region (Kowalski, 2005). The purpose of the survey was to use a statistically based approach to (1) estimate the rate of goshawk occupancy (frequency of goshawk presence) within a grid that approximates the territory size for this species, and (2) better define and document the geographic distribution of goshawks across the Northern Region. The survey was conducted using the Northern Region Goshawk Bioregional Monitoring Design (Woodbridge and Hargis 2006, Hargis and Woodbridge 2006). Survey results found goshawk presence in 40 out of 114 Primary Sampling Units (PSUs), suggesting that during nesting periods goshawks were fairly common and widely distributed in the roaded (or more managed) portions of NFS lands in Region 1. This information, combined with goshawk nest information accumulated between 2000-2005, suggest that goshawk is a relatively common and well-distributed avian predator in the Northern Region.

LEWIS AND CLARK GOSHAWK MONITORING AND INVENTORY

METHODS

The Forest Plan requires annual monitoring of all known goshawk territories. Monitoring methodology has varied from checking the known nests in a territory, walking suitable habitat near previous nests searching for signs of presence, or using broadcasted calls. In 2006, the Forest began using intensive nest searches and broadcast calls. For inventory, all proposed treatment areas, and one-half mile outside of treatment areas in suitable nesting habitat, were surveyed. In addition, habitat judged by the observer to be nesting habitat based on personal experience was also surveyed. For project level inventories and active nest area monitoring, survey protocols outlined in Woodbridge and Hargis (2006a) were incorporated, including survey transect details, survey timing, calling procedures, nest location procedures, and interpretation of goshawk responses.

Terminology has changed some since the Forest Plan monitoring item was written. The term "active nesting territory" is no longer used as intended in the Forest Plan. Ongoing Northern Region overview work on northern goshawk define a territory as "an exclusive area defended by goshawks. An active nest is not an essential element of a territory". The presence of an aggressive goshawk often leads to a more intensive survey, but does not always result in identification of a nest. Brewer defines an active nest area as "an area containing an active goshawk nest within the last 10 years..." Breeding activity at an active nest area can include: defense of a nest by an adult, observation of eggs, young or fledglings in nest area, or presence of obvious signs of nest occupation (e.g. whitewash, prey remains). For the purposes of the Forest Plan monitoring element and in order to be consistent into the future, the Forest biologists agreed upon the following criteria in 2006 to define **active nest areas**:

- An active nest area (consisting of a nest stand and PFA) occurs when:
    1. an active nest has been located within the last 10 years.
    2. recently fledged young that would still be in the nest vicinity are identified
    3. if nests are located more than 1 mile apart (nests located less than 1 mile apart will be considered the same territory unless both are active the same year (based on Reich et al. 2004)
- To determine if a nest area is no longer active, monitoring must be conducted in 8 out of 10 consecutive years.
- Other sightings of goshawks will be tracked. If aggressive ("territorial") behavior is observed with individual sightings, a nest search will be conducted.

RESULTS

Based on these criteria, the number of known active nest areas has changed since the May 2004 monitoring report. If a nesting area was monitored for at least 8 out of 10 years with no evidence of reproductive activity, the nesting area was reclassified from active to historic. Past monitoring may have identified the presence of a goshawk, but no nest site or evidence of reproduction was found.

Table C-8c below details the results of goshawk monitoring since 1979 and displays activity identified at nest sites inventoried. It identifies those locations considered to meet the definition provided earlier for an active nest area. Ten "territories" have been reclassified as potential (for those which never had any evidence of reproduction) or historic. These locations are highlighted on the following table. Historical nest areas may receive incidental monitoring, but will no longer be monitored to comply with this Forest Plan monitoring item. Continued monitoring may result in reclassification of some nesting areas from active to historic. Sites that have not been monitored in at least 8 out of 10 years will continue to be monitored to determine their status.

The table shows there were several new observations in 2005. Thirteen active and 8 new nest areas were identified in 2006. Five of the new nest areas were on the Rocky Mountain Ranger District, one on the Belt Creek Ranger District and two in the Blacktail Hills on the Judith Ranger District. Additional active nest areas will continue to be added to the monitoring program as they are discovered.

Table C-8c Lewis and Clark National Forest Goshawk Survey Results

Count	District	year found	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Notes
1	1	1988										A2											I	I		I	O				2-3 downy young in nest
2	1	1988										A2											O	I	O	I		I			2-3 downy young in nest
3	1	1991													O										I	I	I				Bird seen 1991, not surveyed until '01, unoccupied nest found '02
4	1	1992														O									I						Aggressive bird in 1992 but nest never found
5	1	1994																A				I	I		I	I		I		A2	Fledglings observed in area 1985
6	1	1992														A		O				I	I	I		O	I	I			Nest disappeared in 2000, bird observed in area in 2002
7	1	1993															A						O	O	A	O	AF1	O		A2	
8	1	1992														O					A		AF1	I	AF1	I	I	I		F3	Survey in 1994 possibly in wrong area, 2006 no nest found
9	1	1999																					AF2	O	I	I	I	I			
10	1	1998																				AF1	O	I	I	I	I	I			
11	1	1999																					A	O	AF1						File unclear on 1997 and 1998 activity
12	1	2002																								A	O	AF2			Aggressive bird in area in 2001 but no nest search done
13	1	2002																								AF2	I	I			Birds first seen in area in 2001, non-aggressive bird seen 2003
14	1	2000																						O	F1	I	I				2001- fledgling and adult but no nest, 2000-2001 cluster of observations of aggressive adult
15	1	2005																											O	A	
16	1	2005																											O	O	No nest found
17	1	2006																												A1	
18	1	2006																												AF3	
19	1	2006																												A1	Adult observed in area in 2001
20	3	1996																		I	I	I		AF1	O		I	I		I	Nest found 1996, no birds recorded
21	3	1999																					AF2	I	I		I	I	I	I	
22	3	2006																												AF1	
23	4	1979	O	O						F2	A	A	A	I	A	O	I	I	I	O				F2	A	A	I	I		F2	
24	4	2005																											O	A	
25	4	2006																												F2	
26	4	1990												A	I	I	A	I	I	A		F2		O	O	I		I	I		
27	4	1990												O	F2	A	O	I	I	I		A	F2	F1	A	A	F3	I			
28	4	1998																				F2			I	F2	O	I	I		
29	4	1995																	O	A		O	F2	O	I	F1	I	O	I		
30	4	2001																							A	O	I	I	I		
31	4	2002																								A	O	I		I	
32	4	2002																								F1	O	F1		A	
33	4	2002																								A	I	I		I	
34	6	1988										F3	A	O	O	A		I		F1					O	O	I	I			
35	6	1985							F3	F2	F2	F3	I	I	I		A	I	I	I					I	F2		F3		F2	
36	6	1986								F2	O	A	I					A		A					A	A	A	I		I	
37	6	1986								F2				I					I	I					O	I	F2			O	
38	6	1986								F1	I								I	I					I	I					Recommend removing, no activity since 1986
39	6	1987									F1	A	A	I					I						I	I	I	I	I	I	Recommend removing, no activity since 1989
40	6	1986								A	F3	I		I		I	I	I		I					I	I	I	I	I		Recommend removing, no activity since 1987
41	6	1988													A			A	I	I					I	I	I	I			
42	6	1988																							I	I	I	I		I	Recommend removing, no activity ever recorded. Unoccupied, possible goshawk nest found in 1988.
43	7	1987									F3	AF1	I	I		I											I	I	O	I	
44	7	1989											AF3	AF3	A2	I				I	I	A	I		AF1	O	I	I		I	3 known nests in this territory
45	7	1992														AF3	I				I	F2	I	I	I		I	I		O	
46	7	1992														AF2						O	I	I	I		I	I		I	
47	7	1992														F1	I							I			I	I	I	O	
48	7	1987									I		I			I				I			I	I	I	O	I	O	I	I	Inactive nest located in 1987
49	7	2004																										AF1	I	I	
50	7	2005																											O		No nest found

= Prior to year found = Not Active I = Inactive (no birds found) O = Occupied (birds found, no nesting obs) A = Active nest (bird or young in nest) F# = Fledglings (e.g. F3 = 3 fledglings)

Table C-8d below summarizes the results of Forest-wide monitoring each year since 1992. The number of active nest areas is based on the criteria described above for defining an active nest area, and has resulted in a change in numbers or percentages from those reported in previous monitoring reports. The figures show that a high percentage of active nest areas have been monitored each year. It has been difficult to monitor 100% of all active nest areas as access to nest areas during the spring nesting season is not always possible in many locations in the Little Belts. Manpower and other circumstances during the survey season in 2005-2006 resulted in fewer locations being surveyed during the nesting season. Monitoring efforts have focused on the Jefferson Division, particularly the Little Belts, where a majority of management actions have taken place.

As of 2006, there are 40 known active nest areas, more than twice the number known when the Forest Plan monitoring item was developed. This trend is likely to continue. As described by Samson, habitat does not appear to be a limiting factor for goshawk. The barred owl represents a significant influence on northern goshawk abundance and distribution due to predation on young (Hanauska-Brown et al. 2003), and the great horned owl, which is a common species on the Forest, is also a predator of goshawk nests and fledglings. Reich (2003) found that territorial behavior and not habitat was setting the upper limit to northern goshawk population growth rate. Food availability (Salafsky et al. 2005) and lack of predation characterize high quality habitat (Squires and Kennedy 2006).

Table C-8d. Goshawk Nest Areas Monitored *

Year	Active Nest Areas	Number of Nest Areas Monitored (%)	Number of Monitored Areas Occupied (%)	Number of Monitored Areas with Active Nests (%)	Change in % of active nest areas from previous year
1992	19	11 (58%)	7 (64%)	6 (55%)	------
1993	20	8 (40%)	4 (50%)	3 (38%)	-17%
1994	21	10 (48%)	4 (40%)	3 (30%)	-8%
1995	21	8 (38%)	0 (0%)	0 (0%)	-30%
1996	21	11 (52%)	5 (45%)	4 (36%)	36%
1997	21	3 (14%)	1 (33%)	1 (33%)	-3%
1998	23	10 (43%)	8 (80%)	6 (60%)	27%
1999	25	15 (60%)	9 (60%)	6 (40%)	-20%
2000	26	17 (65%)	8 (47%)	3 (18%)	-22%
2001	28	24 (86%)	14 (58%)	9 (38%)	20%
2002	33	26 (79%)	16 (62%)	11 (42%)	5%
2003	32	27 (84%)	9 (33%)	4 (15%)	-27%
2004	33	29 (88%)	6 (21%)	4 (14%)	-1%
2005	33	7 (21%)	1 (14%)	0 (0%)	-14%
2006	40	24 (60%)	16 (67%)	13 (54%)	54%

* This data was screened using the criteria reported above to define active goshawk nest areas; therefore, numbers are different than previously reported.

Of the 40 known active nest areas; 16 of these occur on the Rocky Mountain Division and 24 occur on the Jefferson Division. In the last 15 years, monitoring results indicate that the percent of occupied territories (territories that were monitored and goshawk presence was detected) has varied from zero to 80%, and the percent of active nesting areas has varied from zero to 60%. The Forest Plan monitoring item states that a decrease of 10% or more in active nest territories

would initiate further evaluation. As shown in Table C-8d, the change in active territories has varied from an annual decrease of 30% to an increase of 54%.

DISCUSSION

As described in previous monitoring reports, the reasons for decreases in number of occupied or active nest areas are unknown. However, many recent studies have reported wide variance in the proportion of active nests and young fledged. Anderson et al. (2005) conducted a technical review of available information on northern goshawks and reported that annual productivity and nest success "are highly variable." For example, Salafsky et al. (2005) reported that the proportion of territories with active nests varied from 18% in 2002 to 58% in 2000. Wiens et al. (2006) found that the proportion of pairs breeding varied from 8% to 97% in territories monitored from 1991 to 2004. Boal et al. (2005) found that nesting success varied from 37% to 83%. The results of monitoring efforts to date on the Lewis and Clark National Forest appear consistent with variations reported in the above research.

Several recent reports have looked at the reasons for the high variability of occupancy and nest success. Anderson et al. (2005) reported that "(h)igh annual variability in reproduction appears to be characteristic of all goshawk populations studied to date and is associated with annual variation in weather and prey (Kostrzewa and Kostrzewa 1990, Keane 1999, Doyle and Smith 2001)." Boal et al. (2005) reported that weather contributed to 35% of nesting failures in his study area. Fairhurst and Bechard (2005) found that colder February and March temperatures and increased rain in April were related to declines in occupancy of nesting territories by breeding goshawks. Keane et al. (2006) found that annual variation in the number of goshawk territories with active nests, successful nests, and number of young produced was associated with variation in late-winter and early-spring temperatures and Douglas squirrel abundance. Further, Reynolds et al. (2005) stated the "low detectability of nonbreeding goshawks (combined with uncertainties stemming from variations in breeding and use of alternate nests) made it difficult to categorize territories unequivocally as "unoccupied" by goshawks in non-egg-laying years." Reynolds et al. (2005) further suggest that "(l)ow detectability, variations in breeding, and large samples require that demographic and habitat studies of goshawk employ intensive and repeated searches for goshawks in large study areas over at least 8 years." Even research level monitoring is subject to the variety of reasons a territory may be determined "inactive" and variations in occupancy and breeding in any given year.

Given the wide range in the percentage of active nests found on the Forest and evidence, supported by the literature, that weather and prey variability play a large role in breeding success, the variance identified for monitoring item C-8 (i.e. a decrease in 10% or more in active nest territories) does not appear to provide a reasonable threshold for further evaluation of management activities.

As tables C8-c and C8-d show, new active nest areas are being found throughout the forest. The application of consistent monitoring protocols will also likely result in additional sightings.

GOSHAWK HABITAT ANALYSIS

The May 2004 update to Forest Plan Monitoring item C-8 displayed data on the vegetation types present in occupied post-fledging areas (PFAs) compared to a randomly placed PFA on the Forest landscape. A statistical analysis of the data was done, using the Kolmogorov-Smirnov (KS) test. The KS test is used to test the hypothesis that the means of two data sets are equal for small data sets that are not normally distributed around the mean.

RESULTS

The results of the analysis are shown in Table C-8e. For vegetation types grass/rock, seedling/clear cut, sapling, and old growth there is no statistical difference in the means for percentage of each vegetation type in the PFA around known nest sites and random sites. This means that goshawk are selecting for these vegetation types at the same rate as they occur on the landscape. For the mature forest vegetation type we can say with 95% confidence that the means are not equal. In other words, goshawk do not select mature forest vegetation type at the same level as it occurs on the Forest. For known nest sites, 69.1% of the area is in a mature forest vegetation type on average. For the random sites, 62.8% of the area is in a mature forest vegetation type on average. Therefore, the data indicates goshawk select mature forest at a higher percent than it occurs on the landscape. This was a relatively small sample size (n = 25 for post fledging areas around occupied nest areas from 1990-2003 data), and additional data would be necessary to increase the confidence in the results.

Table C-8e. - Comparison of habitat types in post fledging areas (PFA) around known nest sites and random sites within modeled nest habitat

	PFA around known nest sites		**Randomly placed PFA**		**Kolmogorov – Smirnov test**	**Result**
Vegetation type	Mean (%)	95% confidence interval	Mean (%)	95% confidence interval	P value	With 95% Confidence (α = 0.05)
Grass / rock	11.2	5.65 – 16.75	8.44	4.22 – 12.67	0.058	**Accept** that the means are equal
Seedling / clear cut	2.6	0.76 – 4.44	2.24	0.18 – 4.31	0.171	**Accept** that the means are equal
Sapling	0.92	0.11 – 1.73	4.31	1.67 – 7.0	0.085	**Accept** that the means are equal
Old growth	13.7	7.64 – 19.72	22.1	16.82 – 27.35	0.171	**Accept** that the means are equal
Mature conifer	69.1	60.51 – 77.65	62.8	56.53 – 69.02	0.035	**Reject** that the means are equal

DISCUSSION

McGrath et al. (2003) compared the vegetation in concentric circles around nests. This study found that "the goshawk's reliance on specific habitat conditions for nesting decreases as distance from the nest increase" (McGrath et al. 2003:48). Daw and Destefano (2001) recommended at the PFA scale to "maintain forest conditions intermediate between the high foliage volume and canopy cover of nest sites and more open foraging heights" (page 59). These studies and others such as Clough (2000) suggest that a mix of age structures in the PFA is important.

The Lewis and Clark National Forest Plan was completed in 1986, with the northern goshawk chosen as Management Indicator Species for old growth. Recent studies indicate that northern goshawk do not depend solely on old growth for nesting, but do select mature and old growth forests disproportionately to their availability for nesting (Beier and Drennan 1997, Graham et al. 1999, Daw and DeStefano 2001, Greenwald et al. 2005, McGrath et al. 2003, Mahon and Doyle 2005, Wiens et al. 2006). Our analysis of known nests on the Lewis and Clark National Forest as reported in Table C-8c is consistent with these research findings with regard to mature forest, but in contrast found that old growth was used at the same rate as it occurs on the landscape.

EVALUATION

Monitoring Item C-8 indicates that a “decrease of 10% or more in active nesting territories.” would initiate further evaluation. The direction to conduct further evaluation when a 10% decrease is identified does not address any of the potential sources of the change that are discussed above. From the research and studies discussed above, it is evident that it is not unusual for active goshawk nesting to vary substantially due to weather, natural variability of occupancy and nesting, predation, and prey competition. Some variation may also be explained by survey methodology. The monitoring data show that active nest areas both increase and decrease, due, likely to a number of factors.

The Forest continues to identify new nesting areas; the data do not show a decreasing trend over time. Evaluation of the data show that the variability experienced on the Forest is within the range of variances in goshawk nesting occupancy and success experienced under natural conditions, as documented in the literature. Management practices will continue and future monitoring will focus on goshawk nest areas near management activities compared to those that are not near management activities within the same landscape (as a control). Additional effort to monitor all known active nest areas will be undertaken during 2007 and further evaluations will be reported when that data is compiled. This addresses the further evaluation requirements of the Forest Plan. See pages 5-7and 5-8 of the Forest Plan).

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%**

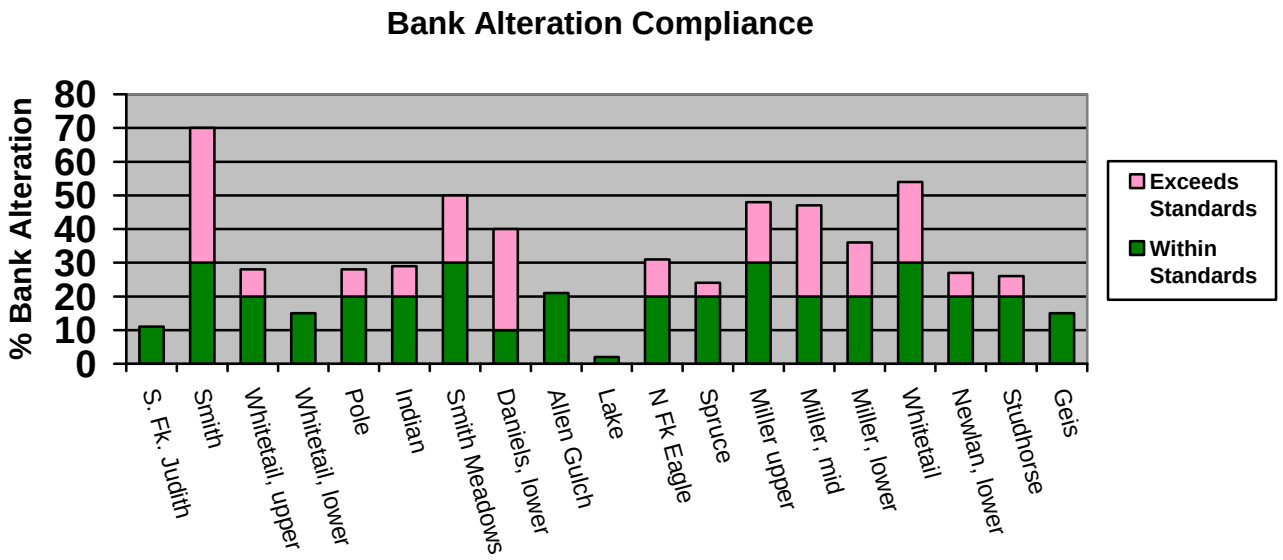
[1] Condition: PF = proper functioning, AR = at-risk, NF = non-functioning
[2] Fish Species: WC = westslope cutthroat trout, EB = eastern brook trout, RB = rainbow trout
[3] Per settlement agreement, bank alteration standard is known as bank alteration "indicator"

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%)