J-17

File Code: 1920-2-3

Date: July 6, 2004

Dear Forest User:

I stated in my March 15, 2004 Forest Plan Monitoring letter that the Forest planned to release expanded monitoring information to include up-to-date old growth survey results from site-specific inventories to augment information provided previously. Enclosed for your review are updated Forest Plan Monitoring and Evaluation reports for monitoring items C-8 (Old Growth Habitat for Goshawk) and C-10 (Cavity Nesting Habitat). These reports include new old growth survey information and discuss the monitoring efforts and analysis that has taken place regarding goshawk populations and habitat on the Forest.

Thank you for your continued interest in the Lewis and Clark National Forest. For more information on programs and events on the Lewis and Clark Forest, please visit our website at www.fs.fed.us/r1/lewisclark. We hope you will continue to be involved in the management of your National Forest System lands.

Sincerely,

LESLEY W. THOMPSON
Forest Supervisor

Enclosure

C-8 Old Growth Habitat for Goshawk

OUTPUT, MANAGEMENT PRESCRIPTION, EFFECTS TO BE MEASURED	REPORTING PERIOD	VARIABILITY (+/-) WHICH WOULD INITIATE FURTHER EVALUATION	Change Monitoring Item?	Change Forest Plan?
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**	**No**	

This May 2004 update to the Forest Plan Monitoring item C-8 is the second update reporting on monitoring item C-8 this year. The first update was provided to the public in March 2004 and provided the new Forest Inventory and Analysis (FIA) forest-wide old growth information. This update includes the FIA forest-wide old growth information along with the new 2003 old growth survey information and goshawk nest territory information recently complied by the forest. This monitoring item is being divided into two segments for this report; the first discusses what the Forest has completed in relation to old growth monitoring and the second discusses the monitoring efforts and analysis that has taken place in relation to goshawk populations and habitat on the Forest.

OLD GROWTH MONITORING METHODS

In 1992 the Forest completed its required five-year review of the Forest Plan. The five-year review revealed that the Forest was in need of a process that would standardize how the Forest would define, inventory and allocate old growth across the Forest. The Forest wildlife biologists developed this process and included in it the definitions of “Old growth Forest Types of the Northern Region” published by Pat Green, John Joy, Dean Sirucek, Wendel Hann, Art Zack, and Bob Naumann. This process defines how old growth will be queried from the existing Timber Stand Management Record System (TSMRS) database, and how it will be field inventoried. This process was finished in 1993 and is entitled “Lewis and Clark National Forest Old Growth Inventory and Allocation Process”, and has since been the guidance for old growth inventory on the Forest.

A computer program was then developed to interact with the Timber Stand Data Base and identify timber stands that correlate to specific aerial photo interpretation types. The timber stands identified by standard aerial photo reconnaissance are mapped and field inventoried to determine whether they meet the definition of old growth forest, as defined in the Forest Plan (Glossary, page 14) and by the Regional guidance written by Green et al (1992)

Old growth stands are selected to provide distribution across different habitat types and to maintain a minimum of five percent within a timber compartment. Using the parameters defined in the draft R-1 Goshawk Habitat Suitability, lower elevation Douglas-fir stands are prioritized and selected. Higher elevation timber stands are generally dominated by lodgepole pine with mixtures of alpine fir or spruce. These mixed stands are prioritized on the basis of their proximity to meadows, seeps, springs, streams, or other environmental factors which contribute to the diversity of plant and

animal life beyond that visible in surrounding stands.

Forest Plan direction provides old growth "stands will be identified as a part of resource program and project level wildlife inventories and evaluations (Forest Plan p.2-16). On the ground inventories continue to be completed (in accordance with Forest Plan direction) in regards to different projects that the Forest undertakes. The major project completed this reporting period was an old growth inventory within the Judith River watershed and the results have been documented in the Judith Vegetation Restoration FEIS, which covered about 200,000 acres.

Along with the on the ground inventory process the Forest recently received data from the Forest Inventory and Analysis (FIA) showing the amount of old growth across the Lewis and Clark National Forest. (Bush et al. 2004). This data was previously reported in the March 2004 Forest Plan monitoring report update.

FINDINGS

Forest Inventory and Analysis (FIA) Data

As reported in the March 2004 Forest Plan monitoring report update, a detailed report entitled "Detailed Estimates of Old Growth and Large-Snags on the Lewis and Clark Forest" was received in January 25, 2004. (Bush et al. 2004). This report provided statistical percentages of old growth forest-wide based on vegetative plots gathered as part of the Forest Inventory and Analysis (FIA) program were screened by commercial forest lands, landscapes (mountain range) and watersheds (5^{th} HUC (hydrologic unit code)). FIA is a Congressionally mandated, comprehensive, field-based forest inventory consisting of data collected from 120,000 forested field plots in the United States. FIA uses field plots as it is not practical to measure billions of trees within millions of acres of forests. The plots measure a diverse spectrum of forest conditions. Therefore, FIA selects a representative sample of field plots, located at randomized points within a standardized grid across the entire US, and uses data from those plots to estimate conditions across a larger landscape. FIA uses a probability sample, which allows it to quantify the uncertainty in its estimates that are caused by random sampling. The grid evenly covers all lands, regardless of whether or not they are suitable for timber production. FIA utilizes sampling and there is uncertainty in estimates from any sample. The Forest Survey scientist makes these estimates and characterizes the degree of this uncertainty (Czaplewski et al. 2003). This level of inventory is not spatially explicit, but quantities of old growth can be estimated with statistical confidence for large, 5^{th} code watersheds.

The report provides estimates of old growth percentages and snag densities across the forest (see monitoring item C-10 for snag information). Forested lands are comprised of both commercial and noncommercial forest. Commercial forest lands were determined using landtype information and the forest plan criteria for defining commercial forest lands.

The report estimates 12.06% old growth on all forested lands within the Lewis and Clark National Forest, with a 90% confidence interval of 9.5% to 14.47%. On commercial forest lands, the FIA data analysis shows an estimated 9.67 percent old growth, with a 90% confidence interval of 5.86% to 13.83%.

The following is a summary of the FIA data.

Table C-8a Estimates of percentage of Old Growth by Commercial lands across the Lewis and Clark National Forest and the associated 90% confidence intervals follow (Bush and Leach 2004).

Commercial	Percent Old Growth			Plot Frequency	
	90% CI Lower Bound	Point Estimate	90% CI Upper Bound	Number of Plots (Number of Subplots)	% of the Plots
Noncommercial	10.00	13.30	16.77	176(880)	52.38
Commercial	5.86	9.67	13.83	91(455)	27.08

Table C-8b Estimates of proportion of old growth and associated 90% confidence interval by Landscape (Bush and Leach 2004).

Landscape	Percent Old Growth			Plot Frequency	
	90% CI Lower Bound	Point Estimate	90% CI Upper Bound	Number of Plots (Number of Subplots)	Percent of the Plots
Big Snowy Mountains	1.82	11.67	23.64	12(60)	3.57
Castle Mountains	0.00	10.00	30.00	6(30)	1.79
Crazy Mountains	0.00	13.33	30.00	6(30)	1.79
Highwood Mountains	0.00	0.00	0.00	3(15)	0.89
Little Belt Mountains	**10.39**	**14.62**	**19.06**	**119(595)**	**35.42**
Little Snowy Mountains	0.00	0.00	0.00	3(15)	0.89
Rocky Mountains	6.67	10.17	13.98	118(590)	35.12

Table C-8c Estimates of old growth and associated 90% confidence intervals by Landscape and Commercial/Non-commercial lands (Bush and Leach 2004).

Commercial	Landscape	Percent Old Growth			Plot Frequency	
		90% CI Lower Bound	Point Estimate	90% CI Upper Bound	Number of Plots (Number of Subplots)	Percent of the Plots
Commercial	Big Snowy Mtns	0.00	13.33	33.33	6(30)	1.79
	Castle Mountains	0.00	0.00	0.00	4(20)	1.19
	Crazy Mountains	0.00	6.67	20.00	3(15)	0.89
	Highwood Mtns	0.00	0.00	0.00	3(15)	0.89
	Little Belt Mtns	**6.91**	**12.13**	**17.89**	**61(305)**	**18.15**
	Little Snowy Mountains	0.00	0.00	0.00	3(15)	0.89
	Rocky Mountains	0.00	3.64	10.00	11(55)	3.27
Non-commercial	Big Snowy Mtns	0.00	10.00	25.71	6(30)	1.79
	Castle Mountains	0.00	30.00	80.00	2(10)	0.60
	Crazy Mountains	0.00	20.00	46.67	3(15)	0.89
	Little Belt Mtns	**10.70**	**17.24**	**24.29**	**58(290)**	**17.26**
	Rocky Mountains	6.97	10.84	14.95	107(535)	31.85

Lewis & Clark NF Ground Inventories:

Table C-8d is a compilation of timber compartments that have been surveyed in their entirety for old growth forest and the old growth forest acres that have been allocated to date, including the results of the inventory completed for the Judith Analysis area. This table does not break out commercial forest lands from non-commercial forest lands, but just considers the amount of forested lands within each compartment. All of these compartments are in the Little Belt Mountains, with the exception of three compartments (601-603) that make up the Little Snowy Mountains.

Table C-8d. Acres Designated as Old Growth 1988-2001

OLD GROWTH INVENTORIED AND ALLOCATED ACROSS THE LCNF (Includes only the compartments that have a complete inventory; acres of forested lands equals commercial and non-commercial lands)								
DISTRICT	**COMPARTMENT**	**ACRES OF COMPARTMENT**	**ACRES OF FORESTED LANDS**	**EXISTING OLD GROWTH ACRES**	**%TOTAL OLD GROWTH**	**ACRES ALLOCATED**	**% ALLOCATE for FP STANDARD**	**INVENTORY COMPLETE**
D3	366	4101	3301	476	14.4	476	14.4	YES
	367	13767	12956	2437	18.8	2276	17.6	YES
	368	16822	15563	1378	8.9	1378	8.9	YES
	370	13208	11613	3244	27.9	2484	21.4	YES
	372	13909	13107	1328	10.1	1328	10.1	YES
	373	11559	11127	2014	18.1	2014	18.1	YES
	374	6279	5993	952	15.9	952	15.9	YES
	375	8933	8259	1723	20.9	1723	20.9	YES
	376	24201	23275	1632	7	1632	7	YES
D4	446	5669	5350	972	18.2			Allocation not complete[1]
	448	13229	12077	97	0.8			Allocation not complete[1]
	449	13128	11864	1635	13.8			Allocation not complete[1]
	450	11077	10611	937	8.8			Allocation not complete[1]
	451	14699	11818	1935	16.4			Allocation not complete[1]
	452	10390	10066	3640	36.2			Allocation not complete[1]
	453	11996	10671	1250	11.7			Allocation not complete[1]
	454	11698	10851	2115	19.5			Allocation not complete[1]
	455	11436	10325	2439	23.6			Allocation not complete[1]
	456	14717	13988	4445	31.8			Allocation not complete[1]
	457	17421	15989	1881	11.8			Allocation not complete[1]
	458	9777	9180	472	5.1			Allocation not complete[1]
	459	13962	12436	1604	12.9			Allocation not complete[1]
	460	21718	19304	1891	9.8			Allocation not complete[1]
	461	10170	9647	670	6.9			Allocation not complete[1]
	462	12437	11812	1063	9	1063	9	YES

D6	601	6845	5697	1294	22.7	1294	22.7	YES
	602	5530	4734	304	6.4	304	6.4	YES
	603	2813	2043	310	15.2	310	15.2	YES
	632	6806	5932	308	5.2	308	5.2	YES
	633	9405	8980	801	8.9	801	8.9	YES
	634	6703	4889	623	12.7	544	11.1	YES
	635	10797	10699	816	7.6	816	7.6	YES
	636	9316	8324	1447	17.4	1388	16.7	YES
	637	6252	5469	1445	26.4	866	15.8	YES
	646	2429	1575	763	48.4	763	48.4	YES
D7	701	13270	12485	740	5.9	740	5.9	YES
	702	6711	6410	1027	16	1027	16	YES
	703	8592	8225	836	10.2	836	10.2	YES
	704	9417	9187	1368	14.9	1368	14.9	YES
	705	8496	8081	1733	21.4	1733	21.4	YES
	706	8271	7787	225	2.9	225	2.9	YES
	707	11655	10609	371	3.5	371	3.5	YES
	708	13118	12093	133	1.1	133	1.1	YES
	709	9733	9289	337	3.6	337	3.6	YES
	711	24534	23797	1947	8.2	1947	8.2	YES
TOTAL		496998	457487	59058	12.9			
[1] The following compartments are within the Judith analysis area and will be allocated in summer of 2004 in the FEIS.								

Table C-8e. Acres Designated as Old Growth 1988-2001 (Partial Compartment Inventory [1])

DISTRICT	COMPARTMENT	ACRES OF COMPARTMENT	ACRES OF FORESTED LANDS	EXISTING OLD GROWTH ACRES	%TOTAL OLD GROWTH	ACRES ALLOCATED	% ALLOCATED FOR FP STANDARD	INVENTORY COMPLETE
D3	377	16967	16276	578	3.5			NO
	378	6111	5917		0			NO
	379	6305	6146	151	2.5			NO
	380	14436	14127		0			NO
	386	10025	9703	2109	21.7			NO
	387	10797	10297	651	6.3			NO
D4	447	12106	10725	221	2.1	221	2.1	NO
	463	18026	14567	586	4	586	4	SC 4, 9 ONLY
	464	22332	20018	350	1.7	350	1.7	SC 4 ONLY
D6	631	9296	9063	611	6.7	611	6.7	SC 9 ONLY
D7	712	19252	18214	326	1.8	326	1.8	SC 1,2,6,7
	781	8467	8216	918	11.2	918	11.2	SC 5,6,7
	782	7468	7295	1087	14.9	1087	14.9	SC 4,5,6,7,
TOTAL		161589	150563	7588	5	4099	2.7	

[1]OLD GROWTH INVENTORIED AND ALLOCATED ACROSS THE LCNF, BUT TOTAL COMPARTMENT WAS NOT EXAMINED THESE ACRES HAVE BEEN INCLUDED IN PAST MONITORING REPORTS.

The Forest has completed old growth surveys on 42 compartments (496,998 acres) within the Little Belt Mountains and have 41 compartments left to survey. Of these, 13 compartments have had some level of surveys completed. These acres and compartments are included in Table C-8e.

When one compares the FIA data at the mountain range scale with the information that has been gathered at the project level, the amount of acres of old growth on all forested lands falls within the range of old growth as described by the FIA data for all forested lands. The total old growth through project surveys reveal there is 12.9 percent old growth for the surveyed acres within the Little Belts and the FIA data for the Little Belts ranges from 10.4 – 19.1% with a mid point of 14.6%.

GOSHAWK MONITORING and INVENTORY

METHODS

The Forest's goal is to monitor all of the known territories each year to establish occupancy and production and be able to track this information through time. A computer program has been developed to track all nest territories as to their occupancy, production, and nest site characteristics.

RESULTS

Goshawk Nest Territories

The result of the goshawk monitoring completed from FY 1990 through FY 2003 is summarized in Tables C-8f and C-8g. In 2002 and 2003, the Forest continued to use the computer model (*see discussion in the goshawk model section of this report*) developed in 1998 for determining potential goshawk nesting habitat. This model has been used to aid in prioritizing areas in which forest personnel conduct surveys for goshawks. Use of the tape recorder playback method in potential habitat has resulted in the discovery of 12 new nests from 1998 to 2001. In 2002, 4 additional goshawk territories were discovered on the Jefferson Division and two additional territories were recorded on the Rocky Mountain Division. No new territories were found through contracted surveys on the Forest in 2003 (see below). No goshawk surveys were conducted by Forest Service personnel due to limited manpower and our efforts were directed at monitoring the existing territories.

In 2003 a contract for goshawk surveys was awarded to GANDA to survey the area in the Hall/Box Creek area in the RM1 unit on the Rocky Mountain Ranger District. This survey was in response to a renewed interest in exploratory oil and gas drilling in the Hall Creek area. No new nests or territories were found but the two known territories were validated. One was active and produced young and one was not active, but adult birds were seen in the area.

Another contract for goshawk surveys was awarded to MAXIM Technologies INC (in 2003) to survey the Blackleaf area on the Rocky Mountain Ranger District and adjacent BLM lands. This survey was in response to a renewed interest in the Blackleaf gas/oil drill sites. No new nests or territories were found on Forest Service

System lands, but the two known territories were validated. One was active and produced young, one was not active, but adult birds were heard in the area. One new nest was found on BLM lands. This nest was active and produced at least one young.

Across the Forest there are currently 53 historic or currently active territories; 14 on the Rocky Mountain Division and 39 on the Jefferson Division. These territories are dispersed across the two Divisions as shown in Map 1 and the results of monitoring of these territories are shown in Tables C-8f and C-8g.

Table C-8f. Goshawk (Nesting Territories on Rocky Mountain Division)

Table C-8f. Goshawk (Nesting Territories on Rocky Mountain Division)	Nesting Territories[1]	Territories Monitored	Territories Active[2]	Percent Active[3]	Fledglings Produced
1990	**0**	0	0	0	0
1991	3	1	1	100	Unknown
1992	4	1	1	100	Unknown
1993	6	0	Unknown	Unknown	Unknown
1994	6	6	4	67	1
1995	7	0	Unknown	Unknown	Unknown
1996	7	0	Unknown	Unknown	Unknown
1997	7	0	Unknown	Unknown	Unknown
1998	8	3	1	33	2
1999	9	9	7	78	3
2000	11	9	2	22	2
2001	12	11	5	45	3
2002	14	11	3	27	No young observed
2003	14	11	2	18	4

AVERAGE ACTIVE TERR = 37%

[1]Territory—defined by a known nest site or an area being defended by a goshawk.
[2] Active Territory—a territory that is occupied by a pair of goshawks.
[3]Percent Active = number of territories active divided by number of territories monitored.

The average for active territories for the Rocky Mountain Front from 1998-2003 is about 37%. This is very comparable to the Jefferson Division. As with the Jefferson Division, the Rocky Mountain Front varies in production of young.

As the Forest continues to survey potential habitat there are more territories (nest sites or areas being defended) being discovered. Therefore, knowledge in the data pool is being acquired and a larger population of goshawks is being discovered. When one looks at the active territories in relation to territories monitored for the Jefferson Division from the period of 1990-2003 it appears that that on the

average only about 31 percent of the territories are active and the amount of young produced varies widely. Reasons for low percentage of active territories are unknown. It is suspected that weather plays an important part in amount of young being produced (Clough, 2000). McGrath et al. (2003) also stated that parental experience, weather, and prey abundance are the most influential in determining nest productivity.

Table C-8g Goshawk (Nesting Territories on Jefferson Division)

	Nesting Territories	Territories Monitored	Territories Active	Percent Active[1]	Fledglings Produced
1990	**14**	9	6	66	*
1991	17	10	8	80	7
1992	22	16	3	19	3
1993	22	10	3	30	4
1994	22	13	4	29	1
1995	22	7	0	0	0
1996	25	14	4	29	Unknown
1997	25	24	1	4	Unknown
1998	27	27	10	37	15
1999	30	30	10	33	16
2000	34	27	11	41	8
2001	35	32	9	28	3
2002	39	25	6	24	4
2003	39	25	5	20	2

*Attempted to monitor, but data inconclusive AVERAGE ACTIVE TERR = 31%
[1]Territory—defined by a known nest site or an area being defended by a goshawk.
[2] Active Territory—a territory that is occupied by a pair of goshawks.
[3]Percent Active = number of territories active divided by number of territories monitored.

GOSHAWK HABITAT ANALYSIS

Given the mobility of goshawks and the wide range of forest types that they use, it is difficult if not impossible to define discrete breeding populations (Woodbridge, et al, 2003). This is further complicated by some normal population change due to environmental factors, most notably climate and prey abundance (Ibid). Because of these difficulties and the inability to count all goshawks on the forest, the Forest maps habitat and uses that as an indicator as to the health of the population (as well as monitoring goshawk nests) as indicated by Boyce (1992). The following is a discussion of that process.

Goshawk Habitat Modeling

METHODS

In 1998 the Forest constructed a goshawk nesting habitat model based on known nest parameters of existing goshawk territories and information that was collected by Tom Whitford (1991) during his Goshawk Masters study on the Forest. The base layer for this model was the Timber Stand Data Base (TSMRS).

The Rocky Mountain Division has not been mapped due to the amount

of land area that is not covered by TSMRS because of the Bob Marshall-Great Bear-Scapegoat Wilderness area. The habitat for this Division will have to be mapped at a later date by the use of other vegetation layers (e.g. Silc1 or Silc3).

RESULTS

The entire Jefferson Division has been mapped for distribution of potential nesting habitat. This information is displayed in Map 2 and shows habitat as aggregated by 6th code HUC (Hydrologic Unit Code). The modeling effort has projected that there is 119,630 acres of potential nesting habitat within the Jefferson Division and that 96 of 146 HUCs (66 %) contain nesting habitat, and there are 28 HUCs that currently contain at least one active or historic territory. Not all nesting habitat will ever contain a nesting pair because of the territoriality of the goshawk.

Goshawk Habitat Analysis

Reynolds, et al (1992) published the Management Recommendations for the Northern Goshawk in the Southwestern United States. Included in this report was the recommendation that the desired forest vegetative structural stages (VSS) for sustaining northern goshawks in the southwestern United States are 10% grass/forb/shub, 10% seedling/sapling; 20% young forest; 20% mid-aged forest; 20% mature and 20% old forest. Several environmental groups have recommended to the Lewis and Clark National Forest that these are also the desired forest conditions that the Forest should be utilizing when managing for goshawk habitat. In particular some have suggested that based on Reynolds 20% old growth or old forest is required for goshawk. In order to respond, the Lewis and Clark National Forest has reviewed available literature on the matter and has undertaken a review of goshawk nesting territories to determine what, in fact, are the forest conditions on the Lewis and Clark that the goshawk nest and rear young – particularly in relation to old growth First, after reviewing the recommendations and several other research papers, it is clear that the Reynolds recommendations were just that, recommendations, and not based on what the existing condition of the known nest sites were. In fact, it is suggested that desired vegetative conditions are most appropriately determined at the local level. Bassett, et al (1994) states:

"The recommended 10-10-20-20-20-20 VSS percentage is now being considered as a hard and-fast rule by those implementing and reviewing timber sale projects. **However, the 10-10-20-20-20 distribution was intended to describe approximate percentages of each VSS throughout the post-fledging family and foraging areas to sustain suitable goshawk habitat (Reynolds, et al. 1992).** The achievable VSS percentage should be determined by considering existing local factors that influence forest establishment and growth, expected management intensity, and tree longevity."

See also Graham et al (1994) and McGrath, et al, (2003) in their Wildlife Society monograph.

Second, as described below, the known and active goshawk territories on the Lewis and Clark NF show that vegetative conditions in goshawk PFAs are composed of an average

of 14% old forest. The methods of our analysis are described below.

METHODS

Because of the ever-increasing concern of the management of goshawks, the Forest undertook an analysis of known goshawk territories to determine the vegetative composition on the Lewis and Clark Forest that goshawks occupy. Several studies have identified the post fledgling family area (PFA) as critical to the goshawk. This is the area that the young birds utilize to learn to hunt and evade predators (Kennedy et al, 1994; Reynolds et al 1992).

The foraging area or the remainder of the goshawks home range has also been identified as an area of concern. However, in order to actually map a home range one would need to have telemetry points to describe the outside area of use. Instead of mapping the home ranges, nesting habitat is being displayed across the forest in relation to 6th code HUC. This is more in line with the recommendations of Graham et al (1994) in examining a larger landscape and not just the goshawk home range. Also the make up of the general forest is provided as reference in Table C-8i.

In the winter of 2003/2004 goshawk territories on the Jefferson Division that have had some consistency of occupancy were analyzed in regards to the vegetation composition of the post fledgling area as described by the above stated literature.

In order to describe and quantify the vegetation makeup of the PFAs within known territories, the Forest used the ArcGIS system to evaluate 23 known territories on the Jefferson Division that have been occupied and have produced young since 1990. Table C-8c displays the vegetation makeup of these PFAs. Two other PFAs were developed at the Beldon Flat and Neil Creek territories because of multiple nests and one PFA did not encompass all nest sites.

The process selected the territories and then buffered the center of the territory by 800 meters to create the PFA (Kennedy, 1994). This coverage was then intersected with a vegetation layer created from TSMRS. The vegetation layer was unable to break out the coniferous forest in young, mid-aged and mature vegetative structural stages as recommended by Reynolds (1992). Therefore, the coniferous forest designation includes the structural stages of young, mid-aged and mature forest. The data files from the layer were then analyzed by using excel spreadsheet programs.

In conjunction with the known PFAs a random sample of PFAs were generated and distributed across the Little Belts and Little Snowy Mountains. First a GIS layer was created from DEM data to determine the area within the forest boundary below 6800 feet in elevation. This was then intersected with the timber compartment map of all compartments that have had on the ground old growth surveys completed due to other project work. From this layer random sample points were generated and buffered by 800 meters to generate hypothetical PFAs. Using a similar process as before we also generated random PFAs and intersected them with the predicted nesting habitat

that has been created by the goshawk nest model.

RESULTS

The goshawks on the Lewis and Clark National appear to be selecting a habitat make of on the average of 11 percent grassland, 2 percent clearcut/seedlings, 1 percent sapling, 14 percent old forest, and 68 percent coniferous forest (Tables C-8h and C-8i). When one examines the midpoint of the data it is similar but differs from the recommended percentage by Reynolds (1992) in relation to sapling stage and old forest. However, when the 90% confidence interval is examined, the general recommendations are being met with the exception of the sapling stage (e.g. 0-2% known territories versus 10% from Reynolds). Reynolds recommended 10% within the grass/forb stage. Examination of the data (Table C-8i) also reveals that on the Lewis and Clark National Forest our grass/forb component is being made up of natural grasslands plus the clearcuts, and falls within the recommended percentage of Reynolds (1992). The proximity to natural grasslands and meadows was also demonstrated by Clough (2000) in the Deerlodge National Forest. When one looks at the distribution of the known nest sites on the Jefferson Division, they are generally at the interface of the prairie and the mountains and these appear to be the more productive nests also (Table C-8h, map 1).

Table C-8h summarizes the analysis that was done for the known PFAs and the randomly sampled PFAs. The first two columns are shown to provide a broad scale comparison of the vegetation makeup of the Jefferson Division and Little Belt Mountains. The range (90% CI) of vegetation composition for PFAs across the forest and PFAs in potential nesting habitat was within the recommendations by Reynolds (1992), with the exception of the sapling stage. In all samples this vegetation stage was less than Reynolds (1992) recommended. Both sets of random plots contained more old forest vegetation type (based on the mid point) than the known territories and the recommendations by Reynolds (1992) and the range was also somewhat higher.

The inventoried and modeled old growth (old forest) across the Jefferson Division is 14%. When one examines the FIA data, this also predicts that on the Jefferson Division there is 14.6% (FIA Tables in old growth section of this report) with a range from 10.4% to 19.1%. The known goshawk PFAs has 14% old growth (old forest) within them. Therefore, it appears that the goshawks are selecting PFAs and nesting areas that contain similar amounts of old growth within them as there is distributed across the Jefferson Division. McGrath (2003) reported in Oregon that the goshawks in their study area were using old growth in proportion to its availability.

Based on two different data sets (FIA and TSMRS), there appears to be adequate amounts of old growth across the Forest to insure that it is an integral part of goshawk habitat. As illustrated in Map 1, the known goshawk territories are distributed across the Jefferson Division as well as nesting habitat. Therefore, it appears that the Forest is providing adequate habitat to support populations of the goshawk and

contribute to the overall viability of the species.

TABLE C-8h. VEGETATION COMPOSTION OF 23 PFAs of KNOWN GOSHAWK TERRITORIES.

BASED ON TSMRS VEGETATION DATA FROM WILDVEG MODEL

Territory Name	Grass/Rock		Clearcut/Seedling		Sapling		Old Forest		Coniferous Forest			Year of	Years Active	Production
	Acres	Per cent	Acres	Per Cent	Acres	Per Cent	Acres	Per Cent	Acres	Per Cent	Grand Total	Discovery	from 1990-2003	from 1990-2003
Antelope Gorge-411		0		0		0	82	17	414	83	496	2002	1	0
Arrow Creek-45	34	12		0		0		0	238	88	271	1990	7	9
Beldon Flat-42	99	20		0		0	4	1	391	79	494	1990	6	3
Beldon Flat2-422	59	12		0		0	23	5	414	83	496			
Blanding Gulch-77	106	21		0		0	223	45	167	34	496	1997	2	1
Cabin Creek-72		0	9	2	39	8	107	22	341	69	496	1990	5	1
Copper Creek-76	305	61		0		0	91	18	101	20	496	1985	1	0
Crawford Creek-78	18	0		0		0	122	0	357	34	496	1999	1	0
Daniels Creek-73	7	1	2	0	6	1	26	5	455	92	496	1992	2	3
Dry Gulch-44	37	8	5	1	3	1	76	16	362	75	482	1990	5	4
Dry Pole-412	29	6		0		0	112	23	355	72	496	2002	1	0
Eagle Creek-74	141	28		0		0	145	29	210	42	496	1992	2	3
Elephant Rock-64	12	3	7	1	26	5	4	1	447	90	496	1990	4	0
Ettien Ridge-414	26	5		0		0	63	13	407	82	496	2002	1	1
Indian Hill-413	15	4		0	5	1		0	357	95	377	2002	2	2
Mill Creek-68	1	0	30	6		0	252	51	213	43	496	1992	2	0
Neil Creek-62	69	20	45	13	2	1		0	238	67	355	1990	8	3
Neil Creek2-622	56	12	11	2	7	2	34	8	347	76	455			
Pasture Gulch-63		0	69	14		0	181	36	246	50	496	1990	1	0
Skunk Gulch-410	18	4	33	7	20	4	128	26	297	60	496	2001	2	0
South Bench-612	2	0	31	8		0		0	335	91	368	1993	0	0
Tollgate-47	95	23		0		0	10	3	303	74	409	1999	3	2
Townsend Gulch-65	81	20		0		0	48	12	271	68	400	1990	3	2
Upper Ashbridge-615	42	10		0	1	0	8	2	379	88	429	2000	0	0
Yogo Creek-46	51	10	56	11		0	33	7	356	72	496	1998	2	2
TOTALS	1301		298		109		1773		8000		11482			
Minimum		0		0		0		0		20			0	0
Maximum		61		14		8		51		95			8	9
Average		11		2		1		14		68			3	2
Median		6		0		0		12		74			2	1

Beldon Flat2 is a second PFA for Beldon Flat territory due to distance of nests from one another

Neil Creek2 is a second PFA from Neil Creek territory due to distance of nests from one another

TABLE C-8i. Vegetation composition of occupied goshawk post-fledging areas (PFAs), randomly sampled potential goshawk habitat and randomly sampled forested stands (the size of PFAs), and across the Little Belt Mountains and the Jefferson Division. Number of samples (n) (for territory column) is based on territories that have consistently been occupied/productive 1990-2003.

Vegetation Type	Jefferson Division[a]	Little Belt Mtns.[a]	Forest (PFA)[b] (n=45)	90% CI[c]	Potential (PFA)[d] (n=47)	90% CI[c]	Territory (PFA)[e] (n=25)	90% CI[c]
% Old Forest	14%	16%	22%	18 - 26%	22%	17 - 27%	14%	8 - 20%
% Coniferous Forest	68%	67%	63%	58 - 63%	65%	58 - 71%	69%	61 - 78%
% Sapling	2%	3%	4%	2 - 7%	2%	1 - 3%	1%	0 - 2%
% Clearcut/Seedling/Fire	4%	4%	2%	1 - 4%	0%	0 - 1%	2%	1 - 4%
% Grass/Rock	12%	11%	8%	8 - 12%	11%	7 - 15%	11%	6 - 17%

[a] Data is from a query of cover-types (TSMRS database) below 6,800 across the Jefferson Division and Little Belt Mountains and are intended to characterize the overall vegetation composition across the landscape.
[b] Data is from randomly sampled areas equivalent in size to goshawk post-fledging area, with sample plot centered in a random forested stand.
[c] 90% CI: The ninety-percent confidence interval is the predicted range, statistically determined from the distribution of actual samples, that one would expect the value to fall in if a random sample was taken. A confidence interval is a range of values that has a high probability of containing the parameter being estimated (in this case the average). The 90% confidence interval is constructed in such a way that 95% of such intervals will contain the parameter.
[d] Data is from randomly sampled areas equivalent in size to goshawk post-fledging area, with sample plot centered in a forested stand that is designated potential nesting habitat by the Lewis and Clark goshawk habitat model).
[e] Data is from post-fledging area around nesting territories occupied on the Lewis and Clark NF (1990-2003).

RECOMMENDATIONS

Survey work needs to continue to be completed to detect whether there are new territories present, as well as continued monitoring of the known territories.

Attachments

Map 1---distribution of all historic and known territories.
Map 2---Nesting habitat as predicted by the goshawk nest model.

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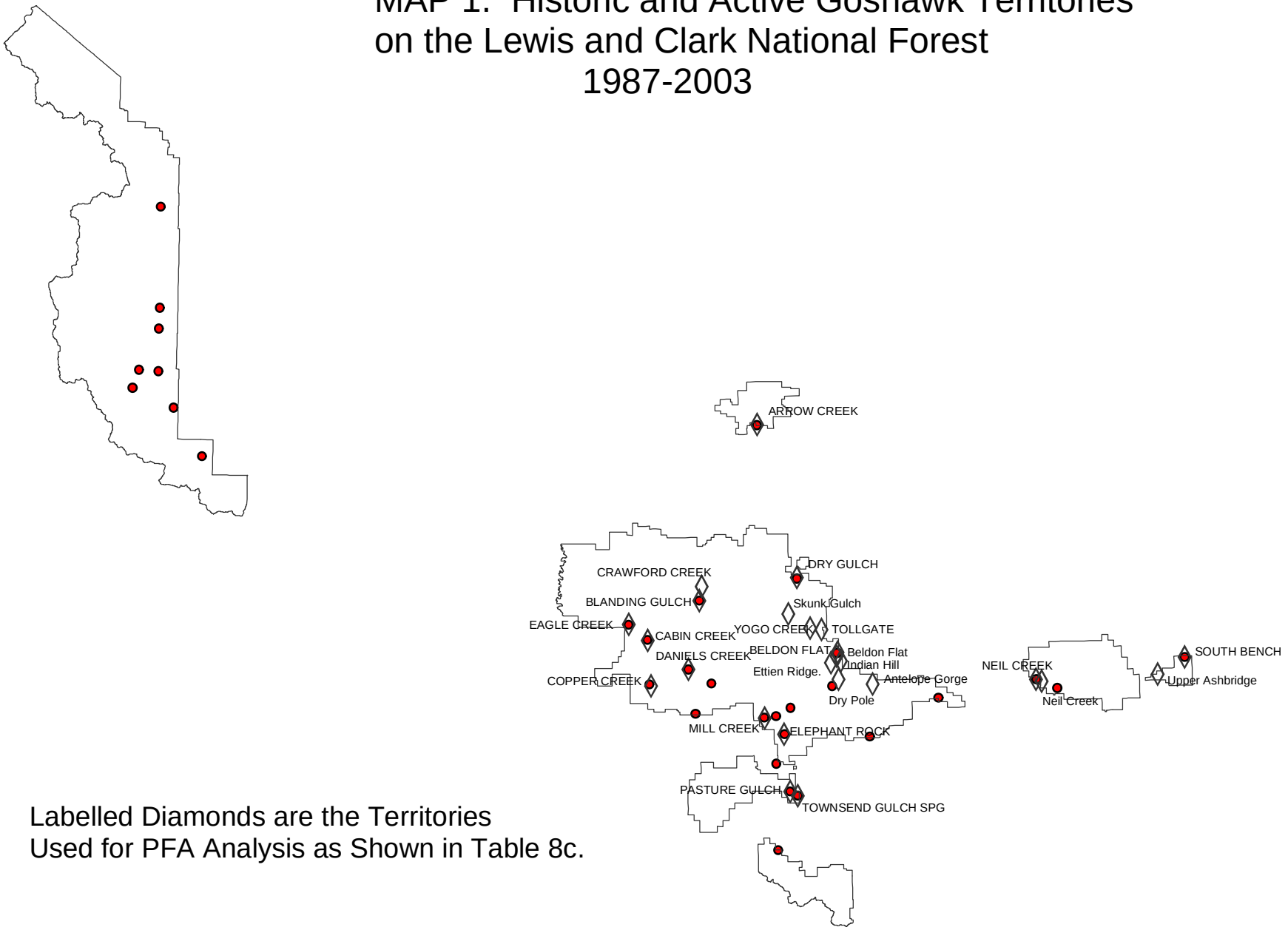
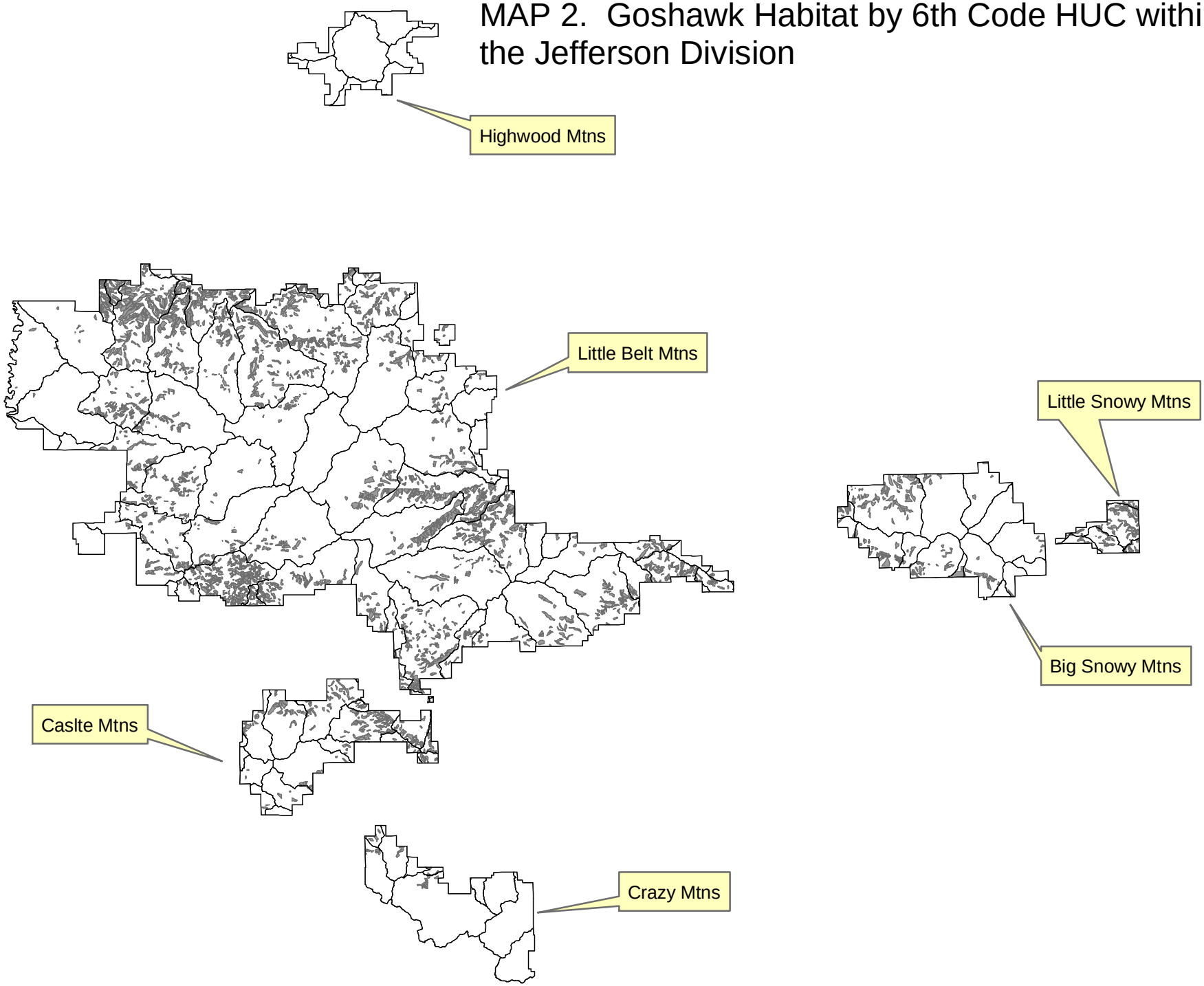
MAP 1. Historic and Active Goshawk Territories on the Lewis and Clark National Forest 1987-2003



Labelled Diamonds are the Territories
Used for PFA Analysis as Shown in Table 8c.

MAP 2. Goshawk Habitat by 6th Code HUC within the Jefferson Division



C-10 Cavity Nesting Habitat

OUTPUT, MANAGEMENT PRESCRIPTION, EFFECTS TO BE MEASURED	REPORTING PERIOD	VARIABILITY (+/-) WHICH WOULD INITIATE FURTHER EVALUATION	Change Monitoring Item?	Change Forest Plan?
Cavity Nesting Habitat for Northern Three-toed woodpecker - percent optimum habitat	**5 years**	**Reduction in snags to below numbers needed to maintain a viable population level of woodpeckers in any timber compartment as measured by a three year running mean compared to the existing percent optimum habitat**	**Yes**	**Yes, at revision**

METHODS

An annual Forest review of selected timber sales is conducted to determine effectiveness of snag management guidelines and timber sale administrative guidelines. Monitoring efforts focus on stands where snag densities may change due to management activities.

Cavity dependant species habitat was measured by examining the gain, loss, or no change status of National Forest System acres of mature conifer stands.

Breeding bird plots were used to determine the presence or absence of avian species.

On January 25, 2004, the Lewis and Clark Forest received data related to snag densities across the forest using data compiled through the Forest Inventory and Analysis (FIA) program. As detailed in the report entitled "Detailed Estimates of Old Growth and Large-Snags on the Lewis and Clark Forest" (see updated monitoring report for C-8 and C-10; dated March 15, 2003), vegetative plots gathered as part of the Forest Inventory and Analysis (FIA) program were screened for the whole forest, and by commercial and non-commercial forest lands, landscapes (mountain range) and watersheds (5th HUC (hydrologic unit code)). The FIA data provides a forest-wide perspective on snag densities across the Lewis and Clark forest to aid in understanding the amount of snag habitat and its distribution across the planning area.

FIA is a Congressionally mandated, comprehensive, field-based forest inventory consisting of data collected from 120,000 forested field plots in the United States. It is not practical to measure billions of trees within millions of acres of forests. The plots measure a diverse spectrum of forest conditions. Therefore, FIA draws a representative sample of field plots, located at randomized points within a standardized grid across the entire US, and uses data from those plots to estimate conditions across a larger landscape. FIA uses a probability sample, which allows it to quantify the uncertainty in its estimates that are caused by random sampling. The grid evenly covers all lands, regardless of whether or not they are suitable for timber production. The FIA inventory is not spatially explicit, but quantities of snags can be estimated with statistical confidence for large, 5th code watersheds and across large landscapes such as the lands encompassed by the Lewis and Clark Forest.

FINDINGS

The updated monitoring report for C-8 and C-10 (dated March 15, 2004) provides estimates of old growth percentages and snag densities across the forest. Forested lands are comprised of both commercial and noncommercial forest. Commercial forest lands were determined using landtype information and the forest plan criteria for defining commercial forest lands. A subset of commercial forest land is those lands identified in the Forest Plan as suitable for timber harvesting. Roughly 41% of commercial forest lands were identified in the Forest Plan as suitable for timber harvest.

The report estimates snag density at 11.37 per acre with a 90% confidence interval of 8.90 to 14.04 snags per acre. It is further broken down by commercial and non-commercial lands as well as by landscape (mountain ranges and 5th code HUC) and by dominant cover type.

The following is a summary of the FIA data.

Table C-10a. Estimates of percentage of snag density by Commercial lands and associated 90% confidence intervals (Bush and Leach 2004).

Commercial	Ave Snags/Acre ≥ 10" DBH			Plot Frequency	
	90% CI Lower Bound	Point Estimate	90% CI Upper Bound	Number of Plots (Number of Subplots)	% of the Plots
Noncommercial	9.57	12.85	16.43	176(880)	52.38
Commercial	5.23	8.49	12.14	91(455)	27.08

Table C-10b. Estimates of snag density and associated 90% confidence interval by Landscape (Bush and Leach 2004).

Landscape	Ave Number of Snags/Acre ≥ 10" DBH			Plot Frequency	
	90% CI Lower Bound	Point Estimate	90% CI Upper Bound	Number of Plots (Number of Subplots)	Percent of the Plots
Big Snowy Mountains	0.00	3.14	6.86	12(60)	3.57
Castle Mountains	0.00	4.36	16.34	6(30)	1.79
Crazy Mountains	1.57	10.08	19.81	6(30)	1.79
Highwood Mountains	0.00	0.00	0.00	3(15)	0.89
Little Belt Mountains	6.98	10.16	13.68	119(595)	35.42
Little Snowy Mountains	0.00	4.89	14.67	3(15)	0.89
Rocky Mountains	9.91	14.29	19.10	118(590)	35.12

Table C-10c. Estimates of snag density and associated 90% confidence intervals by species cover type

Cover Type	Ave Number of Snags/Acre ≥ 10" DBH			Plot Frequency	
	90% CI Lower Bound	Point Estimate	90% CI Upper Bound	Number of Plots (Number of Subplots)	Percent of the Plots
ABLA-PIAL	8.76	19.29	31.67	23 (115)	6.85
HW	0.00	0.00	0.00	2 (10)	0.60
MIXCon	7.13	10.10	13.47	99 (495)	29.46
NONE	0.00	19.84	45.57	8 (40)	2.38
PICO	9.07	15.40	22.35	72 (360)	21.43
PIPO-PSME	2.77	5.13	7.89	63 (315)	18.75

Note: ABLA = subalpine fir, PIAL = whitebark pine, HW = hardwoods, Mix Con = mixed conifers, None = density of live trees precludes the assignment of a cover type, PICO = lodgepole pine, PIPO = ponderosa pine, PSME = Douglas-fir.

Snag standards in the Forest Plan were developed using Thomas (1979), and prescribed the number of nest and roost trees to leave for specified woodpecker populations. The numbers proposed by Thomas were based on a hypothetical, untested model, and did not include snags for foraging (Bull et al. 1997). Snag standards based on the requirements of woodpeckers are known to underestimate the number of snags necessary for the many roles that snags, and later downed-woody debris, play in the forest ecosystem (Bull et al. 1997). In January 2000 a snag management protocol was developed for Region 1 of the U.S. Forest Service using Forest Inventory and Analysis (FIA) data from forests west of the Continental Divide (Lolo, Bitterroot, Flathead, and Kootenai National Forests). The use of FIA data for estimating snag densities and consideration of Region 1 Snag Retention protocol is consistent with Forest Plan direction (Forest Plan, p. 2-32) which encourages "maintaining active communications with research organizations to ensure current research data are being used in resource planning and administration concerning Threatened and Endangered, and Sensitive species and their habitats." As mentioned above, however, the snag management protocol developed for Region 1 was based on data from the highly productive forests west of the Divide and may not be appropriate for the drier, less productive forests of the Lewis and Clark National Forest especially in the recommendations for snags greater than 20 inchs dbh. Therefore, management of snag habitat is still guided by the Lewis and Clark Forest Plan standards.

The Forest plan standards for snag retention on the Lewis and Clark National Forest are identified by forest type (Forest Plan, p. 2-35). Table C-10d lists the Forest Plan standard that is currently in place. Comparing the Forest Plan standard with FIA data it is clear that the snag densities exceed the Forest Plan Standard, with the exception of the riparian/aspen type, however, there were only 2 plots taken within this vegetation type. Table C-10d also lists the snag densities that it would take to manage for 100% of the potential population level of woodpeckers (Thomas, 1979). Once again the snag levels far exceed the required density (except

riparian/aspen). Therefore it appears that the Forest is providing adequate amounts of snag habitat to contribute to the overall viability of snag dependent species at the Forest scale. Snag levels are also exceeding snag levels being recommended by the Region 1 Snag Protocol in regards to Lodgepole pine and Spruce-fir/Whitebark Pine types. Information was not available to determine the number of snags greater than 20 inchs dbh for the Douglas-fir/Ponderosa pine types. In general across the Forest there are 11.37 snags/acre with a 90% confidence interval of 8.90 to 14.04 snags/acre. Even the lower bound of the interval is higher than the Forest Plan standard or the standard that it would take to manage at 100% of maximum potential populations of woodpeckers. Therefore, comparing the standard with what is being displayed from FIA data, there appears to be adequate snag habitat across the forest to contribute to maintaining viable populations of snag dependent species.

Table C-10d. Density of standing dead trees (snags) on the Lewis and Clark National Forest by forest type in Relation to the Forest Plan Standard.

Forest Type	FP Standard Snags/acre at Various Management Levels ( )	Existing Snags/acre[a]	Snags/acre at 100% of management Level(Thomas, 1979)[b]	Snags/acre as per Region 1 Snag Protocol
Douglas-fir/Ponderosa pine	1.58≥10" dbh (70%)	5.1≥10" dbh	2.25≥10" dbh	1-2 >20" dbh
Riparian/Aspen (HW)	3.0≥6" dbh (100%)	0.0≥6" dbh	3.0≥6" dbh	No Recommendation
Lodgepole pine	0.7≥10" dbh (40%)	15.4≥10" dbh	1.8≥10" dbh	5-10>10" dbh
Spruce-fir/Whitebark Pine	1.08≥10" dbh (60%)	19.3≥10" dbh	1.8≥10" dbh	5-10> 10"dbh
Mixed Conifer	1.35≥10" dbh (60%)	10.1≥10" dbh	2.25≥10" dbh	No Recommendation

[a] Existing snags/acre is the current snag density from FIA data using the point estimate. A breakout of snags >20"dbh is not provided.

[b] Snags that would be required to manage for 100% of required management level versus the management level specified in the Forest Plan.

Snag Management: Even though the FIA data displays that there is adequate snag habitat at the Forest level, retention of snags is still a concern within timber harvest units. Coordination at the Environmental Assessment phase is still important to ensure snags are being marked during timber sale layout and how many are needed. In some cases the snags are marked with paint and in others they are signed with metal signs, designating them as wildlife trees.

Snag management is also being examined more at the landscape level on the Forest. Table C-10e looks at the total forested acres on the Jefferson Division and compares the amount of acres that have been harvested as well as burned with wildfire from 1940 to 2003. The percentage of acres treated with timber harvest or wildfire is a very minor component of the land base within the Jefferson Division. Based on acres harvested versus acres of forested habitat, the timber program on the Forest has had an effect on only 6.9

percent of the forested habitat. While at the same time timber harvest has removed all or a portion of the snag habitat on 6.9% of the forested habitat, natural fire has created 41,262 acres (4.7%) of snag habitat on the Jefferson Division. These are gross acres and one cannot make a direct comparison of snags lost on 6.9 percent of the forest or snags gained on 4.7 percent of the forest. But one can make a determination that the timber management on the Forest is having very little effect on snag habitat on the Jefferson Division, therefore, very little effect on snag dependent species, especially when wildfire has created snag habitat during the same time period.

In 2003, the Forest surveyed the recent Lost Creek Fire of 2001 for black-backed woodpeckers. One black-backed woodpecker responded to a playback call within the fire. It appears that the black-back woodpeckers are still utilizing the fires, however in very low numbers.

RECOMMENDATIONS

Continue to survey for presence of black-back woodpeckers in the burns on the forest. Continue to coordinate with the timber sale program in regards to snag management objectives and standards.

Table C-10e. Snag Habitat on the Lewis and Clark National Forest

Division	Acres Forested	Acres Harvested[(1)]	Acres Burned[(2)]	% Acres Affected by Harvest/Burn
Jefferson	**880,000**	**60,686**	**41,262**	**6.9/4.7%**
Rocky Mt	**470,000**		**176,099**	**37.5%**

(1) Data from TSMRS, March 2003.

(2) Data from Fire History Map, March 2003.

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