United States
Department of
Agriculture

Forest
Service

September 2014

Kootenai National Forest

Forest Plan Monitoring and Evaluation Report 2013

For More Information Contact:

Forest Planner
31374 US Highway 2
Libby, MT 59923
Phone: 406-293-6211

USDA United States Department of Agriculture | Forest Service | Kootenai National Forest
406 293-6211
Forest Supervisor's Office
31374 US Highway 2
Libby, MT 59923-3022

File Code: 1920
Date: October 6, 2014

Dear Forest Planning Participant:

Enclosed is the Kootenai National Forest's Fiscal Year 2013 Forest Plan Monitoring and Evaluation Report. This report, along with past reports, can be found at the following website: http://www.fs.usda.gov/main/kootenai/landmanagement/planning.

The Kootenai Forest Plan was approved on September 14, 1987. It established management direction that became effective on October 1, 1987. We have now completed over 25 years of implementing the Forest Plan. Information from our monitoring reports and other assessments has been useful in revising our Forest Plan. Our Monitoring and Evaluation program has shown that land management occurs in complex and changing situations and our results will not always be totally predictable, definitive, or certain. Many things, including natural events that cannot be predicted, affect management results.

If you are interested in becoming involved in a project or other planning activity, please see our national website at: http://www.fs.fed.us/sopa.

Sincerely,

CHRISTOPHER S. SAVAGE
Forest Supervisor

Enclosure

Table of Contents

List of Tables

List of Figures

Introduction

The Kootenai Forest Plan was approved on September 14, 1987. It established management direction that became effective on October 1, 1987 (Fiscal Year (FY) 1988). This direction was the result of a comprehensive analysis of land capabilities, public issues, and environmental effects along with a balancing of legal requirements.

Over the last twenty-plus years our Monitoring and Evaluation program has shown that land management occurs in complex and changing situations and our results will not always be totally predictable, definitive, or certain. Many things, including natural events that cannot be predicted, affect management results.

Old Growth Habitat, Item C-5

ACTION OR EFFECT TO BE MEASURED: Old growth habitat amount and condition.

MONITORING OBJECTIVE: Maintain habitat capable of supporting viable populations of old growth-dependent species (10 percent old growth within each of the drainages).

VARIABILITY WHICH WOULD INITIATE FURTHER EVALUATION: Reduction below 10 percent in the drainages which was previously over minimum or any reduction in each of the drainages previously under minimum.

Purpose: This monitoring item was established to help ensure that an adequate amount of old growth habitat is designated on the Forest. The expected accuracy and reliability of the information is moderate to high.

Background: The Forest Plan (Volume 1, page II-22) specifies that at any time 10 percent of the KNF land base below 5,500 feet in elevation would be managed as old growth habitat for those wildlife species dependent on old growth timber for their needs. The old growth would be spread evenly through most major drainages, and would represent the major forest types in each of the drainages.

Kootenai Supplement (Supplement 85, 1991) to Forest Service Manual (FSM) 2400 describes the validation process to be conducted on a compartment basis before the Forest conducts management activities that could affect old growth habitat. Validation, as defined in the Manual, is "on-the-ground verification." One of the requirements is that a minimum of 10 percent of each third order drainage or compartment (or combination of third order drainages or compartments) be designated as old growth habitat. If 10 percent old growth does not exist within a compartment, designate the best available, soon to be future old growth to bring the total up to 10 percent, or designate additional old growth from an adjacent area to make up the difference.

Mature stands identified as old growth replacement are stands replacing a current deficiency of higher quality (effective) old growth and will provide for old growth habitat in the future as they age and gain the desired attributes. See the Forest Plan Glossary and Appendix 17 of the Plan for more detail on the description of old growth attributes, including desired distribution patterns.

Inventory and Mapping: The KNF has two separate and independent sources of information for old growth. These are:

1) Forest Inventory and Analysis (FIA) data used to calculate KNF Forest-wide old growth percentages.
2) GIS layer of stands designated or undesignated effective old growth or replacement old growth.

1) <u>Old Growth Estimates from FIA Data</u>

The FIA program provides a congressionally mandated, statistically-based, continuous inventory of the forest resources of the United States. The FIA inventory design is based on the standardized national FIA grid of inventory plots that covers all forested portions of the United States (all ownerships). FIA protocols specify sample plot location within this systematic grid. Both sample plot location and data collection standards are strictly controlled by FIA protocols. The sample design and data collection methods are scientifically designed, publicly disclosed, and repeatable. Data collection protocols are publicly available at: http://www.fia.fs.fed.us/. There are also stringent quality control standards and

procedures, carried out by FIA personnel of the Rocky Mountain Research Station. All of this is designed to assure that there is no bias in sample design, plot location, trees selected for measurement, or the measurements themselves.

The FIA provides a statistically sound representative sample designed to provide unbiased estimates of forest conditions at large and medium scales. This inventory design is appropriate for making estimates of old growth percentages at the scale of a national forest, or large areas of forest land. (More detail on the statistical foundation of using FIA data to assess old growth on national forests is found in: *Application of Forest Inventory and Analysis (FIA) Data to Estimate the Amount of Old Growth Forest and Snag Density in the Northern Region of the National Forest System* by Raymond L. Czaplewski, Ph.D. November 5, 2004 [available from Northern Region, US Forest Service]).

FIA estimates for old growth cannot be used to determine whether or not the Forest is meeting the Forest Plan standard for old growth. The FIA estimate is for all forest lands (not only lands <5500 feet in elevation) and does not include lands managed as replacement old growth. The estimate from FIA is helpful, however, in comparing to the Forest's stand-level map of old growth.

A periodic inventory of FIA data for the Forest was collected from 1993 to 1997. Beginning in 2003, the Forest began re-measuring FIA plots on an annual basis. These re-measured data replaces data collected earlier on a plot. The current data set for FIA combines the older plots (1993 – 1997) with the re-measured plots (2003 – 2007), resulting in a "hybrid" data set.

2) <u>Stand-level map of old growth</u>

The KNF continues to use a GIS layer to identify stands that are effective or replacement old growth to meet Forest Plan standards. The stand-level old growth layer provides for distribution of old growth across the Ranger Districts and landscape, and serves as a basis for project planning. The acres associated with the old growth layer indicate whether or not Forest Plan standards are being met.

The Forest has been validating portions of its lands for old growth over the past 25 years (1989-2013). In 2002, in response to litigation, the Forest conducted a forest-wide validation and inventory of old growth, using various survey methods. FIA data for estimating the amount of old growth forest-wide was not available at this time. The mapping of old growth included all of those lands previously validated as old growth, as well as other National Forest lands. This inventory was conducted, in part, to verify that the Forest had an adequate amount of well-distributed old growth habitat to meet the Forest Plan standard (e.g. 10 percent of the National Forest lands below 5500 feet in elevation), as well as the condition of the old growth (whether it was considered effective or replacement).

In 2013, the forest changed databases for storing and reporting old growth. Not all data was able to transfer in the same format as previous, as data fields changed. The districts reviewed all data and updated as appropriate.

Figure C-5-1 displays effective and replacement old growth forest-wide. Figure C-5-2 displays lands designated or undesignated for old growth management forest-wide.

Results: The results from the FIA estimate of old growth are documented in the attached report, *Estimates of Old Growth on the Kootenai National Forest* by Bush and Reyes, dated February 23, 2013. This report indicates the estimated percentage of old growth (effective) on all forested lands on the KNF is 8.9 percent with a 90 percent confidence interval of 7.0 percent to 10.9 percent.

Acres from the stand level map are summarized forest-wide in Table 1 C-5-1, displaying the total amount of old growth, whether the old growth is considered to be effective or replacement, and if the old growth has been designated or remains undesignated. There are approximately 1,870,000 acres of National Forest lands below 5,500 feet in elevation. As of September 2012, the stand level inventory

indicates a total of 299,294 (16 percent) of National Forest lands below 5,500 feet in elevation are either effective or replacement old growth. Approximately 10.8 percent (201,577 acres) of those lands were determined to be effective old growth and an additional 5.2 percent (97,717 acres) identified as replacement old growth.

Comparison: For existing old growth, the two separate tools for inventorying and monitoring old growth show similar results. The FIA data estimates old growth forest-wide at 8.9 percent of the forest with a 90 percent confidence interval of 7.0 percent to 10.9 percent. The acres of effective (existing) old growth in the stand-level GIS layer total 10.7 percent of forested lands less than 5500 feet in elevation (see Table 1 C-5-1). Although the FIA data shows less old growth at the mean (8.9 percent) than the stand level map (10.7 percent), the stand level map results are within the 90 percent confidence interval for FIA. As stated earlier, these data sources are measures for different land bases. The FIA percentage is forest-wide, while the stand level data is for lands less than 5,500 feet in elevation.

Evaluation: The monitoring and evaluation of old growth habitat continues to indicate that the Forest is meeting its Forest Plan requirement for managing 10 percent of the Forest as old growth habitat well distributed across KNF lands below 5,500 feet in elevation.

Recommended Actions: Project level analyses will continue to use the FIA Forest data and the stand-level GIS layer in their project level assessments. Revision of the Forest Plan will address how to manage old growth into the future.

Table 1- C-5-1 Stand Level Old Growth Summary

Oldgrowth updated August 2013

10/1/2013

Forestwide Old Growth (FSVeg Spatial) Below 5500' Elevation

District	FS ACRES (total FS acres under 5500' minus lakes and highways)	Designated old growth (designated as an old growth MA)*				Undesignated old growth (not in an old growth MA)*			TOTAL EFFECTIVE old growth (designated and undesignated)*		TOTAL REPLACEMENT old growth (designated & undesignated)*	Grand Total ALL TYPES old growth*		FS Acres DESIGNATED as an old growth Management Area*	
		designated and effective (QP, QS, SE, WA)	designated and effective (PT)	designated and replacement	desig unknown (original FP categorized as PT)	undesignated and effective (QP, QS, SE, WA)	undesignated and effective (PT)	undesignated and replacement	TOTAL acres effective og	Percent of FS Acres in effective og		Acres of all old growth	Percent of FS Acres as all types old growth	Acres designated as old growth MA	Percent of FS Acres as old growth MA
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	
D1	245,642	22,959	349	4,701	275	14,699	828	6,545	38,529	15.69%	11,246	49,775	20.3%	28,284	11.5%
D3	183,774	17,935	2,337	1,245	1,381	16,685	2,040	0	38,075	20.72%	1,245	39,320	21.4%	22,898	12.5%
D4	504,323	41,212	1,485	16,818	200	4,181	2,973	3,821	48,188	9.55%	20,639	68,827	13.6%	59,715	11.8%
D5	557,361	46,716	3,291	24,022	291	2,737	2,890	6,079	53,336	9.57%	30,101	83,437	15.0%	74,320	13.3%
D7	378,212	6,382	3,408	21,156	11,852	418	9,687	14,661	21,768	5.76%	35,817	57,585	15.2%	42,798	11.3%
Forest Total	1,869,312	135,204	10,870	67,942	13,999	38,720	18,418	31,106	199,896	10.69%	99,048	298,944	16.0%	228,015	12.2%

** All old growth acreages and percents shown in this table include only those stands below 5500' elevation. Not shown are approx 20,000 acres of old growth identified above 5500' elevation.*

(1) Total FS Acres minus those acres over 5500' elevation, lakes and highways

(2) Designated Effective Old Growth stands - designated as a Management Area (MA) - inventoried by plot or walk-through data

(3) Designated Effective Old Growth stands - designated as an MA - inventoried by photo interpreted data - only 60% of this acreage is calculated as effective old growth (reference FP Appendix 17, pg.17-3)

(4) Designated Replacement Old Growth stands - designated as an MA

(5) Designated unknown: Old Growth designated in the original Forest Plan as an MA, not inventoried yet to determine effectiveness - only 60% of this acreage is calculated as effective old growth (reference FP Appendix 17, pg.17-3)

(6) Undesignated Effective old growth - not in an old growth MA - inventoried by plot or walk-through data

(7) Undesignated Effective old growth - not in an old growth MA - inventoried by photo interpreted data - only 60% of this acreage is calculated as effective old growth (reference FP Appendix 17, pg.17-3)

(8) Undesignated Replacement stands

(9) TOTAL acres of effective old growth includes column (2) + column (6) and 60% of column (3), (5) and (7) (these columns reflect stands inventoried by photo interpretation: Reference FP Appendix 17, pg 17-3)

(10) PERCENT of Forest Service acres that are effective old growth = TOTAL old growth (column 9) divided by total FS acres (column 1)

(11) Total Replacement old growth acres = column (4) + column (8)

(12) TOTAL all acres of old growth below 5500' = total effective old growth (column 9) + total replacement old growth (column 11)

(13) Percent of Forest Service acres that are effective or replacement old growth below 5500' = Total all acres old growth (column 12) divided by total FS acres (column 1)

(14) Acres and Percent of FS acres Designated as an old growth Management Area (MA). Includes effective and replacement old growth. Does not include designated old growth over

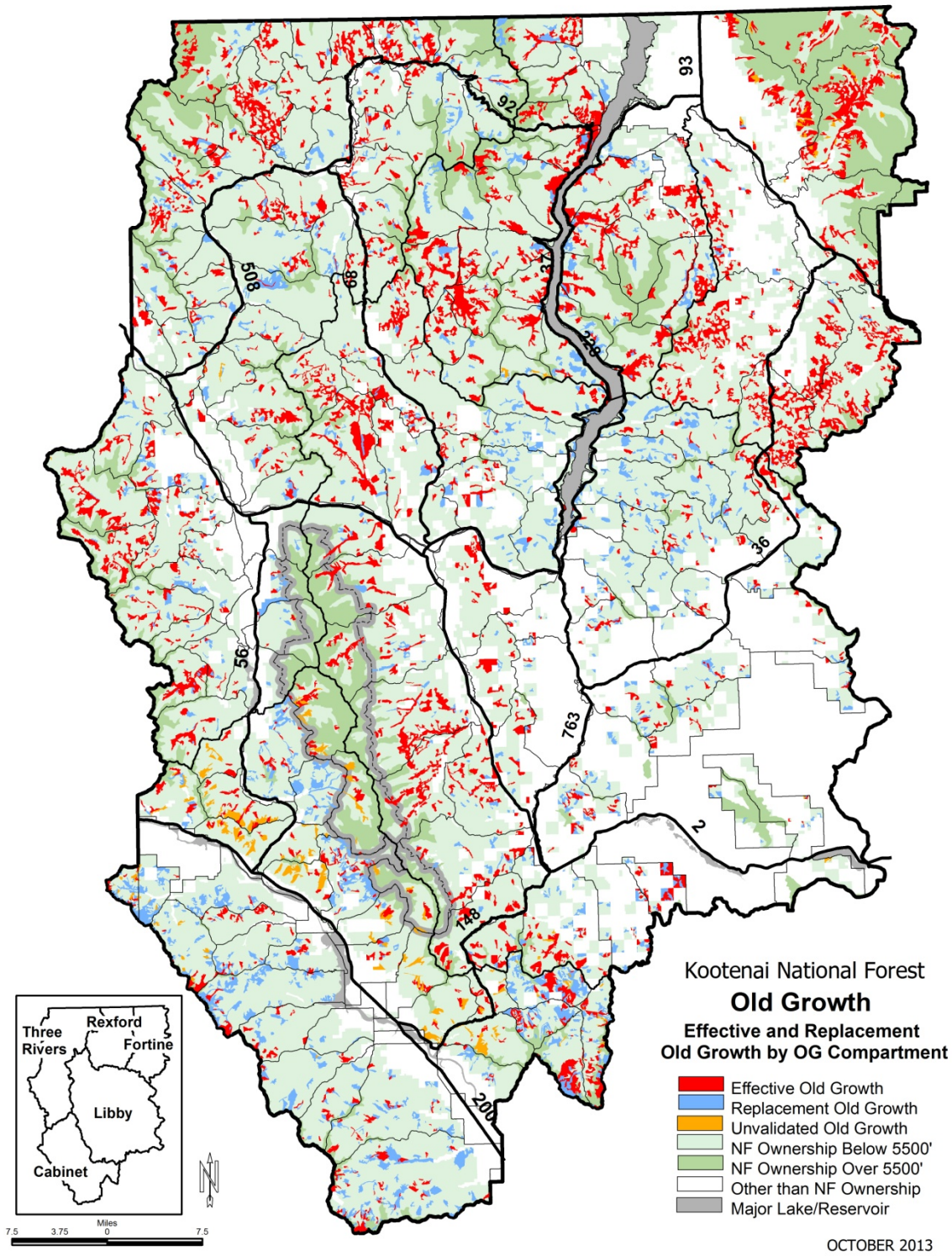


Figure 1- C-5-1 Old Growth by Type

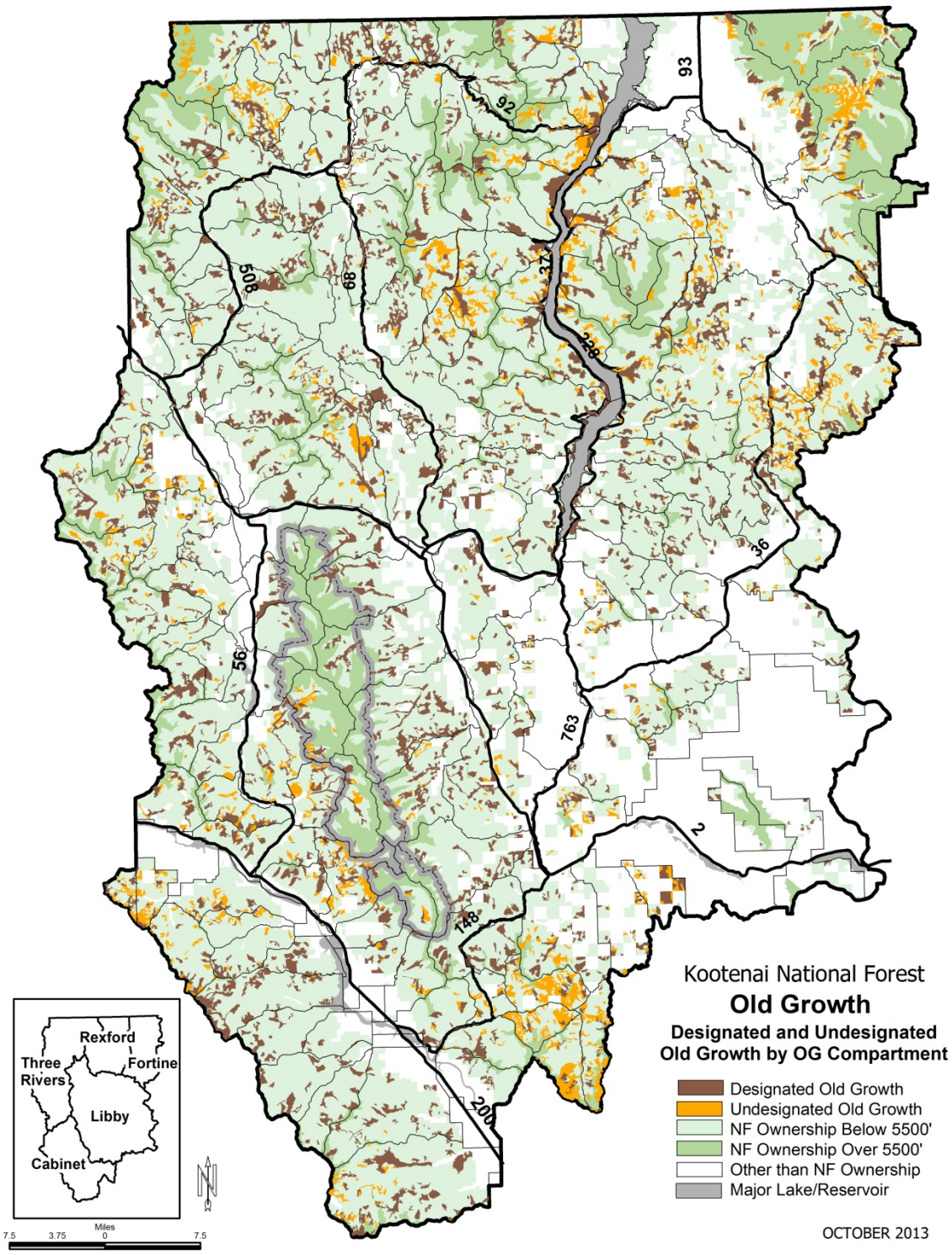


Figure 2- C-5-2 Designated & Undesignated Old Growth

Additional Information:

There are no Forest Plan standards that establish a minimum unit size for old growth but management recommendations for old growth habitat found in Appendix 17 of the Kootenai Forest Plan describe goals to strive for in the distribution and amount of old growth.

Although, the Forest Plan states that "efforts should be made to provide old growth habitat in blocks of 100 acres or larger," it was recognized that situations such as past fires or management activities might limit remaining old growth blocks in an area to less than 50 acres in size. While these may still provide useful old growth habitat, the recommendation in Appendix 17 of the Plan is that unit sizes of "50 acres or less should be the exception rather than the rule."

In 2010, the stand-level map of old growth was used to analyze the size of old growth blocks on the Forest. Table 2 C-5-2 displays the number of blocks of old growth by acre size category. The table also displays the total acres within an acre category. The table indicates the size category with the greatest number of polygons is in the less than 50 acre size. However, the total acres associated with the less than 50 acre block size is less than 7 percent of the total effective old growth and less than 17 percent of the replacement old growth. When effective and replacement old growth are combined, it is less than 6 percent of the old growth.

Table 2- C-5-2 Size of Old Growth Blocks (10/1/10)

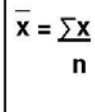
	Effective Old Growth		Replacement Old Growth		All Old Growth	
Block Size	Number of Blocks	Acres	Number of Blocks	Acres	Number of Blocks	Acres
<50	559	16,089	660	17,585	706	20,228
>=50 and <100	344	24,729	287	20,295	439	31,855
>=100 and <300	365	61,890	221	37,196	472	81,591
>=300	169	133,265	51	28,205	247	205,580
Totals	1,437	235,973	1,219	103,281	1,864	339,254

The acres shown in Table 2 C-5-2 are approximately 40,000 acres more than shown in Table 1 C-5-1. Table 2 C-5-2 includes all polygons identified as old growth, including approximately 20,000 acres of old growth over 5,500 foot elevation. This table also includes all of the polygons that were photo-interpreted. The acres in Table 1 C-5-1 are for lands less than 5,500 foot elevation and include only 60 percent of stands photo-interpreted (reducing effective old growth by approximately 20,000 acres).

These figures do not reflect the fact that most blocks are connected on one or more sides directly to larger blocks of forest that are equal to or greater than 50 acres. This means that they are not isolated, but connected to additional habitat. Although some blocks are under 50 acres in size, these stands were retained due to their old growth characteristics, their contribution to the overall continuity or connectivity of existing old growth stands within the compartment, or their potential to develop into higher quality old growth.

Region One
Vegetation Classification, Mapping, Inventory and Analysis Report



Numbered Report 13-6 v1.0		February 23, 2013

Estimates of Old Growth on the Kootenai National Forest

Renate Bush[1]
Brian Reyes[2]

[1]USDA Forest Service, Region 1, Forest and Range Management, 200 E Broadway, Missoula, MT
[2]RedCastle Resources Inc., 644 17th Ave., Salt Lake City, UT 84103

Contents

Introduction

This analysis was done using Forest Inventory and Analysis (FIA) data. *See Application of Forest Inventory and Analysis (FIA) Data to Estimate Amount of Old Growth Forest and Snag Density in the Northern Region of the National Forest System* (Czaplewski, 2004) for discussion on why FIA data is appropriate to use for broad-level estimates of old growth. The following are estimates of old-growth percentages, and associated acre estimates, for the Kootenai National Forest as a whole, as well as by landscape

analysis areas delineated by the Kootenai National Forest, see Figure 1 and Table 2. All plots that had a forested habitat type (Pfister and others, 1974) were used to derive these estimates.

In the near future, estimates of old growth will be derived which take into consideration fires and harvest that have happened since date of inventory. This document will be updated at that time.

Sample Design used to Collect FIA data:
FIA plot design and layout has changed over the years. Comprehensive manuals used for data collection from 1998 to present are available from the IW-FIA website. From 1992-1998, an FIA plot consisted of a cluster of 5-7 subplots. The number of subplots installed depended upon the year of inventory; early inventories had a seven-point cluster, whereas later inventories had 5 points. Trees 5.0" diameter breast height (DBH) and larger were selected with a basal-area factor of 40. If major differences in forest type or size-class were observed from one subplot to the next, the subplots were "rotated" into the same condition as subplot 1. For example if subplot 1 was sawtimber and subplot 2 was a clearcut, subplot 2 was rotated into a sawtimber condition following specific protocols. This design was used from 1992 – 1998 for Forests whose majority of the lands they administered were in the state of Montana. This design is sometimes referred to as the rotated design.

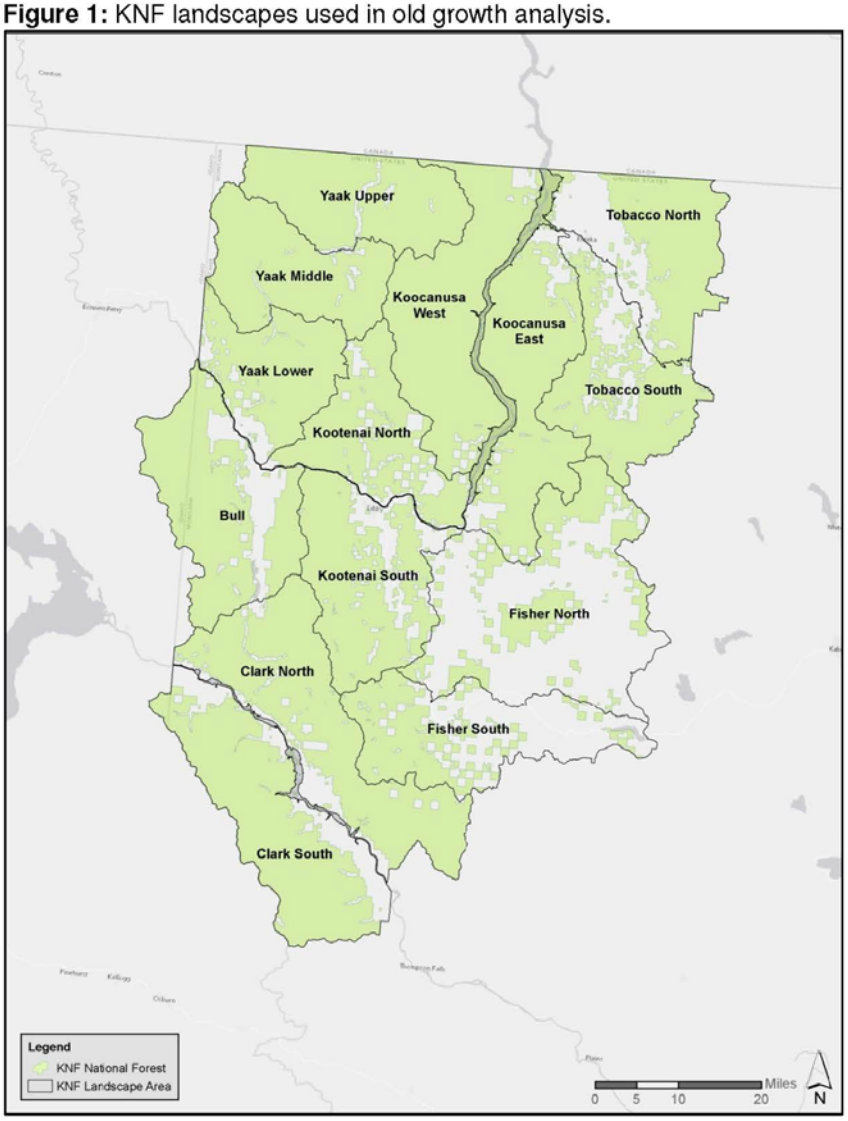
After 1996, FIA adopted a national plot layout consisting of 4 fixed-radius (1/24th acre) subplots. Under this current design, subplots are no longer rotated, instead general forest conditions based on structure, type, and ownership are "mapped" on each subplot and those areas of the subplot that are considered forested[1] are automatically measured by FIA. These protocols have been used in Montana since 2003, when the annual inventory was implemented. The annual inventory specifies that 10% of the plots are measured, in a spatially balanced manner, across the entire state, every year. Therefore, all Forests have plots measured each year with all plots on a Forest measured in a 10-year time frame. For a detailed description of field procedures see the IW-FIA website, http://fsweb.ogden.rmrs.fs.fed.us/data_collection/data_collection.html. Currently plots measured through 2007 are available to the Region.

Starting with the FIA annual plots collected in 2004, the Region has been contracting with IW-FIA to collect the "All Condition Inventory" (ACI). This inventory supplements the base FIA plots by measuring "FIA protocols" on those plots, and portions thereof, that do

[1] "..land at least 10 percent stocked by trees of any size, or has been at least 10-percent stocked in the past. Additionally, the condition is not subject to nonforest use(s) that prevent normal tree regeneration and succession such as regular mowing, intensive grazing, or recreation activities, ...in several woodland species where stocking cannot be determined, and the condition has at least 5 percent crown cover by trees of any size, or has had at least 5 percent crown cover in the past. Additionally, the condition is not subject to nonforest use that prevents normal regeneration and succession such as regular mowing, chaining, or recreation activities" (USDA Forest Service 2011).

not meet FIA's definition of "forested". Currently, IW-FIA is collecting ACI as part of their standard field data collection throughout the Region. In general, these plots are not on forested habitat types so are not considered in the Forests estimates of old growth.

Figure 1: KNF landscapes used in old growth analysis.



3

Hybrid FIA Analysis Dataset:
The "hybrid" FIA dataset used for this analysis was created from the most recent available data for each inventory point location across the Region. Therefore, the hybrid FIA dataset for the Kootenai contains:

- all of the annual plots that are availableto Region 1 (2003-2007)
- any periodic plots where annual plots have not been measured/released to NFS

Table 1: Total number of plots in the Hybrid FIA dataset for the Kootenai National Forest and vintage of data.

Number of Periodic plots	Measurement years of periodic inventory	Number of Annual plots	Measurement years of annual inventory	Total # plots	# plots that have a forested habitat type*
167	1993-1997	201	2003 - 2007	368	352

* Pfister and others 1977

Estimates of old growth reported in this document are for the entire Kootenai Forest and by landscape analysis areas. Table 2 shows the number of plots by the landscape analysis areas used in this report and the approximate administrative acres in each of the areas.

Table 2: Number of FIA plots and number of FIA plots with Forested PVT by landscape analysis area.

Kootenai Landscapes	Total # of plots	Total # of plots with Forested PVT	Acres
	368	352	
Bull	29	27	183,229
Clark North	37	35	230,624
Clark South	33	33	201,472
Fisher North	20	20	110,963
Fisher South	15	15	95,386
Koocanusa East	32	31	189,389
Koocanusa West	37	37	221,804
Kootenai North	20	19	126,833
Kootenai River	4*	0	24,269
Kootenai South	27	23	160,340
Tobacco North	20	19	130,158
Tobacco South	24	24	133,290

Kootenai Landscapes	Total # of plots	Total # of plots with Forested PVT	Acres
Yaak Lower	21	21	119,447
Yaak Middle	22	22	154,436
Yaak Upper	27	26	160,952

*Two plots are census water and two are non-sampled due to non-forested.

Classification of Old Growth

Region One's old-growth definition (Green and others, 1992 errata corrected 12/11) was used in the analysis, namely Table 1, Western Montana Zone Old Growth Type Characteristics, columns 1-5. "…Numerous definitions for old growth forests all tend to focus on age, size and successional stage of overstory trees" (Foster et al. 1996). The four attributes identified by Foster et al. are consistent with the four important attributes in Region One's old-growth definition, i.e., *minimum age, diameter, and trees per acre (TPA) over minimum age and diameter, and minimum basal area.* All four of these criteria are used as required attributes to define old growth. Moreover, Foster et al., in agreement Spies and Franklin (1996), suggest an old-growth ecosystem is distinguished by old trees but is not necessarily in the late successional condition nor free of evidence of human activities." A variety of additional "associated characteristics" have been identified in the 1992 Green et al. paper that can be very useful in determining the quality of old-growth communities for some specific purposes when developing a fine-scale management approach.

Percent and Distribution of Old Growth on the Kootenai National Forest

Estimated percentage of old growth on all forested lands on the Kootenai National Forest is 8.9% with a 90% confidence interval of 7.0% to 10.9%. Estimates of old growth, and associated confidence intervals, by landscape areas are reported in Table 3.

Table 3: Estimates of percentage Old Growth by Kootenai landscapes and associated 90% confidence intervals.

Kootenai Landscapes	Standard Error	90% Confidence Interval Lower Bound	Estimate of Percent Old Growth	90% Confidence Interval Upper Bound	Total Number Subplots with forested habitat type
Bull	3.7	3.8	9.1	16.0	140
Clark North	2.3	0	3.4	7.8	166
Clark South	3.2	0	4.9	10.8	165
Fisher North	5.4	1.8	10.2	19.5	107
Fisher South	4.1	0	4.7	12.5	77
Koocanusa East	3.3	2.2	7.5	13.4	171
Koocanusa West	4.0	2.7	8.8	15.8	195
Kootenai North	3.5	0	3.8	10.6	98
Kootenai South	5.7	6.2	15	24.5	117

5

Kootenai Landscapes	Standard Error	90% Confidence Interval Lower Bound	Estimate of Percent Old Growth	90% Confidence Interval Upper Bound	Total Number Subplots with forested habitat type
Tobacco North	7.9	8.2	19.9	34.6	103
Tobacco South	5.4	5.4	14.1	23.4	132
Yaak Lower	5.5	3.7	11.8	22.2	106
Yaak Middle	2.7	0	4.2	9.2	113
Yaak Upper	5.4	2.8	11	20.9	131

Literature cited

Czaplewski, Raymond L. 2004. Application of Forest Inventory and Analysis (FIA) Data to Estimate the Amount of Old Growth Forest and Snag Density in the Northern Region of the National Forest System. USDA Forest Service; Research and Development Deputy Area; Rocky Mountain Research Station; Natural Resource Assessment, Ecology, and Management Science Research, Research Work Unit RMRS-4852; 2150 Centre Ave. Bldg. A., Fort Collins, CO 80526. http://fsweb.r1.fs.fed.us/forest/inv/fia_data/analysis.htm.

Foster,D.R.,D.A. Orwig, and J.S. McLachlan. 1996.Ecological and conservation insights from reconstructive studies of temperate old-growth forests. Trends in Ecology and Evolution. 11:419-424, Harvard Forest, Harvard University, Petersham, Ma.

Green, P.; J. Joy; D. Sirucek; W. Hann; A. Zack; and B. Naumann. 1992 (errata corrected 12/11). Old Growth Forest Types of the Northern Region. United States Department of Agriculture, Forest Service, Northern Region. Missoula, MT. 60 p

Pfister, R.D.; Kovalchik, B.L.; Arno, S.F.; Presby. R.C. Forest Habitat Types of Montana. 1977. Gen. Tech. Rep. INT-34. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station. 174 p.

Spies,T.A. and Franklin, J.F. (1996) The diversity and management of old growth forests, in Biodiversity in Managed Landscapes (Szaro,R. and Johnston, D., eds) pp.235-248, Cambridge University Press

USDA Forest Service. 2011. Forest Inventory and Analysis National Core Field Guide. Volume 1: Field collection Procedures for Phase 2 Plots..version 5.1.P310.

6

Wildlife and Fisheries, Item C-7

ACTION OR EFFECT TO BE MEASURED: Provide habitat adequate to ensure KNF contribution to the recovery of Threatened and Endangered (T&E) Species including: lynx, grizzly bear, bull trout, and white sturgeon.

VARIABILTY WHICH WOULD INITIATE FURTHER EVALUATION: Any downward population trend. Any forest-wide decrease in habitat quantity or quality. Failure to meet recovery plan goals for the KNF.

Purpose: This monitoring item was established to help ensure that the KNF contributes to the recovery of listed threatened and endangered species. The Forest Plan requires that this item be reported annually. The expected precision and reliability of the information is high and moderate, respectively.

Grizzly Bear – The KNF contains portions of two grizzly bear recovery zones: the Cabinet-Yaak Ecosystem (CYE) and the Northern Continental Divide Ecosystem (NCDE). About 72 percent of the CYE is located on the western portion of the Forest and about four percent of the NCDE is located in the extreme northeast corner of the Forest. Each of these ecosystems is further subdivided into smaller areas for analysis and monitoring, known as bear management units (BMUs).

The Forest's primary efforts in grizzly bear recovery are in habitat management, cooperating in grizzly bear studies in the Yaak River and Cabinet Mountain areas, and working with local citizens and interest groups to achieve understanding and consensus on grizzly bear management issues.

Recovery goals for each recovery zone are based on the Grizzly Bear Recovery Plan (FWS 1993). Three main criteria are used to evaluate grizzly bear recovery:

1) The number of unduplicated sightings of females with cubs averaged over a six-year period;
2) The distribution of females with cubs, yearlings, or two-year-olds measured as the number of BMUs occupied over a six-year period; and
3) The level of known human-caused mortality measured as a percentage of the estimated population average for the past three years.

The CYE met a portion of the recovery criteria regarding female mortality caused by humans. The numbers for unduplicated sightings of females with cubs, distribution of females with young, and total human caused mortality do not yet meet recovery goals. The NCDE continues to progress towards recovery.

The following is a discussion of the Forests contribution toward meeting the recovery plan goals.

Unduplicated Sightings of Females with Cubs: In 2013, there were two credible sightings of unduplicated female grizzly bears with cubs-of-the-year in the CYRZ or within 10 miles (Kasworm, Draft 2014). As of 2013 the six-year average was 2.5 females with cubs with a Recovery Plan goal of six.

Distribution of Females with Young: Seven of the 17 BMUs on the Kootenai portion of the CYE were occupied by females with young in 2013. The total number of different BMUs

occupied over the entire recovery zone during the past six years (2008-2013) was 12, compared to the Recovery Plan goal of 18 (Kasworm, Draft 2014).

Mortality: There were no human-caused mortalities in the United States portion of the CYE in 2013. There were no mortalities in the Kootenai portion of the NCDE in 2013. As of 2013, the six-year average human caused mortality was 1.5 total with female human caused mortality at 0.3. The Recovery Plan limits are 1.2 and 0.4, respectively (Kasworm, Draft 2014).

Table 3 C7-1 Grizzly bear females with cubs, distribution of females with young, and human-caused mortality on the Kootenai portion of the CYE and NCDE

Bear Year (BY)	NCDE (KNF Portion only)			CYE (KNF portions only)		
	# Females with Cubs of the year	#BMUs Occupied by Females with Young	# Human Caused Mortalities	# Females with Cubs of the year	# BMUs Occupied by Females with Young	# Human Caused female Mortalities
2008	1	1	0	2	3	0
2009	**	**	0	2	2	1
2010	**	**	0	3	7	0
2011	**	**	2	2	4	0
2012	**	**	0	2	5	0
2013	**	**	0	2	7	0

** This item is no longer tracked as recent DNA research has made it possible to estimate the population of grizzly bears in the NCDE at 765 bears (11/20/08 Servheen memo).

The Access Amendment[1] set wheeled motorized access management direction for grizzly bear habitat during the active bear year (April 1-Nov 30) in the CYE. Identified monitoring parameters include Open Motorized Route Density (OMRD)[2], Total Motorized Route Density (TMRD)[3], and Core.

Tables 4 C-7-2A, 5 B, and 6 C display Core (see Figure 3 C-7-1), OMRD, and TMRD values by BMU for bear years (BY) 2004 through 2013.

Table 4- C7-2A. Bear Year (BY) Percent Core for the CYE and NCDE by BMU in the CYE and NCDE portions of the KNF.

BMU	BY 04	BY 05	BY 06	BY 07	BY 08	BY 09	BY 10	BY 11	BY 12	BY 13
CYE										
Cedar	84	85	85	83	83	83	81	83	83	83
Snowshoe	78	77	76	76	76	76	76	77	77	77

[1] Titled "Forest Plan Amendments for Motorized Access Management within the Selkirk and Cabinet-Yaak Grizzly Bear Recovery Zones," 2011.

[2] OMRD= Calculation made with the moving windows technique that includes open roads, other roads not meeting gated or impassible criteria, and open motorized trails. Density is displayed as a percentage of the analysis area in a defined density category (IGBC 1998).

[3] TMRD = Calculation made with the moving windows technique that includes open roads, restricted roads, roads not meeting all impassible criteria, and open motorized trails. Density is displayed as a percentage of the analysis area in a defined density category. Example: 20 percent great than 2.0 miles of road per square mile of habitat (IGBC 1998).

BMU	BY 04	BY 05	BY 06	BY 07	BY 08	BY 09	BY 10	BY 11	BY 12	BY 13
Spar	63	63	62	60	60	62	62	62	62	62
Bull	63	63	63	62	63	62	62	62	62	62
Saint Paul	60	59	60	58	59	58	58	58	58	58
Wanless	56	54	54	53	54	53	53	53	53	53
Silver Butte/ Fisher	66	67	67	62	63	62	63	63	65	65
Vermillion	56	56	56	54	55	55	55	55	55	55
Callahan	60	59	58	58	59	59	59	58	57	59
Pulpit	52	51	51	52	52	51	51	54	54	54
Roderick	53	53	52	52	54	54	54	54	53	54
Newton	56	56	56	56	57	58	58	56	56	56
Keno	61	61	59	59	59	59	59	59	60	60
NW Peak	57	56	55	55	56	56	56	56	56	55
Garver	48*	46	45	46	54	55	55	54	55	55
East Fork Yaak	55	54	53	53	54	54	54	54	54	55
Big Creek	50	49	54	55	59	58	58	56	58	56
NCDE										
Murphy Lake	72	72	72	72	72	73	--	--	--	--
Sub BMU: Therriault							71	71	71	71
Sub BMU: Krinklehorn							75	75	75	75

BY13 highlighted values do not yet meet the Access Amendment design criteria.

* Garver BMU, percent core change is the result of an error correction in BY03. Correction was made after on-the-ground validation of road status.

Table 5- C7-2B Bear Year OMRD Conditions (Percent BMU >1 mi/mi^2) for the CYE and NCDE by BMU

BMU	BY 04	BY 05	BY 06	BY 07	BY 08	BY 09	BY 10	BY 11	BY 12	BY 13
CYE										
Cedar	13	14	12	12	14	14	15	15	14	14
Snowshoe	17	19	20	19	19	20	20	18	18	19
Spar	25	26	27	27	27	27	28	30	30	33
Bull	37	37	36	37	37	37	37	38	38	38
Saint Paul	26	27	27	28	28	28	27	29	28	28
Wanless	33	35	35	32	30	29	33	32	32	32
SilverButte/Fisher	23	24	23	25	27	32	32	24	27	24
Vermillion	32	32	32	33	33	33	33	32	32	32
Callahan	26	28	28	27	27	27	27	28	29	27
Pulpit	41	42	41	44	44	44	45	45	45	45

BMU	BY 04	BY 05	BY 06	BY 07	BY 08	BY 09	BY 10	BY 11	BY 12	BY 13
Roderick	29	28	28	28	28	28	28	28	28	29
Newton	41	42	42	42	42	42	42	43	43	42
Keno	33	34	34	34	34	34	33	33	33	32
NW Peak	28	28	28	28	28	28	28	28	35	28
Garver	29	33	30	30	29	29	34	31	30	30
East Fork Yaak	31	28	28	29	31	29	32	29	31	29
Big Creek	31	29	31	30	30	30	30	31	31	30
NCDE										
Murphy Lake	20	20	20	20	20	20	--	--	--	--
Sub BMU: Therriault							23	23	23	23
Sub BMU: Krinklehorn							18	18	18	18

BY 13 highlighted values do not yet meet the Access Amendment design criteria.

Table 6- C7-2C. Bear Year (BY) TMRD conditions (Percent BMU > 2 mi/mi2) for the CYE and NCDE by BMU

BMU	BY 04	BY 05	BY 06	BY 07	BY 08	BY 09	BY 10	BY 11	BY 12	BY 13
CYE										
Cedar	10	8	8	9	9	10	11	8	8	10
Snowshoe	14	14	15	16	15	16	16	16	16	16
Spar	24	24	24	27	27	26	26	26	26	26
Bull	26	26	26	26	26	29	29	29	29	29
Saint Paul	21	24	23	23	24	23	23	23	23	23
Wanless	31	31	33	33	33	34	34	34	34	34
Silver Butte/ Fisher	21	20	21	23	23	23	23	23	23	23
Vermillion	23	23	23	24	22	24	24	24	25	24
Callahan	26	26	26	26	26	26	26	27	27	26
Pulpit	31	29	28	28	28	29	30	27	27	27
Roderick	29	29	28	29	28	28	28	27	27	28
Newton	31	31	30	31	30	29	29	32	32	32
Keno	23	24	25	25	25	25	25	25	24	24
NW Peak	26	26	26	26	26	26	26	26	26	26
Garver	29	34	33	32	25	25	25	26	25	25
East Fork Yaak	25	26	26	27	27	27	27	27	27	26
Big Creek	25	25	20	18	15	16	16	16	16	16
NCDE										
Murphy Lake	6	6	6	6	6	11	--	--	--	--
Sub BMU:							10	10	10	10

BMU	BY 04	BY 05	BY 06	BY 07	BY 08	BY 09	BY 10	BY 11	BY 12	BY 13
Therriault										
Sub BMU: Krinklehorn							11	11	11	11

BY 13 highlighted values do not yet meet the Access Amendment design criteria.

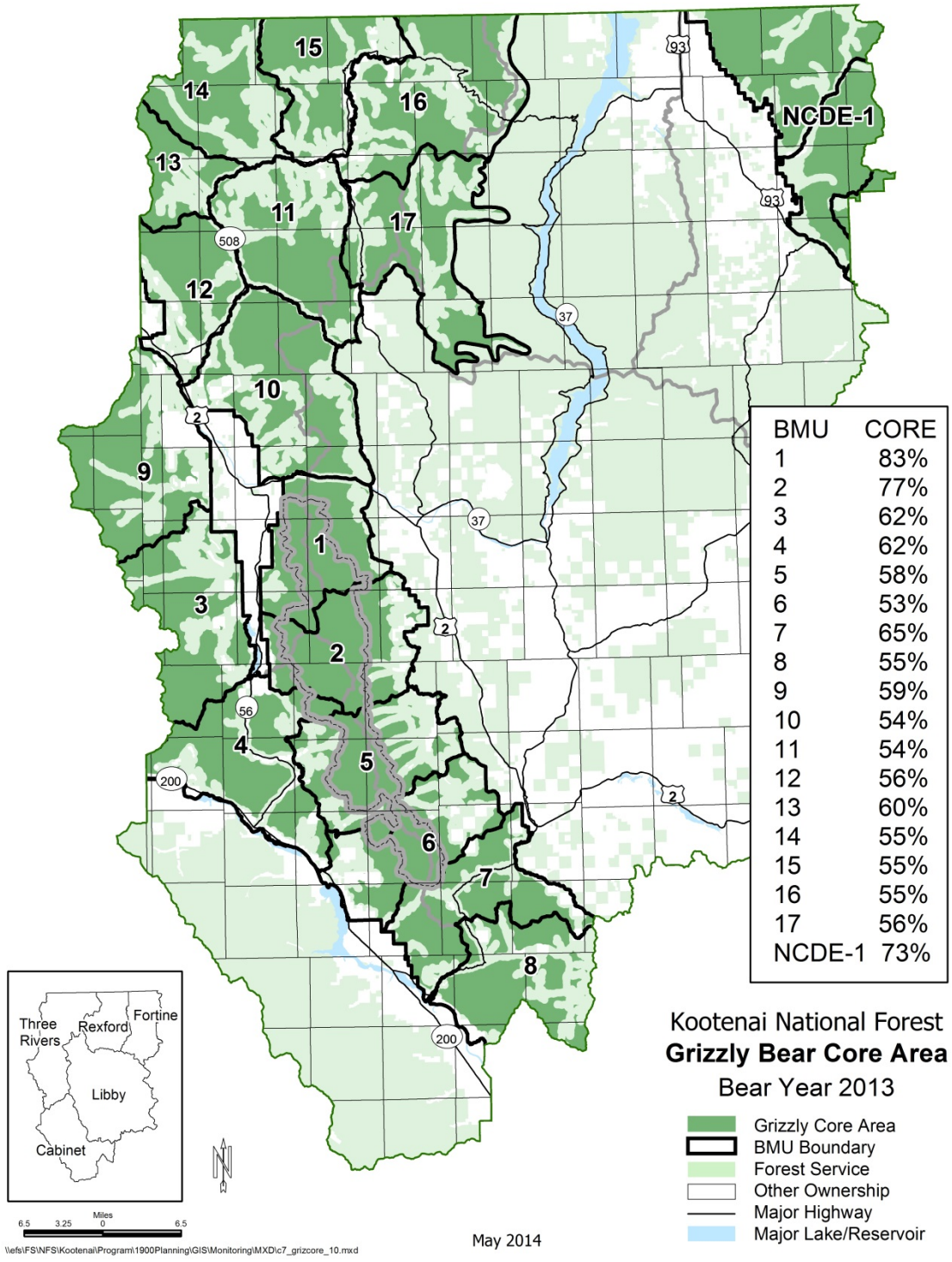


Figure 3- C-7-1 Grizzly Bear Core

Bears outside the Recovery Zone (BORZ): In addition to the monitoring items inside the recovery zone, criteria for areas outside the recovery zones that are occupied by grizzly bear are also monitored to assure compliance with the Endangered Species Act. The criteria for bears outside the recovery zone (BORZ) areas are:

- No permanent increases in linear miles of open road above baseline conditions.
- No permanent increases in linear miles of total road above baseline conditions.

Table 7 C7-3 shows the baseline conditions established as of 2010 and corrected in 2013 and reports this year's status.

Table 7- C7-3 Linear miles of Open & Total routes by BORZ Area

BORZ Name	Grizzly Bear Ecosystem	National Forest	Total Size (Acres)	NFS Lands (Acres)	Total Roads on NFS Lands (Linear Miles) 2013/(baseline)	Open Roads on NFS Lands (Linear Miles) 2013/(baseline)
Clark Fork	Cabinet-Yaak	KNF	101,899	100,421	238.2 (256.1)	172.8 (176.9)
Cabinet Face	Cabinet-Yaak	KNF	28,052	27,093	164.6 (164.6)	129.5 (129.5)
West Kootenai	Cabinet-Yaak	KNF	187,097	179,888	641.9 (654.4)	342.3 (343.0)
Tobacco	Cabinet-Yaak	KNF	287,240	266,947	1108.3 (1,123.9)	864.2 (867.0)

For more information regarding the numbers in this table, please see the Cabinet-Yaak Grizzly Bear Recovery Zones 2013 Annual Monitoring Summary Report.

Summary within the Kootenai portion of the CYE: Unduplicated sightings of female grizzly bears with cubs of the year in FY13 totaled two family groups within the CYRZor within 10 miles. Females with young occupied seven BMUs in the CYRZ. There were no human-caused grizzly mortalities in 2013 in the United States portion of the CYE or on the KNF portion of the NCDE. Compared to the previous year, core increased in 3 BMUs and decreased in 2, OMRD decreased in 7 BMUs and increased in 3, and TMRD decreased in 3 BMUs and increased in 2.

Lynx – The Canada lynx was listed as threatened in March, 2000. The KNF currently manages for lynx habitat using the Northern Rockies Lynx Management Direction (McAllister et. al. 2007). The Forest delineated 47 Lynx Analysis Units (LAUs) which approximate a lynx home range size. At the end of 2013, none of the lynx analysis units had more than 30 percent of the lynx habitat in the early stand initiation structural stage (VEG S1 from the NRLMD). All LAUs had < 15 percent lynx habitat regenerated due to timber management in the last 10 years (VEG S2) and none of the LAUs have an adjacent LAU that exceeded the 30 percent in the early stand initiation stage. Management for lynx on the Forest meets the Northern Rockies Lynx Management Direction.

During the winter of 2013-2014 the method for querying the data to identify lynx habitat had to be updated. The location of the data needed to run the query had changed databases since 2010 and the KNF was no longer able to query for lynx habitat using the old method. The new method results in refinements to acreages since 2010, and some changes in acreages also occurred since the last time the query was run due to natural forest succession, fires, and management activities. As seen in Table 8 C7-4 below, none of the updates resulted in LAUs being near to the thresholds identified in VEG S1 and VEG S2.

Table 8- C7-4 – Percentages in 2013 pertaining to VEG S1 and VEG S2 from the Northern Rockies Lynx Management Direction (NRLMD). For VEG S1, the percentage of lynx habitat currently in an early stand initiation structural stage that doesn't provide winter snowshoe hare habitat is displayed (all land ownerships). For VEG S2, the percentage of lynx habitat regenerated due to timber management in the last decade is displayed (NFS lands only)

LAU	VEG S1 – %	VEG S2 - %
Baldy	1	0
Beaver-Whitepine	4	2
Boulder-Sullivan	5	2
Bristow	8	3
Bull	0	0
Callahan	0	0
China	3	0
Crazy	0	0
Cripple	3	0
Crowl	0	0
Dry Fork-Weigel	2	0
Edna	4	4
Elk-Pilgrim	1	0
Fortine	4	4
Good	11	3
Grave	0	0
Hawkins	0	0
Keeler	1	0
Krinklehorn	0	0
Lookout	9	7
Lost Horse	18	2
Lower Pipe	12	1

LAU	VEG S1 – %	VEG S2 - %
Lower Quartz	0	0
McElk	7	0
McGuire-Tenmile	6	3
North Fork Big	1	0
Parsnip	4	0
Pinkham	16	5
Robinson	1	0
Rock	1	0
Ross	0	0
Silver Butte	0	0
Skookum	1	1
South Fork Big	2	1
Sunday-Trego	2	1
Sutton	13	4
Swamp	2	1
Terriault	0	0
Thunder	0	0
Treasure	8	0
Trout-Marten	1	0
Upper Pipe	1	0
Upper Quartz	0	0
Upper Wolf	16	0
Vermillion	0	0
West Fisher	2	1
Young-Dodge	4	3

White Sturgeon — The Fish and Wildlife Service (FWS) Recovery Plan for the Kootenai River white sturgeon was signed on September 30, 1999. The short-term goals of the Plan are to re-establish natural reproduction and prevent extinction of the species. Long-term goals include providing suitable habitat conditions and restoring a natural age-class structure and an effective population size. This stock of fish will be considered for down listing to threatened status after 10 years only if natural reproduction occurs in three different years; the estimated population is stable or increasing; enough captive-reared juveniles have been added to the population for 10 consecutive years that 24 to 120 juveniles survived to maturity; and a long-term Kootenai River flow strategy is implemented that ensures natural reproduction. Delisting of this population is estimated to take at least 25 years following the approval of the Recovery Plan.

Sturgeon recovery is directed by the United States Fish and Wildlife Service (FWS). Recovery of white sturgeon is managed by the Idaho Department of Fish and Game (IDFG), Kootenai Tribe of Idaho, and the Montana Department of Fish Wildlife and Parks (MDFWP). The Sturgeon Recovery Plan (which will be updated in the next two years) outlines a comprehensive set of actions for the recovery process. The Plan (circa 1999) does not identify actions or objectives that directly affect management of the KNF and will not have Forest implications (Personal Communication, Hoffman 2012). However, under the Endangered Species Act (Section 7(a) (1)), the Forest is obligated to use its authorities to aid in the recovery process and to consult with the FWS on all proposed or authorized activities. All proposed projects and activities evaluated by the Forest in FY 12 were found to have “No Effect” on the species.

In 2006, the FWS issued a Biological Opinion (BO) regarding the Army Corps of Engineers’ and the Bonneville Power Administration’s proposed operation of Libby Dam and its effect on the Kootenai River white sturgeon and its critical habitat (FWS 2006). This BO was clarified in 2008 with well-defined actions related to habitat.

Most of the post-Libby Dam spawning events have been documented to occur downstream of Bonners Ferry over substrate conditions unsuitable for egg attachment and incubation and larval rearing (Paragamian et al. 2001). No larvae and very few wild juveniles have been collected despite years of intensive sampling (Rust and Wakkinen 2005).

All population estimates for Kootenai sturgeon indicate that the wild population continues to decline (Paragamian et al. 2005; Beamesderfer et al. 2010). Beamesderfer et al. (2009) estimated the existing adult Kootenai sturgeon population to be approximately 1,000 fish, with a 95 percent confidence interval of 800 to 1,400. The draft report also revised the estimated annual rate of decline to four percent (Beamesderfer et al. 2009).

Hatchery origin Kootenai sturgeon have been released into the Kootenai River since 1990. Releases from 1990 to 1993 were largely experimental and were made up of small year classes. Since 1995, the Kootenai Tribe of Idaho's Kootenai sturgeon aquaculture program has released over 170,000 hatchery origin juvenile sturgeon into the Kootenai basin. Typically between 10,000 and 35,000 juveniles representing as many as 18 family groups are released each year. The larger releases have primarily occurred since 2004. Recapture data indicates that hatchery juvenile Kootenai sturgeon survive at high rates after release, with 60 percent survival the first year after release and 90 percent the following years (Ireland et al. 2002).

Bull trout – The KNF continues to consult with the FWS on all proposed activities under Section 7 (a) (2) of the Endangered Species Act. The Forest also works closely with the five other western Montana National Forests, Bureau of Land Management and the FWS to implement Programmatic Biological Assessments and maintain consistency for consultation standards. There were no biological assessments submitted for formal consultation on bull trout and bull trout critical habitat with the FWS in FY 2013; however, formal consultation was completed for the proposed Montanore Mine and the Forest Plan revision. The biological opinion for the revised Forest Plan included consultation on the effect of implementing INFISH to designated bull trout ctritical habitat across the Kootenai NF. The Forest anticipates implementing habitat enhancement projects identified in the Western Montana Bull Trout Restoration Strategy for the lower Clark Fork Core Area in 2015.

The Forest continues to work closely with MDFWP, IDFG, Avista, and the FWS to determine distribution and abundance of bull trout within the boundaries of the KNF. This includes yearly surveys to identify the number of redds and spawning adults in several streams across the Forest. Table 9 C7-4 shows the number of bull trout redds surveyed in 2013.

Table 9- C7-4- Bull trout redd survey summary for all index tributaries of the Kootenai and Clark Fork River Basins in 2013

Stream	Number of Redds	Miles Surveyed
Kootenai River Tributaries		
Grave Creek – includes (Clarence) and (Blue Sky) Creeks	55 (20) (15)	9
Quartz Creek – includes (West Fork)	9 (5)	10.0
O'Brien Creek	35	5.3
Pipe Creek	8	8.0
Bear Creek	8	4.25
Keeler – includes (North Fork) and (South Fork)	3 (21) (9)	8.9
Wigwam – includes (Bighorn, Desolation, Lodgepole – U.S.)	1441 (6)	3
Other British Columbia, Canada- includes (Skookumchuk) (White) (Blackfoot)	na (na) (na) (na)	15
West Fisher (USFS and FWP.)	4	6
Callahan Creek (FWP) includes (North Callahan) and (South Callahan)	na (9) (2)	5
Clark Fork Tributaries		
Bull River	0	na
South Fork Bull River	0	na
East Fork Bull River	1	na
Rock Creek	na	na
Swamp Creek	1	na
Marten Creek	2	na
Vermilion River	13	na
Graves Creek	11	na
West Fork Trout Creek	10	na

*na= not available

**Information is collected by US Forest Service and Idaho and Montana Fish, Wildlife and Park State agencies.

Redd numbers in Kootenai River tributaries were again down from previous years with increased redd numbers in the Canadian portion of the Wigwam River. Bull trout redd counts seem most stable in Grave and Obrien creeks in the US portion of the Kootenai Core Area. Numbers of redds continue to remain low in Quartz Creek which has seen no active management for nearly 20 years

The Clark Fork River tributaries were also down. One possible explanation would be the high flows in the fall of 2013 which would obscure redds and frustrate efforts to get an accurate count.

Recommendations

Based upon the best available information, populations of all threatened or endangered terrestrial species, except grizzly bear, on the Kootenai are stable or increasing. The bald eagle was removed from the threatened and endangered list in August 2007. Wolves were removed from the threatened and endangered list by Congress in 2011. All of the threatened and endangered species' habitats being monitored appear to be maintaining or improving. Information shows that the KNF is progressing toward providing adequate habitat for threatened and endangered species recovery. Based on review of this item, specific changes to Forest Plan direction are necessary and are being developed in the ongoing Forest Plan revision process. It is recommended that the Forest continue to implement recovery actions and actively seek to improve habitat conditions for listed species populations. It is further recommended that the Forest increase information and education efforts related to grizzly bears, especially food attractants and the Forest's forest wide food storage order. It is also recommended that the Forest increase cooperative efforts with county officials to place bear resistant dumpsters to reduce grizzly bear mortality risks due to food attractants.

Lastly, it is recommended that the Forest continue to implement recovery actions under section 10 (a) (1) (A) of the Endangered Species Act and actively seek to improve connectivity of bull trout populations. The forest will continue to implement the Western Montana Bull Trout Conservation Strategy which emphasizes the Vermilion River on the lower Clark Fork. The next proposed project would stabilize a sediment source at Miner's Gulch roughly 0.5 miles downstream of previous work at Chapel Slide (2011).

REFERENCES:

Beamesderfer, Ray, Casey Justice. 2009. Kootenai Sturgeon Population Status Update. Prepared for the Bonneville Power Administration. 40 pp.

Hoffman, Greg. 2012. US Army Corps of Engineers, Libby Dam. Personal Communication.

Range: Noxious Weed Infestations; Monitoring Item D-2

ACTION OR EFFECT TO BE MEASURED:	Determine acreage infested with noxious weeds.
VARIABILITY, WHICH WOULD INITIATE FURTHER EVALUATION or a	10% increase in number of acres infested, 10% increase in density of existing infestations change in the diversity of noxious weed species.

Purpose: This monitoring item was established to identify the changes in noxious weed infestations on the Forest. The Forest Plan requires that this item be reported annually. This item was last published in 2008 for fiscal year 2007. The expected accuracy and reliability of this information is moderate to high.

Background: The Forest Plan states that noxious weed infestations will be monitored for increases in total acreage, increases in weed density, and the introduction of new weed species on the Forest. In some areas, weed infestations have been established along many roadsides, railroad, and power line rights-of-way and other disturbed areas such as gravel pits. Spotted knapweed, tansy ragwort, rush skeletonweed, and other weed species have migrated away from the road right-of-way onto undisturbed hillsides, especially within the drier vegetation types. Orange hawkweed has increased a presence on moist habitat types under full canopies and is converging on the edges of the Cabinet Mountain Wilderness. Weeds are also becoming established in harvest units where the seeds have been brought by machinery and other vectors such as wildlife, cattle, railcars, and/or wind.

Table 10 D-2-1 shows the types of weeds that occur on the Forest and their respective category.

Table 10- D-2-1 Noxious Weeds on the Kootenai National Forest

Category	Status	Threat	Goal	Species Included	
Category 1. *Established infestations*	Large and widespread populations	High probability of causing severe economic and environmental damage	Contain inside infested areas and reduce plant populations	common burdock	*Arctium minus*
				absinth wormwood	*Artemisia absinthium*
				cheatgrass	*Bromus tectorum*
				diffuse knapweed	*Centaurea diffusa*
				spotted knapweed	*Centaurea maculosa*
				oxeye daisy	*Chrysanthemum leucanthemum*
				Canada thistle	*Cirsium arvense*
				field bindweed	*Convolvulus arvensis*
				common hound's-tongue	*Cynoglossum officinale*
				orange hawkweed	*Hieracium aurantiacum*
				meadow hawlweed complex	*Hieracium sp. (H. caespitosum, H. floribundum, H. piloselloides, H. pratense)*
				common St. John's-wort	*Hypericum perforatum*
				sulfur cinquefoil	*Potentilla rectum*
				common tansy	*Tanacetum vulgare*
				mullein	*Verbascum spp.*
				Germander speedwell	*Veronica chamaedrys*
				common speedwell	*Veronica officianlis*
Category 2. *New Invaders*	Small and medium populations at limited sites	High probability of causing severe economic and environmental damage	Eradicate small infestations and reduce larger infestations	bugloss	*Anchusa officinalis*
				flowering rush	*Berteroa incana*
				white bryony	*Bryonia alba*
				whitetop (hoarycress)	*Cardaria draba*
				musk thistle	*Carduus nutans*
				meadow knapweed	*Centaurea pratensis*
				Russian knapweed	*Centaurea repens*
				dwarf snapdragon	*Chaenorrhinum minus*
				rush skeletonweed	*Chondrilla juncea*
				chicory	*Cichorium intybus*

Category	Status	Threat	Goal	Species Included	
				Scot's broom	*Cytisus scoparius*
				blueweed	*Echium vulgare*
				Russian olive	*Elaeagnus augustifolia*
				leafy spurge	*Euphorbia esula*
				spotted cat's-ear	*Hypochaeris radicata*
				yellowflag iris	*Iris pseudacorus*
				kochia	*Kochia scoparia*
				Dalmatian toadflax	*Linaria Dalmatica*
				yellow toadflax	*Linaria vulgaris*
				scentless chamomile	*Matricaria maritima var. agrestis*
				Eurasian watermilfoil	*Myriophyllum spicatum*
				Scotch thistle	*Onopordum acanthium*
				Japanese knotweed	*Polygonum cuspidatum*
				curly leaf pondweed	*Potamogeton crispus*
				tall buttercup	*Ranunculus acris*
				tansy ragwort	*Senecio jacobaea*
Category 3. *Potential invaders*	Not known to occur	high probability of causing severe economic or environmental damage	Prevent and eradicate promptly, if found	hoary allysum	*Butomus umbellatus*
				plumeless thistle	*Carduus acanthoides*
				yellow starthistle	*Centaurea solstitialis*
				common crupina	*Crupina vulgaris*
				Dyer's woad	*Isatis tinctoria*
				purple loosestrife	*Lythrum salicaria*
				tamarisk	*Tamarix* spp.

Nomenclature for vascular plants follows Hitchcock and Cronquist (1973) and for bioagents follows Rees et al. (1996).

Evaluation: All the weed species listed in Table 10 **D-2-1** are of concern on the Kootenai National Forest (KNF). This list includes the State of Montana and Lincoln County lists as well as other weed species that the Forest considers important. The State of Montana and Lincoln County are very concerned about new invaders, especially two relatively new terrestrial weed invaders--tansy ragwort, and rush skeletonweed. There is a strong desire to keep these species from moving east of the Continental Divide into the large farming areas of central and eastern Montana. The State has provided grant funds for surveys and spraying to contain the expansion of these species and to eradicate them. However these funds have declined over the last several years. Even though strong emphasis is placed on these species, concern remains for all the other weed species listed. Control is not confined to the three species above. Treatments for all weed species uses an Integrated Pest Management approach that includes one, or a combination, of the following: **biological**--release of bioagents; **mechanical**--hand pulling, hoeing, clipping of seed heads, etc.; **chemical**--application of herbicides; and **cultural**--establishment of desirable plants as competition. The 2007 Invasive Plant Management Final EIS and Record of Decision place the emphasis on an integrated ground-based weed control operation.

Weed infestations have expanded greatly in numbers, aerial extent, and diversity over the past 30 years. The most common weed on the KNF is spotted knapweed. In 1995, county weed specialists estimated that knapweed infested over 250,000 acres across the forest

(Hirsch and Leitch 1996). Two-thirds of the total infestations are in forestlands, rangelands, and/or wildlands; the remaining third are in road or railway corridors. The most widespread infestations are in the Clark Fork, Fisher River, and Kootenai River valleys. The spread of weeds has become apparent on winter game ranges, especially to the east of Libby. As an example, the "horse range" behind (north of) Canoe Gulch Ranger Station is estimated to have lost >80 percent of its effectiveness as winter range due to displacement of the native plant species. Most of the encroachment has been by spotted knapweed. Spotted knapweed is less widespread in the Tobacco Valley area because of earlier weed control programs that included the use of herbicides (1986 Noxious Weed Treatment Program Final Environmental Impact Statement authorized the use of herbicides on the Rexford and Fortine Ranger Districts). Kootenai National Forest specialists estimate that approximately 250,000 acres are at moderate or high risk of infestation by spotted knapweed, tansy ragwort, leafy spurge, blueweed, and St. John's-wort; one million acres are at high risk of infestation by orange and meadow hawkweeds; and 500,000 acres are at moderate or high risk of infestation by tansy ragwort. These acres were compiled by applying a modification of the process described by Mantas and Jones (2001).

Orange and meadow hawkweeds, oxeye daisy, and common St. John's-wort have made significant increases in the last 15 years in areas across the Forest. The toadflaxes, absinth wormwood, and common hound's-tongue are increasing in different parts of the Forest. Blue weed has been observed in many recent harvest units in the Clark Fork Valley area.

Since the last Forest Plan Monitoring report on weeds published for fiscal year 2007, some aquatic invaders have been introduced to the Forest, including Eurasian watermilfoil (*Myriophyllum spicatum*), yellowflag iris (*Iris pseudacorus)*, flowering rush (*Berteroa incana)* and curly leaf pondweed (*Potamogeton crispus*). Yellowflag iris, flowering rush, and curly leaf pondweed have been introduced to Noxon and Cabinet Gorge Reservoirs. Eurasian watermilfoil is found in Noxon Reservoir. These species have since been added to the KNF Invasive Plants list. Dyer's woad (*Isatis tinctoria*), a terrestrial species, has been introduced into Montana, and is currently given priority 1A, which includes weeds that are either not present in the state, or have a very limited presence. Dyer's woad has been found in seven Montana counties. It has not been located in Lincoln or Sanders Counties to date, though it has been found in Flathead County. This species has not been found on the KNF.

Biological Agents

Implementation: The KNF's present weed management program is an Integrated Pest Management (IPM) approach that combines prevention, education, and biological, mechanical, cultural, and chemical control of weeds. Biological control (biocontrol) has been a method of weed control across much of the forest since 1987. Approximately eighteen different biological control species have been released in the KNF. Since 1987 the KNF, in cooperation with the Western Agricultural Research Center (WARC), which is a branch of Montana State University, the USDA Animal and Plant Health Inspection Service (APHIS), and other agencies and entities, has made approximately 601 releases (Table 11-D-2-4) of biocontrol agents. Each release contains 50 to 200 insects. Most of these releases have been targeted at control of spotted knapweed and tansy ragwort, though several biocontrol agents for common St. John's-wort, leafy spurge, Canada thistle, musk thistle, and Dalmatian and yellow toadflaxes have also been released. Due to the length of time required to locate a plant's natural enemy and the required quarantine period, noxious weeds normally gain a very competitive edge over the biological control agents.

The banded gallfly (*Urophora affinis*) was released in Montana and Oregon in 1973. This bioagent attacks the seed heads of spotted knapweed. It has survived and has become established to the point where it can be found throughout much of the Forest. The spotted knapweed seed head moth (*Metzneria paucipunctella*), UV knapweed seed head fly (*Urophora quadrifasciata*), lesser knapweed flower weevil (*Larinus minutus*), sulphur knapweed moth (*Agapeta zoegana*), and the knapweed root weevil (*Cyphocleonus achates*) have also been released. The first three attack the seed head, while the last two attack the root system. The knapweed root weevil appears to be the most damaging agent available to spotted knapweed. A collection site for this weevil was established in Libby on the property of the former Stimson mill. Three species of knapweed biological control insects were regularly collected at this location, including *Cyphocleonus*, *Larinus minutus*, and occasional *Agapeta zoegana*. Insects were collected at this site for approximately seven years for released across the Forest as well as by locals for release on private property. In 2014, attempts to collect insects at this site failed. It appears that the insects may have been so effective as to nearly eliminate spotted knapweed from the collection site. This gives hope for the effectiveness of these agents against knapweed on the Forest.

An explosion of tansy ragwort occurred on the Forest following the Little Wolf Fire in 1994. Two biocontrol agents, cinnabar moth (*Tyria jacobaeae*), and ragwort flea beetle (*Longitarsus jacobaeae*), were released. These two bioagents have proved very successful. The population trend of both tansy ragwort and the biological controls follows a pattern of decline, rebound, and decline again. The insects reduce plants dramatically, but then have very little food. The insect population crashes, and then the tansy ragwort population rebounds. As that population rebounds, so do the insect populations and the tansy ragwort populations decline again. Herbicide treatments will continue to be needed to treat the outlying populations and plants in locations where seed are likely to be dispersed to other areas.

Biological controls have advantages and disadvantages. If they become established, they will increase in number and continue to attack the target organism. These controls are generally species or species group specific. Other vegetation and resources are not harmed. However, many years are required for biocontrol populations to become large enough to impact the host weed. Other insects and animals may also prey upon biological control insects. Some biocontrols may be limited by climatic and environmental conditions (rainfall, cold, shade etc.). Biocontrols usually do not eradicate the host weed completely and are often required in very large numbers to significantly affect the host.

The following table indicates the number of bioagents released and the year of release.

Table 11- D-2-4: Number of biological control agents released per year

Year	1987	1988	1989	1990	1991	1992	1993	1994	1995
No.	2	6	4	4	10	10	12	14	28

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004
No.	58	40	11	38	2	6	4	3	6
Year	2005	2006	2007	2008	2009	2010	2011	2012	2013
No.	??	22	25	53	49	86	45	45	18

Effectiveness:

It is difficult to determine the exact effect of biological control agents across the Forest. It is evident through anecdotal observation that biological control agent populations have been building. However it is hard to determine whether biological controls have measurably reduced

weed populations across the Forest. The collapse of the spotted knapweed infestation at the old mill site in Libby is encouraging and has occurred in other areas, specifically, in the Bitterroot Valley, and at another collection site in Plains, Montana. There is observational evidence that seed head flies have slowed the rate of knapweed spread and, with continued releases and reproduction, these and other biocontrol insects may, over time, visibly and measurably reduce existing weed populations. Infestations of spotted knapweed, St. John's-wort, toadflax, and other existing weed species will continue spreading where dispersal mechanisms are still in place.

Various spot checks have shown that larvae of the released biological controls can readily be found, indicating establishment of the agents. The success of the cinnabar moth in at the tansy ragwort infestation on the Forest is also reason for optimism. In addition, some biological control agents, such as *Cyphocleonus achates*, appear to be distributing themselves more broadly than might have been expected given their limited mobility.

Biological control agents have not proven to effectively control small populations of new invaders because small weed populations generally won't support the necessary population growth of the biological control. Effective biocontrol agents also may not be available, depending on the weed species. Biological controls are best used to decrease the density or vigor of established noxious weed infestations.

Herbicide Application

Implementation: From 2007 through 2013 the KNF continued to manage invasive plant species per the 2007 Invasive Plant Management FEIS and ROD. Herbicide control efforts have been targeted at high priority species such as rush skeletonweed, tansy ragwort, and blueweed, as well as well-established species such as spotted knapweed.

Table 12- Total Acres Treated with Herbicide by Year

Year	Acres
2007	2,795
2008	2,528
2009	5,623
2010	3,492
2011	3,299
2012	3,046
2013	2,465
Total	**23,248**

Effectiveness:

Effectiveness monitoring is required on 50% of acres treated in order to count any weed treatments toward target accomplishment. This effectiveness monitoring reveals that average weed control over the years 2007 – 2013 is 83 percent.

Mechanical and Cultural

Implementation: Mechanical control over the years 2007 – 2013 was completed on 778 acres. Species targeted for mechanical control include tansy ragwort, rush skeletonweed, and blueweed. Mechanical control is sometimes used on new invaders late in the growing season to capture

viable seed in garbage bags for later burning with a follow up herbicide treatment on the remaining plant. Small areas are sometimes also hand pulled. A non-government entity in the Yaak Valley has an agreement with the Forest to attempt control of spotted knapweed and hawkweed in a small area adjacent to the Yaak River using only non-herbicide means such as hand pulling and vinegar application.

Table 13- Total Acres Treated with Mechanical Treatment by Year

Year	Acres
2007	63
2008	11
2009	85
2010	80
2011	334
2012	169
2013	36
Total	**778**

Cultural controls

Cultural control uses plant competition to maintain or enhance desired plants. Seeding of disturbed sites such as is required in timber sale contracts to help occupy the site with vegetation other than noxious weeds (as well as reduce erosion) has been a practice since the late 1970s.

Effectiveness: Hand pulling, which is the principal method of mechanical control used on the KNF, has been effective on individual plants of some species or very small and isolated weed populations. Attempts to hand-pull large infestations of knapweed and toadflax have provided only temporary control because seeds remain viable in the soil for 12 years or potentially more. Hand pulling has not been attempted on larger infestations of weeds. Hand pulling has been proven to be ineffective on weeds with deep taproots and weeds which reproduce through runners or shoots, such as rush skeletonweed and leafy spurge. Pulling these species stimulates growth in the roots and fragments, which remain in the soil, resulting in more plants instead of less. Clipping and bagging seed heads for new invaders can be an effective way of reducing or eliminating weed spread by seed as long as collected seed are destroyed. Cultural controls have been effective at reducing the availability of sites for weeds to occupy, and have helped slow the spread of weeds.

New Invaders: Since the last noxious weed monitoring report in 2007, several weed species have been introduced to the forest and have gone from being potential invaders to new invaders. These are Eurasian watermilfoil, flowering rush, yellowflag iris, and curly leaf pondweed. All four are associated with water bodies and have been introduced into Noxon and/or Cabinet Gorge Reservoirs as described above. Three of these species, flowering rush, yellowflag iris, and curly leaf pondweed, are new additions to the Montana noxious weed list as well. This indicates an increase in new invaders, particularly those associated with water.

Montana Fish, Wildlife, and Parks have strengthened their aquatic nuisance species (ANS) program since the last Forest Plan monitoring report. On the KNF, mandatory boat check stations have been placed to detect any ANS on boats. Boat check stations are located at Troy, Noxon, and Eureka. Another is located at Thompson Falls, outside, but in close proximity to the Forest.

These stations have detected and removed invasive species from boats in the area to the benefit of area water bodies.

Efforts to contain and/or eradicate tansy ragwort and rush skeletonweed have been largely successful on the KNF. While there is some spread of these species occurring, recognition of these plants is high, and new populations are often detected early and controlled. Tansy ragwort is largely controlled using biological control agents, with chemical applications occurring in areas with high potential for seed dispersal, such as on roads. Most known and previously treated rush skeletonweed infestations have not had plants detected for many years. New infestations are located here and there, however, so the effort to manage this species continues. A new infestation of rush skeletonweed was detected on tribal lands within the Flathead Indian Reservation. This population, while not on the KNF, is of concern to the State of Montana. It covers around 1,200 acres near Niarada, Montana. The Confederated Salish Kootenai Tribe is managing this infestation.

While leafy spurge is not a new invader in the state of Montana, it is considered a new invader on the KNF. It was introduced to private property near Eureka approximately 20 or more years ago, and was not eradicated. Forest Service personnel continue to manage this species each year with the intent of eradication. However since the last Forest Plan monitoring report on weeds, the area surrounding the Forest, including the Flathead and Clark Fork valleys, has become increasingly infested with leafy spurge. Therefore it is expected that leafy spurge may be introduced to the Forest periodically from these sources.

Conclusion: Monitoring indicates that several noxious weeds (see Table D-2-2) have increased more than 10% in the numbers of acres affected and some have had a 10% or more increase in density of existing infestation since 1987. In addition, with the discovery of new invaders over the last several years, it is apparent that the diversity of noxious weed species is continuing to increase over time. Based on this, this monitoring item is outside the range prescribed in the Forest Plan. The Forest continues to implement strategies to reduce the spread of noxious weeds and in many areas weed populations have been visibly reduced and weeds have been prevented from spreading to un-infested areas.

Recommended Actions: On the southern part of the Forest, prior to 1997, and on the north part of the Forest prior to 1986, weed control focused on the use of biological and cultural controls. On the north part of the Forest from 1986 to present the use of herbicides and biological and cultural controls were implemented. In 1996, a Noxious Weed Control Provision was added to the timber sale contracts. In 1997, the Herbicide Weed Control EA was issued giving the Forest the ability to use a more integrated approach to controlling weeds. In 2007, the KNF Invasive Plant Management Final EIS and Record of Decision were signed giving further direction on weed management on the Forest. These actions are occurring under the direction of the Forest Plan and should help improve the noxious weed situation on the Forest. Because the necessary management tools for weed management are currently available to the Forest, it is recommended that no changes are needed in the Forest Plan at this time.

REFERENCES:

Hirsch, S.A., and J.A. Leitch. 1996. *The Impact of Knapweed on Montana Economy*. Agricultural Economic Report No. 355, Dept. of Ag. Econ., Ag. Exp. Sta., North Dakota State Univ., Fargo, ND.

Hitchcock, C.L., and L. Cronquist. 1973. *Flora of the Pacific Northwest*. 8th Printing 1991. Illustrations by Jeanne R. Janish. Univ. of Wash. Press, Seattle and London. 730 pp.

Kootenai National Forest. 2002. *Noxious Weed Handbook*. Edition 4.0. 110 pp.

Mantas, Maria, and Jeff Jones. 2001. *Evaluating Risk to Native Plant Communities from Invasion of Selected Exotic Plant Species*. A Proposal for the Western Montana Planning Zone. Flathead National Forest. 20pp.

USDA Ag. Res. Ser. and MT Dept. of Ag. Montana State Univ. 1996. *Biological Control of Weeds in the West.* ed. by Norman Rees et al. Western Society of Weed Science. Bozeman, MT.

USDA Forest Service. Northern Region. 1996. *Noxious Weed Treatment Program*. Final Environmental Impact Statement, Kootenai National Forest, Libby, MT. 72 pp.

USDA Forest Service, Northern Region. 1987. *Kootenai National Forest Plan - Final Environmental Impact Statement*, Vol. 2. 405 pp.

USDA Forest Service, Northern Region. 1987. *Kootenai National Forest - Land and Resource Management Plan*, Vol. 1 201 pp.

USDA Forest Service, Northern Region. 1987. *Kootenai National Forest - Record of Decision*. 44 pp.

USDA Forest Service, Kootenai National Forest. 1997. *Herbicide Weed Control, Environmental Assessment*. Kootenai National Forest, Libby, MT. 50 pp plus appendices.

USDA Forest Service, Kootenai National Forest. 2007. Kootenai National Forest Invasive Plant Management FEIS and ROD.

Whitson, Tom D. (editor), Larry C. Burrill, Steven A. Dewey, David W. Cudney, B.E. Nelson, Richard D. Lee, and Robert Parker. 1996. *Weeds of the West*. Published by the Western Society of Weed Science. University of Wyoming. Pioneer of Jackson Hole Jackson, Wyoming. 630 pp.

Timber, Item E-1

ACTION OR EFFECT TO BE MEASURED: Determine if the sell volume meets the projections of the Forest Plan, including other permissible sale volumes.

VARIABILITY WHICH WOULD INITIATE FURTHER EVALUATION: +/- 5 percent deviation for the ASQ volume, and +/- 10percent deviation for the other permissible volumes.

Purpose: This monitoring item was established to help ensure that the Allowable Sale Quantity (ASQ) stated in the Forest Plan is not exceeded. If the ASQ is not attained, this monitoring item is to explain why. The expected accuracy and reliability of the information are both high.

Background: The ASQ is a projected maximum or ceiling. The Forest's projected total maximum timber sell volume for the decade from suitable management areas is 2,270 million board feet (MMBF), which is an average of 227 MMBF per year (see Forest Plan, Appendix 11). In addition, 60 MMBF was estimated to be sold from unsuitable management areas, averaging six MMBF per year. These two components of suitable and unsuitable sell volumes comprised the total potential timber sale program of 2.3 billion board feet for the decade, or an average of 233 MMBF per year.

In November 1995, the Chief of the Forest Service issued a decision on a Forest Plan appeal related to a technical error in the calculation of the Forest's ASQ. The issue centered on how timber age classes were cataloged in the inventory information used to calculate ASQ. A description of the problem is in the FY92 Monitoring Report. The decision required that the Forest is not to exceed a sell volume of 150 MMBF per year until the Plan is either amended or revised.

Results: Table 14 E-1-1 shows that sell volumes have declined from approximately 200 MMBF in FY 88 to approximately 65 MMBF in FY05 and 35.6 MMBF in FY13. For the past 26 years, the average yearly amount sold has been 76.6 MMBF per year. This actual sell volume is well below the ASQ limit as set in the Plan.

Evaluation: After 26 years of implementation, the trend of decreasing sell volume is continuing. In the FY 92 and FY 97 Monitoring Reports, the Forest reported in detail on a number of factors that caused this decrease. Most of these factors are still influencing the sell volume. The first five years of implementation, sell volume was relatively high, averaging 161 MMBF/year (see the FY92 Monitoring Report). During the second five years of implementation, sell volume averaged about 81 MMBF/year. The average for 1998-2002, the third five-year period, was 60.9 MMBF/year. The last five years has an average of 42.3 MMBF/year.

Many factors have influenced the timber sale program. The United States Fish & Wildlife Service (USFWS) amended the biological opinions for grizzly bear recovery in July 1995 and changed how recovery processes would take place on the Forest. The Inland Native Fish (INFS) Decision of July 1995 resulted in additional streamside protection measures. In general, it has become more difficult to plan and execute sales due to public controversy, protection of threatened and endangered species habitat, inability to enter inventoried roadless area, water quality concerns, and reduction in forest budgets.

The evaluation limit for this monitoring item is plus or minus 5 percent for suitable volumes and plus or minus 10 percent for unsuitable volumes. These limits have been exceeded and this

indicates that evaluation of these factors, which started in the FY92 Monitoring Report, will need to continue during the revision of the Forest Plan.

Table 14- Timber Volume Sell Volume (MMBF) by Fiscal Year

Forest Plan Annual ASQ Projection, Adjusted ASQ	Average Sell Volume FY 88-92	Average Sell Volume FY 93-97	Average Sell Volume FY 98-02	Average Sell Volume FY 02 - 07	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	Average Sell Volume FY 1988 – 2013
233 from 1988 – 1994 150 from 1995 on	161	81.4	60.9	43.4	48.4	47.1	50.6	39.4	38.9	35.6	76.6

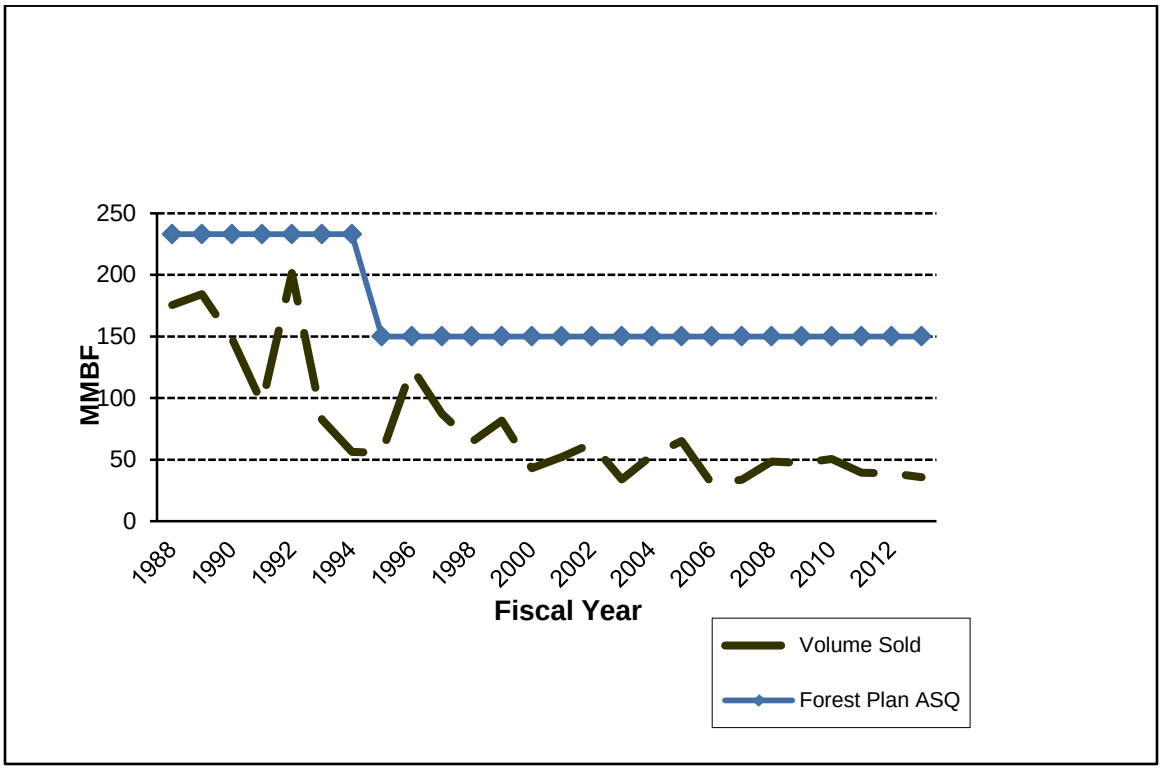


Figure 4- E-1-1 Timber Sell Volume Compared to ASQ

Recommended Actions: The Forest has not exceeded the ASQ in 26 years of implementation. However, large changes in the actual program levels versus the projections of the Forest Plan indicate that revision of the Plan will need to address the sustainability of the timber sale program.

Soil and Water, Item F-4

ACTION OR EFFECT TO BE MEASURED: Determine the changes in site quality due to surface displacement and soil compaction.

VARIABILTY WHICH WOULD INITIATE FURTHER EVALUATION: A 15percent decrease in site productivity.

Purpose: This monitoring item was established to help ensure that the basic soil resource is not compromised in the production of other resources such as timber harvesting, grazing, etc. The Plan requires this item to be reported every five years. The expected accuracy and reliability of the information are moderate.

Background

Soil resource management has the goal of maintaining or improving long-term soil productivity and soil hydrologic function. Soils can be physically damaged by displacement, compaction, and puddling from the tracks of tractor, wheels of vehicles, the hooves of cattle, the weight of a dragged log, the equipment dragging the log, etc. These factors result in the reduction of pore space, which reduces the ability of water to move into and through the soil. The soil is especially vulnerable during wet weather and wet soil conditions. Pore space reduction means more overland flow which can result in surface erosion and/or mass soil movement. The soil can also be physically and chemically damaged by heat during any intense burning, such as from wildfires, broadcast burning during site preparation, or by the burning of mechanically-bunched slash piles. Soils that are damaged from the above conditions incur adverse effects on their hydrologic function and/or losses in soil productivity.

Region 1 has a directive that allows up to 15 percent detrimental disturbance (FSH 2509.18, 5/1/94; updated 1999 FSM 2500 – Watershed and Air Management, R-1 Supplement 2500-2009-1, Chap 2550 – Soil Management). The Kootenai Forest uses the 15 percent detrimental soil disturbance (DSD) as a measure to track the impact on site productivity. If 15 percent of an area is significantly disturbed, then we can say that it has probably incurred a decrease in long-term site productivity. Post-harvest data collection regarding soil monitoring activities has occurred on the Kootenai National Forest over the past 26 years (1988-2013).

Field monitoring prior to 2007 (1988-2006) was done within activity areas using both *line transect* and *walk-through* methods (patterned after Howes et al. 1983). The *walk-through* method is a random, visual survey of the activity area involving walking through the unit and providing a qualitative description of the soil impacts. The *line transect* is performed perpendicular to the direction of the ground-disturbing activity and involved from one to five transects within each activity area. Steps along each transect represented a monitoring point. Both quantitative and qualitative descriptions were provided. Each transect represented the various activities that occurred within that portion of the activity area. The monitoring was representative of the variety of timber harvesting techniques that occurred on the Kootenai NF. The activities represented are helicopter harvest, skyline/cable logging, forwarder logging, tractor logging (rubber tired skidders and tracked vehicles) and horse logging. Both summer and winter operational periods are included in the ground-based activities. *Summer* usually refers to operations that begin following spring “break-up” and cease with the fall rains. *Winter* usually refers to the December, January, and February period. Fuel reduction/site preparation activities have occurred in some of the units.

In 2007 the Kootenai began using the draft Northern Region Soil Disturbance Monitoring Protocol (2007) which became finalized in 2011, titled: *USFS Region 1 Approach to Soils NEPA Analysis Regarding Detrimental Soil Disturbance in Forested Areas – A Technical Guide.* This methodology provides a means of sampling to determine if soil conditions are meeting the requirements addressed in FSM 2500-2009-1. This methodology is similar to what had been used on the Kootenai for the previous 20 years; however, the two data sets are not statistically comparable, so for the purposes of Forest Plan Monitoring Report the respective results for the two methodologies are reported separately. The new methodology requires determining soil disturbance at one of four levels along a random transect. Transects are documented for future use and a minimum of 30 points are randomly collected within the activity area along a randomly selected transect. Not only are the procedures slightly different but the new data collection activity also includes collection of information regarding temporary road construction and landings associated with harvest activities. The goal of such data collection process is to obtain a representative estimate of the amount and types of management-caused disturbance. When sampling is chosen randomly and "large enough," it can be considered representative of the activity area, as a whole.

The KNF disturbance categories are similar to R1 protocol but instead of using numerical categories they are categorized using three descriptive categories for ranking disturbance. These categories are: 1) undisturbed; 2) Light/Moderate Disturbance; and 3) Heavy Disturbance. Heavy disturbance is where any of the five key components is considered to be detrimentally disturbed and would impact long-term site productivity. It should be noted that the KNF combined the light and moderate categories because, from an analysis standpoint, detrimental disturbance is the primary measure and, as a result, there is little reason to keep light and moderate separate.

The following forest level soil monitoring questions are part of the Region 1 monitoring strategy:

- What are conditions and trends of soil quality for the project area? How do these conditions compare to desired conditions and objectives and is there a need to change the Plan or management actions?
  - Measurement: Acres in detrimental soil conditions reported as a percentage of total treatment area acres (forested).
- How are management actions maintaining soil quality?
  - Measurement: 1) Implementation of protective measures, e.g. design criteria, mitigation measures-verifying that they were implemented in compliance with Forest Plan and Environmental Management System (EMS) and 2) Effectiveness of the protective measures.

Results

Table 15 F4-1a summarizes the amount and type of timber harvest monitoring completed from 1988-2006. Surveys were completed on 510 timber harvest units (251 transects and 259 walk-throughs) across the forest for a total of 197,438 data points. During this time period the areas reviewed ranged in size from two to 231 acres for a total of 17,087 acres. These areas are representative of current logging methods and types of equipment still in use, including mechanical falling, skidding, yarding, and slash piling. Some sales had both transect and walk-through monitoring. Soil monitoring surveys from 1988-2006 did not include sampling of temporary road prisms and landings occurring outside of harvest units that were used to access the units. However, temporary roads and landings inside unit boundaries were included in the surveys.

Table 15- F4-1a KNF Soil Monitoring Summary

Year	Total No. of Sales	Total No. of Units	Total Acres	No. of Transected Sales	No. of Transected Units	No. of Transects	No. of Monitoring Points	No. of Walk-through Sales	No. of Walk-through Units
1988	4	10	316	0	0	0	0	4	10
1989	10	20	672	0	0	0	0	10	20
1990	12	21	718	0	0	0	0	12	21
1991	14	25	833	0	0	0	0	14	25
1992	14	26	637	10	20	68	6800	4	6
1993	15	34	935	6	14	31	7407	10	20
1994	3	6	115	2	4	8	1963	1	2
1995	6	15	343	4	9	18	4394	3	6
1996	19	39	1609	9	17	50	14004	11	22
1997	21	45	1676	13	23	47	15294	10	22
1998	21	38	1574	13	26	62	20536	8	12
1999	16	32	657	11	17	42	9759	7	15
2000	5	6	337	0	0	0	0	5	6
2001	4	9	520	1	3	12	4706	3	6
2002	22	51	1643	13	28	77	21037	10	23
2003	14	31	1263	6	15	41	19283	9	16
2004	13	28	639	8	21	53	13997	6	7
2005	15	48	1843	12	28	Unknown	28355	4	20
2006	11	26	757	11	26	Unknown	29903	0	0
Total[1]	239	510	17087	119	251	509	197438	131	259

[1]The years 2005 and 2006 did not differentiate the number of individual transects collected per harvest unit during soil monitoring activities.

Table 16 F4-1b summarizes the amount and type of timber harvest monitoring completed between 2007 and 2013. During this time period post-harvest monitoring surveys was completed on 246 timber harvest units (244 transects and 2 walk-throughs) across the forest. Similar to 1988-2006, the areas monitored represent logging methods including the types of equipment currently being used for mechanical falling, skidding, yarding, and slash piling. The areas reviewed ranged in size from one to 211 acres for a total of 7,740 acres analyzed with a total number of 79,105 soil monitoring data points collected during that time period. Surveys during this time frame were completed using the R1-Supplement-2500-99-1 Soil Disturbance Monitoring Protocol which now included temporary road prisms constructed outside unit boundaries in order to access proposed harvest units.

Table 16- F4-1b KNF Soil Monitoring Summary using R1 Monitoring Protocol[1]

Year	Total No. of Sales	Total No. of Units	Total Acres	No. of Transected Sales	No. of Transected Units	No. of Transects	No. of Monitoring Points	No. of Walk-through Sales	No. of Walk-through Units
2007	16	30	1363	16	30	Unknown	1306	0	0
2008	6	15	751	5	13	20	669	1	2
2009	21	65	1893	21	65	166	18286	0	0
2010	13	41	1302	13	41	99	17104	0	0
2011	7	17	609	7	17	45	8686	0	0

Year	Total No. of Sales	Total No. of Units	Total Acres	No. of Transected Sales	No. of Transected Units	No. of Transects	No. of Monitoring Points	No. of Walk-through Sales	No. of Walk-through Units
2012	10	28	717	10	28	61	8396	0	0
2013	21	48	1105	21	48	129	24658	0	0
Sub-Total [2]	94	244	7740	93	242	520	79105	1	2
Grand Total [3]	333	754	24827	212	493	1029	276543	132	261

[1]Region 1 adopted the new soil monitoring protocol

[2]The year 2007 did not differentiate the number of individual transects collected per harvest unit during soil monitoring activities.

[3] Grand Total is a summary of 1988-2013 soil monitoring data collected on the KNF

Table 17 F4-2a displays the types of timber sales monitored and Table 18 F4-2b displays the number of units by harvest types monitored in the past twenty-five years (1988-2013). Harvest areas that where cable or helicopter yarded displayed minimal detrimental soil disturbance. The use of forwarders and/or winter logging also resulted in low (generally <5%) detrimental disturbance. Areas where tractors were used or where moist soils were present or harvest occurred on steeper grounds typically resulted in a higher level of detrimental disturbance. However, DSD values typically are still within the desired levels (<15%). In general, the amount of detrimentally disturbed area increased with the number of machinery operations (cutting, yarding, and/or piling), the amount of area impacted, the amount of moisture in the soil, and steepness of ground where harvest activities occurs.

Table 17- F4-2a Types of Timber Sales Monitored by Year

Sale Type	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Regular	2	2	1	3	10	9	3	7	8	4	12	5
Pest Control	2	3	1	2	4	2	0	0	8	6	7	11
Fire Salvage	0	5	10	9	0	4	0	0	4	11	3	0
Totals	4	10	12	14	14	15	3	7	20	21	22	16
Continued	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Regular	3	3	19	5	13	9	10	11	6	19	11	**7**
Pest Control	2	1	2	1	0	0	0	1	0	0	0	**0**
Fire Salvage	0	0	1	8	0	6	1	4	0	2	2	**0**
Totals	5	4	22	14	13	15	11	16	6	21	13	**7**

Continued	2012	2013
Regular	10	21
Pest Control	0	0
Fire Salvage	0	0
Totals	10	21

Table 18- F4-2b Number of Units by Harvest Type by Year

Sale Type	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Regular	5	6	1	7	17	20	6	15	13	9	20	7
Pest Control	5	5	1	2	9	4	0	0	15	14	14	25
Fire Salvage	0	9	19	16	0	10	0	0	11	22	4	0
Totals	10	20	21	25	26	34	6	15	39	45	38	32
Continued	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Regular	4	7	48	10	28	44	25	20	15	58	38	**17**
Pest Control	2	2	2	2	0	0	0	2	0	0	0	**0**
Fire Salvage	0	0	1	19	0	4	1	8	0	7	3	**0**
Totals	6	9	51	31	28	48	26	30	15	65	41	**17**
Continued	2012	2013										
Regular	28	48										
Pest Control	0	0										
Fire Salvage	0	0										
Totals	28	48										

As previously mentioned, only walkthrough surveys were conducted from 1988-1991, so no specific numeric values are listed in Table 19 F4-3a for those years. Beginning in 1992, such values have been collected using linear transect procedures to provide quantitative summaries of human-related timber harvest impacts to soil conditions. The 1992 Monitoring and Evaluation Report indicated that 49% of the 501 transected-acres surveyed to that point exceeded the Forest Plan variability limits of 15% detrimental disturbance. Between 1993 and 2006, approximately 7,145 acres had transect surveys, of which only 1% (78 acres) was above the Forest Plan limits. Similarly, in the last seven year reporting period (2007-2013), of the 7,740 acres monitored for post-harvest soil disturbance (regeneration or intermediate harvest), only three units were found to exceed 15% detrimental disturbance for a total of 59 acres or less than 1% of the total area sampled. Table 19 F4-3a shows the number of units with line-transect surveys and related disturbance categories while Table 20 F4-3b displays the acres breakdown of acres reviewed by the percent groupings of detrimental soil disturbance category.

Table 19- F4-3a- Units by Soil Disturbance Category (Line Transect)

Disturbance Category (%)	1988[1]	1989[1]	1990[1]	1991[1]	1992	1993	1994	1995	1996	1997	1998	1999
<6	0	0	0	0	0	5	3	8	11	21	17	10
6-10	0	0	0	0	6	4	0	1	6	5	9	4
11-15	0	0	0	0	6	4	0.5	0	0	0	0	3
15+	0	0	0	0	8	1	0.5	0	0	0	0	0
Total	0	0	0	0	20	14	4	9	17	26	26	17
Continued	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
<6	0	1	7	11	7	15	11	16	8	40	22	11

Disturbance Category (%)	1988[1]	1989[1]	1990[1]	1991[1]	1992	1993	1994	1995	1996	1997	1998	1999
6-10	0	2	13	4	10	10	9	8	5	20	11	6
11-15	0	0	8	0	4	2	5	4	0	5	7	0
15+	0	0	0	0	0	1	1	2	0	0	1	0
Total	0	3	28	15	21	28	26	30	13	65	41	17

Continued	2012	2012
<6	16	25
6-10	9	21
11-15	3	2
15+	0	0
Total	28	4

[1] No transect sampling occurred on that given year.

Table 20- F4-3b- Acres by Detrimental Soil Disturbance Category (Line Transect)

Disturbance Category (%)	1988[1]	1989[1]	1990[1]	1991[1]	1992	1993	1994	1995	1996	1997	1998	1999
<6	0	0	0	0	0	170	32	167	357	671	566	170
6-10	0	0	0	0	134	68	0	29	254	95	251	147
11-15	0	0	0	0	122	131	22	0	0	0	0	58
15+	0	0	0	0	245	8	18	0	0	0	0	0
Totals	0	0	0	0	501	377	72	196	611	766	817	375

Continued	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
<6	0	38	247	588	110	406	315	682	445	1195	842	407
6-10	0	246	526	120	221	365	312	401	306	549	271	202
11-15	0	0	168	0	94	21	102	259	0	149	151	0
15+	0	0	0	0	0	24	28	21	0	0	38	0
Totals	0	284	941	708	425	816	757	1363	751	1893	1302	609

Continued	2012	2013
<6	410	676
6-10	194	383
11-15	113	46
15+	0	0
Totals	717	1105

[1] No transect sampling occurred on that given year.

Evaluation

1988-1992 Results: During this 5-year timer period a total of 102 units (20 transects and 82 walk-throughs) were monitored. Only walk-through monitoring occurred during the first four years of this five year period. The 1992 Monitoring Report indicated that 49% of the line-transected surveyed acres, to that point, were beyond the Forest Plan variability limits. Twenty units on 10 sales were monitored. Eight units with a total of 245 acres contained greater than 15% detrimental compaction. These units ranged in disturbance values from 19 to 27 percent. The influence of

past activities was observed in one of the units. Unit One of the Good Creek Pest Control Sale only had 10 percent detrimental impact from the current activities. However, a previous harvest entry in the early sixties had already created an existing nine percent detrimental impact. Since the previous activity built excavated trails horizontally across the terrain and the current activities were generally accomplished vertically on the landscape, the combination of the two activity periods created 19% cumulative DSD impact.

Some reasons for the activity areas being beyond the Forest Plan limit of 15% detrimental disturbance were: the inclusion of small areas of steep terrain within areas of more gentle terrain which resulted in improper equipment being used on steep topography, some operations where dozer piling was still required in the contract, inadequate designation of proper logging equipment, level of experience of the sale administrator(s) and/or logging operator(s), and disturbance from previous harvest entries.

1993-1997 Results: One hundred thirty-nine units within 64 sales were monitored during this five year period. Sixty-seven units were line transects and 72 were walk-throughs. Of the 67 transect units only 26 acres (less than one percent of measured acres) were beyond the Forest Plan limits. The 67 transect units contained a total of 2,022 acres. This very major reduction in acreage over the 15 percent level is mainly a result of far fewer acres that were "dozer piled". Other reasons include: a) increased winter logging, b) more broadcast burning, and c) preferred use of forwarder logging equipment. During this same period walk-throughs were conducted on 72 units containing a total of 2,656 acres. The line transects represent approximately seven percent of the total harvested acres, while the walk-throughs represent about nine percent. The total of 4,678 acres surveyed from 1992-1997 represent about 16 percent of the annual harvest acres during that 5-year timer period. If the areas measured are representative of the entire Forest, about 11 percent of logging and site preparation activities may be beyond the soil disturbance limit of the Forest Plan. This number, however, is very misleading since only one percent of the harvest activities during 1993-1997 were detrimentally disturbed. This reduction of soil disturbance exceeding 15 percent is a result of forest harvest activities moving away from dozer as opposed to excavator piling. Refer to Tables F4-1a and F4-1b.

1998-2002 Results: One hundred thirty-six units within 68 sales were monitored during this five year period. During this time period 74 units were sampled using the line-transects and 62 units were walk-throughs. During this time period a total of 2,417 acres were monitored using the linear transect procedure of which none were determined to be beyond the 15 percent detrimental disturbance level. During this same period walk-through surveys were conducted on 62 units for a total of 2,314 acres. The total of 4,731 acres surveyed from 1998-2002 represents approximately 11 percent of the harvested acres. One thing noted in the year 2002 was the increase in the “6-10%” and “11-15%” disturbance categories (Tables F4-3a and F4-3b). Part of the explanation was the increased number of units monitored for soil disturbance (11) that contained past activities. Another factor for consideration is the increased intermediate harvest activities and related increase in trails due to tree avoidance in harvest units.

2003-2006 Results: One hundred thirty three units within 53 sales were monitored during this four year period. Of the 90 line-transected units (2,706 acres) two were determined to be beyond the 15 percent detrimental disturbance level. The two units that exceeded the 15% criteria were measured in 2005 and 2006 and were both regeneration units harvested during winter season. The total affected area was 9 acres out of 52 total acres for the two units. The two units exceeding the 15% DSD value were harvested on on low relief foothills and drumlins located in the far north end of the KNF and results of soil compactions may have been mistaken for existing glacial compactions verses mankind influenced activities. Regardless, as noted in the year 2002 there continued to be an increase in the “6-10” and “11-15” disturbance categories which is attributable to units that contained past activities (Tables F4-3a and F4-3b). This is also assumed to be a result

of moving from clearcut harvest activities to intermediate harvest activities which result in more equipment entries into a unit during timber removal and more pile burning following harvest.

2007-2011 Results: This data was collected using a different methodology than the previous 19 years and although similar is not directly comparable. Data collection procedures in this time period includes sampling of temporary roads and landings located outside of the harvest units which earlier procedures (pre-1997) did not include. Similar to the 1988-2006 procedures, both temporary roads and landings located inside harvest units are sampled when randomly placed soil transects cross them. As a result, new data can still be compared to old data but old data cannot be used as part of the new data set. For 2007, 30 units from 16 sales were monitored for soil disturbance. Two of the 30 units exceeded the 15% detrimental disturbance criteria. The total area for these two units was 21 acres, of which roughly seven acres had detrimental disturbance. Both units required winter logging. The impacts were caused by logging activities that occurred when the ground was not frozen and/or appropriate snow conditions. Between 2008 and 2011 an additional 138 units from 46 sales were randomly selected and monitored for soil disturbance using the new Region 1 Soil Monitoring protocol. Of these units reviewed during this timeframe only 3 units (59 acres) located in 2 sales were found to exceed an overall 15% detrimental soil disturbance value. These units were all intermediate harvest operations completed in the fall-winter-spring operational period.

The total area reviewed between 2007 and 2011 was 5,918 acres (Table 20 F4-3b). The total affected area exceeding 15% for this time period is only 59 acres or slightly less than 1% of the total unit acres sampled using the random transect procedure (see Table 20 F4-3b). The general trend of a declining acreage and percent DSD exceeding 15% is likely due to: 1) cooperation with sale administrator(s) and/or logging operator(s); 2) changes in overall timber operations and machinery types used for harvest activities; 3) requirements by timber sale administrators to take into account slope concerns and address what types of machinery should and should not be used on site; and 4) enhanced post-harvest operations such as underburn or grapple pile activities which no longer involve aggressive dozer piling activities. Some of the factors which may still result in soils exceeding the 15% DSD value is the Region 1 requirement include: 1) data points collected on temporary roads and landings where these were not earlier a part of the Soils DSD database; and 2) forest's direction to move more towards intermediate harvest operations which result in increased number of machinery entries into a given sale unit when compared to previous regeneration harvest operations; and 3) and more disturbance from the burn pile areas themselves

2013-Present Date Results: This data was collected similarly to the 2007-2011 procedures thus includes random sampling of not only skid trails and landings located within the harvest unit but associated landings and skid trails located outside of harvest units if used for harvest activities of the unit in question. As a result this data is comparable to the data collected between 2007-2011. During 2012 – 2013, 76 units from 31 sales were randomly selected and monitored for soil disturbance, which equates to monitoring over 30% of the acres accomplished during that timeframe. Of the 1,822 acres monitored, 60% (1086 acres) were found to be <6% DSD; 32% (577 acres) were found to range between 6-10% DSD; 8% (159 acres) ranged between 11-15% DSD and no acres (0%) were found to exceed the 15% detrimental soil disturbance criteria (Table 20 F4-3b). The higher DSD values found to be present on clipper cut Cow Creek Units A2 and C3 and North Stewardship II 45T are believed to be the result of harvest operations on over-steepened ground during moist soil conditions. However, all units still fall below a 15% DSD value. Similar to the 2007-2011 data, the general trend of a declining acreage and percent DSD associated with harvest operations is likely due to: 1) cooperation with sale administrator(s) and/or logging operator(s); 2) changes in overall timber operations and machinery types used for harvest activities; 3) requirements by timber sale administrators to take into account slope concerns and address what types of machinery should and should not be used on site; and 4)

enhanced post-harvest operations such as underburn or grapple pile activities which no longer involve aggressive dozer piling activities.

Recommendations

In summary the Kootenai National Forest has collected soil compaction information on nearly 276,543 data points spread across the forest since 1992. Monitoring has shown harvest activities to be consistent with Forest Plan direction. Of the 244 units sampled using a *line transect* method in the past six year sampling period (2007-2012), only three were determined to exceed 15% detrimental disturbance (see Table 19 F4-3a). The reason for this, in all cases, was associated with required winter logging occurring when conditions were not as prescribed. This level of impact can be avoided through diligent sale administration and increased operator awareness.

Ideally, the soil quality standards that would be used for measuring soil damage would be soil structure and soil productivity. Because these soil qualities are difficult to measure, other soil qualities are substituted. These surrogates are soil compaction, rutting, soil displacement, surface erosion, severely-burned soil, and soil mass movement. The Northern Region Soil Monitoring (2011) requirements include sampling of temporary road segments and landings constructed for harvest activity to be monitored as part of the units involved. Pre-existing temporary roads and landings that are outside of the unit are not required to be monitored. Many burn piles fall outside of the detrimental category however, it should be noted that there has been an increase to the number and size of these activities. Finally, a number of additional units were reviewed for soil disturbance since the release of the R1-Supplement-2500-99-1 Soil Disturbance Monitoring Protocol but fall outside of the “random selection” category and are therefore not included in the tables presented above.

During 2012-2013, the KNF completed a two-year study and re-sampled 183 past timber sale units which were monitored following timber harvest and fuel abatement activities between 1992-2006 to determine if there was a reduction in the overall percent detrimental soil disturbance in those units. Re-sampling involved collecting data along randomly orientated transect lines and using sampling procedures identical to those used between 1992-2006. The study’s goal was to determine if soils within these timber stands have begun to ameliorate over time thereby resulting in a reduction in the overall soil bulk density conditions as compared to the results of the initial post-harvest soil monitoring data. This study did not include collecting soil disturbance values associated with temporary roads or landings located outside of unit boundaries either constructed to access timber sale units or used during harvest activities as they were not sampled on the KNF prior to 2007. Temporary roads and landings located within the unit boundaries were sampled if randomly placed transects crossed them. Data collected in that study found that of the 183 units revisited, 86% had reduced detrimental soil disturbance values as compared to the original sample values.

REFERENCES:

Gier J.G. 2014. Tracking post-harvest soil recovery of compacted soils (1992-2006) on the Kootenai National Forest, Slide Presentation, USDA Forest Service, Kootenai National Forest, 26 slides.

Howes, Steve, John Hazard, and John Michael Geist. 1983. Guidelines for Sampling Some Physical Conditions of Surface Soils. USDA Forest Service, Pac. Nor. Region. R6-RNW-146-193.

USDA Forest Service Region One. 1999. Soil Quality Monitoring. FSM 2500-Watershed and Air Management. R-1 Supplement No. 2500-99-1. 6p.

USDA FS 2011. Region 1, Approach to Soils NEPA Analysis Regarding Detrimental Soil Disturbance In Forested Areas, A Technical Guide, 32p.

USDA FS 2009. FSM 2500-Watershed and Air Management, Chapter 2500-Soil Management, Amendment 2500-2009-1, 9p.

Road Access Management, Item L-1

ACTION OR EFFECT TO BE MEASURED: The miles of road closed surface displacement and soil compaction.

VARIABILITY WHICH WOULD INITIATE FURTHER EVALUATION: +/- 20 percent of the proportion of open to closed roads, as described in the Forest Plan by the end of the first decade.

Purpose: To see if the road closure objectives of the Forest Plan are being achieved. The Plan requires that this item be reported every five years. The expected accuracy and reliability of the information is high.

Background: Just prior to the time the Plan was approved in September, 1987, about 27 percent of the National Forest System roads had either yearlong or seasonal prohibitions in effect (Forest Plan FEIS, page IV-51). The Plan projected that in order to provide the issue resolution desired, about 57 percent of the roads would eventually need some form of prohibition. This would be about double the miles of road with prohibitions at the time the Plan was approved. The assumption was that the number of new roads needed to harvest timber would increase significantly, and that they would all have prohibitions in effect when the timber sales were completed - the net result being an increase in the number of miles of road with prohibitions but the number of miles of roads without prohibitions would remain the same. The need for additional prohibitions was to protect dispersed recreation values, provide for wildlife security in big game winter and summer range, reduce road maintenance costs, and provide for grizzly bear recovery. Because of the significant increase in the amount of miles of road under prohibitions needed (from 27 percent to 57 percent), it was assumed that it would take about 10 years to accomplish. This is about an 11 percent increase each year to reach the planned level.

Evaluation: By FY 97, the objective of having prohibitions on approximately 57 percent of the Forest's roads (Forest Plan p. II-10) was achieved. By 2002, the percentage of existing roads with either yearlong or seasonal prohibitions reached 63 percent. In 2004, the percentage stabilized at 63 percent and continued to be stable through 2007. It was at 64% for 2008 through 2011, went to 65% in 2012, and back down to 64% in 2013.

Table 21 L-1 shows the progression of total miles of roads, miles with prohibitions, and percent with prohibitions. The fluctuation in road miles over the last several years has been primarily because of corrections to road data. The road data is continually improved and updated through project-level NEPA analysis.

The percentage of roads with prohibitions is 7 percent greater than estimated, and the total amount roads without prohibitions are 1,715 miles less than was estimated in the 1987 Forest Plan. This is partly a result of the fact that new road construction was less than anticipated due to reductions in the timber sale program. Prohibitions have been placed on roads that previously had no prohibitions (which were not anticipated to have prohibitions in the Forest Plan) and on newly constructed roads. The reasons for these unanticipated prohibitions include additional wildlife habitat security measures, to decrease potential sedimentation, and to improve hydrological conditions.

The trend over the last five years is that the miles of roads where motor vehicle use is prohibited, either yearlong or seasonally, has risen slightly. While the total miles of roads with prohibitions have increased by approximately 6 miles over the last five years, this is primarily from improved road data and corrections to the status of roads (changed from decommissioned to intermittently-stored).

Recommended Actions: Continue to monitor the mileage of roads with prohibitions and the reasons for the prohibitions.

Table 21- L-1 Forest Roads Access Restrictions*

FY	Total Miles of Road	Total Miles of Road with Prohibitions**	% of Total Roads with Prohibitions	Total Miles of Road without Prohibitions	Difference in Miles of Road without Prohibitions since FY87
87	6,200	1,669	27%	4,531	0
92	7,149	3,784	53%	3,365	(1,166)
97	7,460	4,275	57%	3,185	(1,346)
02	7,954	4,982	63%	2,972	(1,559)
04	7,916	4,971	63%	2,945	(1,586)
06	7,908	4,968	63%	2,940	(1,591)
07	7,888	4,983	63%	2,905	(1,626)
08	7,886	5,030	64%	2,856	(1,675)
09	7,888	5,057	64%	2,831	(1,700)
10	7,888	5,059	64%	2,829	(1,702)
11	7,862	5,041	64%	2,821	(1,710)
12	7,893	5,092	65%	2,801	(1,730)
13	7,893	5,068	64%	2,825	(1,706)

*This table reflects changes made to data prior to fiscal year 2014. Changes are due to the correction of data base and numerical errors which have and will continue to affect total road numbers. The Forest will continue to review and correct the database over the next several years. It is not anticipated that numbers will substantially change.

** National Forest System roads only, where motor vehicle use is prohibited either yearlong or seasonally.

Project Specific Amendments 1992 – 2013

The following table displays a list of approved project-specific Forest Plan amendments on the Kootenai National Forest from fiscal year 1992 through fiscal year 2013.

Table 22- Project Specific Amendments – 1992 through 2013

FY	District	Decision Date	Project Name	Standard Amended	Description	Years in Effect
1992	Rexford	7-May-92	Flat Creek	MA 15, TS #5	Placement of units adjacent to existing uncertified units	10 yrs
1992	Three Rivers	9-Jun-92	Arbo Creek	MA 12 ORD. Exceed water yield. MA 12 cover/forage rations, allow timber salvage in MA 2	Water yield created by existing situation	ORD increase-life of sale; MA2 salvage - life of sale; cover/forage rations 10-15 years
1992	Three Rivers	9-Jun-92	4th of July	MA12 ORD, MA12 cover/forage ratios, MA2 timber salvage	Water yield created by existing situation	ORD increase-life of sale; MA2 salvage - life of sale; cover/forage rations 10-15 years
1993	Fortine	12-Jul-93	Meadow View	MA 12, FS #3	ORD of 1.0 during sale; 0.75 after	2 yrs
1993	Libby	2-Jul-93	Weigel Creek	MA 12, FS #3	ORD of 1.9; 0.6 after	2 yrs
1993	Libby	14-Dec-93	Purcell	MA 12 FS #3; MA 14 FS #4 in comp 504; MA 15/16/17/18 WS #2 in comp 503	ORD increase during project activities	2 yrs
1993	Libby	14-Jun-93	Thomas/Gulch Rainy Blue	MA 12, FS #3	ORD of 3.3 (max) during Dec-Aug; 0.6 after	2 yrs
1993	Rexford	23-Jul-93	Compartment 10	MA 12, FS #3	Exceed ORD until 1994	2 yrs
1993	Rexford	25-Apr-93	Dodge Creek Heli	MA 12, FS #3	Exceed ORD until 1994	2 yrs
1993	Rexford	20-Oct-93	Compartment 26	MA 12 WS #7, TS #2	Not meeting hiding cover requirements due to harvest of dead LPP	10-15 yrs
1994	Cabinet	19-Oct-93	Gray Woodchuck	MA 12, FS #3	ORD 1.85 during sale; .75 after	3 yrs
1994	Libby	29-Apr-94	Tepee Salvage	MA 12, FS #3	ORD max 2.3 in Comp 33; 1.5 in Comp 43; ORD after sale 0.7 in Comp 33, 0 in Comp 43	2 yrs

FY	District	Decision Date	Project Name	Standard Amended	Description	Years in Effect
1995	Libby	26-Apr-95	Dry Fork Salvage	MA 12, FS #3	ORD 2.1 during sale; 0.75 after	1 yr
1995	Libby	11-May-95	Road 4904K; Mushroom harvest	MA 12, FS #3	ORD 1.5 during picking	1 yr
1995	Libby	1-Jun-95	Canyon Salvage	MA 15, WS #2	ORD 3.8 during sale; 3.0 after	1 yr
1995	Libby	27-Jun-95	Cripple Horse Salvage	MA 12, FS #3	ORD 2.1 during sale; 0.7 after	1 yr
1995	Libby	27-Jun-95	Brush Creek Salvage	MA 12, FS #3	ORD 1.4 during sale; 0.75 after	1 yr
1995	Libby	18-Aug-95	Peace Alexander Salvage	MA 12, FS #3	ORD up to 2.5 during sale; 0.75 after	1 yr
1995	Rexford	27-Jul-95	Webb	MA 12, FS #3	ORD 1.12 during sale; 0,44 after	2 yrs
1995	Rexford	5-Jan-95	Compartment 4	MA 12 TS #2 and WS #7	Harvest w/in movement corridors	10-15 yrs
1995	Rexford	5-Jan-95	Compartment 26	MA 12, FS #3	ORD 1.3 during sale; 0.75 after	2 yrs
1996	Fortine	6-Feb-96	South End Allotments	MA 24, Range #1	Allow grazing in MA 24	10 yrs
1996	Libby	10-Jan-96	Little Wolf	MA 12, FS #3	ORD max 2.3 in Comp 33; 1.5 in Comp 43; ORD after sale 0.7 in Comp 33, 0 in Comp 43	2 yrs
1996	Rexford	1-Oct-95	North Fork Salvage	MA 12, TS #7; MA 14 TS #5b	Harvest w/in movement corridors	10-15 yrs
1996	Rexford	26-Apr-96	Pinkham Allotments	MA 24, Range #1	Allow grazing in MA 24	10 yrs
1996	Rexford	24-Sep-96	Huckleberry Salvage	MA 12, TS #2, WS #7; MA 12 FS #3	Harvest w/in movement corridors. Existing ORD 0.65; during sale = 1.03, after sale = 0.65	10-15 yrs (movement corridors); 2 yrs (ORD)
1996	Three Rivers	6-Oct-95	South Fork Salvage	MA14, RS #1	Not meet partial retention	15 yrs
1996	Three Rivers/Libby	23-Apr-96	Skyline Ridge/China Basin	ORD in BMU 10	ORD of 1.2 in BMU 10; ORD of 1.71 in BAA 4-10-1	3-4 yrs
1997	Libby	21-Oct-96	Warland Salvage	MA 12 TS #2 & WS #7, MA 12 FS #3	Harvest w/in movement corridors. Existing ORD 2.6; during sale = 2.05, after sale = 0.66	10-15 years; 2 years

FY	District	Decision Date	Project Name	Standard Amended	Description	Years in Effect
1997	Libby	23-Oct-96	Bristow Salvage	MA 12 TS #2 & WS #7, MA 12 FS #3	Harvest w/in movement corridors. Existing ORD 1.27; during sale = 1.27, after sale = 0.74	10-15 years; 2 years
1997	Libby	26-Nov-96	Weigel Salvage	MA 12 TS #2 & WS #7	Harvest w/in movement corridors	10-15 years
1997	Libby	19-Jun-97	Cripple Horse Timber Sale	MA 12 TS #2 & WS #7	Harvest w/in movement corridor	10-15 years
1997	Libby	19-Jun-97	Cripple Horse Timber Sale	MA 12, FS #3	Comp 609 Existing ORD 1.4, during sale 2.2, after sale 1.4 (this is allowed for under amendment #8). Comp 610 existing ORD 0.9, during sale 2.2, after sale 0.0	2 yrs
1997	Rexford	18-Nov-96	Burro Face Salvage	MA 12 TS #2 & WS #7; MA 12, FS #3	Harvest w/in movement corridors. Existing ORD 1.01, during sale 1.49, after sale 0.75	10-15 years; 3 years
1997	Rexford	6-Jun-97	McSutton Salvage	MA 12 TS #2 & WS #7, MA 15 TS #5, MA12 FS #3	Harvest w/in movement corridors. Harvest adjacent to units not recovered. Existing ORD 0.81, during sale 1.53, after sale 0.75	10-15 years; 2-4 years; 3 years
1998	Cabinet	26-Jun-98	Beaver Creek Ecosystem Mgmt Project	MA 13, TS #3	Allow harvest in old growth	3-5 years
1998	Cabinet	26-Jun-98	Beaver Creek Ecosystem Mgmt Project	MA 10, WS #3	Suspend snag requirements	3-5 years
1998	Libby	23-Jan-98	Alexander Salvage Timber Sale	MA 12, FS #3	Comp 601, overlaps with amendments for Peace Alexander. Will allow ORD to go to 2.0, after sale 0.63	2 yrs
1998	Libby	9-Mar-98	Sheep Range Timber Sale	MA 10, WS #3	Suspend snag requirements	2-3 yrs
1998	Libby	9-Jun-98	Grubb Salvage Timber Sale	MA 12, FS #3	Comp 643, existing ORD 0.0, during project 1.53, after 0.0	1-2 yrs
1998	Libby	9-Jun-98	Grubb Salvage Timber Sale	MA 12, TS #2	Removal of hiding cover	10-15 years
1998	Libby	17-Jun-98	North Fork Jackson Salvage	MA 12, TS #2, WS #7;	Harvest w/in movement corridors	10-15 years

FY	District	Decision Date	Project Name	Standard Amended	Description	Years in Effect
			Timber Sale			
1998	Libby	17-Jun-98	North Fork Jackson Salvage Timber Sale	MA 12 FS #3	Comp 602. Existing ORD 0.75, during sale 1.5, after sale 0.75	1 years
1998	Three Rivers	16-Jun-98	Wood Rat Timber Sale	MA 10, WS #3	Suspend snag requirements	2-3 yrs
1999	Libby	11-Mar-99	Deer Marl Salvage Timber Sale	MA 12, TS #2	Removal of hiding cover	10-15 years
1999	Libby	23-Jun-99	Dry Pocks Timber Sale	MA 12, FS #3	Comp 579, existing ORD 0.0, during project 1.0, after 0.0	3 years
1999	Rexford	23-Jan-98	Parsnip Lodgepole Pine Salvage Timber Sale	MA 16, TS #4	suspend requirement that existing cutting units will not be enlarged until they are certified as regenerated and recovered	10-15 years
1999	Rexford	16-Jun-99	Pinkham timber sale	MA 12, TS #2 & WS #7	harvest within movement corridors adjacent to un-recovered openings	10-15 years
1999	Rexford	16-Jun-99	Pinkham timber sale	MA 12, FS #3	Comp. 18 and 21. Existing ORD is 1.51 and will increase to 1.81 during activity	3-5 years
1999	Three Rivers	18-Jun-99	Clay Beaver Timber Sale	MA 12, TS #2 & WS #7	harvest within movement corridors adjacent to un-recovered openings	10-15 years
1999	Three Rivers	15-Mar-99	Pine Timber Sale	MA 10, WS #3	Suspend snag requirements	2-3 years
2000	Libby	8-Jun-00	Syrup Salvage	MA 12. FS #2	Removal of hiding cover	10 yrs
2000	Libby	16-Jun-00	Syrup Salvage	MA 12, FS #3	Comp 578, existing ORD 0.34, during 2.1, after 0.34	3 years
2000	Libby	22-Jun-00	McSwede Timber Sale	MA 16, MA 11	Short term reduction in VQO for both MAs	20-25 years for each
2001	Libby	1-Oct-00	Alexander Timber Sale	MA 12, FS #3	Comp 551, existing ORD 0.33, During 2.0, after 0.33	3 years
2001	Libby	1-Oct-00	Alexander Timber Sale	MA 10, WS #3	Suspend snag requirements	3-5 years
2001	Three Rivers	10-Apr-01	Spar and Lake Forest Health Project	MA 10, WS #3	Suspend snag requirements	3-5 years
2001	Three Rivers	1-May-01	Troy Beetle	MA 10, WS #3	Suspend snag requirements	2-3 years

FY	District	Decision Date	Project Name	Standard Amended	Description	Years in Effect
2002	Cabinet	17-Jun-02	White Pine	MA 13, TS #3	Timber salvage in MA 13	2-3 years
2002	Cabinet	17-Jun-02	White Pine	MA 12, FS #3	Temporary increase in ORD from 0.71 to 2.23	5 years
2002	Cabinet	14-Jun-02	White Pine	MA 10, WS #3	Suspend snag requirements	2-3 years
2002	Rexford	5-Oct-01	Pink Stone fire recovery	MA 12, FS #3	ORD to increase to 2.70 during activities	2-5 years
2002	Rexford	5-Oct-01	Pink Stone fire recovery	MA 12, TS #2, WS #7	harvest within movement corridors adjacent to un-recovered openings	10-15 years
2002	Rexford	14-Dec-01	Gold/Boulder/Sullivan	MA 13, TS #2 and #3	Timber salvage in MA 13	2 years
2002	Rexford	14-Dec-01	Gold/Boulder/Sullivan	MA 12, TS #2, WS #7	harvest within movement corridors adjacent to un-recovered openings	10-15 years
2002	Rexford	14-Dec-01	Gold/Boulder/Sullivan	MA 12, FS #3	ORD increase to 1.52 during project activities	5-7 years
2003	Rexford	11-Oct-02	Young J	MA 12, FS #3	ORD increase to 1.19 during activities	2 years
2004	Cabinet	1-Sep-04	Dead Beaver	MA 10, WS #3	Suspend snag requirements	1 year
2004	Libby	2-Jun-04	Pipestone	MA 12, FS #3	ORD increase in 3 compartments during activities. Post project ORD at or below existing levels for 5 compartments	3-5 years
2004	Libby	2-Jun-04	Pipestone	MA 17, RS #4	Harvest will not meet partial retention VQO	20 years
2004	Libby	16-Jun-04	South McSwede	MA 12, FS #3	Comp 539 existing and during project ORD of 3.88, post-project ORD of 2.44. Comp 540 existing and during project ORD of 1.20, post project ORD of 1.20	3-5 years
2004	Libby	16-Jun-04	Bristow	MA 12, FS #3	For sub-planning unit, ORD increase from existing 1.0 to 1.5 during. Post-project ORD will be 0.78	3.5 years
2004	Rexford	28-Jul-04	Lower Big Creek	MA 12, TS #2; WS #7	harvest within movement corridors adjacent to un-recovered openings	15 years

FY	District	Decision Date	Project Name	Standard Amended	Description	Years in Effect
2005	Libby	15-Jun-05	Riverview (Alder, Cow)	MA 12, FS #3	ORD of 1.30 during activities, post project ORD of 0.96. Existing ORD = 2.0	5 years
2005	Libby	15-Jun-05	Cow Creek	MA 10, WS #3	Suspend snag requirements	5 years
2005	Rexford	14-May-05	McSutten	MA 12, FS #3	ORD increase to 1.0 during activity	10 years
2005	Rexford	14-May-05	McSutten	MA 12, TS #2; WS #7	harvest within movement corridors adjacent to un-recovered openings	10-15 years
2005	Three Rivers	14-Jun-05	Northeast Yaak	MA 13, TS #3	Timber salvage in MA 13	3-5 years
2006	Libby	18-Apr-06	Smoked Fish	MA 10, WS #3	Suspend snag requirements	5 years
2007	Cabinet	8-Jun-07	West Elk Interface Protection	MA 10, WS #3, TS #3	Suspend snag requirements. Harvest for fuel reduction objectives	3-4 years
2007	Libby	26-Jul-07	Kootenai River North	MA 10, FS #3	Suspend snag requirements	5 years
2008	Cabinet	2-May-08	Marten Creek Project	MA 10, WS #3	Suspend snag requirements	3-4 years
2008	Libby	28-Apr-08	Brush Creek Fire Salvage	MA 12, FS #3	Existing ORD of 0.84 to increase during project activities to 1.28. Post-project ORD reduced to 0.69	3 years
2008	Libby	30-Jul-08	BPA Libby-Troy Transmission Line	MA 10, WS #3	suspend snag requirements	50 years
2008	Libby	30-Jul-08	BPA Libby-Troy Transmission Line	MA 17, RS #4	Harvest will not meet partial retention VQO	50 years
2008	Rexford	25-Apr-08	Young Dodge	MA 12, FS #3	Management at the existing ORD of 0.81 during, and following of project activities	3-6 years
2008	Rexford	25-Apr-08	Young Dodge	MA 12, TS #2; WS #7	harvest within movement corridors adjacent to un-recovered openings	10-15 years
2009	Libby	8-Jun-09	Miller West Fisher	MA 12, FS #3	Existing ORD of 1.30 to increase during project activities to 2.13. Post-project ORD returns to 1.30	1-2 years

FY	District	Decision Date	Project Name	Standard Amended	Description	Years in Effect
2012	Rexford	2-May-12	Young Dodge	MA 12, FS #3	ORD above 0.75 miles per square mile over the life of the project.	5 years
2012	Rexford	2-May-12	Young Dodge	MA 12, TS #2; WS #7	harvest within movement corridors adjacent to un-recovered openings	10-15 years
2013	Cabinet	8-April-13	Pilgrim Creek	MA 12, FS #3	ORD above 0.75 miles per square mile over the life of the project.	Life of the project

List of Acronyms

AMS	Analysis of the Management Situation
ASQ	Allowable Sale Quantity
AUM	Animal Unit Months
BH	Breast Height
BMU	Bear Management Unit
BORZ	Bears Outside the Recovery Zone
BY	Bear Year (April 1 to November 15 (IGBC))
CYE	Cabinet Yaak Ecosystem
DBH	Diameter Breast Height
DSD	Detrimental Soil Disturbance
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	Endangered Species Act
EMS	Environmental Management Systems
FEIS	Final Environmental Impact Statement
FIA	Forest Inventory and Analysis
FP	Forest Plan
FSH	Forest Service Handbook
FSM	Forest Service Manual
FWS	(US) Fish and Wildlife Service
FWP	Fish, Wildlife and Parks
FY	Fiscal Year
GIS	Geographic Information System
HE	Habitat Effectiveness
IDFG	Idaho Department of Fish and Game
IGBC	Interagency Grizzly Bear Committee
INFS	Inland Native Fish Strategy
KNF	Kootenai National Forest
LAU	Lynx Analysis Units
MA	Management Area
MDFWP	Montana Department of Fish, Wildlife and Parks
MMBF	Million Board Feet
NCDE	Northern Continental Divide Ecosystem
NEPA	National Environmental Policy Act
OMRD	Open Motorized Route Density
ORD	Open Road Density
ORV	Off-road Vehicle
R1	Region 1 (Forest Service Region 1)
T&E	Threatened and Endangered
TMRD	Total Motorized Route Density
TPA	Trees per Acre
TRD	Total Road Density
USFWS	United States Fish and Wildlife Service