United States
Department of
Agriculture

Forest
Service

December 2016

Gallatin Forest Plan

Management Indicator Species Assessment

Population and Habitat Trends
5 year monitoring document

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Introduction

The Forest Service is required by National Forest Management Act (NFMA) to "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives" 16 U.S.C. 1604(g)(3)(B). The Forest Service's focus for meeting the requirement of NFMA and its implementing regulations is on assessing habitat conditions based on local information and knowledge, best available science, and/or habitat models to provide for diversity of animal communities. To aid in meeting this requirement, the Forest Plan indentifies Management Indicator Species. MIS are selected because their population changes are believed to indicate the effects of management activities (MIS; 1982 implementing regulations for NFMA (36 CFR 219.19).

The Gallatin National Forest Plan (1987) includes Forest-wide standards for major resource categories, including wildlife. Management Indicator Species are specifically addressed on Gallatin National Forest Plan; Page II-18, #13 (as amended in 2015), which states:

"Indicator species, which have been identified as species groups, whose habitat is most likely to be affected by Forest management activities, will be monitored to determine population change."

Grizzly Bear	TES
Bald Eagle	TES
Elk	big game
Wild Trout	coldwater fisheries
Goshawk	Mature Forest related species
Marten	Mature Forest related species

The monitoring section of the Forest Plan includes the following monitoring item relative to MIS:

Gallatin National Forest Plan; Page IV-6; monitoring item #16

Determine population trends of indicator species and relationships to habitat changes: Moderate precision; Moderate Reliability, 5 year intervals

The Gallatin National Forest published the Forest Plan Monitoring Report summarizing information for the period 2004-2006. That report, with respect to MIS, indicated stable to increasing population trends for Gallatin MIS wildlife species. The 2011 report also reported stable to increasing trends, but also indicated the difficulty in detecting trends in species like northern goshawk who are affected by weather in the spring, and pine marten, who are directly affected by trapping.

The purpose of this 2016 assessment is to update the best available information about population and habitat trends for Gallatin wildlife MIS species, at the Forest level or other scales, if biologically appropriate. This will set a context for the assessment of project level effects.

BALD EAGLE

Bald Eagle populations

In Montana, the bald eagle was removed from the Endangered Species list in August of 2007. In the 2009 nesting season, there were 233 active bald eagle nests in western Montana, fledging over 200 young. As of 2009, Montana had an estimated 526 bald eagle territories and targets for individual recovery zones were exceeded by 4 to 7 times. The most current state-wide estimate is about 700 pairs. Population trends on the Gallatin National Forest are also trending upward. In 2006, there were 9 nesting pairs of bald eagles on the Gallatin National Forest and bald eagles have occupied one new nest territory on the Gallatin in recent years. Nests are monitored in partnership with the state of Montana each year. In addition, data on nests around Hebgen Lake (where all but one of the Gallatin active nests are found) is summarized below.

Figure 1. Montana Bald Eagle Nesting Territories:
 # per year from 1980 to 2009 (DuBois 2016).

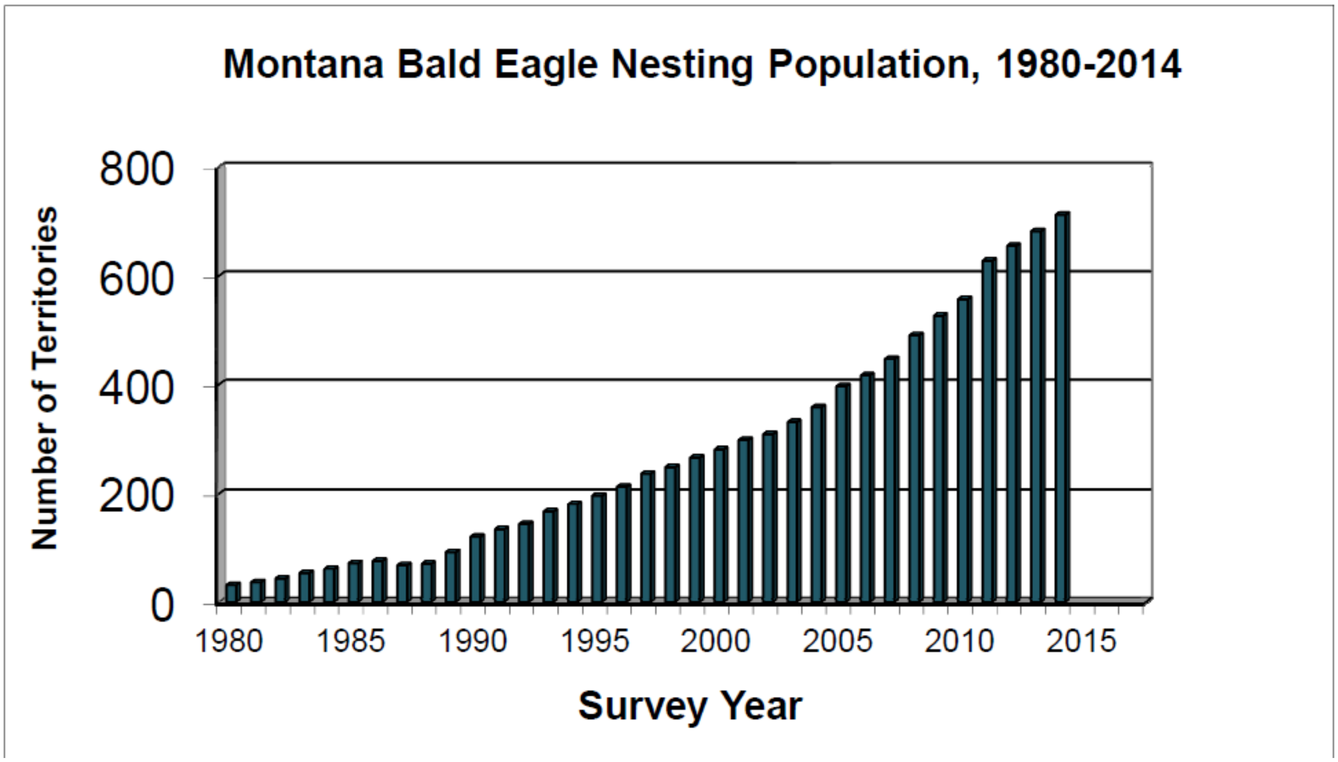
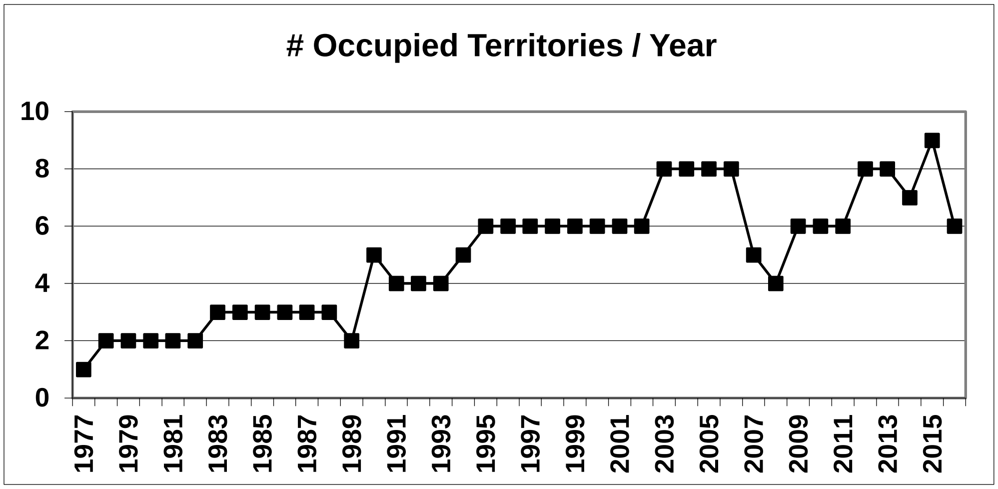
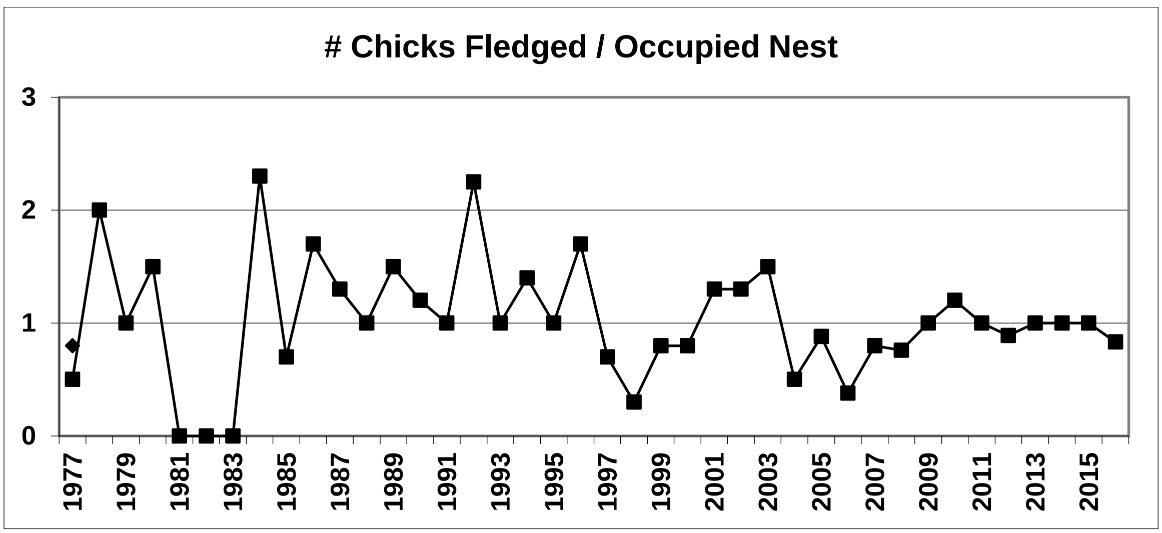


Figure 2. Hebgen Lake Bald Eagle Nests





For the past 5 years, the number of bald eagle territories have remained relatively stable. The productivity appears may have declined relative to a few banner years during recovery.

<u>Bald Eagle Habitat:</u>

Habitat for bald eagles occurs around the periphery of lakes and reservoirs (at least 80 acres in size) and in forested corridors within one mile of major rivers (MTBEWG 1994). Nests are most commonly constructed in multi-layered, mature stands with large diameter trees. All of the bald eagle territories on the Gallatin National Forest are found around Hebgen Lake; however in recent years, bald eagles have been observed nesting along the Gallatin River, with one nest (Dudley Creek) possibly on National Forest System lands. Management activities have not affected bald eagle habitat due to the incorporation of effective mitigation measures (no treatments or removal of overstory trees within 330 feet of a nest, as per National Guidelines). There are also specific nest site management plans for nests located on the Gallatin National Forest.

Summary: Populations of bald eagles have increased state-wide and on the Gallatin National Forest. The effects of management activities on the Gallatin National Forest have been effectively mitigated through nest management plans that limit vegetation alteration and human disturbances.

GRIZZLY BEAR

Grizzly Bear populations:

The Greater Yellowstone Ecosystem (GYE) grizzly bear population occupies parts of Montana, Idaho, and Wyoming, and includes parts of five national forests (including the Custer Gallatin), two national parks, state, private lands, and lands managed by BLM.

The GYE grizzly bear population met recovery objectives and was petitioned for delisting by the U.S. Fish and Wildlife Service in 2005. A Final Rule designating GYA grizzlies as a Distinct Population Segment and removing this segment from the endangered species list was published in the Federal Register in March 2007. However, a September 21, 2009 court order vacated the delisting and the GYA grizzly bear population was again listed as threatened under the ESA.

A new delisting proposal was published in March 2016 and there is a draft 2016 Conservation Strategy that will provide direction for the management of grizzly bears when delisted. The Gallatin amended their forest plan in 2015 to include the habitat standards for secure habitat, developed sites, and livestock grazing from the 2007 Conservation Strategy. Those standards are in place regardless of listing status, and are mostly verbatim for the direction in the 2016 conservation strategy. As part of the updates (in both the 2015 amendment and the draft 2016 Conservation Strategy), 3 subunits on the Gallatin National Forest (Gallatin #3, Madison #2, and Henry's Lake #2) now have secure habitat baseline levels at the full implementation of the 2006 Gallatin Travel Management Plan.

Critical habitat for grizzly bears has not been designated in the Greater Yellowstone Ecosystem (GYE). A Recovery Zone (RZ) boundary was delineated as part of the Recovery Plan for grizzly bears. It is the area determined to be sufficient to meet recovery goals for an ecosystem and provide the habitat components that allow a high probability of persistence into the future (ICST 2007). Within the RZ, bear management units (BMUs) were delineated as a way to measure and monitor population and habitat conditions; subunits allow better resolution of habitat measurement (ICST 2007). The following excerpt is from the final Grizzly bear 5-year review published in 2011 by the USFWS (USDI 2011):

> Critical Habitat
>
> FR Notice: No final rules issued. Action: In 1976, we proposed to designate critical habitat for the grizzly bear (41 FR 48757, November 5, 1976). This designation was made stale by the 1978 critical habitat amendments to the ESA including the requirement to perform an economic analysis. This proposal was never finalized. Recognizing the importance of habitat to the species, instead, the Interagency Grizzly Bear Committee (IGBC) issued habitat management guidelines (hereafter referred to as the Guidelines) within all occupied grizzly bear habitat (USFS 1986). *Note: The 1986 IGBC Guidelines have been superseded by the Habitat-based Recovery Criteria appended to the 1993 Grizzly Bear Recovery Plan (USDI 2007). The 2007 Final Conservation Strategy for the Grizzly Bear in the Greater Yellowstone Area is consistent with the Recovery Plan.*

Overall, general habitat conditions in the GYE are excellent due in part to large blocks of undisturbed and secure habitat within the recovery zone, with low open road and total motorized access route densities in most of the grizzly bear subunits (USDI 2006).

Bears are well-distributed in that they occupied 17 of 18 Bear Management Units (BMUs) in 2015 (IGBST 2015), including all the 9 BMU's that are at least partially within the Gallatin National Forest.

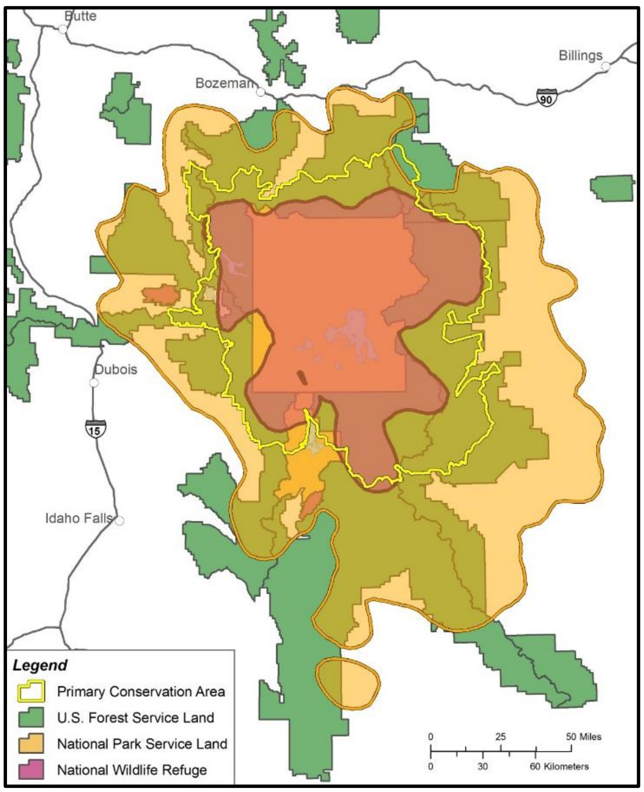
Occupied Range 1959 - 1970

- ~ 234 Bears
- 16,160 km²

Occupied Range 2000 - 2014

- 757 – 1,000 Bears
- 58,314 km²
- 261% increased range

Figure 3. Grizzly Bear Distribution over time



The current population estimate (IGBST 2015) is 717 bears in the demographic monitoring area (639-794; 95% Confidence Interval).

Grizzly Bear habitat:

The measure of habitat quality for grizzly bears is secure habitat, which is defined as habitat at least 500 meters from an open or gated motorized access route. Inside the Recovery Zone, this information is summarized for individual bear management units (BMU), which are divided into subunits (Figure 4). The Gallatin National Forest undertook a comprehensive (forest-wide, all seasons) travel planning effort beginning in 2002. The Travel Plan Record of Decision (ROD) was signed in 2006 (when the bear was a listed species). Secure habitat on the Gallatin National Forest has increased over 1998 levels since the travel plan decision specifically targeted increases in secure habitat for three bear subunits that were designated as needing improvement (Table 2). Outside the Recovery Zone, monitoring of habitat is done every other year using Bear Analysis Units (BAUs). Figure 5 shows the BAUs on the Gallatin National Forest. Conditions outside the Recovery Zone are summarized in

Figure 4. Bear Management Units and subunits in the GYE

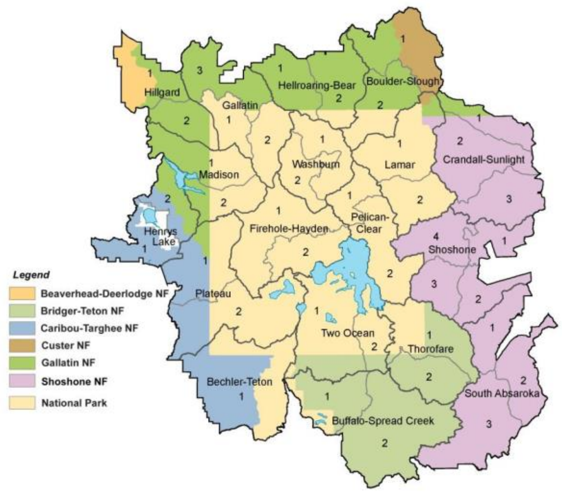
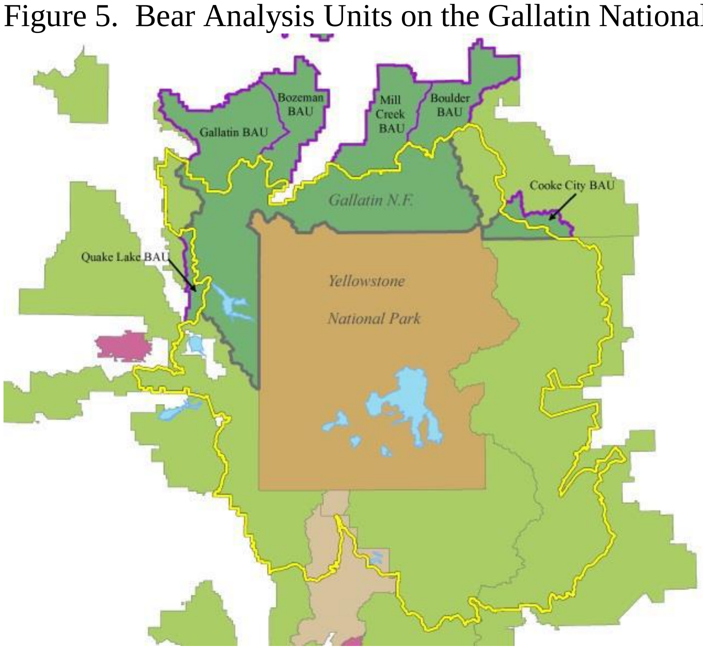


Figure 5. Bear Analysis Units on the Gallatin National Forest



Summary: Management activities on the Gallatin National Forest have increased secure habitat for grizzly bears, which may be contributing to the increasing occupation and populations of grizzly bears on the Gallatin National Forest outside of the recovery zone.

Table 1. Conditions outside the Grizzly Bear Recovery Zone

BAU	**2014 Secure Habitat**	**Full Travel Plan Secure**
Boulder	69.9	69.9
Bozeman[1]	59.4	58.6
Cooke City	99.6	99.6
Gallatin[1]	59.5	57.0
Mill Creek	83.8	83.8

[1]Current levels are higher than full travel plan because of more restrictive interim travel management in the Hyalite Porcupine Buffalo Horn Wilderness Study Area. This is unlikely to change anytime soon.

Table 2. 2014-2015 GNF Changes in OMARD, TMARD, and Secure Habitat. Golden color shading indicates subunits in need of improvement which now have a 2006 baseline.

BMU Subunit Name	OMARD (% > 1 mile / sqmile) Season 1 (Mar 1- Jul 15)			OMARD (% > 1 mile / sqmile) Season 2 (Jul 16- Nov 30)			TMARD (% > 2 miles / sqmile)			% Secure Habitat			
	2014	2015	Diff	2014	2015	Diff	2014	2015	Diff	1998 or 2006	2014	2015	Diff
Boulder/Slough #1	2.8	2.8	0.0	2.8	2.8	0.0	0.2	0.2	0.0	96.6	97.1	97.1	0.0
Boulder/Slough #2	2.1	2.1	0.0	2.1	2.1	0.0	0.0	0.0	0.0	97.7	97.7	97.7	0.0
Crandall/Sunlight #1	12.5	12.4	0.0	18.5	18.5	0.0	6.3	6.3	0.0	81.9	81.9	81.9	0.0
Gallatin #3	18.6	18.6	0.0	27.4	27.4	0.0	12.5	12.5	0.0	70.7	**72.0**	**72.5**	**0.5**
Hellroaring/Bear #1	18.4	18.4	0.0	18.4	18.4	0.0	**11.6**	**12.1**	**0.5**	77.0	**80.6**	**80.4**	**-0.2**
Hellroaring/Bear #2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	99.5	99.6	99.6	0.0
Henry's Lake #2 **	41.3	41.3	0.0	41.3	41.3	0.0	**30.8**	**30.7**	**0.0**	51.5	51.5	51.5	0.0
Hilgard #1 **	8.2	8.2	0.0	**13.4**	**13.3**	**0.0**	4.4	4.4	0.0	69.8	83.1	83.1	0.0
Hilgard #2	8.8	8.8	0.0	16.1	16.1	0.0	4.6	4.6	0.0	71.4	80.2	80.2	0.0
Lamar #1 **	9.7	9.7	0.0	9.7	9.7	0.0	**3.9**	**4.0**	**0.0**	89.4	89.9	89.9	0.0
Madison #1	13.2	13.2	0.0	20.3	20.3	0.0	7.5	7.5	0.0	71.5	80.7	80.7	0.0
Madison #2	32.0	32.0	0.0	32.0	32.0	0.0	21.6	21.6	0.0	66.5	67.5	67.5	0.0
Plateau #1	16.9	16.9	0.0	19.0	19.0	0.0	10.3	10.3	0.0	68.8	70.6	70.6	0.0

** changes in OMRD or TMRD were less than 0.1% due to database cleanup; **Red text denotes a change;**

ELK

<u>Elk Populations</u>

Elk populations are managed by the Montana Department of Fish, Wildlife, and Parks (FWP) to provide diverse hunting and viewing opportunities. As a hunted species and also a prey species for large carnivores, there are many factors affecting population trends independent of Forest Service management actions.

Elk populations are generally monitored using annual winter surveys from fixed wing aircraft. For some populations on the Gallatin, there have also been radio-telemetry data to study elk movements. There are 15 hunting districts that span the breadth of the Gallatin National Forest (see attached maps). Each of these is grouped into an Elk Management Unit (EMU) that has specific objectives, including population ranges that are desired. These objectives are outlined in the State's Elk Plan (updated in 2004). The table below was summarized from the State's Elk Plan and the most current flight reports.

Elk numbers have been increasing in Montana and throughout the west since the early to mid-1900s (MDFWP 2004). Elk are managed and counted, however, by elk hunting districts (HDs) or elk management units (EMUs) for which population and habitat objectives have been set (MDFWP 2004, Cunningham 2014, MDFWP 2015). The most recent elk counts, as well as information regarding whether the unit (HD or EMU) is at, above, or below the objective established in the statewide plan is displayed in Table 2.

Table 2. Estimated Elk Population and Trend; data from FWP.

Elk Management Unit	Hunting District(s)	ElkPlan Objective (Observed Elk)	Most Recent Number Elk Observed	Status	Estimated Actual Elk Numbers*	Hunter Opportunities (2016 regulations)
Bridger[1]	312, 390, 391, and 393	2,840-4,260	9,236	Over objective	11,545	Brow-tined bull or antlerless plus unlimited cow permits on private land
Crazy Mountain	315, 580	800-1,200 780-1170	1,246 4,616	Slightly over Over objective	1,558 5,770	Brow-tined bull or antlerless plus 400 cow permits; either sex permits on private land
Gallatin Madison	301, 309 Lower Gallatin; Bozeman Face	400-600	587	At objective; stable	734	301: Brow-tined bull or antlerless plus cow permits on private lands only. 309: either sex archery and rifle; cow harvest late season on private lands

Elk Management Unit	Hunting District(s)	ElkPlan Objective (Observed Elk)	Most Recent Number Elk Observed	Status	Estimated Actual Elk Numbers*	Hunter Opportunities (2016 regulations)
Gallatin Madison	310 Upper Gallatin Canyon	1,200-1,800	372	Below objective; increasing	465	Youth season for brow-tined bulls; permits for brow-tined bulls; one per hunter
Gallatin Madison	311 Spanish Peaks	2,000-3,000	1,052 (only surveyed on the Flying D	At objective; stable (FWP estimated)	1,315	Either sex youth hunt; brow-tined or antlerless
Gallatin Madison	314 West Paradise Valley	2,400-3,600	3,528	At objective	4,410	Brow-tined bull or antlerless plus 25 cow permits
Gallatin Madison	360,361,362 East Madison Valley	4,260-5,140	5,694	Slightly over; stable to increasing	7,118	Brow-tined bull or antlerless archery; brow-tined rifle; youth either sex; 500 cow permits
Northern Yellowstone	313, 316 Gardiner Basin North of Yellowstone Park	3,000-5,000	3,758	At objective outside of the park. There has been a dramatic decline in the elk population on the Yellowstone Northern Range	4,698	313: 30 cow permits for youth and by draw (holders may not hunt antlered elk) 50 brow-tined bull permits first choice only Sept 3-Oct 16 and Nov 14-Nov 27 316: backcountry hunt; either sex Sept 15-Oct 21 antlered bull Oct 22-Nov 27 (either sex youth)
Absaroka	520, 560 Beartooth District, Boulder River	2,420-3,180	4,374	Over objective	5,468	Antlerless archery and either sex rifle; 1200 cow permits on private land plus early and late season hunts on private land

The Forest Plan EIS suggested that 3,300 elk constituted a minimum viable population on the Gallatin National Forest (EIS, page II-62). Generally, elk populations have increased since the Forest Plan was signed. In addition, FWP developed an elk plan and set objectives based on habitat and landowner tolerances (updated in 2004). Many of the elk herds on the Gallatin are within the objectives set by FWP. There are two situations where elk populations are dramatically lower than in the past. These include the Upper Gallatin elk (HD 310), where historically there were concerns about elk being over carrying capacity. Since 2005, elk have been declining and a part of the elk herd leave the Gallatin Valley and occupy private lands in the Madison Valley during the winter (or earlier) (Cunningham 2014). Similarly on the Northern Yellowstone Range (HD 313), historic elk populations were very high due to high numbers of elk summering in YNP. Elk populations were managed in part through the Gardiner "late hunt" giving hunters an opportunity to harvest elk as they migrated out of YNP. The overall population has dropped from over about 20,000 to fewer than 5,000 elk. However, the number of elk wintering outside YNP in Montana has remained within this rough objective for most of the last 10 years (Cunningham 2014). The proportion of elk leaving YNP during the winter has increased from about 50% to over 70%. Causes for this population decline may include overharvest by hunters, predation by wolves, and competition with a growing bison population on the northern range.

Other elk populations on the CGNF are dramatically over objective. These situations are generally a result of poor hunter access to harvest animals due to a preponderance of private lands (e.g. HD 580, HD 393).

FWP elk population management focuses on maintaining numbers above population viability thresholds, protecting certain sex and age classes from over-harvest, providing public hunting opportunity, and attempting to balance elk distribution across public and private lands. This is reflected by the hunter opportunities shown in Table 2. The USFS strives to complement MFWP's efforts through management of elk habitat on USFS lands (MFWP and USFS 2013). As such, both agencies share the management goal of maintaining elk on public lands and work together to design habitat management recommendations to achieve this goal.

<u>Elk Habitat:</u>

With the exception of the 2006 Derby Fire, FWP flight memos do not include any commentary of the habitat conditions on public lands. The implication made relative to the Derby Fire is that elk were attracted to the increase in available forage and the vegetation mosaic created by different fire intensities.

The most common reason FWP biologists gave for elk populations being "over objective" is limited access during the hunting season or displacement of elk to private land during the rifle season, when most elk are harvested. Because much of the Gallatin National Forest is bordered by adjacent lower elevation private land, in some places there is limited public access to the public land. In other areas, hunting pressure on public lands displaces animals to private "refuges".

In a series of meetings (2011-2013) attended by FWP and eastside Forests (Gallatin, Helena, Custer, and Lewis and Clark), specific elk habitat issues on the Gallatin National Forest included open ATV routes during archery season which displace elk onto private land (Smith-Shields portion of the Crazy Mountains) and the loss of cover due to mountain pine beetle mortality (Boulder River area in Absaroka-Beartooth Mountains) (MDFWP and USFS 2013).

COVER and FORAGE:

Elk are habitat generalists, foraging on a wide variety of grasses, forbs, and occasionally on shrubs or other browse. They typically summer in higher elevation areas, often on NFS lands, where both forage and cover are available. Winter habitat usually occurs at lower elevations and most often below the elevation of the National Forest on private lands. Small groups of elk may remain over winter at higher elevation where slopes consistently blow free of snow. Use of specific areas and habitats may change over time due to a variety of factors that may include changes in vegetation, patterns of human use, transportation systems, weather and climate patterns, changes in the behavior of individuals and groups of elk, and both hunter harvest and natural predation.

Just prior to the first Forest Planning efforts, forest management focused primarily on road building and timber management. The cooperative elk-logging studies of the 1970s and 1980s providing some of the first insights into the effects of these activities on habitat use by elk, and developed the concept of managing public lands to include secure areas for elk (Lyon et al. 1985). While specific recommendations were not made, it was recognized that logging activity and the associated roads caused displacement of elk from areas of traditional elk use. Thus, it was recommended that timber harvests should be designed to minimize the number of routes and the duration of logging activity (Lyon et al. 1985). This body of information was originally incorporated into many Forest Plans, including the Gallatin Forest Plan. The main standard for elk in the current Gallatin Forest Plan is 6a (5) (item 9 in table above) requiring retention of 2/3 of the hiding cover over time. This standard was worded differently in 1987 and required a white paper for its interpretation (Canfield 2011) and therefore was "cleaned up" in an amendment completed in 2015.

The habitat standard for providing cover for elk in the Forest Plan (amendment 2015) is as follows:
6 a (5). "Vegetation treatment projects (e.g. timber harvest, thinning and prescribed burning) shall maintain at least two-thirds (2/3) of Douglas fir, lodgepole pine, and subalpine fir conifer forest cover types (on National Forest System lands) with at least 40% canopy cover (on National Forest System lands), to function as hiding cover for elk at any point in time. Hiding cover will be assessed for an elk analysis unit (EAU) which is based on a collaborative mapping effort between the local state (MDFWP) wildlife biologist and the local Forest Service wildlife biologist. In designing vegetation treatment projects protect the integrity of key habitat components, such as wallows or moist meadows, through project design or mitigation (e.g. no cut buffers)."

A current snapshot of cover by analysis area is found in Table 3. Hiding cover is defined as all Douglas fir, lodgepole pine, and subalpine fir cover types having at least 40% canopy cover.

Affected hiding cover is defined as those areas with the potential to be hiding cover, but because of recent (15 years) disturbances, are currently not functioning as hiding cover. Other cover is defined as those forest types mentioned above at canopy cover levels less than 40%. Forty percent is used as a proxy based on field studies completed on the Gallatin (Canfield 2011).

Table 3. Cover for the Gallatin National Forest as of 2016 data.

Madison, Henry's, Gallatin and Absaroka Beartooth Mountains

Hiding Cover	**Affected Hiding Cover**	**Other Forest Cover**	**Not potential hiding Cover**
38%	7%	23%	32%

Bridger, Bangtail, and Crazy Mountains

Hiding Cover	**Affected Hiding Cover**	**Other Forest Cover**	**Not potential hiding Cover**
52%	1%	17%	30%

The Ranglak et al. (2016a) model indicated that during summer, cow elk selected for areas of high nutrition. The effect of motorized routes varied by elk herd, but generally was dramatically overshadowed by nutrition as represented by a time integrated greenness index (NDVI). In areas of poor nutrition, elk avoided motorized routes; and in areas of good nutrition, elk did not avoid motorized routes. The report recommends that the current elk summer habitat management paradigm based on managing motorized route density to maintain elk habitat effectiveness (Lyon 1983) be expanded to also consider nutritional resources, and that managers assess the relationships between time integrated NDVI and existing vegetation mapping products (e.g., R1VMAP) to determine the types of areas within their jurisdiction that contain optimal NDVI values (i.e., values $\geq$ 66). High values should be evaluated with respect to fire, grazing, weed treatments, etc. to help managers understand the relationships between management actions and summer range elk nutrition. Low motorized route densities may, in some cases, compensate for sub-optimal nutrition. Wisedom et al. (2005) found that in northeast Oregon, elk responded both to the presence of motorized routes and the level of traffic on those routes.

Overall, areas of high nutrition are rare and seem to be associated spatially with north aspects and high elevations. Around 3,000 acres were recently burned forests. Proportionally, compared to low nutrition areas (class 0-1), optimal nutrition areas included more "wet grass", shrub and deciduous tree lifeforms and less tree lifeform. Proportionally, compared to low nutrition areas, optimal nutrition areas included less of all the conifer cover types except spruce with a notable small proportion in whitebark pine cover types and in recently burned or transitional forest types. Relative to tree size class in the forested areas, there was not a notable difference between nutrition classes except that optimal nutrition areas were more often in the 15" plus tree size class compared to low nutrition areas. Low nutrition areas were more likely to have high (60% plus) canopy cover than higher nutrition areas. Four classes of relative nutritional quality using time integrated NDVI are summarized (existing condition) in Table 6. The classes were based on parameters from Ranglak et al. (2016a), which considered optimal elk summer nutrition as

NDVI > 66; moderate summer nutrition was classified as NDVI 46-65; poor summer nutrition were areas with NDVI <46.

Table 6. NDVI levels for the Gallatin National Forest.

Madison, Henry's, Gallatin and Absaroka Beartooth Mountains

NDVI classes	Optimal	Moderate	Poor
% and acres	4% (83,300 acres)	19% (445,800 acres)	77% (2,346,316)

Bridger, Bangtail, and Crazy Mountains

NDVI classes	Optimal	Moderate	Poor
% and acres	3% (9,200 acres)	36% (104,800 acres)	61% (291,111)

TRAVEL MANAGEMENT

In the early 1990's, biologists from both agencies recognized that a new management paradigm was needed, leading to the Elk Vulnerability Symposium in Bozeman, Montana in April 1991, hosted by the Montana Chapter of the Wildlife Society. It was here that the concept of security areas for elk was first formalized (Hillis et al. 1991). Hillis et al. (1991) analyzed data collected from radio-collared elk (bulls and cows) during the rifle hunting season in relatively continuous conifer forests in western Montana (Lyon and Canfield 1991) They recommended managing for at least 30% of a valid analysis area in forest blocks of similar canopy cover structure, which were at least 250 acres in size, and at least 0.5 mile from the nearest motorized route. The objective of managing for security areas was to provide reasonable levels of bull elk survival and hunter opportunity during the rifle hunting season. The authors cautioned that the numerical parameters they reported for block size and distance to the nearest motorized route should not be considered an exact 'recipe' to be followed in all situations, but that the concepts (size, distance, and percent of a valid analysis area) could be tailored to an area based on local knowledge. As such, a variety of security definitions, some including specific requirements for minimum forest cover, have been used in developing travel management plans and for evaluating project level effects on elk (Christensen et al. 1993). In areas where forest cover is less contiguous than western Montana, where the Hillis paradigm was generated, the importance of forest cover for security areas has been questioned, but not formally examined.

More recently, a group of USFS and FWP biologists recently summarized and evaluated literature and discussed their own experiences in managing elk populations and habitats across southwest Montana and developed collaborative recommendations that included the need to manage travel routes and closures to include the archery season; the need to provide hunting season security through tailoring the concepts from Hillis et al. to specific situations and security area needs; the need to manage summer range for low motorized route densities (habitat effectiveness); the need to provide forest cover within the historical range of its distribution; acknowledgement that there is no need to distinguish between hiding and thermal cover (and agreeing on a proxy of 40% canopy cover); the need to minimize disturbance of all types (motorized and non-motorized) on elk winter range; and the need to provide quality forage for elk across seasonal ranges (MDFWP and USFS 2013).

Over the past year, as a way to beta test the recommendations with elk relocation data, in 2015 FWP and the FS sponsored a post doc student at MSU to use fine-scale location data collected during 2005–2014 to assess female elk resource selection during the archery and rifle hunting seasons in 9 elk herds in southwestern Montana. These results include summer range selection, archery season selection, and rifle season selection. The summer range and fall reports are final and there are peer reviewed manuscripts in progress (Ranglack et al. 2016a, Ranglack et al. 2016b).

While most research and management has focused on the impacts of rifle hunting on elk, archery hunting has been increasing in popularity, with a 98% increase in archery license sales in Montana since 1985 (Montana Fish, Wildlife and Parks, unpublished data). As such, it is important to examine elk responses to archery hunting. Archery hunting has the potential to lead to reduced pregnancy rates and delayed conception in elk (Davidson et al. 2012). Nutritional condition of female elk during the late-summer and rut is also related to pregnancy rates and conception (Noyes et al. 2004, Cook et al. 2013). It is therefore possible that human disturbance associated with archery hunting may shift elk distributions away from areas of high nutritional resources, potentially impacting elk population dynamics further than would be expected through archery hunting mortality alone. Ranglack et al. (2016b) is recently available and summarized below. As indicated by the collaborative recommendations from 2013, some elk in this study selected for private lands not known to be accessible to public hunters during the archery season. One main finding that differs from the collaborative recommendations was that hunter density influenced elk resource selection during the fall. Elk were significantly ($p \leq 0.05$) more likely to use areas further from motorized routes as mean hunter effort in the annual range increased during both the archery and rifle seasons. As discussed in the collaborative recommendations, forest hiding cover was not selected by elk overall. Of the traditional security area metrics with a minimum block size of 250 acres at least 0.5 miles from a motorized route, 0-10% canopy cover (i.e., no canopy cover threshold) was the most supported. This validates the collaborative recommendation that the traditional security model derived from research in western Montana (Hillis et al. 1991) where forested blocks of similar canopy structure were important to elk during the stress of hunting season did not fit the conditions in southwest Montana where there is a natural mosaic of cover and openings. In the Ranglack et al. (2016b) analysis, elk selected for some low level of forest cover after which selection leveled off quickly and distance to a motorized route was more important.

In general, during the **archery season**, elk were more likely to use areas that were not known to be publicly accessible (private lands). Regardless of accessibility, elk were less likely to use hunting districts with higher hunter effort. Further, elk were more likely to use areas as distance to motorized routes, canopy cover, time integrated NDVI, and solar radiation increased, though distance to motorized routes and canopy cover quickly reached a pseudo-threshold at ≥1.71 miles and ≥13% respectively for publicly accessible lands, after which further increases in distance to motorized routes and canopy cover resulted in only small increases in elk resource selection. Elk were also more likely to use moderate slopes. All interactions improved model fit. Model results indicated that at high NDVI values, there was little difference in elk selection for areas near *versus* far from motorized routes, but at low NDVI values, elk were more likely to use areas far from motorized routes. Elk also were less likely to use areas with higher hunter effort if they were closer to motorized routes, but elk showed little response to increases in hunter effort far from motorized routes. Additionally, the difference in strength of selection for areas with high and low canopy cover was greater on publicly accessible lands that on lands that are not known to be publicly accessible. This same pattern was also found for the difference in the strength of selection for areas near and far from motorized routes.

Similar to the archery hunting season model, during **rifle season** elk were more likely to use areas that were not known to be publicly accessible (private lands). Regardless of accessibility, elk were more likely to use areas as distance to motorized routes, canopy cover, hunter effort, and solar radiation increased. Elk were less likely to use areas as elevation and snow water equivalent (SWE) increased. Elk responses to distance to motorize routes, canopy cover, and hunter effort quickly reached pseudo-thresholds at ≥0.95 miles, ≥9%, and ≥3.44 hunter days/mile^2 respectively for publicly accessible lands, after which further increases in distance to motorized routes, canopy cover, and hunter effort resulting in only small increases in elk resource selection. Elk also were more likely to use moderate slopes.

The authors concluded that elk responses to hunting risk during the archery season were similar to elk responses during the rifle season and that travel closure dates should acknowledge this relationship. They even suggested that some routes may be able to be re-opened for rifle season and this might have the effect of keeping elk on public land for the archery season. Nutrition is very important to elk during summer, somewhat important during archery season, and then snow depth becomes important during the rifle season. They recommended that managers assess the balance between hunter pressure and motorized routes in their area and consider wildlife related travel closure dates during both archery and rifle hunting season in areas of high hunter pressure (≥12.75 hunter days/mile^2), or hunting seasons that limit hunter pressure in areas of high motorized route densities. The information from this study daylights the need for State population managers and federal land managers to be working closely together to manage elk and their fall habitat. Based on their results, the authors felt that the traditional Hillis et al. security area be replaced (in southwest Montana) by security areas being defined as having ≥13% canopy cover that are ≥1.71 miles from a motorized route during the archery season, with no minimum block size requirement, and as having ≥9% canopy cover that are ≥0.95 miles from a motorized route, that are at least 5,000 acres during the rifle season.

The old and new security area models are summarized in Table 4. The Hillis et al. (1991) model was run relative to routes open September 1 through November 30. Generally speaking, the Hillis model (run without the cover requirement) predicts much higher levels of security areas than the model derived from elk resource selection in southwest Montana. If the new paradigm is more accurate than Hillis et al. (1991) for the area that was included in the study (Madison, Henrys, Gallatin, and Absaroka Beartooth Mountains), it may help explain why elk redistribution to private lands often occurs during the archery season and those elk then are not available to the average public hunter. The new paradigm suggests that hiding cover is not the key habitat feature that elk select under pressure. It also suggests the importance of FWP and USFS working together to balance hunter access (travel management) and hunting pressure (regulations). Ranglack et al. (2016 b) cautioned about extrapolating resource selection inferences to areas outside of southwest Montana. Therefore, although, displayed, the Ranglak model results for the Bridger, Bangtails, and Crazy Mountains may not reflect resource selection by elk that inhabit those areas. In those areas, the Hillis paradigm, without a hiding cover constraint, can help inform project level effects on elk.

Table 4: Security percentages on the Gallatin National Forest using the old and new paradigms.

Madison, Henry's, Gallatin and Absaroka Beartooth Mountains

Security Paradigm	**Archery**	**Rifle**
Hillis et al. (1991)	72%	72%
Ranglack et al. (2016)	23%	29%

Bridger, Bangtail, and Crazy Mountains

Security Paradigm	**Archery**	**Rifle**
Hillis et al. (1991)	50%	50%
Ranglack et al. (2016)	8%	11%

Looking at specific hunting districts (Table 5), the trend has been an increase in security (Hillis) and a decrease in motorized route density, which was a result of the 2006 travel management plan decision.

Table 5. Motorized route density and security levels before and after the 2006 Gallatin Travel Management Plan.

Hunting District	Pre travel plan level (Alt 2)		Current (as per travel plan decision Alt 7-M in 2006)	
	Open route density (all motorized FS routes)	Security areas (%)	Open route Density	Security areas (%)
301	1.2	31	1.2	33
310	0.6	64	0.5	69
311	0.1	86	0.1	86
312	1.0	49	0.8	51
313	0.3	69	0.3	68
314	0.6	51	0.3	54
315	0.9	31	0.7	35
316	0.1	94	0.1	94
317	0.4	77	0.3	78
360	0.3	27	0.4	25
361	1.3	23	1.2	24
362	0.4	66	0.3	76
393	0.7	11	0.8	12
560	0.4	76	0.3	80
580	0.2	70	0.2	70

Thresholds for open route density from the literature include <0.7 miles/square mile (Christensen et al. 1993) where elk are a featured species; <1.9 miles/square mile where elk are one of the primary resource considerations, and less than 1.0/mile/square mile to optimize elk summer use (Canfield et al. 1999).

Post travel plan decision, only 2 hunting districts exceed the 1.0 mile/square mile threshold; all are within the upper threshold from Christensen et al., and 10 of 15 are below the lower threshold from Christensen et al.

Only 3 hunting districts are below the recommended level of security areas, and only one of those hunting districts (361) has a route density >1.0 mile/square mile.

At the forest level, there are about 1,200,000 acres of security (using the Hillis et al. definition). When security areas are intersected with FWP elk summer/fall distribution, there are 1,164,377 acres that are farther than ½ mile from an open motorized route during the summer/fall months (this includes wilderness areas), or over 55% of the Forest.

Summary: Elk populations are managed by the FWP to include a harvestable surplus, but to be sensitive to the tolerances of private landowners as well. FWP adjusts harvest quotas to try and stay within an agreed upon population level for each EMU. These populations are influenced by multiple variables, but generally not by a lack of habitat. Habitat on the Gallatin National Forest includes many areas with high security (low road density) and abundant hiding cover. High quality foraging habitat appears to be very limited and management actions that create such habitat (prescribed burning; timber harvest), designed collaboratively with MDFWP could benefit elk and perhaps result in more elk available on public lands for wildlife viewing and hunting.

Northern Goshawk

Goshawk Populations:

The northern goshawk is the largest of three forest raptors in the Accipiter family. In Region 1 of the Forest Service (R1), the species breeds in mountainous or coniferous regions throughout Montana as well as northern Idaho. Goshawks winter throughout their breeding range with a portion of the northern goshawk population wintering outside regularly used areas.

The northern goshawk was removed from the Northern Regional Forester Sensitive Species list in 2007, and evaluated again in 2010. Based on the 2010 evaluation, it was recommended to the Regional Forester that inclusion of the northern goshawk on the sensitive species for Region 1 is not warranted at this time. The goshawk has a Nature Conservancy rank of G5T5, which represents the species as globally secure, including the subspecific taxon, ***atripicaulis***. The Montana Heritage Program rank for the goshawk is S3, potentially at risk because of limited and/or declining numbers, range, and/or habitat, even though it may be abundant in some areas. This was upgraded from S4 to S3 due to the increased potential threats to habitat from insect outbreaks and fire.

The Northern Goshawk Northern Region Overview – key findings and project considerations was initially completed in 2007 and updated in 2009. The following discussions are derived from this work and the literature cited in the overview is generally not repeated here.

Mortality risk factors include those caused by humans, such as shooting, trapping and poisoning, as well as trauma (from injuries, including collisions with motor vehicles); natural causes, such as weather, starvation, disease/parasites; and predation by avian and mammalian species. Predators include American marten, fisher, wolverine, raccoon, and great horned owls. Weather, more than any other factor is thought to affect egg and nestling survival (as well as territory occupancy).

Goshawk breeding populations are thought most limited by food (shown to limit reproduction), predation, and density-dependent territoriality. Therefore, management activities that have a negative effect on prey populations, increase risk of predation or other mortality factors, or degrade or destroy nesting habitat within a home range are important considerations. The primary influences on the amount, distribution and suitability of goshawk habitat are management treatments in forest vegetation (e.g., thinning, timber harvest) and stand-replacing wildfires.

The current mountain pine beetle outbreak within the Northern Region, and the associated tree mortality, poses uncertain risks to goshawk populations as a function of habitat change and loss. Data are lacking to comprehensively predict goshawk response to the beetle outbreak, though some studies do exist. Goshawk nest areas on the Ashley National Forest experienced a mountain pine beetle outbreak of approximately 100,000 acres in lodgepole pine in the early 1980s. Goshawks continued to nest successfully in lodgepole pine forests where up to 80% of the overstory trees were killed. The number of young that fledged on these territories from 1989 until 1996 was comparable to numbers fledged over the same time period for many other populations in the western United States.

During the 2005 breeding season, R1 piloted the "Northern Goshawk Bioregional Monitoring Design," a grid-based survey protocol based on a random sampling design with suggestions for stratification by habitat quality and ease of access. The purpose of the survey was to employ a statistically-based approach to: (1) estimate the rate of goshawk occupancy (frequency of presence) within a grid that approximates the territory size for the species (1,700 acres); and (2) better define and document the geographic distribution of goshawks across R1. Additional survey data was needed in R1 to strengthen and augment the statistical reliability of existing Forest field data on the species, and to complement the Regionwide Conservation Assessment of the Northern Goshawk developed by Samson (2006a; Bush and Lundberg 2008).

R1 used a simplified random sample approach using 1,700-acre Potential Sampling Units (PSUs) overlaid in a grid-fashion on National Forest System (NFS) lands that had road access to within at least one mile of the edge of the PSU (Woodbridge and Hargis 2006). Of the 17,750 total PSUs, 12,350 were included in the sampling frame (Kowalski 2006).

In addition to obtaining 40 detections out of the 114 PSUs sampled, crews located seven new goshawk nests. This one-year estimate suggested that during the nesting period goshawks were fairly common and widely distributed in the roaded (or more managed) portions of NFS lands in Region 1. By extrapolation of the data, about 40% of the total possible sample units (12,350) would have goshawk detections.

As part of this Regional survey, 10 PSUs were sampled on the Gallatin; goshawks were detected in two of the PSUs and one active nest was found in an additional PSU. This rate of detection (33%) is similar to the Regional trend overall.

The Gallatin National Forest has also done independent surveys and inventories for goshawks, mostly in conjunction with project level analyses, and therefore generally outside of roadless and wilderness areas within the managed portions of the forest. In 2010, all data were compiled and centralized into a spreadsheet; known nests were entered into the NRIS wildlife national database. Most of the known goshawk nests and/or detections occur on the Yellowstone Ranger District, followed by Bozeman, and with very few known nests on the Gardiner and Hebgen Lake Ranger Districts. Conditions on those 2 districts may be too extreme (weather-wise) to be optimal for goshawks to successfully produce young.

In addition, 18 sites were resurveyed in 2010; however results should be interpreted cautiously since 2010 was a wet cold spring and early summer, such that surveys were not initiated until about mid-July. Goshawks were detected in 8 of 18 surveyed locations.

Goshawks have also been surveyed nearly every year since 2010. In 2011, three new nests were discovered on the Yellowstone Ranger District, and four project areas were surveyed on the Gardiner District with no goshawks detected. Starting in 2012, the forest designed and completed a PSU type survey with random locations across the forest that was completed in 3 field seasons. None of the historic territories were surveyed as part of this effort. The PSU's sampled in this study had never before been systematically surveyed. The results from the PSU survey are summarized in Table 6.

Table 6. PSU goshawk surveys on the Gallatin National Forest, 2012-2014.

District	#PSU surveyed	#NOGO detections	#NOGO new nests
Yellowstone	**12**	**9**	**3**
Gardiner	**3**	**2**	**1**
Bozeman	**11**	**2**	**2**
Hebgen	**7**	**2**	**1**
TOTAL	**33**	**15**	**7**

Generally speaking, goshawks were detected in many areas that had never been surveyed. The detection ratge was about 45% and nests were found at 47% of the PSU's with a detection. Again, the Yellowstone District supported the most detections and new nests.

In 2015, thirteen sites were surveyed and one new nest was found in the southern portion of the Bridger Mountains in a proposed timber harvest. That unit was dropped from the project. In 2016, three project areas were surveyed extensively on the Hebgen Lake Ranger District and one new nest location in Red Canyon was discovered. In addition, one detection was made in the Lonesome Wood Project in unit 17, but no nest was found. Four territories in the Bridger Mountains were surveyed, but no goshawks were detected.

In 2016, data for the entire forest was again compiled. Since 2011, 11 nests have been occupied by breeding goshawks across the forest and goshawks have been detected in 5 additional locations. Since the 90's, there have been goshawk detections and/or nests at 46 different locations.

In summary, the goshawk is a relatively common and well-distributed avian predator in the Northern Region (Kowalski 2006). Although there is a standardized protocol for detecting goshawk presence, it is difficult to consistently interpret the results of monitoring efforts at the forest level since most of the survey efforts are associated with project level inventories and some goshawks do not respond to recorded calls. In addition, interpretation of that data is complicated by weather-related influences, and fact that goshawks utilize alternate nest sites. Based on the more rigorous survey design at the Regional level in 2005, where 3 of 7 primary sampling units yielded goshawk detections, and the PSU study in 2012-2014, where 15 or 33 sampling units yielded goshawk detections, populations on the Gallatin appear to be stable.

Goshawk habitat:

Goshawks use large landscapes, integrating a diversity of vegetation types over several spatial scales to meet their life-cycle needs. Goshawk home ranges include the nest stand, post fledging area (PFA), and some amount of general habitat used for foraging, with the diversity of forest vegetative composition, age and structure increasing beyond the nest area.

In "The Northern Goshawk Status Review," the USFWS found that the goshawk typically uses mature forests or larger trees for nesting habitat (the nest area); however, it is considered a forest habitat generalist at larger spatial scales (USFWS 1998). The Service found no evidence in its finding that the goshawk is dependent on large, unbroken tracts of "old growth" or mature forest.

However, a pattern of goshawk nest site selection in coniferous forests, especially mature forests with closed canopy and open understory conditions, has emerged repeatedly in numerous studies throughout western North America.

The amount of goshawk habitat on the forest at any given time is a function of the amount of potential habitat (mature forests) minus what has been lost to stand-replacing wildfires, timber harvest, and mature tree mortality due to insect and disease agents, most notably mountain pine beetles. Even-age or clearcut harvesting was more or less discontinued by the mid-90's, and timber harvest currently is implemented as relatively small urban interface thinning projects. Therefore, the rate of change from each of these influences has shifted in the past two decades.

An analysis of all nest locations by the Regional office analysts and ecologists was completed in 2012 (Bush et al. 2012). That analysis which included nests east of the Continental Divide in Montana summarized their conclusions as follows:

Based on the results of our survey work and vegetation analysis, we summarized our monitoring questions as follows:

> **Do goshawks breeding on eastside forests use old growth habitats for their nest sites?** Goshawks are not exclusively using old growth forests for their breeding sites, despite their long-regarded status as a MIS for old growth forests. Only seven of 49 nest stand exams (14%) and eight of 57 nest tree plots (14%) met the criteria for the regional old growth definition (Green and others 1992, errata 2005).
>
> **Do goshawks breeding on eastside forests select the largest or tallest trees for nesting?** Our goshawk nest tree plot and nest stand exam data do not support the hypothesis that goshawks preferentially select the largest or tallest trees available in their nest stands.
>
> **Within goshawk nest stands, are nest sites located closer to the boundary of the nest stand or the center of the nest stand?** Goshawks chose nest sites that were significantly closer to stand boundaries than the center of the stand.
>
> **Does the current regional nest model (Samson 2006; Table 1) accurately describe the patterns found in inventoried nest stands or plot data?** Data from stand exam inventories and geospatial nest buffers are not well-described by the current regional goshawk nest model (Samson 2006). Inventory data collected from 49 goshawk nest stands showed that only two nest stands (4%) met the requirements of the 2006 regional goshawk nest model. Similarly, vegetation attributes measured in plots around nest trees also differed from the current regional goshawk nest model.
>
> **Does the current geospatial model (Brewer et al. 2009; Table 2) accurately describe the patterns found in VMap nest buffer data?** Data from geospatial nest buffers are fairly well-described by the current geospatial goshawk nest model (Brewer and others 2009). VMap data analyzed from 267 goshawk nest buffers showed that goshawk nests occur in very diverse settings and vary by geographic area. Even within individual forests, there is a high amount of diversity as shown by very high standard deviations around mean and min/max values that span the entire range (0-40 acres).

Do goshawks breeding on eastside forests select nesting habitats that differ significantly from the vegetation characteristics available on the forest? Goshawks nesting on eastside forests use a variety of existing vegetation characteristics, and do not exhibit a significant preference for habitat parameters out of proportion with their availability.

Table 6: Estimates of goshawk nest habitat by Forest from the models developed by Samson (2005, as amended 2006 and updated USDA Forest Service 2008) and using the proposed new goshawk nest model (Bush et al. 2012). These estimates are based on Forest Inventory Analysis (FIA) data.

Forest	nest habitat estimate 2008 acres *(percent/90% C.I.)*	nest habitat estimate 2012 acres *(percent/90% C.I.)*
Gallatin	10,342 acres *(0.9; 0.3-1.5)*	409,566 acres *(26.2; 22.6-30.3)*

At that time, the recommendation for the eastside forests was as follows:

Table 7. Proposed new goshawk nest model for the Custer Gallatin, Helena-Lewis & Clark National Forests.

Dominance Type (40% Plurality)	Tree Canopy Cover (percent)	Trees Size Class (inch)
Lodgepole Pine	40% plus	5.0” plus
Douglas fir	25% plus	10.0” plus
Ponderosa Pine	25% plus	10” plus

As additional nests were located on the Gallatin National Forest, further analysis was completed just for nests on the Gallatin. This analysis of 23 nest locations is summarized in Table 8.

Table 8. Vegetation analysis of 23 nests on the Gallatin National Forest.

Dominance Type	Canopy Cover	Size Class	Comments
Douglas fir (57% of nests)	>60%	10”+	
Lodgepole Pine (26% of nests)	>40%	5”+	Wide range of size classes and canopy cover in nest stands used in this cover type
Spruce (17%)	>60%	10”+	

Based on this nest habitat analysis, Table 9 shows the distribution of goshawk nesting habitat across the forest.

Table 9. Distribution of goshawk nesting habitat on the Gallatin National Forest based on 2015 R1VMAP existing vegetation classification.

Geographic Area	Total Acres	Acres Lodgepole Nest habitat	Acres of Douglas fir and Spruce nest habitat	Percent of area providing nest habitat
Absaroka Beartooth	1,035,864	68,230	77,726	14%
Madison Gallatin	1,241,656	68,517	113,998	15%
Bridger and Crazy	483,593	27,500	177,705	42%

Table 9 shows that there is more than enough suitable nesting habitat currently available on the Gallatin National Forest to support a viable population. Current conditions could be expected to shift given climate changes which could favor additional stand-replacement fires or insect epidemics. The small amount of current and planned urban interface timber harvest (thinning), relative to these other factors, is negligible at the forest level.

In addition, forest management activities are mitigated at the project level. Goshawk surveys are conducted in project areas, and as per the northern goshawk Northern Region Overview, the Gallatin National Forest uses a project mitigation to protect 40 acres around the nest tree as well as timing restrictions for project activities, if a goshawk nest is found.

Summary:

- Globally, northern goshawks are well distributed and stable at the broadest scale
- Based on broad-scale habitat and inventory and monitoring assessments conducted in R1 since 2005, breeding goshawks and associated habitats appear widely distributed and relatively abundant on National Forest lands
- Based on a detection surveys, goshawks are present and well distributed across the Gallatin National Forest, with more goshawks nesting on the Yellowstone Ranger District compared to other Ranger Districts. Goshawk populations appear to be stable
- Compared to natural events that have or could affect goshawk habitat, project level management activities on the Gallatin National Forest are relatively inconsequential
- Project level surveys ensure that goshawk nests, if found, are protected by mitigation measures as outlined in the northern goshawk Northern Region Overview

AMERICAN PINE MARTEN

Pine Marten Populations:

The pine marten is listed in the Gallatin Forest Plan as a MIS for mature forest (2015 Forest Plan, p. II-20). The pine marten is closely associated with mature forests with abundant woody debris and snags. Martens eat a variety of animal and plant materials associated with the mature forest, and are opportunistic feeders that on a variety of small mammals. Meadow Voles and

Red-backed Voles were staples in Glacier National Park. They have also been known to eat crickets, jumping mice, shrews, ground squirrels and even birds, other insects, and fruit (Montana Field Guide). Populations fluctuate in response to prey availability, juvenile dispersal, and mortality of adult females. Average home range for adult male = 2.9 square km, female = 0.7 square km, resident juveniles = 0.7 square km (Burnett 1981).

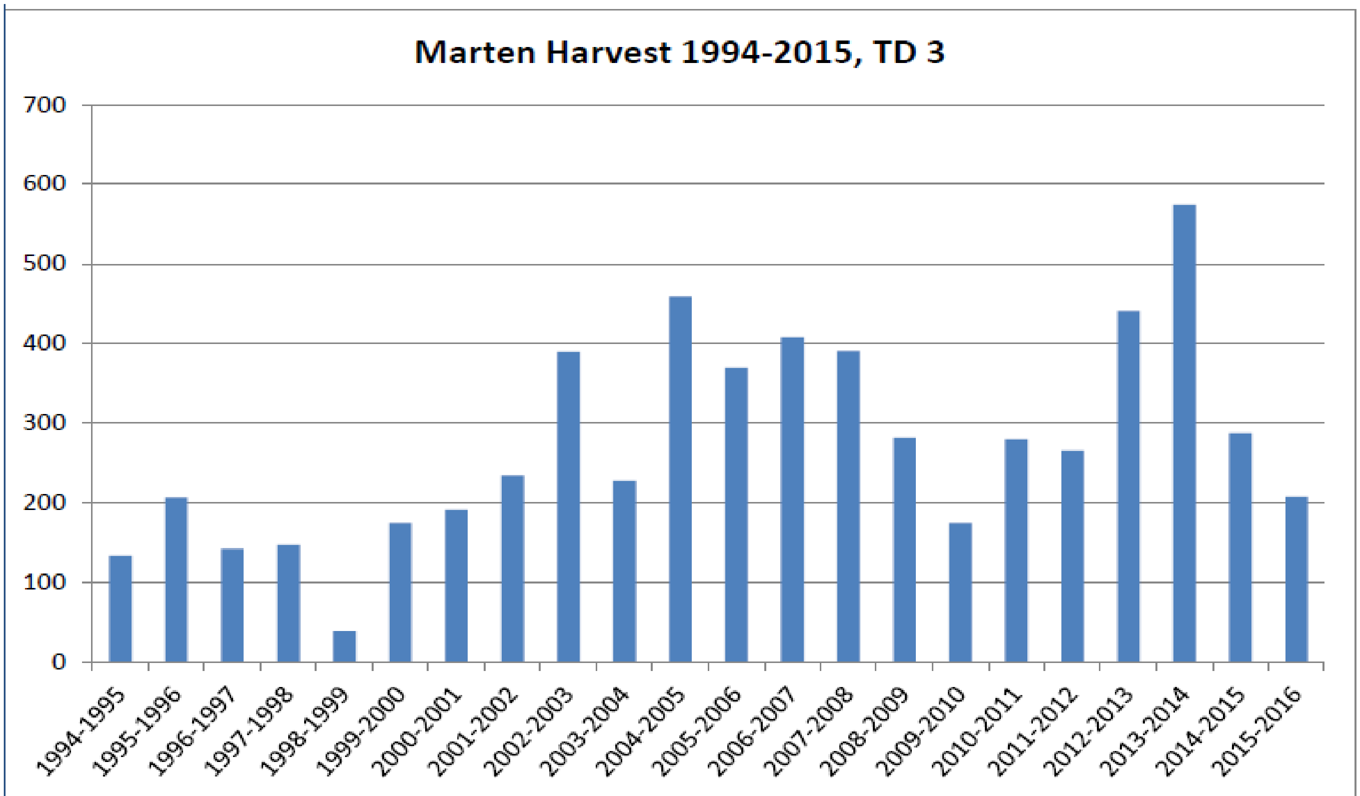
Pine martens are trapped and therefore population trends are not a function of habitat availability or quality per se, but rather a function of pelt prices and trapping effort. Montana Department of Fish, Wildlife, and Parks (MDFWP) monitors the number of trapped marten, but no longer has any systematic snow tracking surveys. The Gallatin Forest is located within the southwest montane ecoregion (Montana Trapping District 3). Marten are one of the five furbearers that are required to be registered and pelt tagged so that the actual number of harvested animals is known. The statewide marten harvest continues to remain relatively stable (Figure 6) but with pelt prices lower, trapping trends are also lower in recent years (MDFWP 2016).

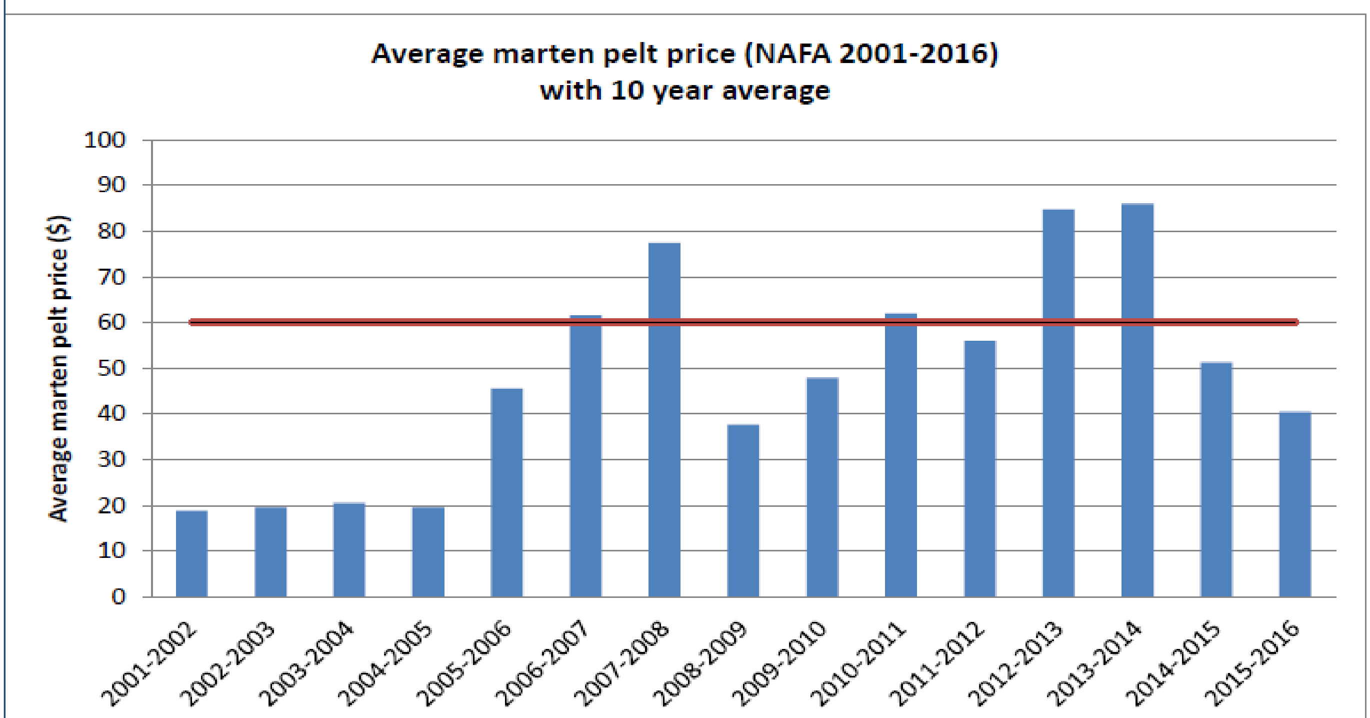
Efforts to track and use bait/camera stations as a population monitoring tool have also shown that pine marten are relatively common on the Gallatin National Forest (Dixon and Wold 2001, 2002, 2003).

The Gallatin has cooperated with Wild Things Unlimited (WTU) to conduct winter carnivore track and/or camera surveys every year since 1997. Their collective work showed that pine marten are very common in the Gallatin and Madison Mountain Ranges, but relatively rare in the Bridger/Bangtails and Crazy Mountains (annual reports, WTU). Cherry (2006) surmised that this might be a habitat related function or that access routes used for tracking do not coincide with marten habitat in these mountain ranges. Given the island nature of those mountain ranges, it is possible that pine marten have been effectively “trapped out” and they have not re-colonized (Gehman and Robinson, 2009, and personal communication 2010).

Data from WTU (Gehman 2016) suggest that the Gallatin Range, and especially the west side of the Range, continues to represent high quality habitat for American martens. During our winter 2015-2016 surveys, marten tracks were observed at a frequency of one track per 1.29 km of transect (166 tracks/213.7 km). This compares to an overall frequency of one marten track per 2.8 km that was calculated from data obtained during five winters (2001-2002, 2003-2004, 2004-2005, 2006-2007, and 2007-2008) in which we surveyed 28 drainages and areas of the Gallatin Range and recorded all observed marten tracks (555 marten tracks/1,555.6km; Gehman, 2011, “Summary of American Marten Detections on the Gallatin National Forest, 1997-2001). In the same report, we presented frequencies of detection for marten tracks in other nearby ranges, as follows: 1 track/3.8 km and 1 track/3.9 km, respectively, for portions of the large Madison and Absaroka Ranges; the much smaller ranges had much lower frequencies of detection – 1 track/40.5 km for the Crazy Mountains, 1 track/248.7km for the Bangtail Mountains, and 1 track/275.4 km for the Bridger Range.

Figure 6. Pine Marten trapping trends in southwest Montana and pelt prices.





*Prices taken from April NAFA sale

Marten track data from the west-central region of the Gallatin Range (Storm Castle Creek to Portal Creek), the results from winter 2015-2016 (1 track/1.09 km) are similar to those from two previous winters when we surveyed that region (2004-2005 and 2006-2007; 1 track/0.89 km). If we add the track data from winter 2015-2016 to those of 2004-2005 and 2006-2007, the result is a frequency of 1 marten track/0.99 km. This frequency of detection is the same as that obtained for the southeastern region of the Gallatin Range (Tom Miner Basin) during three winters, and is higher than those obtained for the east-central region of the Range (Big and Rock Creeks; 1 track/1.7 km) during five winters and the northern region of the Range (Hyalite Creek and its tributaries; 1 track/5.8 km) during two winters (Gehman, 2011).

Pine Marten Habitat:

In the early 1990's, the Gallatin National Forest and FWP sponsored three M.S. degree pine marten studies in the West Yellowstone area, which increased our understanding of local behavior and ecology of this species. Martens selected the moist and structurally complex habitats during the winter. Their winter habitat selection was for forest with high canopy cover, large live trees, large deadfall, and abundant vegetation in the understory (Coffin et al. 2002).

Regional estimates of pine marten habitat using FIA data were updated in 2008 (Bush and Lundberg 2008). They showed that 29.6-37.6 of the Gallatin National Forest was pine marten habitat (90% confidence) or 384,965 acres.

Most habitat models for pine marten differentiate between preferred marten habitat and suitable habitat. Preferred habitat includes only the subalpine fir cover types that are mature to old growth at least 6,000 feet in elevation. Stands that are harvested or burned are not included. Current habitat estimates for the Gallatin National Forest (using 2015 R1VMAP and ARCGIS) are found in Table 10.

Table 10. Acres of preferred marten habitat on the Gallatin National Forest.

Geographic Area	Preferred habitat acres and % of area
Bridger, Bangtails, and Crazies	10,559 (2%)
Absaroka Beartooth	67,832 (7%)
Gallatin, Madison, and Henry	85,432 (7%)

This modeled total habitat estimate is similar to the amount predicted by FIA data, which is derived from ground-based plot sampling. Based on the spatial depiction of these habitats (see map), it does seem to indicate that pine marten habitat is limited in the Crazy, Bridger, and Bangtail Mountains, and relatively plentiful in the Madison, Gallatin, Henry, and Absaroka Beartooth Mountains.

<u>Summary:</u>

Although this species was selected as a MIS and is being monitored accordingly, there are many other factors influencing populations besides habitat change. Because it is a harvested furbearer, fur market prices, accessibility to populations by humans, and other factors related to trapping may be the most important population level determinants. Timber harvest has had a minor influence on pine marten habitat availability on the Gallatin National Forest. The travel plan decision may have had an indirect effect to reduce effective trapping pressure by reducing motorized access in some areas.

Cite this paper as:

Canfield, Jodie E. 2016. Gallatin Forest Plan Management Indicator Species Assessment – Population and Habitat Trends. Unpublished paper on file at: U.S. Department of Agriculture, Forest Service, Gallatin National Forest Supervisor's Office, Bozeman, MT, 33 pages.

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