FY 2010 Monitoring and Evaluation Report

Attachment B Management Indicator Species Supplemental Report

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Introduction

This supplement describes information available to address monitoring driver #10 from chapter 4 of the 2005 *Bighorn National Forest Revised Land and Resource Management Plan* (forest plan), pertaining to management indicator species (MIS). The record of decision for the forest plan (2005, p. 26) set forth the context in which MIS would be monitored on the forest in relation to the National Forest Management Act (NFMA) and the implementing regulations known as the "planning rule" (2005, 36 CFR 219. 14(f)). This provision allows for the use of habitat data in place of population data for MIS, unless the forest plan specifically calls for population monitoring. Chapter 4 of the forest plan, item 10, potential monitoring items 1-3, and 9 (2006 Errata, pgs. 4-14 and 4-15) states:

1. Acres and condition of habitat on the forest for each avian and the red squirrel MIS. Associate habitat trend with available population data where feasible. Participate in the interagency statewide avian population monitoring effort (Monitoring Wyoming's Birds).
2. Results of beaver (MIS) colony reintroduction and aerial survey of number of occupied 6th level HUC watersheds. Tie to habitat condition and trend monitoring provided through aquatic and range resource monitoring.
3. Acres of elk (MIS) security areas, and association with past amounts available, elk distribution patterns, harvest success, hunt area strategies, herd composition, and population objectives. Updates to road density and vegetation GIS layers to rerun security habitat model.
9. Rainbow trout (MIS) and Yellowstone cutthroat trout (sensitive species) habitat condition and trend. Report expansions of Yellowstone cutthroat trout populations by stream name and length.

Most of the reporting frequencies for these elements were scheduled for the 5-year monitoring frequency interval, thus this longer review in the 2010 report.

The premise of MIS, as evidenced in the 1982 planning rule (36 CFR 219.19 (a) (1) and (6)), was to identify species to estimate the effects of forest plan alternatives (1) and then to monitor those species' population trends and determine relationships to habitat changes (6). The selection process and implementation guidance for MIS were described in appendix C of the forest plan (2005, p. C12-17). MIS analysis for each alternative occurred in the FEIS associated with the forest plan (2005, pgs. 3-208 thru 3-238), and included the current population and habitat information known for each species. As stated on p. 3-208 of the FEIS, "monitoring [for MIS] is a challenge with significant costs, and many factors other than regular management activities can affect populations of MIS, with climate and prey/forage levels being the most

common elements driving population trends." Several literature references that review the difficulties with MIS and the suggested "keystone" species concepts also exist, which are prompting further review of this component of the planning regulations, which may change how subsequent forest plans address this topic. The intent of monitoring driver #41 in chapter 4 of the forest plan (2006 Errata, pg. 4-31), the review of MIS status relative to management strategies, will further inform the use of this monitoring and effects analysis approach after the 10-year implementation period, which should help inform the forest for the next revision or amendment.

The sections that follow provide an update of the most current data available, and a comparison to the data reported in 2005, for each species selected as MIS in the forest plan, in order that they were described in the FEIS.

Elk

Elk were analyzed for the forest plan according to their populations, using data available from the Wyoming Game and Fish Department's (WGFD) aerial surveys and population modeling, and their habitat, using data derived from an elk security habitat model. The security habitat modeling was conducted by the Forest Service, based on vegetation and road data available at the time. Both data sets are reviewed below.

Elk **population** information is reported by the WGFD in their job completion report publications. Population objectives for each elk herd were determined by the WGFD, to represent a sustainable population meeting the demands of hunting and also meet the resource capability or carrying capacity of the land. Population objectives are set at the herd unit scale, while individual hunt areas comprise subunits for which individual hunt statistics are tracked. **Hunter success** (% successful harvest as compared to licenses offered) was also a component of the data reviewed, since this has potential to tie to habitat conditions. Neither the herd units nor hunt areas are comprised entirely of national forest system (NFS) lands, further making interpretation of data challenging for MIS purposes. The *2010 Job Completion Report* (WGFD 2010; pgs 240-252; 393-406; 407-427) was used for the following data, and it is compared to the 2003 data used in the FEIS. Only the herd unit scale of data is presented here, whereas the FEIS also displayed hunt area hunter success.

Herd Unit	Population Objective	2003 Population	2010 Population	Hunt Strategy	Hunter Success 2003	Hunter Success 2010
North Bighorn	4,100	4,800	5,300	Limited/General	28%	30%
Medicine Lodge	3,000	3,000	3,300	Limited	28%	41%
South Bighorn - Hunt Areas 33, 34	2,000	2,500	~3,000*	Limited	35%	30%

*= no flight data for 2009/2010. Entire South Bighorn herd unit estimated at 150% of objective in 2010 (2,000 is Hunt Area *objective*, while 7,200 was the 2010 estimate for entire South Bighorn herd unit).

Factors other than habitat also contribute to elk population levels and hunter success. These can include the severity of the winter that can drive down the population through stress and disease, for which a severe one has not occurred within the reporting period. Precipitation levels or other factors affecting access for hunters during the hunting season can also affect harvest success. As reported in the job completion reports, the main factors influencing elk harvest and populations continue to be private land hunting access issues. Elk have learned to seek refuge on private land parcels where there is typically much less hunter access. Several hunt areas have had changes with additional late or early season opportunities to try and bring the elk down to the population objective. As elk populations increase, it would also be presumed that hunter success should increase correspondingly due to more availability of elk, although success is measured against the number of licenses sold, which may also go up in response to population increase.

In 2010, the forest re-ran the **elk security** GIS model that was used to inform the elk security wildlife guideline and accompanying implementation guidance in appendix A of the forest plan. It was evident in the re-application of the model that data layers used for the forest plan and FEIS had been changed or updated that resulted in difficulties comparing the present condition to the baseline in 2005. These changes included an updated road layer that now no longer shows motorized trails that were in the 2005 layer, and some change in the vegetation layer such as how "islands" of forested areas were included or not. In addition, there are differences in the modeling language used in 2005 to 2010, which were largely resolved, although some discrepancies still resulted. The improvement made was that the 2010 model had a script developed to keep the computer process the same for the future, whereas the 2005 process involved some operator decisions on polygons to include or not in potential habitat. For definitions of existing, potential, and percent of potential, refer to appendix A in the forest plan.

The intent of the elk security guideline was to inform decision makers of travel and vegetative related components of each project NEPA decision that could affect wildlife species. The forest did apply and describe in each project decision the impacts to elk security, and how that project would mitigate the impacts if necessary. In general, elk security habitat is defined as forested

areas larger than 250 acres that provide cover, and that are greater than 0.5 mile from an open motorized route. Some of the complexities of the application of this model can be summarized as follows:

- Although completed just before the forest plan revision, the Clear/Crazy designated motorized trail project decision (EA) resulted in a net increase in elk security due to the closure of unauthorized motorized trails, although the model shows a decrease in the amount of habitat available in this area.
- In response to the Bone Creek fire of 2007, there was a drop in existing and potential elk security in the Shell Creek watershed due to the several thousand acres burned.
- Several areas classified as "non hiding-cover" in 2005 have likely grown up to hiding cover since that time but were not accounted for in the vegetation layer.

In summary, the intent of the forest plan guideline was to maintain "no net loss" of elk security habitat (percent of potential) at the forestwide scale as evidenced in objective 1b, strategy 6 in the forest plan (2005, pg 1-3). While the discrepancies in the modeling approach indicate an overall increase in elk security habitat at the forest-wide scale, this is not necessarily the case on the ground. In places where natural disturbances occurred, there was a loss within a watershed, such as the Bone Creek and Little Goose fires of 2007 that altered timber cover, but did not alter road densities.

Good examples of successful application of the model were evidenced in the Woodrock and Babione project decisions, where some new roads were created for a timber sale project, but some existing motorized routes were closed to offset or mitigate the increase in road density. Overall, the forest is likely at the same level of elk security as when the forest plan was finalized in 2005. The application of the elk security guideline continues to inform project decisions to manage wildlife habitat, and should be used, as this type of habitat was also designed as a surrogate for other species' habitat needs.

In addition to the elk security model results, the following summaries provide a review of how individual projects affected elk security habitat. Only projects that were implemented since the since the onset of the elk security management direction in the forest plan are listed, and only those projects that had the potential to affect elk security habitat (i.e. motorized travel routes and/or forested vegetation manipulation).

Project/Type	Decision Year	Summary
Hunt Mountain Travel EA	2007	Implementation of this decision restricted motorized travel to existing roads and motorized routes. While the elk security model cannot reflect such changes, there was a substantial benefit to elk security habitat by reducing the amount of ATV traffic off roads/trails. In addition, elk winter range habitat was protected with a seasonal closure of the Dugway Rd (FR213).
Southwest Fuels Management EA	2007	This project was implemented to treat hazardous fuels and restore the use of fire on the landscape through prescribed burning. Mechanical timber sales were authorized (Southwest Fuels and Canyon Creek) through this project, neither of which have been completed and/or sold to date. Prescribed burning has only occurred in non-forested areas. By the mapped elk security model areas, there was no effect to existing elk security habitat with this project, as treatment was not proposed in these areas. Potential elk security, which had previous timber harvest disturbances, was re-entered in the same units previously harvested in two stands of Douglas-fir.
West Tensleep Phase 2 Fuels Management EA	2008	This project was implemented to reduce hazardous fuels near recreation residences in the West Tensleep Road (FR27) corridor. As this road is a Level 3 (maintenance level) road, there was no existing or potential elk security habitat proposed for treatment with this project, and no effects were to occur. Harvest of timber to reduce fuels is ongoing.
Dullknife Fuels Management EA	2009	This project was implemented to reduce hazardous fuels near private land and residences in and adjacent to the project area. No existing elk security habitat was impacted with this decision, as roads occur in the project area. As road access is used for private land and NFS land, there was also no potential elk security habitat impacted, as roads would not be feasibly closed to eliminate private access. Modifications to the project were made to avoid potential elk security and to provide periods of non-disturbance during hunting season to maximize hunter success.
Babione Forested Vegetation Management EA	2009	This project was approved to treat forested vegetation, in part for fuels reduction, to restore ecological diversity and age structure. Both potential and existing elk security habitat were planned for disturbance. Accordingly, a motorized trail (Antler Creek) for ATVs was closed with this decision. A net increase in existing elk security of approximately 500 acres would occur, with approximately 1,200 acres of timber harvest occurring. The timber sale component of this project has yet to be offered for sale, but the ATV route was closed.
Garland Salvage EA	2009	This project was approved to remove blown-down timber in the project area. Despite a timber sale being offered, there has not been a purchaser for this project. No timber salvage was planned in existing elk security, so no effects were to occur. The salvage stands, prior to blowdown, were considered potential elk security due to the proximity of Level 2 roads. Salvage harvest was anticipated to expedite the return of the cover component to these potential elk security stands, but no change to the travel or management status of the roads was planned to occur.

Project/Type	Decision Year	Summary
Forestwide WUI Hazardous Fuels EA	2010	This project was approved to reduce hazardous fuels near private and federal structures adjacent to or on the forest. As each treatment area identified was near a structure, existing roads were in place, and no impacts to elk security habitat (existing or potential) were planned to occur. There have been a few hundred acres treated out of the 3,000 acres approved.
Johnson Creek Vegetation Management EA	2011	This project was approved to reduce hazardous fuels near private structures, and restore ecological diversity in timber stands. Mechanical removal of timber would reduce approximately 150 acres of existing elk security, and 610 acres of potential elk security. However, the closure of Forest Road 194 associated with the project would result in a net increase of existing elk security once completed. There has been no action on this project to date.

When taking a combined view of the elk security, population, and harvest data information, it is not yet apparent if there have been any changes broad enough on the forest to either improve habitat conditions or worsen habitat conditions that result in a corresponding change in elk populations. Harvest success could be improved by reducing the road density (more elk security), however hunters are also continuing to change their preference towards more motorized access and not taking advantage of more intact (non-roaded) habitat. In terms of overall forest plan level predictions of effects, the predicted level of timber harvest associated with the plan in suited timber areas, in terms of predicted acres of disturbance, has not occurred due to a decline in demand from the timber industry. The overall increases in elk population, at this point, are not attributable to either improved or declined habitat conditions on the forest, and there is no apparent correlation to elk security habitat either.

Elk Security

Change from 2005 to 2010

			Geographic Area:	Clear/Crazy	Devil Canyon	Goose Creek	Little Bighorn	Paintrock Creek	Piney/Rock	Shell Creek	Tensleep Creek	Tongue River	Total
			Total Acres:	**155,939**	**61,199**	**116,955**	**141,818**	**107,947**	**110,258**	**140,133**	**101,133**	**177,073**	**1,112,456**
Acres		**2005**	**Existing**	9,518	5,685	18,929	22,984	6,019	32,609	4,694	647	27,257	**128,342**
		2010	**Existing**	13,170	6,658	20,287	21,579	5,784	33,350	2,614	4,112	25,115	**132,667**
		2005	**Potential**	29,807	12,778	43,257	34,087	10,292	65,012	14,785	7,678	51,649	**269,345**
		2010	**Potential**	28,501	10,213	40,700	27,172	9,661	58,538	8,948	7,288	45,080	**236,103**
	Acres Change		**Existing**	3,651	973	1,357	-1,405	-235	741	-2,081	3,465	-2,142	**4,325**
			Potential	-1,306	-2,565	-2,557	-6,915	-631	-6,474	-5,836	-390	-6,568	**-33,242**
Percent of Geographic Area		**2005**	**Existing**	6%	9%	16%	16%	6%	30%	3%	1%	15%	**12%**
		2010	**Existing**	8%	11%	17%	15%	5%	30%	2%	4%	14%	**12%**
		2005	**Potential**	19%	21%	37%	24%	10%	59%	11%	8%	29%	**24%**
		2010	**Potential**	18%	17%	35%	19%	9%	53%	6%	7%	25%	**21%**
Existing Security as a % of Potential		**2005**		32%	44%	44%	67%	58%	50%	32%	8%	53%	**48%**
		2010		46%	65%	50%	79%	60%	57%	29%	56%	56%	**56%**

Beaver

Beaver were selected as MIS due to their tie to riparian habitats, both as engineers of that habitat and their reliance on healthy willow assemblages for dam and food supplies. Beaver were analyzed for the forest plan according to their populations, using data available from a jointly funded beaver survey conducted in 2003 by the Forest Service and the WGFD, with older data also available from previous WGFD surveys. The survey protocol focused on counting active food caches in the fall as an estimate of population based on literature of similar monitoring. The forest received regional office input on the beaver habitat and population survey methodology. From 2004 through 2009, the WGFD and the forest continued a joint effort to relocate beaver to the forest from adjacent private lands. The forest also installed five "beaver deceivers" designed to mitigate road and stream crossing concerns by preventing beaver from plugging culverts, which typically results in the removal or death of the beaver(s). A survey of beaver populations (occupied habitat) was repeated in 2010 in conjunction with the WGFD to determine if population trends were apparent. There is no population objective developed by the WGFD for beaver, but the forest established a strategy within the forest plan (2005, pg 1-3) to reintroduce beaver into three 6th-level HUC watersheds and increase self-sustaining populations, as beaver populations are thought to be significantly reduced from historic levels. The objective of beaver reintroductions was met successfully by 2009 as evidenced in the Prospect/Owen Creeks, Muddy Creek, and Big Willow Creek drainages. The WGFD released 204 beaver in many locations between 2004 and 2010. The following table displays the 2003 and 2010 population survey information as summarized in the WGFD report (WGFD 2010).

Beaver Survey	2003	2010
Total caches seen	30	23
Estimated missed caches	20	15
Total caches	50	38
Beaver population estimate on forest	225	171

The above information is not conclusive with regard to a relationship to management effects. In the North Tongue drainage, livestock administration activities were increased resulting in less grazing effects to riparian habitat in terms of annual use, and many beaver were transplanted into the area. The increase in number of caches observed in that location cannot be directly tied to livestock or road management related improvements but is likely more a function of the reintroduction effort, as willow habitat quality would not respond significantly for beaver in just a few years. On the south end of the forest, many beaver were also released, but fewer caches were observed, and little to no change in grazing administration occurred. Beaver are also known to be susceptible to disease and predation, which may or may not be correlated to habitat quality. Ungulate grazing (including wildlife) is of concern for willow habitat in many drainages on the forest, and monitoring efforts on the combined plant use continues in conjunction with the

WGFD in three representative locations (North Tongue drainage, Sourdough Creek and Little Sourdough Creek). It is not likely that any further beaver transplants will occur in the next 5-year period, which will allow the effects from transplant efforts to stabilize. A population survey is scheduled to occur again in 2015 if the forest plan monitoring protocol is followed.

Beaver are perhaps one of the best suited MIS species as their habitat quality and quantity affects many other wildlife species and watershed functioning, populations and habitat can be affected by management, and yet populations are also affected by factors other than habitat and management related impacts including predation, trapping, disease, and climate. The largest potential management effects to beaver, as described in the FEIS, are livestock grazing and road networks within riparian areas. The forest continues to actively improve both management situations to improve habitat potential for beaver. Perhaps livestock-related riparian grazing improvements and road relocation improvements could be summarized as part of the 2015 monitoring report.

Red-Breasted Nuthatch

Red-breasted nuthatches were chosen as MIS because of their relationship to mature forested habitat and tied to potential timber harvesting related management effects. However, the forest plan FEIS also noted that fires may play a larger role than timber harvest in shaping vegetative structural stages. Both nuthatch populations and habitat were described in the FEIS with regard to anticipated effects by alternatives. There was no specific population objective or habitat strategies developed in the forest plan specific to the nuthatch. Only the broader direction for emphasis species described in objectives 1b and 1c in the forest plan (pgs 1-2 and 1-4) would apply for this MIS.

The nuthatch **population** information described in the forest plan FEIS (pg 3-227) was obtained from avian monitoring conducted on the forest by the Rocky Mountain Bird Observatory (RMBO) starting in 2002, in response to a forest plan amendment on MIS in 2001. From 2002 to 2007, a total of forty point-count transects were conducted annually on the forest in four different habitat types: montane riparian, sagebrush, mid-elevation conifer, high elevation conifer. These Bighorn-forest-specific surveys were conducted in conjunction with the statewide (RMBO: Monitoring Wyoming's Birds) monitoring effort sponsored by an interagency partnership (WGFD, BLM, USFS). Furthermore, a regional office biologist did a review of the avian monitoring protocol and established the ten transects per habitat type as a minimum for statistical validity. In 2008, due to limited funding and inconclusive data about management effects on the forest, the transects were scaled back to the original ten that had been selected as part of the statewide avian monitoring program. In subsequent years, data were summarized with regard to bird conservation regions, a different spatial scale, to adhere to other national monitoring efforts. The forest is mostly located within Bird Conservation Region 10. The different compiling of data makes for challenges when trying to interpret any trends at the forest

scale, let alone the statewide scale. Population data are also available from the breeding bird survey (BBS), another national monitoring program. The BBS runs two transects on the forest annually. Data are tabulated at the route, state, and larger data scales (Sauer et al, 2009), with caveats on data reliability and the cumulative trend information reported to date. The caveats particularly apply at the route scale due to sample sizes. The following tables summarize the population information available from the two sources: RMBO and BBS.

Monitoring Wyoming's Birds Results for 2002-2006 Seasons (Hutton et al, 2007, pgs 32, 34, 199) with 10 transects per habitat type:

Bighorn NF **high** elevation conifer habitat and red-breasted nuthatch:

Year	Density (#/km2)	Number Detections
2002	8.8	31
2003	8.3	30
2004	2.8	10
2005	6.0	21
2006	4.8	12

Bighorn NF **mid** elevation conifer habitat and red-breasted nuthatch:

Year	Density (#/km2)	Number Detections
2002	9.7	35
2003	9.6	34
2004	3.6	13
2005	4.3	15
2006	6.5	14

Total number red-breasted nuthatches observed per year (all habitats) on Bighorn NF:

Year	Total # Observed
2002	91
2003	86
2004	39
2005	44
2006	45

Monitoring Wyoming's Birds Results for 2002-2007 Seasons (White and Sparks, 2008, p. 198),

Total number of red-breasted nuthatches observed per year (all habitats) in WY:

Year	Total # Observed
2002	146
2003	166
2004	210
2005	174
2006	87
2007	119

Monitoring Wyoming's Birds Results for 2009 Season (Rehm-Lorber et al, 2010, p. 19) for 10 transects total on Bighorn NF:

Density (#/km2)	Population Estimate	Number Detections
4.45	20,981	7

Monitoring Wyoming's Birds Results for 2010 Season (White et al, 2011, p. 272) for 10 transects total on Bighorn NF:

Density (#/km2)	Population Estimate	Number Detections
1.68	7,913	2

Breeding bird survey trend results for red-breasted nuthatch:

	2003	2010
Wyoming (Regional Trend)	Up 5%	Up 4.4%

Nuthatch populations are known to fluctuate widely in response to climate, insect populations, and cone crops. As evidenced above, even at different configurations and years of data, there is wide variability in populations, without known ties to changes in any potential management related effects or such large changes in habitat availability or quality. The likelihood of populations ever being reliably tied to management related effects in habitat are low at a forest scale, at least at the level of habitat changes predicted to occur on the forest in the FEIS with regard to wildfire or timber harvest. Population monitoring at the statewide scale may also be influenced by pine beetle outbreaks that will change habitat in forested areas affected by this outbreak, currently focused in the southern portion of the state, though outbreaks have also recently occurred on the Shoshone NF and the Black Hills NF.

With regard to nuthatch **habitat**, the Region 2 habitat capability (HABCAP) model was used to describe the habitat available in 2005 on the forest, and make predictions associated with forest plan alternatives in the future based on timber harvest and growth modeling predicted changes. The forest's vegetation database (R2Veg) is a GIS compatible system, that is updated to reflect fires and timber harvest affects on forested vegetation. Polygons are delineated and interpreted from aerial photography with regard to the size and density of timber stands with a corresponding habitat structural stage assigned. For nuthatches, a habitat structural stage 3 (pole sized timber) is weighted for 20% habitat value, and structural stage 4 (mature timber) is weighted for 100% habitat value. The HABCAP values in the FEIS were based on 2003 vegetation data. It should be noted that it is not sustainable to manage forested habitat in a 100% value for nuthatches, as it is neither logical nor historically valid that timber occurred in a continuously mature state. The following table describes the HABCAP values by the larger geographic areas, which also had desired future conditions for timber structural diversity described in the forest plan (chapter 3).

Geographic Area	HABCAP Model 2003	HABCAP Model 2010
Clear/Crazy	37%	38%
Devils Canyon	65%	63%
Goose Cr	39%	37%
Little Bighorn	57%	52%
Paintrock	52%	51%
Piney/Rock	41%	40%
Shell	57%	47%
Tensleep	52%	49%
Tongue	43%	42%
Forestwide Average	47%	45%

The most significant change noted in the HABCAP model reanalysis is in the Shell geographic area. This change includes the Bench timber sale project (~800 ac) completed in 2007 and the Bone Creek Fire (~13,000 ac) which burned in 2007. Another large wildfire occurred in the Little Bighorn geographic area in 2003, for approximately 5,000 acres, which accounts for that larger change. The only other large wildfire occurred in the Goose Creek drainage, although only approximately 1,000 acres was on the forest. Overall, other changes in HABCAP numbers were largely due to succession or small timber sale projects. Annual vegetation treatment acres (e.g. timber sale) are also reported in the forest plan monitoring report. That report shows that, at the forestwide or geographic area scale, very few acres are treated with mechanical methods. In summary, the forest appears to be maintaining adequate conditions for this MIS habitat.

With regard to anticipated habitat changes, the forest plan estimated that approximately 10,000 acres (and as much as 20,000) of forested habitat would be burned in the first decade by wildfire. This has been met with the 1,000 acres of the Little Goose Fire (on the forest in timber) and the

9,000 acres of the Bone Creek Fire that affected timber, both in 2007. The Bone Creek Fire was in the Shell geographic area; the Little Goose Fire was in the Goose Creek geographic area. The larger change component anticipated in the FEIS was one of *growth*, as HABCAP numbers were anticipated to grow by approximately 15% over a 50-year period but be near current levels at the 10-year interval. If forest plan monitoring efforts are continued, a re-application of the HABCAP model in 2015 may validate the 10-year prediction in the FEIS.

Red Squirrel

Red squirrels were also chosen as an MIS due to their association with mature conifer habitat, similar to the red-breasted nuthatch. Both squirrel populations and habitat were described in the FEIS with regard to anticipated effects by alternatives. There was no specific population objective or habitat strategies developed in the forest plan specific to the squirrel. Only the broader direction for emphasis species described in objectives 1b and 1c in the forest plan (pgs 1-2 and 1-4) would apply for this MIS. This species is also key prey for many other wildlife species, although it is known to have population fluctuations in response to cone crops and climate-related events.

From 2002 through 2006, **population** monitoring was conducted for red squirrel. Audible/visual detections for red squirrels were noted during the point-count transects for avian species. As with nuthatch monitoring, red squirrel monitoring was dropped following the initial period because population trends were difficult to associate to any potential management effects and because the monitoring was expensive. The following table shows the results of the population monitoring information compiled by RMBO from 2002 through 2006.

Monitoring Wyoming's Birds Results for 2002-2006 Seasons (Hutton et al, 2007, pg 199) with 10 transects per habitat type, and data from RMBO in years 2007 through 2010 based on more limited transects:

Total number red squirrels observed per year (all habitats) on Bighorn NF:

Year	Total # Observed	# Points Surveyed
2002	182	609
2003	284	623
2004	409	630
2005	342	636
2006	312	468
2007	13	37
2008	10	42
2009	66	117
2010	40	95

Monitoring Wyoming's Birds Results for 2009 Season (Rehm-Lorber et al, 2010, p. 19) for the data above on the Bighorn NF:

Density (#/km2)	Population Estimate	Number Detections
78.41	369,468	61

At different configurations and years of data, there is wide variability in populations without known ties to changes in any potential management related effects or such large changes in habitat availability or quality. The likelihood of populations being reliably tied to management-related effects in habitat is low at a forest scale, at least at the level of habitat change from wildfire or timber harvest predicted in the FEIS.

Also similar to the red-breasted nuthatch, the FEIS displayed the calculated HABCAP model results for red squirrel **habitat**. The following table displays the 2005 FEIS calculated results compared to the 2010 results, by geographic area. For squirrels, the HABCAP model assumes structural stage 1 is worth 10% of optimum, ranging up to 100% for structural stage 4. It should be noted that it is not sustainable to manage forested habitat in a 100% value for squirrels, as it is neither logical nor historically valid that timber occurred in a continuously mature state. The following table describes the HABCAP values by the larger geographic areas, which also had desired future conditions for timber structural diversity described in the forest plan (chapter 3).

Geographic Area	HABCAP Model 2003	HABCAP Model 2010
Clear/Crazy	76%	70%
Devils Canyon	75%	75%
Goose Cr	73%	71%
Little Bighorn	72%	71%
Paintrock	72%	70%
Piney/Rock	70%	73%
Shell	70%	60%
Tensleep	70%	69%
Tongue	67%	71%
Forestwide	71%	71%

The most significant change noted in the HABCAP model reanalysis is in the Shell geographic area. This change is includes the Bench timber sale project (~800 ac) completed in 2007 and the Bone Creek Fire (~13,000 ac) which burned in 2007. Another large wildfire occurred in the Little Bighorn geographic area in 2003, for approximately 5,000 acres, which accounts for that larger change. The only other large wildfire occurred in the Goose Creek drainage, although only approximately 1,000 acres was on the forest. Overall, other changes in HABCAP numbers were largely due to succession or small timber sale projects. Annual vegetation treatment acres (e.g. timber sale) are also reported in the forest plan monitoring report. That report shows that, at

the forestwide or geographic area scale, very few acres are treated with mechanical methods. In summary, the forest appears to be maintaining adequate conditions for this MIS habitat.

With regard to anticipated habitat changes, the forest plan estimated that approximately 10,000 acres (and as much as 20,000) of forested habitat would be burned in the first decade by wildfire. This has been met with the 1,000 acres of the Little Goose Fire (on the forest in timber) and the 9,000 acres of the Bone Creek Fire that affected timber, both in 2007. The Bone Creek Fire was in the Shell geographic area; the Little Goose Fire was in the Goose Creek geographic area. The larger change component anticipated in the FEIS was one of *growth*, as HABCAP numbers were anticipated to grow by approximately 15% over a 50-year period but be near current levels at the 10-year interval. If forest plan monitoring efforts are continued, a re-application of the HABCAP model in 2015 may validate the 10-year prediction in the FEIS.

Brewer's Sparrow

Brewer's sparrows were chosen as an MIS due to their association with mature sagebrush habitat. There was no specific population objective or habitat strategies developed in the forest plan specific to the squirrel. Only the broader direction for emphasis species described in objectives 1b and 1c in the forest plan (pgs 1-2 and 1-4) would apply for this MIS.

Population information for Brewer's sparrows was collected from similar methodology and sources as those described above for the red-breasted nuthatch. The results are summarized as follows:

Monitoring Wyoming's Birds Results for 2002-2006 Seasons (Hutton et al, 2007, pgs 39, 197) with 10 transects per habitat type:

Bighorn NF **shrub-steppe** habitat and Brewer's sparrows:

Year	Density (#/km2)	Number Detections
2002	21	77
2003	23	84
2004	21	78
2005	15	56
2006	57	187

Total number Brewer's sparrows observed per year (all habitats) on Bighorn NF:

Year	Total # Observed
2002	88
2003	106
2004	103
2005	78
2006	272

Monitoring Wyoming's Birds Results for 2002-2007 Seasons (White and Sparks, 2008, p. 198),

Total number of Brewer's sparrows observed per year (all habitats) in WY:

Year	Total # Observed
2002	478
2003	770
2004	1,262
2005	1,179
2006	1,527
2007	967

Monitoring Wyoming's Birds Results for 2009 Season (Rehm-Lorber et al, 2010, p. 21) for 10 transects total on Bighorn NF:

Density (#/km2)	Population Estimate	Number Detections
0	0	0

Monitoring Wyoming's Birds Results for 2010 Season (White et al, 2011, p. 272) for 10 transects total on Bighorn NF. **Note:** No transects in shrub-steppe habitat occurred on the Bighorn NF as part of statewide monitoring, so there were no detections and no densities calculated

Density (#/km2)	Population Estimate	Number Detections
0	0	0

Breeding bird survey trend results for Brewer's sparrow:

	2003	2010
Wyoming (Regional Trend)	Down 1.0%	Down 0.7%

Similar to results described for other MIS species, populations of Brewer's sparrows are subjected to many other factors besides management related habitat effects. The large fluctuation in population seen in the years monitored have no apparent tie to habitat, as there were no widespread or large changes in habitat during these years that would affect the population. The primary disturbance agent and management effect for sagebrush habitat has been livestock grazing and prescribed fire/wildfire as predicted in the FEIS. With approximately 2,000 acres per year of sagebrush treated with prescribed fire and no significant wildfires in sagebrush habitat, there are many more acres of sagebrush maturing in any given year. Brewer's sparrows populations are more likely tied to insect availability and climate.

There was no **habitat** capability (HABCAP) model run for this species' habitat in the FEIS; the forest's vegetation database (R2Veg) does not adequately or reliably classify sagebrush habitat, due to uncertainties in photo interpretation. Habitat quantification for sagebrush canopy cover is improving at the project scale, due to the tie with sage grouse habitat and forest plan direction in wildlife guideline #10 (p. 1-47). The intent of the mapping efforts is to determine the overall percent of sagebrush canopy cover at the allotment or geographic area scale to comply with sage grouse habitat management guidance. This would also presumably provide adequate habitat for the Brewer's sparrow due to their habitat preference for more mature sagebrush. Prescribed fire treatments are proposed in several areas throughout the forest over the next 10 years. A summary of prescribed fire treatments and sagebrush canopies could be prepared as part of the 2015 monitoring plan summary.

Rainbow Trout

This species was chosen as a MIS to reflect the clean water and healthy streambank conditions in which this fish thrives, with the most significant management-related impact being livestock grazing. Trout populations were described as "stable" on p. 3-37 of the FEIS, but no summary of estimated populations or habitat was compiled at that time. Aquatic habitat was described in several ways in the FEIS, which described likely effects for rainbow trout populations and habitat.

There was no specific population objective or habitat strategies developed in the forest plan specific to rainbow trout. Only the broader direction for emphasis species described in objectives 1b and 1c in the forest plan (pgs 1-2 and 1-4) would apply for this MIS. However, it was anticipated that rainbow trout populations might be reduced in some geographic areas because they would be removed from drainages to create potential habitat for Yellowstone cutthroat trout. This has been accomplished in portions of several streams to date including Buckskin Ed Creek, Dry Medicine Lodge Creek, Elkhorn Creek, the Little Tongue River, Soldier Creek, and South Paint Rock Creek.

Fish **population** monitoring is done in partnership with the Wyoming Game and Fish Department. The Wyoming Game and Fish Department's Cody and Sheridan regions both

maintain a series of monitoring stations on forest streams. Fish populations are sampled at these stations on a recurring basis, often in collaboration with forest staff. Additional details regarding sampling methods and results can be found in the annual fish division reports of the Sheridan and Cody regions of the WGFD.

The following table summarizes rainbow trout abundance (fish/mile) at sites where this species has been collected for the period from 2005 through 2010:

Waterbody	Station Name	2005	2006	2007	2008	2009	2010
Sheridan WGFD Region							
Bull Creek	Habitat improvement station (8300)	25	6	-	143	56	56
Little Bighorn River	Dayton Meadows	-	12	0	-	0	-
North Tongue River	Burgess Road	2,545	2,338	-	1,927	1,465	1,285
	Experimental Pastures	2,525	1,731	-	2,192	1,731	1,340
	Lower	1,449	1,476	-	1,572	1,277	1,144
	Dead Cow	277	-	-	-	-	-
	Runs	235	295	-	309	342	-
	Moose	-	295	-	172	129	232
	Habitat	-	-	-	176	14	26
Sourdough Creek		-	-	2,024	-	-	-
South Tongue River	Pine Island	-	-	-	-	808	-
Cody WGFD Region							
West Tensleep Creek	Elevation 8,630 ft	-	-	-	-	162	-
Middle Tensleep Creek	Elevation 9,020 ft	-	-	-	-	490	-
Willow Creek	Elevation 8,260 ft	-	-	-	-	66	-

While numbers of fish at North Tongue River stations have declined, total biomass estimates have generally increased, indicating the fish are getting bigger (Andrew Nikirk, Wyoming Game and Fish Department, personal communication). This trend towards larger rainbow trout suggests that habitat quality is being maintained or improved for adult rainbow trout. The quality of spawning and juvenile rearing habitat (based on numbers of young rainbow trout) is more difficult to ascertain trout because of ongoing fish stocking. Trends in rainbow trout populations at other sampling stations are less apparent.

Prepared by Jon Warder and Michael Bower, January 2012.

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