

WILDLIFE

C-8 Old Growth Habitat for Goshawk

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

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

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

OLD GROWTH

OLD GROWTH MONITORING METHODS

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

DESIGNATION OF COMMERCIAL FOREST LANDS

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

Although the Forest Plan identified the number of acres of commercial land, no specific map of these lands was available for project planning. To remedy the lack of a map, the Forest developed a process in 2005 to identify

commercial lands. The process is described in “Commercial/Non-commercial Forest Land, Logic and Process,” dated August 29, 2005. Since 2005, as projects are planned, commercial lands are identified in the timber compartments in which the project occurs.

FINDINGS – OLD GROWTH COMMERCIAL FOREST LAND BY COMPARTMENT

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

| Table C-8a. Old Growth Inventory Data by Compartment – Jefferson Division | | | | | | |
|--|--------------------|---------------------------------|---------------------------------------|------------------------------------|---|---|
| District | Compartment | NFS Acres in Compartment | Inventoried Old Growth Acres * | Acres of Commercial Lands * | Old Growth Acres in Commercial Lands * | % Old Growth in Commercial Lands |
| D3 | 366 | 3858 | 498 | 1300 | 125 | 9.7 |
| | 367 | 12182 | 2420 | 10013 | 2352 | 23.5 |
| | 368 | 15478 | 1537 | 10719 | 1507 | 14.1 |
| | 369 | 10627 | 1018 | 9267 | 843 | 9.1 |
| | 370 | 13208 | 3295 | 10409 | 3282 | 31.5 |
| | 371 | 7253 | 536 | 5926 | 527 | 8.9 |
| | 372 | 13845 | 1846 | 11430 | 1846 | 16.2 |
| | 373 | 11331 | 1994 | 10281 | 1982 | 19.3 |
| | 374 | 5895 | 952 | 4344 | 674 | 15.5 |
| | 375 | 8480 | 1722 | 6668 | 1671 | 25.1 |
| | 376 | 13586 | 2429 | 11467 | 2394 | 20.9 |
| | 377 | 14749 | 1248 | 11534 | 1248 | 10.8 |
| | 380 | 14029 | 1499 | 12114 | 1499 | 12.4 |
| | 387 | 8534 | 1340 | 7230 | 1340 | 18.5 |
| | D4 | 446 | 4983 | 978 | 2751 | 979 |
| 449 | | 12749 | 1692 | 8460 | 1648 | 19.5 |
| 450 | | 11078 | 1086 | 10317 | 1056 | 10.2 |
| 451 | | 14457 | 2011 | 10586 | 1935 | 18.3 |
| 452 | | 10390 | 3667 | 8264 | 3122 | 37.8 |
| 453 | | 11680 | 1380 | 7862 | 1380 | 17.6 |
| 454 | | 11698 | 2208 | 8886 | 2208 | 24.9 |
| 455 | | 11456 | 2470 | 9129 | 2434 | 26.7 |
| 456 | | 14262 | 4510 | 13552 | 4503 | 33.2 |
| 457 | | 16905 | 1881 | 13254 | 1873 | 14.1 |
| 458 | | 9645 | 472 | 6796 | 472 | 7.0 |
| 459 | | 13819 | 2818 | 10157 | 2317 | 22.8 |
| 460 | | 21029 | 2279 | 11547 | 2049 | 17.8 |
| 461 | | 9866 | 1011 | 6440 | 577 | 9.0 |
| 462 | | 11942 | 1063 | 6467 | 850 | 13.2 |
| D6 | 601 | 5836 | 1476 | 5443 | 1446 | 26.6 |
| | 602 | 5301 | 616 | 4554 | 616 | 13.5 |
| | 603 | 2369 | 349 | 1778 | 349 | 19.6 |
| | 632 | 6212 | 435 | 3901 | 317 | 8.1 |
| | 633 | 9242 | 860 | 8172 | 747 | 9.1 |
| | 634 | 5110 | 546 | 1862 | 445 | 23.9 |
| | 635 | 10797 | 950 | 8758 | 861 | 9.8 |

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

| District | Compartment | NFS Acres in Compartment | Inventoried Old Growth Acres * | Acres of Commercial Lands * | Old Growth Acres in Commercial Lands * | % Old Growth in Commercial Lands |
|----------|-------------|--------------------------|--------------------------------|-----------------------------|--|----------------------------------|
| | 636 | 9054 | 1917 | 3586 | 1460 | 40.7 |
| | 637 | 5903 | 878 | 3964 | 865 | 21.8 |
| | 646 | 2190 | 765 | 1770 | 710 | 40.1 |
| D7 | 701 | 12741 | 685 | 6548 | 610 | 9.3 |
| | 702 | 6712 | 1025 | 5255 | 841 | 16.0 |
| | 703 | 8454 | 836 | 6057 | 712 | 11.8 |
| | 704 | 8118 | 1367 | 6107 | 790 | 12.9 |
| | 705 | 8325 | 1710 | 6418 | 1490 | 23.2 |
| | 706 | 7332 | 225 | 5258 | 165 | 3.1 |
| | 707 | 10340 | 344 | 7764 | 344 | 4.4 |
| | 708 | 7873 | 133 | 4919 | 133 | 2.7 |
| | 709 | 6830 | 337 | 5404 | 157 | 2.9 |
| | 711 | 23349 | 1943 | 21160 | 1907 | 9.0 |

* Variations in acreages from the May 2004 monitoring report are due to database corrections and/or updated inventories.

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

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

FIA – OLD GROWTH

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

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

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

GOSHAWK

CONSERVATION ASSESSMENT AND HABITAT ESTIMATES FOR MAINTAINING VIABLE POPULATIONS OF GOSHAWKS

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

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

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

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

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

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

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

In *Habitat Estimates for Maintaining Viable Populations of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten, and Fisher* (Samson, 2006) Samson estimates a critical habitat threshold of 540 km² for a minimum viable population for the single population of the northern goshawk in the Northern Region. Total estimated habitat on the Lewis and Clark is 1,276 km², certainly adequate alone to support a minimum viable population of northern goshawk. Studies (Hessberg et al. 2003, Gallant et al. 2004 and Hessberg et al. 2005) have shown that forested systems in the Northern Region are more extensive than in historic times (1800s) and there is no indication that forested ecosystems in the Northern Region is anywhere near a critical threshold of species habitat loss to 20-30% of historic range.

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

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

REGIONAL GOSHAWK MONITORING

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

LEWIS AND CLARK GOSHAWK MONITORING AND INVENTORY

METHODS

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

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

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

RESULTS

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

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

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

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

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

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

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

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

Table C-8d. Goshawk Nest Areas Monitored *

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

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

Of the 40 known active nest areas; 16 of these occur on the Rocky Mountain Division and 24 occur on the Jefferson Division. In the last 15 years, monitoring results indicate that the percent of occupied territories (territories that were monitored and goshawk presence was detected) has varied from zero to 80%, and the percent of active nesting areas has varied from zero to 60%. The Forest Plan monitoring item states that a decrease of 10% or more in active nest territories would initiate further evaluation. As shown in Table C-8d, the change in active territories has varied from an annual decrease of 30% to an increase of 54%.

DISCUSSION

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

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

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

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

GOSHAWK HABITAT ANALYSIS

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

RESULTS

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

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

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

DISCUSSION

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

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

EVALUATION

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

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