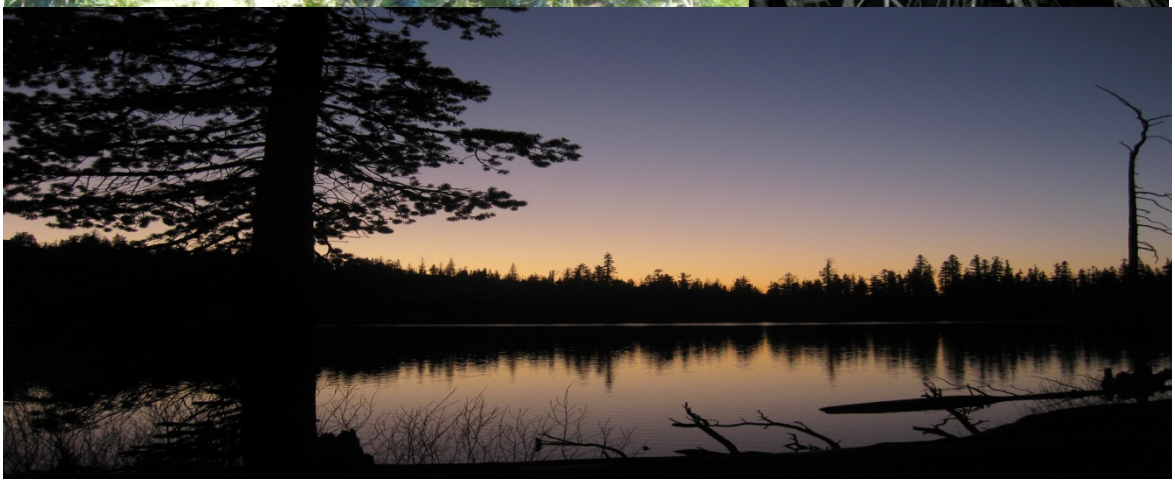
# 2008-2012 Wildlife Survey Program
# Five-year Summary Report
## Ecosystem Conservation Department
## Lake Tahoe Basin Management Unit



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# Introduction

This report describes the results from monitoring select terrestrial wildlife species in the Lake Tahoe Basin during 2008-2012, hereafter referred to as "summary period". The USDA Forest Service Lake Tahoe Basin Management Unit (Lake Tahoe Basin, LTBMU) and its partners conducted surveys during the summary period to assess presence, reproductive activity and success, and/or spatial distribution of California spotted owl (*Strix occidentalis occidentalis*), northern goshawk (*Accipiter gentilis*), peregrine falcon (*Falco peregrinus*), osprey (*Pandion haliaeetus* ), bald eagle (*Haliaeetus leucocephalus* ), willow flycatcher (*Empidonax traillii adastus*), and Townsend's big-eared bat (*Corynorhinus townsendii*). Formal surveys were not conducted for Pacific marten *(Martes caurina)*[1] during the summary period but we have learned new information during this period regarding the population of this species in the LTBMU due to incidental observations and research conducted by USDA Pacific Southwest Research Station (PSW). Therefore, what is known about the status of marten is described in this report.

Many of the surveys conducted for each species during the summary period varied in purpose (e.g., project-related, population monitoring), location (e.g., PAC identity, territory, cliff), and level of effort (e.g., number of acres, nests) within and across years. The lack of consistent surveys for each species limits our ability to draw conclusions about trends in the population at the scale of the LTBMU. However, some species locations in the LTBMU were surveyed consistently during the summary period and we are able to identify patterns related to occupancy and reproductive status at these locations. Furthermore, for species where the survey protocol used was consistent but effort and location differed, we were able to assess occupancy and reproductive status at the level of the LTBMU for that specific level of survey effort. Reproductive success (e.g., # fledged) is described in results but should be interpreted with caution because reproductive success in many species varies annually or cyclically and is strongly influenced by weather, prey abundance, and other factors that were not monitored.

This report is organized by species. For each species we have included a species account, management direction to survey/monitor and protect the species, survey methods used during the summary period, results from surveys, interpretation of the results, and future recommendations and needs. The species accounts in this report are summaries of some of the basic life history information for the species (e.g., geographic range, habitat associations, and threats). Full species accounts that provide additional information can be obtained by contacting the LTBMU Supervisor's Office. The metrics used to describe each species' population vary because the metrics used in each protocol vary. The metrics described and defined in each protocol are the metrics used for this summary report.

# 1.0 California Spotted Owl (*Strix occidentalis*)

## 1.1 Species Account and Management Direction

The California spotted owl is a Forest Service Sensitive (FSS) Species in Region 5 and on the LTBMU and a Management Indicator Species (MIS) for late seral closed canopy conifer forest habitat in Sierra Nevada forests.

The California spotted owl occurs on the west slope (locally on east slope) of Sierra Nevada from Shasta (Pit River) and Lassen Counties south to Kern County, and mountains of central, coastal, southern, and transverse ranges of California from Monterey (south side of Carmel Valley) and Kern Counties south through San Diego County to Cuyamaca Mountains in California, and Sierra San Pedro Martir in Baja California Norte, Mexico (Gutiérrez and Barrowclough 2005). The LTBMU is located on the edge of the range for this species; the only record of spotted owl nesting within the state of Nevada first occurred in 2009 near Spooner Summit within one mile of the eastern boundary of the LTBMU, on the Humboldt-Toiyabe National Forest. A pair with two fledglings was found. In 2010 the nest was located and nesting occurred again.

In the Sierra Nevada Province, spotted owls occur in conifer, mixed conifer and hardwood, and hardwood forests (Verner et al. 1992). Mixed-conifer forest is used most frequently by this species in the Sierra Nevada: approximately 80 percent

[1] This species was previously classified as American marten (*Martes americana)* but is now classified as Pacific marten (*Martes caurina*) and of the subspecies *sierra* based on recent genetic and morphological evidence (Dawson and Cook 2012).

of known sites are found in mixed-conifer forest, 10 percent in red fir forest, seven percent in ponderosa pine/hardwood forest, and the remaining three percent in foothill riparian/hardwood forest and eastside pine (USDA 2001). Spotted owl nesting and roosting locations are strongly associated with mature coniferous forests with high tree canopy cover (≥70%), multilayered canopies, and an abundance of large trees and snags (Bias and Gutiérrez 1992; Bond et al. 2004; Call et al. 1992; Chatfield 2005; Forsman et al. 1984; Verner et al. 1992). Spotted owl foraging habitat consists of a broader range of vegetation types that may include younger, more open habitat (Roberts and North 2012; Williams et al. 2011). Large coarse woody debris is a key habitat feature of spotted owl prey. California spotted owl typically fledge an average of 1 young in years that they attempt reproduction (Gutiérrez et al. 1995).

According to CWHR (CDFW 2005) high quality nesting habitat for spotted owls consists of Montane Hardwood and Red Fir (5D); Montane Hardwood-Conifer, Montane Riparian, Sierran Mixed Conifer and White Fir (5D and 6) habitat types. Medium quality nesting habitat consists of Eastside Pine and Lodgepole Pine (5D); and Sierra Mixed Conifer (4M, 4D and 5M) habitat types. There is 555 acres of high quality nesting habitat and 34,459 acres of medium quality nesting habitat in the LTBMU.

**A juvenile spotted owl with a mouse.**

Potential threats and stressors to this species include high severity stand-replacing fires, expansion of barred owls (*Strix varia*), loss of large trees and dense canopy cover, habitat fragmentation, climate change, and disease.

Throughout the Sierra Nevada, California spotted owl nesting habitat is protected in Protected Activity Centers (PACs). Each PAC includes 300 acres of the highest quality nesting habitat available, and the most recent nest site or activity center within a spotted owl breeding territory as described in management direction for the forest (USDA 2004). A territory is an area including a nest site and a variable foraging range that is occupied and defended by a single or pair of birds. A PAC size of 300 acres corresponds with the following two criteria reported by Verner et al. (1992) in the California Spotted Owl report: 1) the size of the nest stand and adjacent suitable nesting stands; and 2) the area encompassing approximately 50% of radio-telemetry locations within spotted owl territories on the Sierra National Forest (USDA 2001). Additionally, spotted owl habitat is protected by Home Range Core Areas (HRCA). Each HRCA encompass the PAC and include 1,000 acres (approximately 20% of the mean spotted owl territory size) of the best habitat on national forest lands in the closest proximity to the activity center (USDA 2004). Spotted owls are territorial and it should be noted that one territory frequently encompasses more than one PAC/HRCA. As of 2012 (end of the summary period), there were 21 California spotted owl PACs on the LTBMU and 21 HRCAs. Data for California spotted owls found in the LTBMU are stored on the USDA Natural Resource Manager Natural Resource Information System (NRM NRIS) (http://fsweb.nris.fs.fed.us/products/Wildlife/index.shtml).

The 1988 LTBMU Land and Resource Management Plan (LRMP) (USDA 1988) directs the LTBMU to "maintain surveillance for spotted owls" and establish areas that will be managed specifically for spotted owl (PACs). It further directs that no logging, vehicle use or other major disturbance should be permitted during the spotted owl nesting season. The LTBMU contracted with researchers at the Pacific Southwest Research Station (PSW) to develop a California spotted owl monitoring plan to ensure the management objective, protection of the population, is being met for California spotted owls in the LTBMU. The monitoring plan was developed as an early-warning system to detect biologically significant changes in the spotted owl population with statistical rigor. Following initial survey groundwork, the program will be able to evaluate and implicate the stressors (e.g. ski resorts, urbanization, fuels reduction) that influence the status and trend of the spotted owl population. This plan was finalized in 2011 and is referred to as the 10-year California spotted owl monitoring plan (SPOW MP).

## 1.2 Methods

The LTBMU has survey data for spotted owl back to 1981. It is unknown what protocol was used prior to 1993. Three types of survey efforts were conducted for this species during the summary period and include Land and Resource Management Plan Surveys (LRMP), project-level surveys, and SPOW MP surveys. Land and Resource Management Plan surveys were conducted to meet the requirement of the LRMP to "maintain surveillance for spotted owls". Land and Resource Management Plan surveys have been conducted in spotted owl PACs at least every three years in order to determine current activity, pair status, reproductive effort, and productivity. Project-level surveys on the LTBMU were conducted within suitable habitat of a project footprint or within 400 meters of project footprints (depending on the project activities). Both LRMP and project-level surveys followed the Forest Service, Region 5, 'Protocol for Surveying For Spotted Owls in Proposed Management Activity Areas and Habitat Conservation Areas'(USDA 1993). Spotted owl monitoring plan surveys were initiated in 2011. Territory occupancy, reproduction, and nest productivity were the three indicators monitored. Survey methods for the SPOW MP differed from LRMP and project-level surveys as described below.

**The Griff Creek spotted owl nest with a female and a nestling in the nest.**

### *Project-level and LRMP Survey Methods*

The survey protocol implemented on the LTBMU consists of nocturnal acoustic calling of spotted owls from established call stations along established survey routes (spot calling). Survey routes were established in a project survey area for project-level surveys or a PAC for LRMP surveys. Land and Resource Management Plan surveys were conducted in PACs or known territories that either contained a known recent nest or had not been surveyed in the previous two years. All surveys were conducted by a team of trained biologists beginning at sunset. Call stations along these routes were surveyed three times under a standard two-year protocol, from 1 May to 31 August. The first two visits normally occurred prior to 30 June, with the remaining survey conducted after 30 June and before 31 August. Owl call stations were located along these established routes on roads or trails, spaced approximately 300 meters apart, and situated on the landscape to maximize acoustic coverage (e.g. located on high ground or in a forest opening). If a predator (i.e. northern goshawk or great horned owl) was detected during a survey, a ¾ mile buffer was created; every call station within that buffer was omitted from that night's survey to avoid attracting a spotted owl to a possible predator. If an owl was detected a follow-up visit was performed within 48 hours to attempt to locate the owl and determine status (e.g., nesting). Mousing was utilized during follow-up surveys as a means of determining reproductive activity and locating nests. If an active nest was found, spot-calling surveys were suspended for the season and biologists instead conducted bi-weekly monitoring at the nest site in order to obtain more refined data on reproduction (e.g., number of young, number fledged). Owl pairs were confirmed if a male and a female were detected within ¼ mile of each other as described in the protocol. A territory was determined to be reproductive if nesting activity was observed or if juveniles were detected during the field season. Fledging was verified if juveniles were detected outside the nest cavity. Spotted owl surveys determined survey area occupancy, individual and pair status, nesting status, and reproductive success.

### *Monitoring Plan Survey Methods*

The SPOW MP (Slauson and Baldwin 2011) is an early-warning system, capable of detecting a biologically significant level of change in the spotted owl population, with statistical rigor. The SPOW MP includes analytical tools to be able to evaluate the relationships that anthropogenic stressors may have on influencing the status and trend of the spotted owl population. The SPOW MP is focused on the core areas (PACs) of owl territories distributed throughout the LTBMU. The SPOW MP protocol followed the Forest Service, Region 5, 'Protocol for Surveying for Spotted Owls in Proposed

Management Activity Areas and Habitat Conservation Areas' (USDA 1993), however, there were a few differences from the standard protocol: 1)The SPOW MP surveys occurred between 15 April and 15 August. This change was made in order to trim off the first and last two weeks of the survey period with the thought that they are less productive survey times. Prior to spot calling, nest checks of known historic nests began 15 April. 2) Survey points were positioned on existing roads or trails to increase safety and efficiency, as well as off trail to gain effective coverage that could not be found on roads/trails. This particular change was a departure from local protocol rather than the regional protocol. 3) For a more standardized call sequence, a FoxPro broadcast unit was used to imitate the spotted owl 4-note contact call, female begging call, and the barking call (Slauson and Baldwin 2011) compared to voice calling with the standard protocol. 4) Each survey area contained 8 or 12 spot calling stations, depending on whether the territory encompassed one PAC or two. This provided a standard number of call stations for making comparisons across PACs. 5) Calling stations were located 400-800 meters apart.

Spotted owl monitoring plan surveys during the summary period included 20 of the 22 territories or possible territories included in the SPOW MP. Based on historic data 13 PACs were determined to represent independent territories. Four territories encompassed two PACs each. Five possible territories were identified in patches of suitable habitat that had not been previously surveyed or were infrequently surveyed. Twenty of these selected territories were surveyed during the first survey period in 2011 and 2012. Only the first survey period was completed during the summary period. Each survey period consists of two consecutive survey seasons. Survey periods are separated by a two year break in surveys (i.e. survey in 2011 and 2012 (survey period 1), don't survey in 2013 and 2014). Any survey area that is active (at least one owl detected) during the first season of the survey period is not surveyed during the second season of the survey period, in order to reduce disturbance to the owls. The twelve territories that showed consistent occupancy were surveyed during each period. The nine territories with inconsistent or unknown occupancy were surveyed 2 of the 3 periods. Table 1 lists the categories and survey schedule for each territory.

**Table 1.** Territory, survey category and period (period 1=2011 and 2012; period 2 = 2015 and 2016; period 3 = 2019 and 2020) to be surveyed of areas included in the LTBMU spotted owl monitoring plan.

| Territory | Occupancy Category | Survey Frequency |
|---|---|---|
| Blackwood Creek | Consistent | Every Period |
| Burton Creek | Consistent | Every Period |
| Carnelian/ Mt. Pluto | Consistent | Every Period |
| Cold Creek | Consistent | Every Period |
| Cookhouse-Grass Lake | Unknown | Period 1 & 2 |
| Echo Lake | Inconsistent | Period 1 & 2 |
| General Creek | Consistent | Every Period |
| Griff Creek | Consistent | Every Period |
| Hawley Grade | Inconsistent | Every Period |
| Hellhole | Inconsistent | Period 1 & 3 |
| Lower/Upper Saxon Creek | Consistent | Every Period |
| McKinney Lake/Rubicon Trail | Unknown | Period 2 & 3 |
| Page Meadows East/West | Consistent | Every Period |
| Painted Rock | Consistent | Every Period |
| Paradise Flat | Unknown | Period 1 & 3 |
| Round Lake | Inconsistent | Period 1 & 2 |
| Sierra Creek/Lonely Gulch | Unknown | Period 2 & 3 |
| Spooner Summit | Unknown | Every Period |
| Spring Creek | Consistent | Every Period |
| Stanford Rock/Twin Peaks | Consistent | Every Period |

| Territory | Occupancy Category | Survey Frequency |
|---|---|---|
| Tahoe Mountain | Inconsistent | Period 1 & 3 |
| Twin Crags | Consistent | Every Period |

If an owl was detected during spot calling, the remaining route points were eliminated for that survey to reduce unnecessary disturbance. A follow-up survey could be conducted at night, or if the owl was not located or did not seem interested after considerable time, the surveyors resumed the follow-up effort the following morning. If pair status was confirmed by definitive behavioral indicators (i.e. feeding of begging female, visual of pair during same outing, etc.) the route was not surveyed for the remainder of the season. If a predator (i.e. northern goshawk or great horned owl) was detected during a survey, a ¾ mile buffer was created; every call station within that buffer was omitted from that night's survey to avoid attracting a spotted owl to a possible predator.

## 1.3 Results

The acres of spotted owl habitat and number and identity of spotted owl territories surveyed fluctuated annually (Figures 1 and 2, Table 2) depending on the number of projects requiring surveys, number of PACs selected for surveys under NRI, whether it was an MP survey year or not, and amount of available funding.

Between 17,911 and 39,395 acres of spotted owl habitat were surveyed each year over the summary period (Figure 1). Survey acreage was calculated as the area within a 400 meter radius of call stations and a 1,609 meter radius (1 mile) around active nests or roost sites, and includes surveys conducted by the LTBMU, our partner agencies, and consulting firms (California Department of Parks and Recreation, (CDPR), Nevada Department of Wildlife (NDOW), California Tahoe Conservancy (CTC), Hauge Brueck Associates (contractor for Heavenly Mountain Resort) and Insignia Environmental (contractor for Sierra Pacific Power Company)). The number of individual spotted owl detections ranged from 10-18 (mean = 14, SD = 4) over the summary period. The number of pairs detected ranged from 3-6 (mean = 5, SD = 1) and the number of reproductive territories (defined as a territory containing a pair of owls that attempt to reproduce regardless of whether they are successful or not) ranged from 0-4 (mean = 2, SD = 1). The number of young fledged should be interpreted with caution as reproductive success is strongly influenced by factors that were not monitored (e.g., weather, prey availability). As shown in Figure 1, more survey effort (in terms of acres of habitat surveyed) did not appear to correlate with increased detection probability. However, the data in Figure 1 are based strictly on acres surveyed and not on territory identity, some territories may be more active than others, and some surveys take place in areas not identified as a territory.

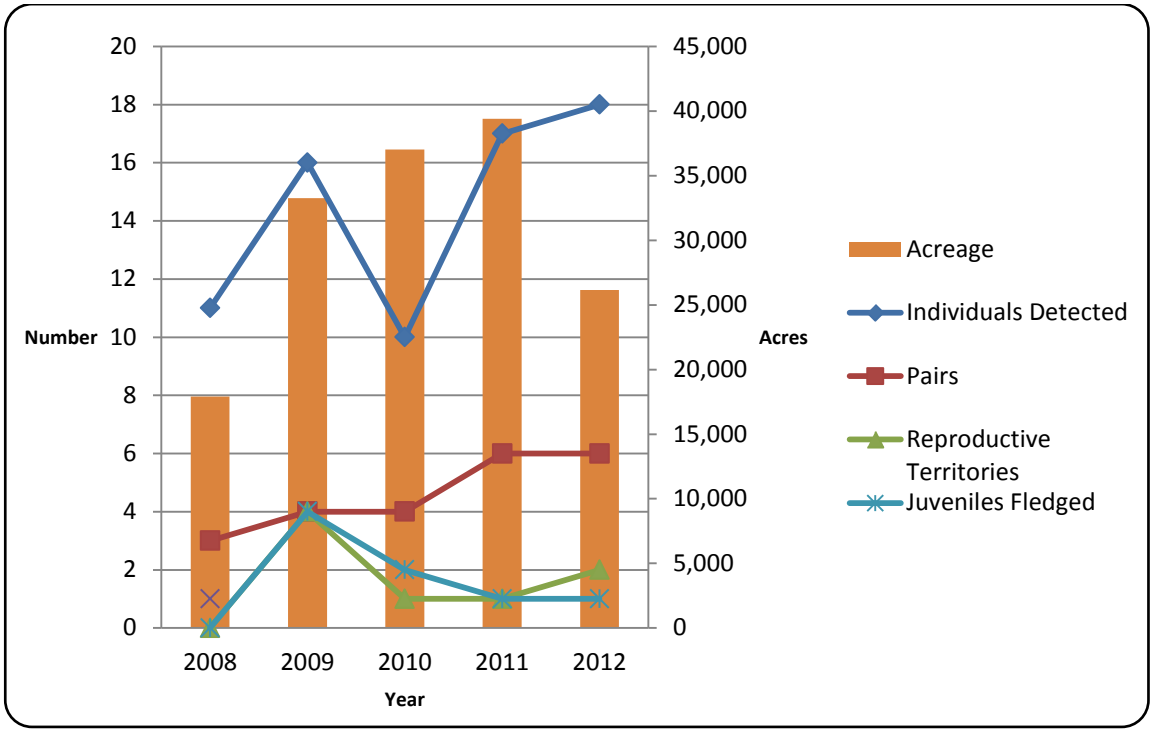



**Figure 1.** Total annual acreage (bars) surveyed for spotted owl 2008-2012 and total individuals detected, pairs detected, reproductive territories, and juveniles fledged for all surveys (lines, not standardized by acres surveyed).

Twenty territories were surveyed at various points during the summary period (Table 2, Appendix A). There were 18 known spotted owl territories that were at least partially in the LTBMU at the beginning of the summary period. Two additional territories (Cookhouse Meadow and Paradise Flat) were discovered during the summary period. Of the 20 territories surveyed, survey effort was divided as follows: 20% of territories (4) were surveyed during all five years of the summary period, 30% of territories (6) were surveyed during 4 years of the summary period, 30% of territories (6) were surveyed during three years of the summary period, and 20% of territories (4) were surveyed during two years of the summary period. Of all the territories surveyed in each year, 54% had detections in 2008, 78% had detections in 2009, 50% had detections in 2010, 40% had detections in 2011, and 56% had detections in 2012 (Table 2, Figure 2). The greatest number of reproductively active territories were identified in 2009 when 44% (4) of territories surveyed exhibited reproduction (Table 2, Figure 2).

**An adult spotted owl delivering a mouse to its juvenile.**

Nine territories were considered reproductively active because they exhibited reproduction at least once since surveys of these territories began on the LTBMU (Table 2, Appendix A). During the summary period, five of these territories attempted reproduction and include: Burton Creek, Cold Creek, Cookhouse Meadow, Griff Creek, and Saxon Creek.

**Table 2.** California spotted owl territories on the LTBMU that were surveyed ([a] = SPOW MP survey, [b] = LRMP survey, [c] = project survey) and their activity status during the summary period.

| Territory | 2008 | | | 2009 | | | 2010 | | | 2011 | | | 2012 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Detection | Reproductively Active | Young Produced | Detection | Reproductively Active | Young Produced | Detection | Reproductively Active | Young Produced | Detection | Reproductively Active | Young Produced | Detection | Reproductively Active | Young Produced |
| Territories Surveyed all Five Years of the Summary Period | | | | | | | | | | | | | | | |
| Burton Creek* | yes[b] | no | 0 | yes[b] | yes | 1 | yes[b] | yes | 0 | yes[a] | no | 0 | yes[c] | no | 0 |
| Cold Creek* | yes[bc] | no | 0 | yes[b] | yes | 0 | yes[c] | yes | 1 | yes[ac] | yes | 1 | yes[b] | yes | 1 |
| Griff Creek* | no[bc] | no | 0 | yes[c] | yes | 2 | no[bc] | no | 0 | no[a] | no | 0 | no[a] | no | 0 |
| Spring Creek* | no[bc] | | 0 | no[c] | no | 0 | no[bc] | no | 0 | no[ac] | no | 0 | no[a] | no | 0 |
| Territories Surveyed Four Years of the Summary Period | | | | | | | | | | | | | | | |
| Carnelian Bay* | yes[bc] | no | 0 | yes[c] | no | 0 | yes[c] | no | 0 | yes[a] | no | 0 | not surveyed | | |
| Hawley Grade* | yes[b] | no | 0 | not surveyed | | | no[c] | no | 0 | no[ac] | no | 0 | no[a] | no | 0 |
| Page Meadows | yes[c] | no | 0 | yes[c] | no | 0 | not surveyed | | | yes[ac] | no | 0 | yes[c] | no | 0 |
| Saxon Creek* | yes[bc] | no | 0 | yes[bc] | yes | 1 | yes[bc] | no | 0 | yes[ac] | no | 0 | not surveyed | | |
| Tahoe Mountain | no[c] | no | 0 | no[c] | no | 0 | no[c] | no | 0 | yes[ac] | no | 0 | not surveyed | | |
| Twin Crags | no[c] | no | 0 | not surveyed | | | no[b] | no | 0 | no[ac] | no | 0 | yes[ac] | no | 0 |
| Territories Surveyed Three Years of the Summary Period | | | | | | | | | | | | | | | |
| Blackwood Canyon | no[c] | no | 0 | not surveyed | | | not surveyed | | | no[ac] | no | 0 | no[ac] | no | 0 |
| Cookhouse Meadow* | not surveyed | | | not surveyed | | | no[c] | no | 0 | yes[ac] | no | 0 | yes[b] | yes | 0 |
| Echo Lake | not surveyed | | | not surveyed | | | no[c] | no | 0 | no[a] | no | 0 | no[a] | no | 0 |
| General Creek* | yes[b] | no | 0 | not surveyed | | | not surveyed | | | no[a] | no | 0 | yes[a] | no | 0 |
| Round Lake | no[c] | no | 0 | not surveyed | | | not surveyed | | | no[a] | no | 0 | no[a] | no | 0 |
| Stanford Rock | not surveyed | | | yes[b] | no | 0 | not surveyed | | | no[ac] | no | 0 | yes[ac] | no | 0 |
| Territories Surveyed Two Years of the Summary Period | | | | | | | | | | | | | | | |
| Hellhole | not surveyed | | | not surveyed | | | no[c] | no | 0 | yes[ac] | no | 0 | not surveyed | | |
| McKinney Creek | not surveyed | | | not surveyed | | | not surveyed | | | no[c] | no | 0 | no[c] | no | 0 |
| Painted Rock | not surveyed | | | not surveyed | | | not surveyed | | | no[a] | no | 0 | no[a] | no | 0 |
| Paradise Flat | not surveyed | | | not surveyed | | | not surveyed | | | no[a] | no | 0 | yes[a] | no | 0 |
| Total Territories Surveyed | 13 | | | 9 | | | 12 | | | 20 | | | 16 | | |
| Territories with Detections (%) | 7 (54%) | | | 7 (78%) | | | 6 (50%) | | | 8 (40%) | | | 9 (56%) | | |
| Reproductive Territories (%) | 0 (0) | | | 4 (44%) | | | 2 (17%) | | | 1 (5%) | | | 2 (13%) | | |

*These are considered reproductively active territories, having exhibited reproduction in the past or during the summary period.

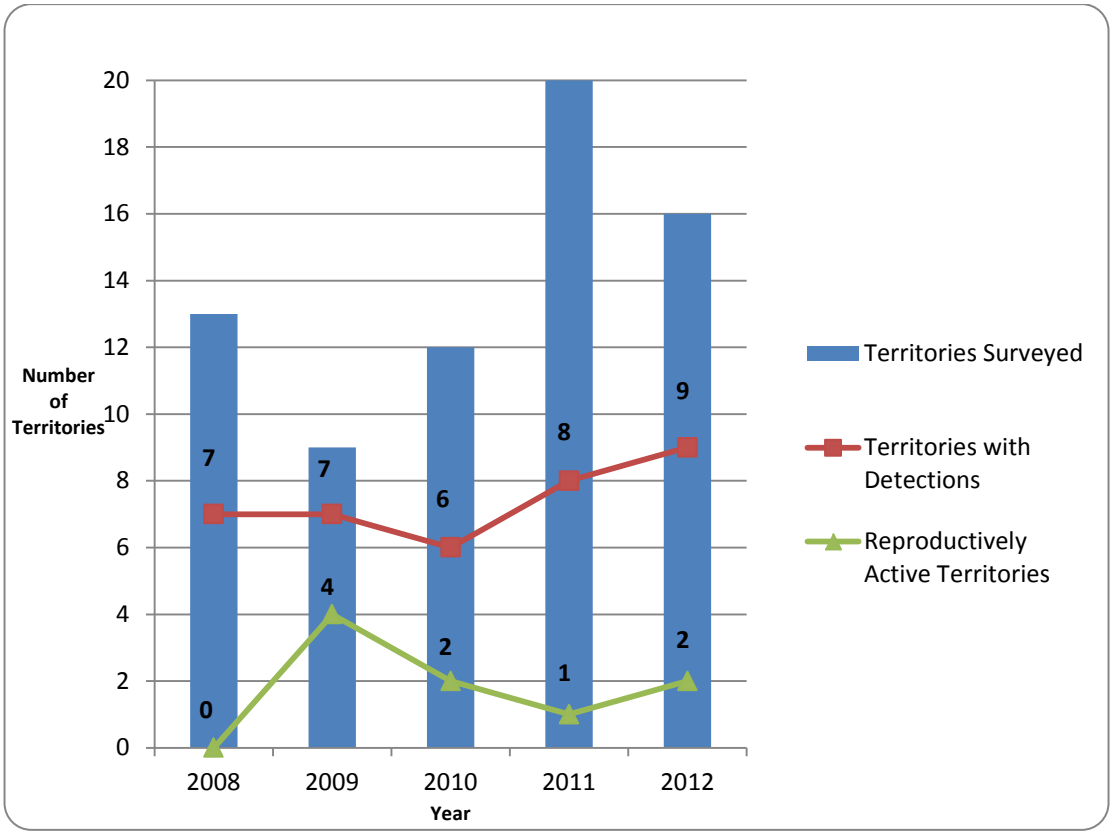



**Figure 2.** Number of territories surveyed each year during the summary period (bars) as well as number of surveyed territories with owl detections and reproductive activity (lines, not standardized by acres surveyed).

Habitat at the nest stand level was calculated using CWHR (CDFW 2005) defined habitat in a one quarter mile buffer around each known spotted owl nest in the LTBMU. While 555 acres (One tenth of one percent of the total land in the LTBMU.) of high quality spotted owl nesting habitat exists in the LTBMU, approximately one percent of habitat found in known nest stands consists of CWHR defined high quality habitat (13 acres). Seventy-eight percent of nest stands are found in CWHR defined medium quality habitat (1,114 acres out of 34,459 acres in the LTBMU). The remaining 21% of habitat in nest stands does not fall into CWHR defined high or medium quality habitat types.

## 1.4 Discussion

### *Detections*

Overall, the number of individual owls and owl pairs detected in the LTBMU increased over the summary period from 11 to 18 and 3 to 6, respectively, despite widely varying annual survey efforts. Acres surveyed were significantly higher in 2009, 2010, and 2011 than in 2008 and 2012. From 2009-2011 surveys were being conducted for large fuel reduction projects and 2011 was the first year of the monitoring plan. It may be that the increase in survey effort contributed to an increase in the number of individuals and pairs detected in 2009 and 2011. However, far fewer individuals were detected in 2010 (10 in 2010 versus 16 in 2009 and 17 in 2011) despite a relatively large survey effort (Figure 1). Furthermore, in 2012 the survey acreage was lower than in the previous three years yet the number of owls detected was the highest of the summary period at 18 individuals and the number of pairs detected (6) was the same as in 2011 which was the highest of the summary period. The reason for these patterns is unclear. It may be that prey availability influenced spotted owl population dynamics such that an increase in prey was tracked by an increase in owls but we do not have data to evaluate this possibility. It may be that surveyor ability or propensity of individual owls to respond to survey calls influenced the detection numbers but as with prey, we do not have data to evaluate this possibility. Since project-level and LRMP surveys used voice calling and the SPOW MP used a broadcast unit, there is the chance that there was a difference in the response rate depending on call type. However, when this was analyzed there was no clear difference.

Weather fluctuated widely over the summary period and could have influenced detections of owls. The winter of 2010/2011 was especially long and wet, with a long-lasting snow pack and snow continuing to fall into June; yet individual owl detections were higher in the 2011 season than the 2010 season. Additionally, the number of pairs detected increased from 2010 to 2011. The winter from 2011 to 2012 was exceptionally mild with a very low snowpack and a long mild spring and the owl detections increased even more than during the 2011 season. Another plausible explanation for the variable detections among summary period years is the number of territories selected for survey each year and the identity of the territory. According to Table 2, all territories were surveyed in 2011, and 2012 had the second most territories surveyed despite fewer acres of survey. The fact that these two years had surveyed the greatest number of territories could be the explanation for why these two years had the highest number of detections of individuals and pairs. Similarly, because 2011 and 2012 surveyed the most territories, surveys conducted these years had the greatest likelihood of including territories that are usually active. Conversely, the fewest number of territories were surveyed in 2009 yet a large number of individuals were detected (but not as many as in 2011 and 2012). As with the other possible explanations, we cannot know if the difference in the number and identity of territories surveyed influenced detections.

**The Burton Creek spotted owl male taking a mouse.**

Although there was an increase in the number of individuals and pairs detected in the LTBMU over the summary period, these results should not be interpreted to mean that there is an increasing trend in the population. Trend patterns cannot be determined by LRMP or project-level surveys because they are not statistically viable. The SPOW MP surveys are trying to identify trends in the population but only one survey period fell within the time frame of the summary period. Moreover, the MP surveys are prohibitively costly due to the large amount of acreage that needs to be surveyed each period in order to have a statistically viable sample size.

Among territories that were surveyed, the percent of territories that had detections changed very little from 2008 (54%) to 2012 (56%) but experienced high detections in 2009 (78%) and low detections in 2011 (40%). As with the inability to explain fluctuations in the number of overall detections for the entire LTBMU (as discussed above), we do not have sufficient data to evaluate the cause for changes in detections within territories. However, as aforementioned, some owls may be more apt to respond to surveyors than others and this may influence detectability.

## *Reproductively Active Territories*

Overall there was an increase in the number of territories that were identified to be reproductively active from zero to two over the summary period. Interestingly, there was a "spike" in territories that were reproductively active in 2009 with 44% of all territories surveyed (four total territories) being identified as reproductively active. This finding occurred despite the fact that the fewest territories were surveyed during 2009 (refer to Table 2 and Figure 2). The greatest number of juveniles fledged (4) was also detected in 2009. Conversely, all twenty territories were surveyed in 2011 and only one (5%) was identified to be reproductively active. For comparison, 17% of territories (2 of 12) surveyed in 2010 were determined to be reproductively active and 13% of territories (2 of 16) surveyed in 2012 were determined to be reproductively active.

Nine territories (Burton Creek, Carnelian Bay, Cold Creek, Cookhouse Meadow, General Creek, Griff Creek, Hawley Grade, Saxon Creek and Spring Creek) have been considered reproductively active on the LTBMU but only five of these territories attempted reproduction during the summary period. Five territories attempted reproduction during the summary period (Burton Creek (2009, 2010), Cold Creek (2009, 2010, 2011, 2012), Cookhouse Meadow (2012), Griff Creek (2009) and Saxon Creek (2009)). Of these territories, only one (Cold Creek) was reproductively active during four of the five seasons it was surveyed. All others were reproductively active during two (Burton Creek) or one (Cookhouse

Meadow, Griff Creek, Saxon Creek) of the seasons. Territories that were reproductively active during multiple seasons (Cold Creek and Burton Creek) attempted reproduction during consecutive years. Reproduction attempts were not separated by non-reproductive seasons. Below is a brief description of all nine territories.

*Burton Creek:* There were spotted owl detections in the Burton Creek territory all five seasons during the summary period and reproduction was attempted in two seasons. One young was fledged in 2009 but the nest failed in 2010. Based on surveys prior to and during the summary period, it would appear that the Burton Creek pair of owls attempt to nest rather inconsistently but continued to attempt reproduction every few years. The original nest in this territory was identified in 2001 and was reused in 2002, 2004, 2009 and 2010. A second nest was identified in 2003 and only used in 2003. This territory nested in 2001 (fledged 2), 2002 (fledged 2), 2004 (outcome unknown), 2009 (fledged 1), 2010 (failed). During the fall of 2011, we became aware of illegal over-the-snow vehicle (OSV) use in three spotted owl PACs (including Burton Creek). The city of Tahoe City grooms cross-country ski and snowshoe trails in Burton Creek State Park. The park roads that they groom cross over onto forest service property and the groomer is continuing the grooming onto USFS lands. The groomed roads cross through the Burton Creek spotted owl PAC on USFS lands. We estimate that this disturbance has likely been occurring for approximately 35 years. This territory is sporadically active and was less active during the summary period than it was in the earlier half of the decade. Although grooming machines are quiet, the presence of the groomer may be introducing disturbances during the critical courtship and early nesting phases that would deter reproduction. It could also be that grooming of these roads might be bringing recreationists into close enough proximity with the activity center to disrupt nesting. Raptors are frequently more disturbed by single or small groups of people moving slowly or sporadically than they are by louder but constantly moving vehicles (Grubb et al. 2012; Swarthout and Steidl 2001).

*Carnelian Bay:* While there is a known pair of spotted owls at Carnelian Bay they are only detected periodically and were only known to nest in 2004, when they fledged one juvenile. This territory was first discovered in 1993 but was not found to contain a pair until 1999.

*Cold Creek:* The Cold Creek spotted owl territory has been the most frequently active and most fecund in the LTBMU since the nest was first discovered in 2002. Two notable events occurred in this territory during the summary period, an attack by a goshawk and the loss of the nest tree. In 2009 while surveyors were conducting a nest check the nest was attacked by a goshawk. The owl pair appeared to be fending it off initially, however assuming that their presence was an added distraction to the owls, surveyors did not stay to observe the altercation. On subsequent nest checks there was no activity at the nest and the adults were not detected for the remainder of the season. They did however return to the same nest cavity in 2010 and reproduced successfully. Over the 2011/2012 winter the nest cavity that this pair had used seven of the previous 10 years fell down. Despite this loss, the pair located a new nest cavity and successfully reproduced during the 2012 season. Over 11 years of surveying, this pair has become increasingly habituated to mousing. Surveyors do not need to call this pair in order to locate them. Both owls, but particularly the female, come to the surveyors and beg for mice. In 2011 and 2012 both owls were observed to follow the surveyors more than a ½ mile from the nest begging for mice. In an effort to continue to monitor the nest but reduce the need for moussing, a camera was installed at the nest site in 2011 and 2012. However, no useable data have been collected by this method to date. The cameras used have infrared video capability but the infrared light needs to be less than 14 meters from the nest. It has been difficult to achieve this due to the height of the nests and the rarity of snags within this distance from the nest tree for camera mounting. Snags are necessary for camera mounting because they provide a clear view due to the lack of needled branches. Additionally, since nests are in forested habitats, the camera is frequently triggered by wind. In order to remedy these problems, future

**The Cookhouse Meadow spotted owl pair.**

camera installments will be mounted on a pole driven into the ground in an appropriate location. This idea needs further development to account for easily raising and lowering the pole, stability and security.

*Cookhouse Meadow:* The Cookhouse Meadow territory was first discovered in 2010. In 2010 and 2011 roosts were located but the pair was not known to have nested. The first known nest was located in 2012 however the cavity appeared to be too small as the female's tail feathers were protruding from the cavity every time she was observed in it. The nest attempt failed. One or both of this pair may be young and inexperienced causing them to have difficulty choosing a suitable cavity. This pair has been easily moused since discovery, suggesting that one or both of the pair are young dispersed from other south shore territories that have been easily moused (Cold Creek, Saxon Creek or Spring Creek). A camera was also installed at this nest site in 2012 but experienced the same difficulties as the Cold Creek nest camera.

*General Creek:* The General Creek territory was first discovered in 1992 and the pair was first known to nest in 2001. This territory is in Sugar Pine Point State Park, so aside from the monitoring plan surveys in 2011 and 2012 it has only been surveyed by CDPR. This territory nested in 2001 (fledged 2), 2002 (fledged 1) and 2004 (fledged 2) but is not known to have nested since then. There were no detections during the MP surveys.

*Griff Creek:* The Griff Creek territory was first discovered in 1999 with a pair present. The only known nests were found in 2004 and 2009. However, this pair will not mouse which makes finding the nest difficult. This territory was known to be reproductively active in 2001 (fledged 2), 2003 (fledged 1), 2004 (fledged 1), and 2009 (fledged 2) but the nest was not located in 2001 and 2003 (i.e. juveniles were found post-fledging).

*Hawley Grade:* The Hawley Grade territory was initially found in 1999. The pair nested in 2000 and 2001 and may have attempted nesting in 2003. Surveys in 2000 and 2001 were conducted by the El Dorado National Forest Spotted Owl Demography Study (EDSODS). Their data sheets mention a nest but the nest location was not entered, so the location of that nest is unknown. The pair fledged two juveniles in 2000 but it is unknown if the nest was successful in 2001. In 2003 the female was seen entering a large mistletoe broom that may have been a nest but reproductive status was never determined. The pair continued to be present with unknown reproductive effort in 2004 and 2005. Other than a detection of a single male in 2008 this territory has been inactive since 2005. In November of 2007 a barred owl was detected in a Christmas Valley neighborhood nearly 3 kilometers north of the Hawley Grade territory; barred owls are known to displace spotted owls. It roosted in a tree for nearly a whole day then was not detected again. Surveys for barred owls were conducted throughout Christmas Valley in the summer of 2008 but there were no detections.

**The Saxon Creek female and her fledgling.**

*Saxon Creek:* The Saxon Creek territory was first discovered in 1982 and the pair may have nested that year. The next known reproductive attempt was in 1999 but that data is incomplete also. There were three known nests in this territory, which were used in 2002 (unknown outcome), 2003 (fledged 1), 2004 (fledged 2), 2007 (fledged 2), and 2009 (fledged 1).

*Spring Creek:* The Spring Creek territory was first located in 2001. A nest was found in 2002 which produced 1 fledgling. Since that time the pair has not been known to reproduce. In the late summer of 2003 a large pile of spotted owl feathers were found in the general area of the 2002 nest. One of the pair may have been predated. Unfortunately a band was not found with the feathers despite a search of the surrounding area. Singles and pairs have been located in the territory periodically, but they have not been known to nest since 2002.

## 1.5 Future Recommendations and Needs

California spotted owl surveys in the LTBMU have been ongoing since 1981. Surveys are anticipated to continue although it may be that fewer acres and territories would be surveyed annually because of a declining trend in the number of projects requiring surveys and funding resources. Surveys and their results are essential to informing management activities and decisions.

Originally, we had hoped that the SPOW MP would provide us with a protocol to select and evaluate spotted owl territories in a way that would provide information on population trends. After all, the intent of the SPOW MP is to be an early-warning system to detect biologically significant changes in the spotted owl population with statistical rigor. The metrics evaluated as part of the SPOW MP (territory occupancy, reproduction, and nest productivity) are considered effective tools for determining population trends and evaluating the stressors influencing the population. However, the SPOW MP is very costly and not likely to be implemented in the future unless we are able to identify cost-saving changes in the SPOW MP that do not jeopardize the statistical rigor and intent of the program. An evaluation of possible alternative solutions is needed and efforts should be made to adapt the monitoring plan to make it more affordable while retaining its ability to detect biologically significant changes in the population.

Until the SPOW MP can be resolved, we recommend continuing LRMP surveys at territories that have been reproductively active. Each year, territories that were active in the previous three years should be surveyed. Additionally, any PAC that has not been surveyed in the previous two years should be surveyed. By selecting these PACs, we avoid becoming hyper-focused on those consistently reproductive territories and are able to gather additional data on territories with less consistent reproductive activity. These surveys will help to inform management decisions such as National Environmental Policy Act (NEPA) biological evaluations and will allow us to track the reproductive success of the frequently active territories in the LTBMU.

In order to reduce disturbance to spotted owls OSV use should be discontinued or limited to the non-breeding season in spotted owl PACs.

Barred owls (*Strix* varia) are closely related to the spotted owl. Historically barred owls were limited to the eastern US and Canada. Throughout the 20$^{th}$ century their range expanded westward in the northern part of their range (Canada) and then south into the western US states. Being larger and more aggressive barred owl are displacing spotted owls in areas where they now overlap (Mazur and James 2000). Any future detections of barred owls need to be closely followed up.

In order to remedy problems experienced with monitoring nest activity with remote game cameras, future camera installments will be mounted on a pole driven into the ground in an appropriate location. This idea needs further development to account for easily raising and lowering the pole, stability and security. Using a camera to monitor nests could reduce habituation to human provided food.

The USFWS (Federal Register: Vol. 71, No. 100, pages 29886-29908) recognized that short term impacts on California spotted owl could occur from fuel reduction projects for the greater, long-term benefit of protecting nesting habitat from being lost to a stand-replacing fire. More on-the-ground information would be useful in an adaptive management framework to understand how owls respond in the short and long-term to fuel reduction treatments. There is currently a Fuel Reduction and PACs monitoring plan in preparation. This effort would monitor how owls respond in the short and long-term to fuel reduction treatments.

We also want to consider a cost-effective way to collect data on some potentially influencing factors such as weather, prey, and stand characteristics. Currently, nest stand vegetation data is collected at the end of the first nesting season that it is found. If this was repeated at intervals we could evaluate potential changes over time and correlate changes in stand characteristics with changes in reproduction. We would be interested in partnering to collect data on small mammals in the LTBMU on a semi-regular basis. We would be interested in gathering additional annual data regarding weather variables that may influence spotted owl nesting. However, the funding for these efforts has not identified.

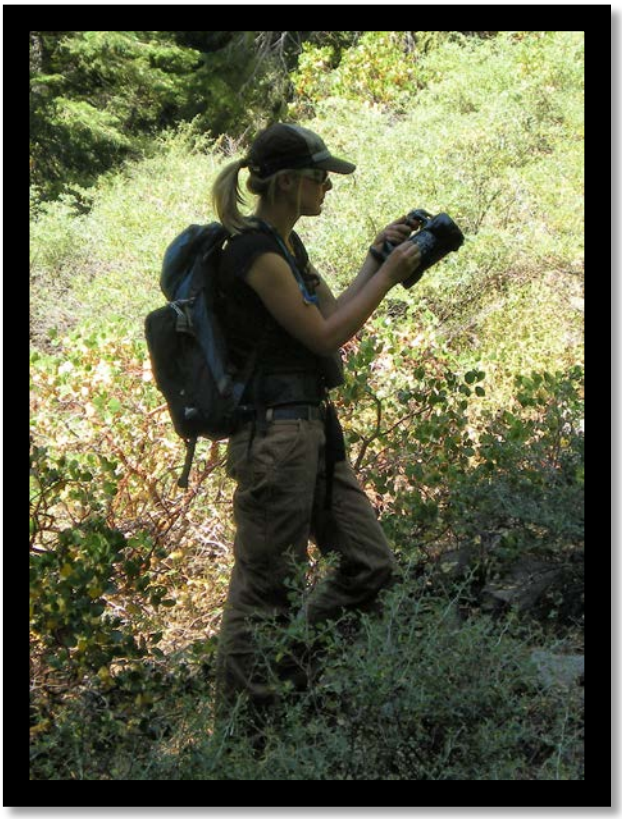
# 2.0 Northern Goshawk (*Accipiter gentilis*)

## 2.1 Species Account and Management Direction

The northern goshawk is a FSS species in Region 5 and on the LTBMU and a Tahoe Regional Planning Agency Special Interest Species (SIS).

Northern goshawks occupy boreal and temperate forests throughout the Holarctic zone (Squires and Reynolds 1997). This broad range of forested communities includes mixed conifer, true fir, montane riparian, Jeffrey pine, ponderosa pine, and lodgepole pine forests (USDA 2004). Within California, this species occurs in the Sierra Nevada, Klamath, Cascade, Inyo-White, Siskiyou, and Warner Mountains, and the North Coast Ranges. Goshawks may also inhabit suitable habitats in the Transverse Ranges and other mountainous areas in southern California (Zeiner et al. 1990) (Zeiner et al. 1990). In Nevada they are found in the Sierra Nevada mountains and insular mountain ranges (Herron et al. 1985). This species is associated with forested habitat that has high canopy cover, basal area, and large diameter trees for nesting. Goshawk may forage in both dense and open habitat. Snags and logs are key components of goshawk foraging areas as they provide habitat for prey species. Goshawk typically fledge an average of 2 young in years that they attempt reproduction (Squires and Reynolds 1997).

According to CWHR (CDFW 2005) high quality goshawk nest habitat consists of Jeffrey Pine, Lodgepole Pine, Montane Hardwood, and Subalpine Conifer (4M, 4D, and 5D); Montane Hardwood-Conifer, Montane Riparian, Sierran Mixed Conifer, and White Fir (4M, 4D, 5D, and 6); and Red Fir (5D) habitat types. Medium quality nest habitat consists of Aspen (4M, 4D, 5D, and 6); Eastside Pine (3M, 3D, 4M, 4D, and 5D); Lodgepole Pine (3M and 3D); Red Fir (4M and 4D); and Subalpine Conifer (3M and 3D) habitat types. There is 51,584 acres of high quality nesting habitat and 7,737 acres of medium quality nesting habitat in the LTBMU.



**Wildlife crew member, Cate Quinn, broadcasting for goshawk.**

Some of the threats to goshawk are habitat loss and fragmentation (e.g., loss of large diameter trees), forest structure changes and changes in prey populations due to fire suppression and climate change, risk of habitat loss due to stand-replacing fires, and disturbance from human activity in and near territories. A study conducted by Morrison et al. (Morrison et al. 2011) in the Lake Tahoe Basin indicated that northern goshawks are susceptible to human disturbance; human activity was twice as high within infrequently occupied territories as compared to frequently occupied territories.

In the Sierra Nevada, northern goshawk nesting habitat is protected by the delineation of PACs. Northern goshawk PACs are delineated to include the best available 200 acres of nesting habitat, and the most recent nest site and alternate nests within a goshawk breeding territory as described in management direction for the forest (USDA 2001; USDA 2004). Goshawk frequently build one to several alternate nests that may or may not ever be used. The importance of alternate nests is unknown (Squires and Reynolds 1997). As of 2012 (end of the summary period), there were 32 northern goshawk PACs on the LTBMU. It is important to note that goshawk PACs and territories do not correlate on a one-to-one basis. The territories currently recognized are based on retrospective examination of approximately 34 years (1977-2010) of surveys whereas goshawk PACs are delineated prospectively as nesting and/or occupancy are discovered. The prospective delineation of PACs is a conservative

management approach. The LTBMU also follows a conservative approach in eliminating goshawk PACs, which in some cases results in multiple PACs within a single territory. Data for northern goshawk in the LTBMU are stored on the USDA Natural Resource Manager Natural resource Information System (NRM NRIS) (http://fsweb.nris.fs.fed.us/products/Wildlife/index.shtml).

The 1988 LTBMU Land and Resource Management Plan (LRMP) (USDA 1988) directs the LTBMU to "Maintain existing goshawk habitat and protect recently active nest sites". Similar to the spotted owl, the LTBMU contracted with researchers at the Pacific Southwest Research Station (PSW) to develop a northern goshawk monitoring plan to ensure the management objective, protection of the population, is being met for northern goshawks in the LTBMU. The Northern Goshawk Population Monitoring in the Lake Tahoe Basin, Monitoring Plan Development and Protocol (Slauson et al. 2008b) (NOGO MP) was developed as an early-warning system to detect biologically significant changes in the spotted owl population with statistical rigor. Following initial survey groundwork, the program will be able to evaluate and implicate the stressors (e.g. ski resorts, urbanization, fuels reduction) that influence the status and trend of the spotted owl population.

## 2.2 Methods

The LTBMU has survey data for goshawk back to 1977. Multiple protocols were used over the years. It is unknown what protocol was used from 1977 to 1999. From 2000 to 2007 the USDA Forest Service Region 5 protocol "Survey Methodology for Northern Goshawk In The Pacific Southwest Region, U.S. Forest Service" was used. The current protocol was used beginning in 2008. Similar to the California spotted owl, three types of survey efforts were conducted for this species during the summary period and include LRMP surveys, project-level surveys, and NOGO MP surveys. Land and Resource Management Plan surveys were conducted in goshawk PACs at least every three years in order to determine current activity, pair status, reproductive effort, and productivity. Land and Resource Management Plan surveys were conducted in PACs or known territories that either contained a known recent nest or had not been surveyed in the previous two years with a goal of covering five PACs/year, depending of funding and need. Project-level surveys on the LTBMU were conducted within suitable habitat of a project footprint or within 400 meters of project footprints (depending on the project activities). Goshawk monitoring plan surveys were initiated in 2009. Territory occupancy, nesting activity, and nest productivity were the three indicators monitored. Only the first year of NOGO MP surveys were completed during the summary period.

All surveys (project level, LRMP and NOGO MP) during the summary period were conducted following the "Northern Goshawk Inventory and Monitoring Technical Guide" (Woodbridge and Hargis 2006). The minor differences between NOGO MP and LRMP and project-level surveys are described below. Surveys were conducted to determine goshawk presence, occupancy, reproductive status and number of fledged juveniles within a survey area. Goshawk presence is defined as one or more goshawks seen or heard in the survey area or presence of goshawk feathers in the survey area. Occupancy was defined as a territorial adult within a nesting area, regardless of reproductive activity. Reproductive status was determined by evidence of egg-laying.

### *Project-level and LRMP Survey Methods*

The Northern Goshawk Inventory and Monitoring Technical Guide (Woodbridge and Hargis 2006) contains three types of surveys. Each is used depending on the circumstances and timing of surveys.

*Dawn Acoustic Survey Methods*

Dawn acoustic surveys were used to detect early season reproductive activity or to survey a small area prior to the summer season. Dawn acoustic surveys for goshawk began 45 minutes before sunrise and ended 1½ hours after sunrise. For each survey, observers were approximately 300 meters apart around focal areas (e.g. nest stands) where, historically, goshawk activity had occurred. The number of surveyors participating varied between two and five depending upon the size of the area to be surveyed and the availability of qualified observers to assist. These surveys were intended to be non-invasive; surveyors avoided approaching nests and did not broadcast calls. Rather, these surveys involved listening for goshawk courtship vocalizations and looking for flight displays. These surveys were conducted 15 February-15 April. Surveyors left the area if detected individuals responded to observer presence with agitation.

*Broadcast Acoustic Survey Methods*
Broadcast acoustic surveys were the principal method used to determine occupied and reproductive goshawk territories. Recorded goshawk calls were systematically broadcast to elicit territorial responses from adult goshawks and their young. Call stations were located a maximum of 250 meters apart to achieve full acoustic coverage. As surveyors traveled between call stations they scanned for goshawk sign such as whitewash, plucking posts, molted feathers, and pellets. When goshawks were positively detected, surveyors conducted the intensive search method to attempt to locate nests.

**Northern goshawk.**

*Intensive Search Survey Methods*
Given that goshawks are territorial and exhibit nest stand fidelity, historic nest sites were initially surveyed using the intensive stand search method. Beginning 1 June, biologists visited nest stands that had been active in any of the previous three years for signs of reproductive activity. If an active nest was found, broadcast surveys were discontinued within a one-mile buffer of the active nest for the rest of the season to prevent disturbance. Instead, nest checks were conducted every two weeks in order to monitor the nest. If no active nest was found within two visits, surveyors returned to using the broadcast acoustic survey method.

## *Goshawk Monitoring Plan Survey Methods*

Like LRMP and project-level surveys, the NOGO MP survey methods are also based on the Northern Goshawk Inventory and Monitoring Technical Guide (Woodbridge and Hargis 2006) except that NOGO MP surveys needed to be done three times each season (instead of two) and surveys needed to be completed by 15 August (instead of 31 August). The plan selected 37 sample units of 600 hectares each (Figure 3) using historic detections, nest data and habitat nested within the Forest Inventory Analysis (FIA) hexagon grid (Woodbridge and Hargis 2006). Twenty of these units were planned for monitoring three times during a 10-year period (Table 3). These twenty units were selected because they encompass territories or parts of territories that were frequently active. The remaining seventeen sites would be surveyed once over the same 10-year period. These units comprised either less active areas of known territories or territories that were infrequently active. A total of 24 sample units were surveyed as part of the 2009 monitoring plan surveys (20 units that were to be surveyed three times and four units that were to be surveyed once over the 10-year period). Only the first year of surveys were completed during the summary period.

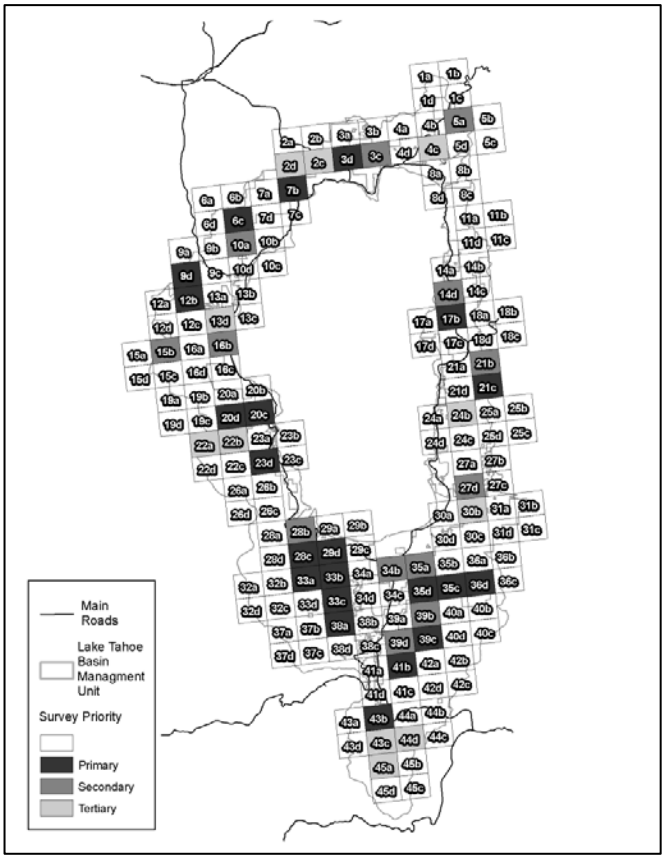



**Figure 3.** Map showing all the possible sample units in the LTBMU. Only the primary and a few secondary sample units were chosen for inclusion in the monitoring plan.

**Table 3.** Thirty-seven sample units, associated territory and survey frequency of the northern goshawk monitoring plan.

| Sample Unit | Territory | Survey Frequency |
|---|---|---|
| 3a | Martis Creek | every period |
| 3c | First Creek | third period |
| 3d | Griff Creek | every period |
| 6c | Burton Creek | every period |
| 7b | Watson Creek | every period |
| 7d | Burton Creek | third period |
| 9d | Chamonix | every period |
| 10a | Burton Creek | first period |
| 12b | Chamonix | every period |
| 14d | Secret Harbor | third period |
| 16a | Blackwood Canyon | every period |
| 16b | Blackwood Canyon | third period |
| 17b | Slaughterhouse Canyon | every period |
| 18a | Slaughterhouse Canyon | second period |
| 20c | Sugar Pine SP | first period |

| Sample Unit | Territory | Survey Frequency |
|---|---|---|
| 20d | Sugar Pine SP | every period |
| 21c | Genoa Peak | every period |
| 22b | Sugar Pine SP | every period |
| 23d | Sierra Creek | every period |
| 27d | Burke Creek | first period |
| 28c | Cascade | second period |
| 29d | Cascade/Spring Creek | third period |
| 30d | Heavenly Ski Resort | second period |
| 33a | Spring Creek | every period |
| 33b | Spring Creek/Tahoe Mountain | every period |
| 33c | Tahoe Mountain | first period |
| 34a | Tahoe Mountain | second period |
| 34b | Tahoe Valley | second period |
| 35c | Upper Cold Creek | every period |
| 35d | Trout Creek | second period |
| 36d | High Meadow | every period |
| 38a | Angora 1 | third period |
| 39c | Hellhole | every period |
| 39d | Saxon Creek | second period |
| 41b | Saxon Creek | every period |
| 43b | Big Meadow | every period |
| 43c | Big Meadow | every period |

## 2.3 Results

The acres of northern goshawk habitat and number and identity of territories surveyed fluctuated annually (Figure 4) depending on the number of projects requiring surveys, number of PACs selected for surveys under LRMP, whether it was an NOGO MP survey year or not, and amount of available funding.

Between 14,465 and 54,045 acres of northern goshawk habitat were surveyed each year over the five year summary period (Figure 4). Survey acreage was calculated as the area surveyed or a 1,609 meter radius (1 mile) around active nests and includes surveys conducted by LTBMU, partner agencies, and consulting firms (CDPR, NDOW, CTC, Hauge Brueck Associates (contractor for Heavenly Mountain Resort) and Insignia Environmental (contractor for Sierra Pacific Power Company)). The number of goshawks detected ranged from 10-16 (mean = 14, SD = 3) over the summary period. The number of reproductive territories ranged from 2-11 (mean = 8, SD = 4) and the number of young fledged ranged from 2-19 (mean = 10, SD = 7) over the summary period (Figure 4). The number of young fledged should be interpreted with caution as reproductive success is strongly influenced by factors that were not monitored (e.g., weather, prey availability). As shown in Figure 4, more survey effort (in terms of acres of habitat surveyed) did not appear to correlate with increased detection probability. However, these data are based strictly on acres surveyed and not on territory identity and some territories may be more active than others.

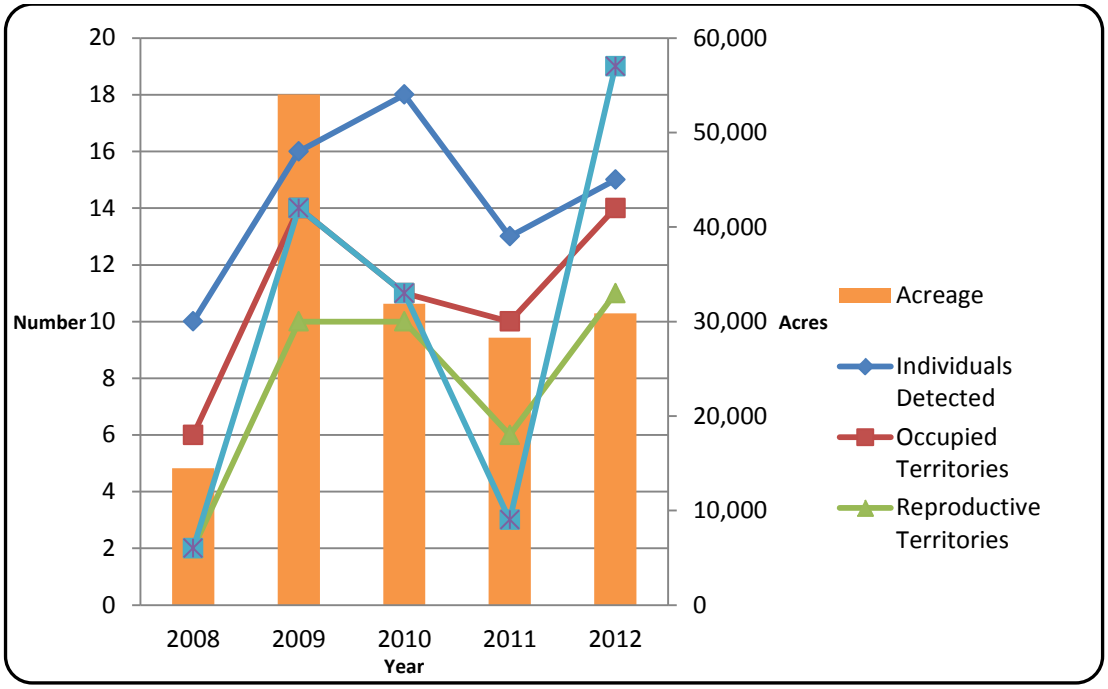



**Figure 4.** Total annual acreage (bars) surveyed for northern goshawk 2008-2012 and individuals detected, occupied territories, reproductive territories, and juveniles fledged (lines, not standardized by acres surveyed).

Twenty-seven reproductive territories were surveyed at various points during the summary period (Table 4, Appendix B). A territory is termed "reproductive" if it has contained a known active nest at some time in its survey history. There were 24 known goshawk reproductive territories that were at least partially in the LTBMU at the beginning of the summary period (Table 4). Four additional reproductive territories were discovered during the summary period and include: McKinney Creek, Page Meadows, Sawmill Pond and Twin Crags. Of the 28 known goshawk reproductive territories on the LTBMU, 27 were surveyed and 16 territories exhibited reproduction during the summary period (Table 4, Appendix B). One territory frequently encompasses more than one PAC.

Northern goshawk fledgling.

Prior to the Angora Fire of 2007 there were two reproductive goshawk territories in the area (Angora I and Angora II). Both territories (and PACs) were in the high severity burn area of the fire. The Seneca Pond PAC was moved south out of the burn area and the associated Angora I territory seems to have moved with it. This territory is now known as the Seneca Pond territory in order to coincide with the PAC name. While detections have been made in this territory, no known nesting has occurred post-fire. There was no suitable habitat to relocate the North Angora PAC post-fire. This PAC was dissolved. It was thought that the reproductive territory had relocated to the area of Sawmill Pond because a nest was found there in 2010. However, this nest failed shortly after it was discovered and no further detections have occurred. Sawmill Pond is considered a territory for the purposes of this report. The Angora II territory is the 28th territory. It was not surveyed during the summary period because its location had not been rediscovered post-fire.

Of the 27 territories surveyed, survey effort was divided as follows: 19% of territories (5) were surveyed during all five years of the summary period, 37% of territories (10) were surveyed during 4 years of the summary period, 22% of territories (6) were surveyed during three years of the summary period, 11% of territories (3) were surveyed during two years of the summary period, and 11% of territories (3) were surveyed during one year of the summary period. Of all the territories surveyed in each year, 38% were occupied in 2008 and 2009, 56% were occupied in 2010, 53% were occupied in 2011, and 81% were occupied in 2012 (Table 4, Figure 5). The fewest territories (16) were surveyed in 2008 and 2012, yet the greatest number (and proportion) of territories were occupied (13, 81%) and reproductively active (11, 69%) during 2012 (Table 4, Figure 5).

**View of Lake Tahoe with red elderberry in the foreground.**

**Table 4.** Northern goshawk territories surveyed ([a] = NOGO MP survey, [b] = LRMP survey, [c] = project survey) on the LTBMU and activity status during the summary period.

| Reproductive Territory | 2008 | | | | 2009 | | | | 2010 | | | | 2011 | | | | 2012 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Presence[a] | Occupied Territory[b] | Reproductively Active | Young Produced | Presence | Occupied Territory | Reproductively Active | Young Produced | Presence | Occupied Territory | Reproductively Active | Young Produced | Presence | Occupied Territory | Reproductively Active | Young Produced | Presence | Occupied Territory | Reproductively Active | Young Produced |
| Territories Surveyed all Five Years of the Summary Period | | | | | | | | | | | | | | | | | | | | |
| Big Meadow | yes[bc] | no | no | 0 | yes[ac] | yes | yes | 0 | yes[c] | yes | no | 0 | yes[bc] | no | no | 0 | no[b] | no | no | 0 |
| Blackwood Canyon | yes[c] | yes | no | 0 | yes[ac] | no | no | 0 | yes[b] | no | no | 0 | yes[c] | no | no | 0 | yes[c] | yes | yes | 2 |
| High Meadows | yes[c] | yes | no | 0 | yes[a] | yes | no | 3 | yes[b] | yes | yes | 2 | yes[b] | yes | yes | 1 | yes[b] | yes | yes | 2 |
| Sierra Creek | yes[b] | yes | no | 0 | yes[a] | yes | yes | 0 | yes[b] | yes | yes | 1 | yes[c] | yes | yes | 0 | yes[c] | yes | yes | 1 |
| Watson Creek | yes[c] | yes | yes | 1 | yes[b] | yes | yes | 3 | yes[c] | yes | yes | 1 | yes[b] | yes | yes | 0 | yes[b] | yes | yes | 2 |
| Territories Surveyed Four Years of Summary Period | | | | | | | | | | | | | | | | | | | | |
| Burton Creek | yes[c] | yes | yes | 1 | yes[a] | no | no | 0 | not surveyed | | | | no[c] | no | no | 0 | yes[c] | yes | no | 0 |
| Chamonix | not surveyed | | | | yes[a] | no | no | 0 | yes[c] | no | no | 0 | yes[c] | yes | no | 0 | yes[c] | yes | yes | 1 |
| Cold Creek | no[c] | no | no | 0 | yes[a] | no | no | 0 | yes[bc] | yes | no | 0 | yes[c] | no | no | 0 | not surveyed | | | |
| Hellhole | not surveyed | | | | yes[a] | yes | yes | 0 | yes[c] | yes | yes | 0 | no[bc] | no | no | 0 | yes[b] | yes | yes | 2 |
| Martis Peak | not surveyed | | | | yes[ac] | yes | yes | 1 | yes[b] | yes | yes | 1 | yes[b] | yes | no | 0 | yes[b] | yes | yes | 2 |
| Page Meadows | no[c] | no | no | 0 | no[c] | no | no | 0 | not surveyed | | | | yes[c] | yes | no | 0 | yes[c] | yes | yes | 2 |
| Saxon Creek | no[b] | no | no | 0 | yes[a] | no | no | 0 | yes[bc] | yes | yes | 2 | yes[bc] | no | no | 0 | not surveyed | | | |
| Spring Creek | not surveyed | | | | yes[ac] | yes | yes | 2 | yes[c] | yes | yes | 2 | yes[b] | yes | no | 0 | yes[b] | yes | yes | 2 |
| Sugar Pine SP | no[c] | no | no | 0 | yes[a] | yes | yes | 2 | not surveyed | | | | yes[c] | yes | yes | 0 | yes[c] | yes | no | 0 |
| Territories Surveyed Three Years of Summary Period | | | | | | | | | | | | | | | | | | | | |
| Bliss Creek | no[c] | no | no | 0 | no[ac] | no | no | 0 | yes[c] | no | no | 0 | not surveyed | | | | not surveyed | | | |
| Griff Creek | no[bc] | no | no | 0 | no[ac] | no | no | 0 | yes[c] | no | no | 0 | not surveyed | | | | not surveyed | | | |
| McKinney Creek | not surveyed | | | | yes[a] | yes | no | 0 | not surveyed | | | | yes[c] | yes | yes | 1 | yes[bc] | yes | yes | 2 |
| Sawmill Pond | not surveyed | | | | not surveyed | | | | yes[c] | yes | yes | 0 | no[c] | no | no | 0 | no[b] | no | no | 0 |
| Seneca Pond | yes[c] | yes | no | 0 | yes[b] | no | no | 0 | yes[c] | no | no | 0 | not surveyed | | | | not surveyed | | | |
| Tahoe Mountain | no[bc] | no | no | 0 | yes[abc] | no | no | 0 | yes[c] | no | no | 0 | not surveyed | | | | not surveyed | | | |
| Upper Cold Creek | no[c] | no | no | 0 | no[a] | no | no | 0 | not surveyed | | | | not surveyed | | | | no[b] | no | no | 0 |
| Territories Surveyed Two Years of Summary Period | | | | | | | | | | | | | | | | | | | | |
| Incline Creek | not surveyed | | | | no[c] | no | no | 0 | no[c] | no | no | 0 | not surveyed | | | | not surveyed | | | |

| Reproductive Territory | 2008 | | | | 2009 | | | | 2010 | | | | 2011 | | | | 2012 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Presence[a] | Occupied Territory[b] | Reproductively Active | Young Produced | Presence | Occupied Territory | Reproductively Active | Young Produced | Presence | Occupied Territory | Reproductively Active | Young Produced | Presence | Occupied Territory | Reproductively Active | Young Produced | Presence | Occupied Territory | Reproductively Active | Young Produced |
| Marlette Creek | not surveyed | | | | no[b] | no | no | 0 | yes[c] | no | no | 0 | not surveyed | | | | not surveyed | | | |
| Territories Surveyed One Year of Summary Period | | | | | | | | | | | | | | | | | | | | |
| Burke Creek | not surveyed | | | | no[a] | no | no | 0 | not surveyed | | | | not surveyed | | | | not surveyed | | | |
| Genoa Peak | not surveyed | | | | no[ac] | no | no | 0 | not surveyed | | | | not surveyed | | | | not surveyed | | | |
| Twin Crags | not surveyed | | | | not surveyed | | | | not surveyed | | | | not surveyed | | | | yes[c] | yes | yes | 1 |
| Total Territories Surveyed | 16 | | | | 24 | | | | 18 | | | | 17 | | | | 16 | | | |
| Occupied Territories (%) | 6 (38%) | | | | 9 (38%) | | | | 10 (56%) | | | | 9 (53%) | | | | 13 (81%) | | | |
| Reproductive Territories (%) | 2 (13%) | | | | 8 (33%) | | | | 8 (44%) | | | | 5 (29%) | | | | 11 (69%) | | | |

[a]As per the protocol, "presence" indicates that goshawk sign was found (plucking post with appropriate prey remains or feathers) but there was no detections of an actual goshawk. [b] As per the protocol, a territory is considered "occupied" if at least one goshawk was detected by sight or sound.

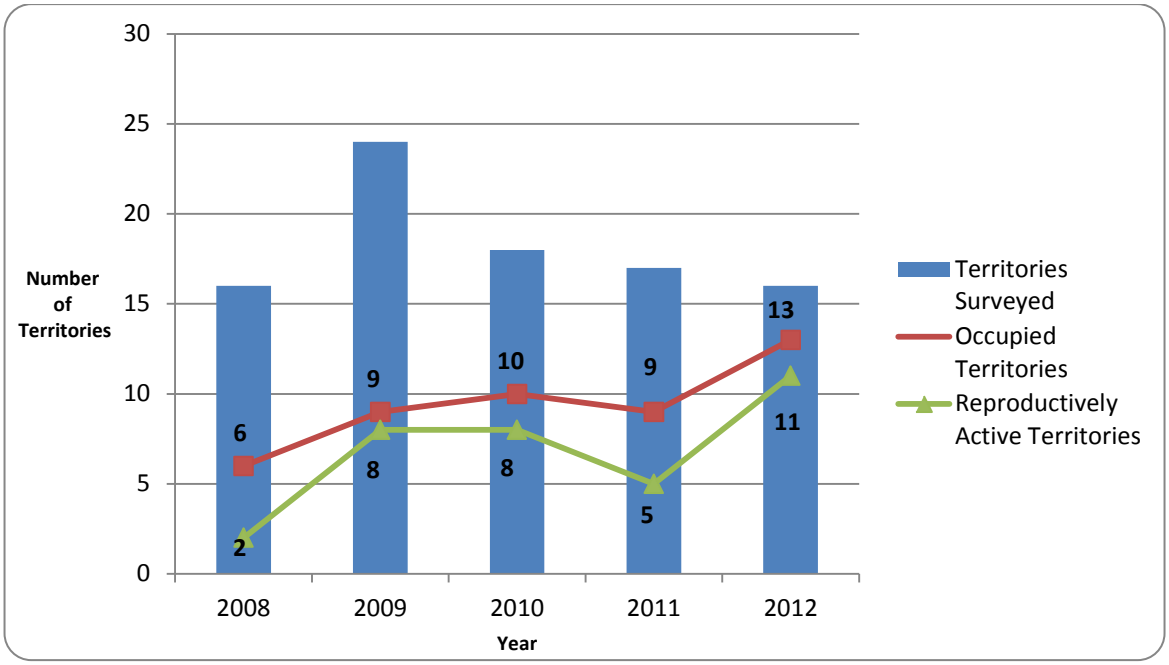



**Figure 5.** Number of territories surveyed each year during the summary period (bars) as well as number of occupied territories and reproductively active territories (lines, not standardized by acres surveyed).

Habitat at the nest stand level was calculated using CWHR (CDFW 2005) defined habitat in a one quarter mile buffer around each known goshawk nest in the LTBMU. While 51,584 acres of high quality goshawk nesting habitat exists in the LTBMU (15% of the total land in the LTBMU), approximately 71% of habitat found in known nest stands consists of CWHR defined high quality habitat (5,961 acres). Five percent of nest stands are found in CWHR defined medium quality habitat (428 acres out of 7,737 acres). The remaining 23% of habitat in nest stands does not fall into CWHR defined high or medium quality habitat types.

## 2.4 Discussion

### *Detections*

Overall, the number of goshawks detected, occupied territories, reproductively active territories, and juveniles fledged increased from 2008 to 2012 despite varying annual survey efforts. Acres surveyed were the highest in 2009 (surveys were being conducted for several large fuels reduction projects that year) and lowest in 2008. Additionally, 2009 was the initial year of the NOGO MP. Individuals detected, occupied territories, reproductively active territories and juveniles fledged were all higher in 2009 than in 2008. Although this increase in goshawk activity could be correlated with increased survey effort, goshawk presence was higher in 2010 and 2012 when approximately 20,000-25,000 fewer acres were surveyed. Similar to spotted owl, 2011 appeared to be a year in which goshawk numbers decreased from the previous season. Also similar to spotted owl, the 2012 season had especially high detection and reproduction numbers. In fact, the number of juveniles fledged was the highest ever recorded in one season in the LTBMU during 2012. The reason for these patterns is not clear. Similar to the spotted owl, it may be that the mild winter of 2011-2012 contributed to more nesting opportunities and prey but we do not have data to evaluate this possibility. Likewise, the long and heavy winter of 2010-2011 may have contributed to a decline in goshawk detections and reproductive activity during the 2011 season. Five territories surveyed in both 2010 and 2011 were reproductively active in 2010 but not in 2011 (Table 4). It may be that the long winter (extending into June) and heavy snowpack influenced nesting opportunities, energetic costs, prey availability, and other reproductive requirements. In addition to weather, the data may have been influenced by multiple other factors such as prey availability, surveyor ability, territory identity (more active versus inactive territories), and propensity of goshawk to respond to broadcast calling.

Although there was an increase in the number of individuals detected, occupied territories, reproductively active territories, and juveniles fledged in the LTBMU over the summary period, these results should not be interpreted to mean that there is an increasing trend in the population. Trend patterns cannot be determined by LRMP or project-level

surveys for the reasons mentioned above. The NOGO MP surveys are trying to identify trends in the population but only one survey period fell within the time frame of the summary period. Moreover, the NOGO MP surveys are prohibitively costly due to the large amount of acreage that needs to be surveyed each period in order to have a statistically viable sample size. The monitoring plan surveys cost approximately $270,000 per year for three years over a ten year period to implement ($810,000 total for the whole ten year plan), whereas LRMP surveys cost $4,600 per year but are conducted annually over a ten year survey ($46,000 total).

## *Reproductively Active Territories*

There were a total of 27 known reproductive territories in the LTBMU. The Burke Creek, First Creek, Genoa Peak, Incline Creek and Upper Cold Creek territories were not known to be active during the summary period. The Bliss Creek, Cold Creek, Griff Creek, Marlette Creek, Seneca Pond, and Tahoe Mountain territories had goshawks present at least once during the summary period but were not known to be reproductively active. Each of these territories had at least one reproductive effort in the past but none of them had consistent reproductive activity. The reason for these territories becoming inactive is not known. Only one of the six inactive territories is in an area with high recreational impacts (Burke Creek). Two others have popular mountain bike trails running through them (Incline Creek and Upper Cold Creek), but so do several of the active territories (Big Meadow, Burton Creek, Griff Creek, High Meadows, Martis, Page Meadows, Saxon Creek, Sugar Pine State Park and Watson Creek). Aside from the Angora Creek territories (see paragraph 4 of the Results section) none of them have experienced significant habitat changes since being discovered.

Among territories that were surveyed, the percent of territories that were reproductively active increased dramatically from 2008 to 2012 (13%-69%) despite surveying the same number of territories in each year (16). Furthermore, 19 young fledged in 2012 and only 2 young fledged in 2008. It may be that territory identity influenced these numbers such that territories that tend to be more reproductively active happened to be surveyed in 2012. There were nest failures in 2009, 2010, and 2011. Most failed nests reproduced successfully in 2012. As with the inability to explain fluctuations in the number of overall detections for the entire LTBMU (as discussed above), we do not have sufficient data to evaluate the cause for changes in reproductive activity within or among territories over time.

The remaining 16 territories that were reproductively active at least once during the summary period are described below. Information on the goshawk territories that were not reproductively active during the summary period can be obtained by contacting the LTBMU Supervisor's Office.

*Big Meadow:* The pair at the Big Meadow territory was reproductively active in 2003, 2004, 2007 and 2009. The nest failed in 2009. The territory continued to be occupied in 2010, but there were no detections in 2011 or 2012. There were three known nests in this territory, which were used in 2002 (unknown outcome), 2003 (fledged 1), 2004 (fledged 2), 2007 (fledged 2), and 2009 (fledged 1).

*Blackwood Canyon:* The pair at the Blackwood Canyon territory was only reproductively active once during the summary period and twice during historic surveys (1981 and 1995 outcome data not available). It was a surprise when an active nest was found post-fledging in 2012 near an ongoing restoration project.

*Burton Creek:* The Burton Creek territory crosses the boundary between Forest Service and CDPR land. The pair was active for nine years in a row (2000, fledged 2; 2001, unknown; 2002, unknown; 2003, fledged 2; 2004, fledged 2; 2005, fledged 1; 2006, fledged 2; 2007, fledged 2; 2008, fledged 1) but was not active during 2009-2012. During the nine years it was active the pair fledged at least 12 juveniles and was not definitively known to fail (there were two years where the outcome was unknown).

*Chamonix:* The pair at the Chamonix territory was first known to be reproductively active in 2000 but only nested in 2000 (unknown outcome), 2001 (fledged 1), 2004 (fledged 1), 2010 (fledged 1) and 2012 (fledged 1). This territory has never definitively failed in years that it was known to nest and four of the five nest attempts used the same nest.

*Hell Hole:* The pair at the Hellhole territory was known to have nested eight years since they were first found to be reproductively active in 1992 but definitively failed in six of those attempts (1992, failed; 1998, failed; 1999, possibly fledged 3; 2001, failed; 2003, failed; 2009, failed; 2010, failed; 2012, fledged 2). This territory has shifted so that it is on the southern edge of its associated PAC.

*High Meadows:* The pair at the High Meadows territory was first found to be reproductively active in 2004. That year the nest was in a thick stand of dead beetle-killed lodgepole pine but it still fledged (1). Subsequently they were not known to nest again until 2009 when the territory was found upslope of the beetle-kill. This territory was one of two territories that were the most fecund during the summary period (the other being Watson Creek). They nested three of the five years and fledged seven juveniles during that time (2009, fledged 3; 2010, fledged 2; 2012, fledged 2).

*Martis Peak:* The pair at the Martis Peak territory was first found to be reproductively active in 1992 (outcome unknown) and then not again until 2009 when it was discovered that the territory had shifted outside of its current PAC. This pair also nested three of the five summary period years but only fledged four juveniles (2009, fledged 1; 2010, fledged 1; 2012, fledged 2).

*McKinney Creek:* The pair at the McKinney Creek territory was first found in 2011 and nested in 2011 (fledged 1) and 2012 (fledged 2).

*Page Meadows:* The Page Meadows territory was a new territory found in 2012. This territory is directly adjacent to an area that was thinned in 2007. The pair nested in 2012 (fledged 2).


Wildlife crew member, Michelle Rambo, watches a goshawk

*Sawmill Pond:* The Sawmill Pond territory was found in 2010 with an active nest which failed almost immediately after it was found. This territory might be the result of the Angora Creek II territory pair relocating after the Angora Fire in 2007. This was an unexpected location for a nest because the area is very close to a four lane busy road and in an area that experiences high levels of on and off road recreation. The nest itself was barely 50 meters from a frequently used 4x4 road. The nest failed soon after it was discovered and there were no further detections in this area.

*Saxon Creek:* The pair at the Saxon Creek territory was first discovered to be reproductively active in 1991 and may have consisted of two territories through the 1990s since there were two known active nests in 1991 (outcome unknown for both nests), 1995 (outcome unknown for both nests), and 1998 (outcome unknown for one nest, the other fledged 2). This territory nested very close to a popular mountain bike trail in 2001 and 2010. This likely occurred due to a lack of activity during the nest building and early incubation periods when there was snow covering the trail. Despite the frequent disturbance both nests were successful (2001, fledged 2; 2010, fledged 2). However the 2010 nest was impacted by recreation. This nest originally had three nestlings. One died when it was flung from the nest. The adult male was delivering prey to the nestlings when a group of mountain bikers passed the nest. The male flushed but did not let go of the prey. One of the nestlings already had ahold of the prey and also did not let go. The nestling was flung from the nest and subsequently died. This event was witnessed by two wildlife crew technicians and the LTBMU trail crew coordinator.

*Sierra Creek:* The pair at the Sierra Creek territory was first found in 2002, however one alternate nest was found at that time so there may have been previous nesting activity. This territory attempted nesting for eight years since 2002, including four of the five summary period years. It failed three of the eight years. This territory was successful approximately half of the time it was known to nest, failing on an every-other-year pattern and never fledging more than one juvenile a year (2002, fledged 1; 2003, failed; 2004, fledged 1; 2009, failed; 2010, fledged 1; 2011, failed; 2012, fledged 1). This territory is in very good habitat with very little disturbance compared to other territories that are more frequently reproductive and more fecund.

*Spring Creek:* The Spring Creek territory was first found to be reproductively active in 1997 and has been known to be active ten times since then, fledging at least nine juveniles (1997, fledged 1; 1999, outcome unknown; 2000, outcome unknown; 2001, outcome unknown; 2003, fledged 2; 2004, fledged 1; 2005, failed; 2009, fledged 2; 2010, fledged 2; 2012, fledged 2).

*Sugar Pine:* The Sugar Pine territory (within Sugar Pine Point State Park) was, for a short time, two territories; one near Lily Pond and one on the east end of the park. The pair at the main territory near Lily Pond has had ten known reproductively active years since 1992 (three of them during the summary period) fledging at least seven juveniles (1992, unknown outcome; 1993, unknown outcome; 1995, unknown outcome; 1996, unknown outcome; 2001, fledged 2; 2005, fledged 1). The eastern territory is not known to have been successful any of the three years it was known to be reproductively active (1998, outcome unknown; 2000, failed; 2003, outcome unknown).

*Twin Crags:* The Twin Crags territory was discovered in 2012 and successfully fledged one juvenile. The female of this territory still retained her juvenile plumage, so this may have been a new territory, or a new female at a territory maintained by the male. This territory is within an area that was thinned in 2005.

*Watson Creek:* The Watson Creek territory is on USFS and private land. It was first found to be reproductively active in 1993 but then was not active again until 2004. It was two territories in 1993, both nested. It was known to be active seven out of nine years, fledging a total of nine juveniles and failing twice (1993, one failed, one fledged 1; 2004, failed; 2005, fledged 1; 2008, fledged 1; 2009, fledged 3; 2010, fledged 1; 2011, failed; 2012, fledged 2). This territory was one of two territories that were the most fecund during the summary period (the other being High Meadows). The 2004 nest was assumed to have failed due to logging activity in the nest stand.

## Nest Characteristics

Goshawk nests are typically in the lower one-third of the largest tree in the nest stand, or just below the forest canopy (Reynolds et al. 1982). Nests are typically built on large horizontal limbs against the trunk, or occasionally on large limbs away from the bole of the tree (Saunders 1982). The LTBMU has nest characteristic data dating back to 1998. Up until 2008 all of the nests surveyed generally followed the above description (Figure 6). In 2008 a nest was found in the Watson Creek territory (on the north shore of Lake Tahoe) that was on the flat top of a broken snag (Figure 7). This nest was reused in 2009.


**Figure 6.** Typical placement of goshawk nests on the LTBMU.

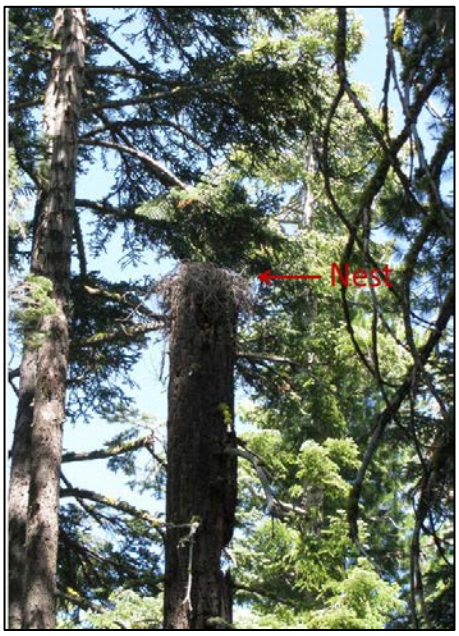



**Figure 7.** Atypical placement of goshawk nests on the LTBMU.

Since 2008 four additional nests have been located in the flat top of a broken snag and include: one at Page Meadows on the northwest shore, two at Sierra Creek on the west shore, and one at Saxon Creek on the south shore. Anecdotal data collected from neighboring forests (the Georgetown and Pacific Ranger Districts on the El Dorado National Forest, the Truckee and American River Ranger Districts of the Tahoe National Forest and the Carson Ranger District of the Humboldt-Toiyabe National Forest) do not indicate similar nest placement in these areas. A literature search also failed to locate reports of this nest situation.

One possible explanation for these nests in the LTBMU is these four nests were established by offspring of the original goshawks nesting in flat tops of broken snags and they could be looking for nest locations similar to their own natal nest. The furthest of the four nests from the Watson Creek nest is 43 kilometers. There is little data concerning initial dispersal, however Squires and Reynolds (Squires and Reynolds 1997) identify dispersal distances from 6.4-100 kilometers. There is no genetic data on these individuals, however, since three of the nests are in territories established prior to the first flat top nest at Watson (two at Sierra Creek and one at Saxon Creek), it is unlikely that more than one territory (Page Meadows) was established from the juveniles fledged from the Watson Creek nest.

Another possibility is that there is some benefit to using these "stovepipe snags" rather than the typical placement. The LTBMU collects nest stand data in the first fall after the nest is found (USDA 2005). Metrics include nest stand (a 50 meter radius around the nest tree) aspect, slope, shrub cover; less than 20 centimeter stem count, canopy cover, duff depth, tons of course woody debris, live tree DBH and height and dead tree DBH and height; nest tree distance to water, distance to human structure, distance to trails, nest tree DBH, height and species; and nest height. However, the sample size is insufficient to determine any significant difference between nest stand data of typical nests and stovepipe nests.

Another possibility is that stovepipe snags are being selected because they offer easier access to the nest (John Keene, pers. comm.). However, if this is the case it seems logical that neighboring forests would be finding the same thing, assuming that stovepipe snags are as available there as they are here.

## 2.5 Future Recommendations and Needs

Northern goshawk surveys in the LTBMU have been ongoing since 1977. Surveys are anticipated to continue although it may be that fewer acres and territories would be surveyed annually because of a declining trend in the number of projects

requiring surveys and funding resources. Surveys and their results are essential to informing management activities and decisions.

Originally, we had hoped that the NOGO MP would provide us with a protocol to select and evaluate goshawk territories in a way that would provide information on population trends. After all, the intent of the NOGO MP is to be an early-warning system to detect biologically significant changes in the goshawk population with statistical rigor. The metrics evaluated as part of the NOGO MP (territory occupancy, reproduction, and nest productivity) are considered effective tools for determining population trends and evaluating the stressors influencing the population. However, the NOGO MP is very costly and not likely to be implemented in the future unless we are able to identify cost-saving changes in the MP that do not jeopardize the statistical rigor and intent of the program. An evaluation of possible alternative solutions is needed and efforts should be made to adapt the monitoring plan to make it more affordable while retaining its ability to detect biologically significant changes in the population.

Until the NOGO MP can be resolved, we recommend continuing LRMP surveys at territories that have been reproductively active. Each year, territories that were reproductively active in the previous three years should be surveyed. Additionally, any PAC that has not been surveyed in the previous two years should be surveyed. By selecting these PACs, we avoid becoming hyper-focused on those consistently reproductive territories and are able to gather additional data on territories with less consistent reproductive activity. These surveys will help to inform management decisions such as biological evaluations for NEPA and will allow us to track the reproductive success of the frequently active territories in the LTBMU.

If stovepipe nests continue to be found, particular attention should be paid to the nest stand vegetation data in order to attempt to determine what is setting these sites apart from traditional nest stands.

We also want to consider a cost-effective way to collect data on some potentially influencing factors such as weather, prey, and stand characteristics. Currently, nest stand vegetation data is collected at the end of the first nesting season that it is found. If this was repeated at intervals we could evaluate potential changes over time and correlate changes in stand characteristics with changes in reproduction. We would be interested in partnering to collect data on small mammals in the LTBMU on a semi-regular basis. We would be interested in gathering additional annual data regarding weather variables that may influence spotted owl nesting. However, the funding for these efforts has not identified.

# 3.0 Peregrine Falcon *(Falco peregrinus)*

## 3.1 Species Account and Management Direction

Peregrine falcon (*Falco peregrinus*) is a TRPA Special Interest Species (SIS). The LRMP (1988) states that there be restricted recreational activity (e.g., rock climbing) on nesting cliffs. As an SIS, TRPA aims to maintain a minimum 0.25 mile 'disturbance zone' around population sites (a.k.a. 'threshold sites'). The locations of these sites are identified on TRPA adopted Special Interest Species map overlays (TRPA 1987) and in the Environmental Impact Statement for the establishment of Environment Threshold Carrying Capacities (TRPA 1982). The intent of TRPA SIS threshold standards is to protect and enhance critical habitat that this species uses for significant periods of their life history and discourage harmful activities at current and future population sites. The TRPA SIS management goal of two nests for peregrine was attained for the first time in 2011.

Peregrine falcons are threatened by human disturbance from recreation activities, including rock climbing.

The peregrine falcon is associated with rivers, wetlands, lakes, or other aquatic features for foraging and cliffs, banks, dunes, mounds, and human-made structures for nesting. Nests are usually situated on open ledges or potholes and a preference for south facing slopes increases with latitude (USFWS 1984). Prior to 2009 peregrine falcon were last known to nest at Cave Rock and Echo Summit in the early 1940s (Boyce and White 1980; USDA 1981). Population numbers drastically decreased in the mid-1940s due to affects from DDT, which eventually led to the ESA endangered species listing status in 1970 (Green 2003). Following recovery efforts the peregrine falcon was delisted in 1999.

In 1980 the LTBMU was included in a peregrine falcon nest habitat assessment conducted by Wilderness Research Institute (Boyce and White 1980) for the USFS. Fifteen sites were rated for peregrine falcon habitat quality based on

aerial photos, ground surveys and helicopter surveys (Figure 8). The top seven rated sites were Luther Rock (called S.E. Echo Summit in the report), Dardanelles Lake, Deer Park, Echo Summit, Cave Rock, Thundercliffs, and Shakespeare Point (in that order). Castle Rock was surveyed but was not included in the final analysis. South Maggie's Peak, Angora Peak and Twin Peaks were not included in the habitat assessment.

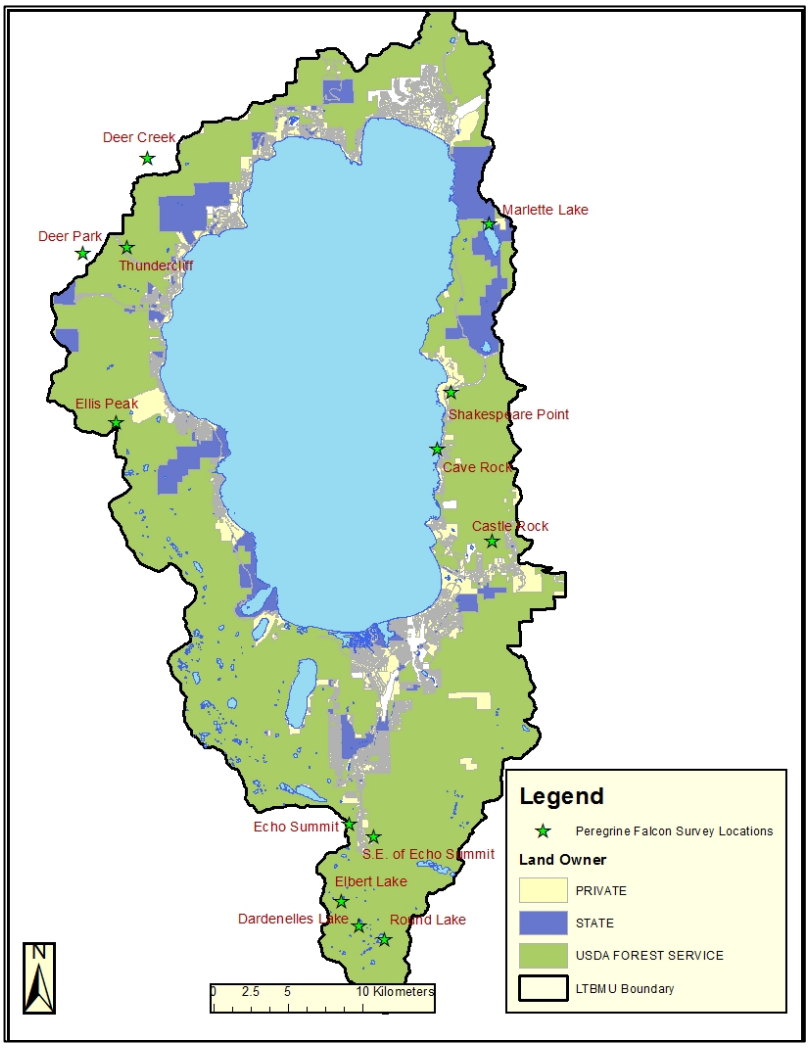



**Figure 8.** Thirteen of the 15 sites surveyed for peregrine falcon nest habitat in 1980. The remaining two sites (West of Alpine Campground, and North of Scott River) were not described accurately enough to locate on a map.

As part of the recovery effort a total of 21 birds were introduced to the Lake Tahoe Basin in 1985, 1986, 1987, 1990 and 1991. The 1985-1987 introductions occurred at Luther Rock. The 1990 and 1991 introductions occurred at Eagle Falls. During each of these introductions 1 male and two females were released except for 1991 when four females and 2 males were released. All released individuals appear to have left the LTBMU the same year they were released (Drager and Linthicum 1985; Drager and Linthicum 1986; Linthicum 1987; Linthicum 1990). The LTBMU conducted surveys for peregrine in 1993 and 1994 near Dardanelles Lake, Meiss Meadows and Eagle Falls but none were detected. There were however 6 incidental detections during the 1990s (Saxon Creek = 1in 1990; Gilmore Lake = 2 in 1990; Eagle Falls = 1in 1991, 1 in 1995; Big Meadow = 2 1992; Meiss Meadow = 1in 1993). All of these detections were in the late summer or early fall so it is unlikely that they were reproducing individuals. The 1993 detection at Meiss Meadow and the 1995 detection at Eagle Falls were made by LTBMU biologists, but not during protocol level surveys. There were no reported incidental detections from 1996 to 2005. In 2006 and 2007 there were five reported incidental detections. Four of which were made by wildlife biologists or field technicians either from the LTBMU or El Dorado National Forest. Surveys for peregrine falcons began in 2008 and have continued annually since that time.

## 3.2 Methods

Annual peregrine falcon surveys were initiated in the LTBMU in 2008 in response to several incidental detections in 2006 and 2007 on USFS land. Since 2008, all known or suspected nesting cliffs on USFS lands in the LTBMU were monitored annually using the "Protocol for Observing Known and Potential Peregrine Falcon Eyries in the Pacific Northwest" (Pagel 1992). The protocol was slightly amended to accommodate a small budget and to include up to date guidance on the species from the Santa Cruz Predatory Bird Group website (http:/www2.ucsc.edu/scpbrg/pefaprotocol.htm).

Annual surveys were conducted monthly from April to September, for a minimum of four consecutive hours per visit and a minimum of 14 days between surveys. When a site was visited twice with no detections, surveys at that site were suspended for the year. When a nest was found, each survey continued only for the amount of time necessary to determine the status of the nest. Although it is not specified in the protocol, surveys were almost always conducted by two biologists at a location suitable for observing the whole cliff area for activity. This was done both for safety reasons and to increase the probability of detecting birds if they were present. In 2012 the protocol was altered in order to accommodate a smaller budget; the April survey was eliminated and if a nest was located during May the site was not visited again until July in order to determine nest outcome.

## 3.3 Results

Seven locations were surveyed for peregrine falcon during the summary period (Angora Peak, Castle Rock, Cave Rock, Luther Rock, Shakespeare Rock, South Maggie's Peak and Twin Peaks). Each of these locations had incidental sightings reported (Table 6, Appendix C). Incidental detections were reported by rock climbers at Luther Rock in 2006 and Shakespeare Rock in 2011. Hikers reported seeing peregrine at South Maggie's Peak and Angora Peak in 2007. Residents in the Castle Rock area reported frequent sightings of a pair of peregrine in 2011. A pair was sighted at Cave Rock in 2011and an individual at Twin Peaks early in 2012, both by a biologist from the Tahoe Institute for Natural Sciences (TINS). The Cave Rock location is difficult to survey because the majority of the site overhangs the lake and is best viewed from a boat. The remainder of the cliff is above the highway with no safe place to stop. Suitable viewing locations are limited and there is no location that allows viewing of the entire cliff area at one time. This location was checked by LTBMU and/or TRPA biologists from a boat during osprey surveys in 2011 but protocol surveys were never conducted. All other locations were surveyed according to the protocol. Only Luther Rock and Castle Rock were reproductively active (see Table 6).

**Luther Rock**

**Table 6.** Peregrine falcon sites on the LTBMU that were surveyed, had detections, were reproductively active and produced young during the summary period.

| | 2008 | | | 2009 | | | 2010 | | | 2011 | | | 2012 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location/Territory | Detection | Reproductively Active | Young Produced | Detection | Reproductively Active | Young Produced | Detection | Reproductively Active | Young Produced | Detection | Reproductively Active | Young Produced | Detection | Reproductively Active | Young Produced |
| Angora Peak | no | no | 0 | no | no | 0 | no | no | 0 | no | no | 0 | not surveyed | | |
| Castle Rock | not surveyed | | | not surveyed | | | not surveyed | | | yes | yes | 2 | yes | yes | unknown |
| Cave Rock | not surveyed | | | not surveyed | | | not surveyed | | | yes | no | 0 | not surveyed | | |
| Luther Rock | yes | no | 0 | yes | yes | 2 | yes | yes | unknown | yes | yes | 1 | yes | yes | 1 |
| Shakespeare Rock | not surveyed | | | not surveyed | | | not surveyed | | | not surveyed | | | yes | no | 0 |
| South Maggie's Peak | yes | no | 0 | no | no | 0 | no | no | 0 | no | no | 0 | not surveyed | | |
| Twin Peaks | not surveyed | | | not surveyed | | | not surveyed | | | not surveyed | | | no | no | 0 |

## 3.4 Discussion

Despite hacking efforts (see the paragraph on Luther Rock below), between 1991 and 2009 no reproducing peregrine were known to occur in the LTBMU. In 2006 and 2007 five incidental detections occurred. Based on these detections, nest surveys began in 2008.

*Angora Peak:* Angora Peak was surveyed 2008-2011 but no detections of peregrine were ever made. A golden eagle nest was observed being built by an immature golden eagle in 2009, although the nest was never used. An immature golden eagle was detected again on the first survey of the season in 2010 but was not detected on subsequent surveys. The presence of golden eagle at this sight, even if they are not actually nesting there, might preclude occupation by peregrine.

*Castle Rock:* There was an incidental detection at Castle Rock in 2010 but a follow-up visit to the site found no evidence of peregrine. In 2011 there were several more incidental detections, so surveys were initiated in July of 2011. This territory nested in 2011 (fledged 2) and 2012 (outcome unknown).

*Cave Rock:* Cave Rock is the only site that Boyce and White (Boyce and White 1980) listed as historically active although internal USFS documents also list Echo Summit as a reproductive site (USDA 1981). In June 2011 incidental detections were made of a pair in the vicinity of Cave Rock on several occasions but because this site is difficult to survey, it was only checked briefly (10 minutes or less) during osprey boat surveys. No further detections occurred.

**A juvenile peregrine falcon at Luther Rock.**

*Luther Rock:* In 1985, 1986, and 1987 the Luther Rock area was used as a hack site by the Santa Cruz Predatory Bird Group (Drager and Linthicum 1985; Drager and Linthicum 1986; Linthicum 1987). The hack box is still visible near the cliff where nesting has recently occurred. In 1985 two females and one male were released on 3 July. All three dispersed before the end of August and the effort was deemed a success. In 1986 again two females and one male were released on 7 June. One female was presumably predated by a golden eagle when her remains were found in close proximity to a golden eagle primary feather. Neither of the other two was seen after 13 June. The surviving two were presumed to have been frightened from the area when the first one was predated. In 1987 another two females and one male were released from the hack box on 6 July. The male dispersed from the site immediately while the females continued to feed at the hack box for up to eight weeks before dispersing.

The Luther Rock territory has had peregrines present every year since 2006. Peregrines nested each year from 2009-2012 producing at least 4 young in that time (2009, fledged 2; 2010, unknown outcome; 2011, fledged 1; 2012, fledged 1).

*Shakespeare Rock:* During a meeting with local rock climbers in 2011 they reported seeing peregrine at Shakespeare Point on several occasions. Based on these reports surveys at this location occurred in 2012. There were detections of a pair on the first two surveys of the season but none on subsequent surveys and no nesting occurred.

*South Maggie's Peak:* South Maggie's Peak was surveyed 2008-2011. There was a pair detected in 2008 but no nesting occurred. No further detections occurred.

*Twin Peaks:* There was an incidental detection of a single peregrine at Twin Peaks in January 2012. Based on this detection surveys were initiated but peregrine were not detected at this site.

The LTBMU Land and Resource Management Plan (LRMP) (USDA 1988) directs the forest to prohibit rock climbing on nesting cliffs. When nesting was first discovered at Luther Rock steps were taken to begin closing the nesting area to climbers. However, the process was time consuming enough that the nest fledged before the closure was completed. Since the nest fledged successfully without the cliff being closed the decision was made to try to work with the climbing community to protect the nests rather than exclude them from the area. Coordination with the climbing community has been minimal to date, however the territory continues to nest and fledge young, so the two uses seem to be successfully coexisting in the areas where nests have currently been found. The territory at Castle Rock is less straight forward to manage. There is rock climbing at this location also, but not on the same cliff face as the nest, so closing the area to climbing was not necessary. However, this location is popular as a hang-out for local youth. This disturbance is possibly a greater hindrance to successful nesting than the rock climbing is and also harder to manage. However, again the territory has nested and fledged young for at least two seasons with no intervention from the forest service.

**Wildlife crew member, Jon Wilson, during a peregrine falcon survey.**

It would appear that the peregrine falcon population in the LTBMU is either increasing, is becoming more easily detected, or is being reported more frequently. If the population is increasing, it could be the result of juvenile dispersal from the Lover's Leap territory or other nearby territories (there have been multiple urban peregrine detections in Reno, Nevada). Lover's Leap is on the El Dorado National Forest Pacific Ranger District just outside the LTBMU. This site has had a peregrine falcon pair since 2004 that has nested frequently. In addition, the peregrine falcon population is expanding nationally due to increased reproductive success resulting from their DDT era recovery and reintroduction efforts (Kauffman et al. 2003). Since delisting in 1999 to the end of the first post-delisting monitoring period (2003) the population grew from 1,750 nesting pairs to 3,005 nesting pairs nation-wide (Federal Register Vol. 71, No. 198 Doc. E6-17009).

## 3.5 Future Recommendations and Needs

Because the peregrine falcon population in the LTBMU may be increasing and surveys are currently only conducted after incidental sightings are reported, it would be beneficial to conduct a comprehensive LTBMU-wide assessment of peregrine falcon occupancy in suitable habitat and conduct this assessment annually in order to address trends in the population. However, given that peregrine falcons are not a Forest Service Sensitive species and budget is limited, a comprehensive assessment or even continued monitoring of known nest locations may not be feasible unless it is undertaken as a partnership effort.

Peregrine falcon surveys should also continue in locations where rock climbing or other recreational activities could disturb nests or possible nests. Coordinating with local climbers to close a portion of a cliff is preferable to closing entire nesting cliffs as long as the falcons continue to tolerate the disturbance and climbers continue to respect the peregrines. However, close attention should be paid to failed nests and the possible causes for them.

# 4.0 Osprey (*Pandion haliaetus*)

## 4.1 Species Account and Management Direction

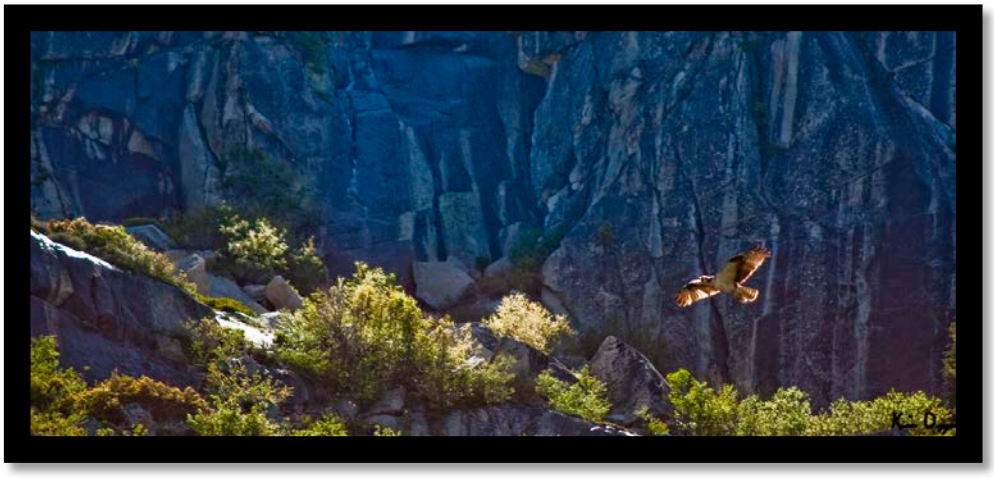
Osprey (*Pandion haliaetus*) is a TRPA SIS. Osprey are migratory and arrive in the Tahoe region from South and Central American wintering grounds in March and April when the snow begins to melt and fish return to shallower waters. The species is associated with open forests with large snags for nest sites that are typically located near open water. Nest sites include large coniferous and deciduous trees, cliffs, and pole tops located near or over water. Primary threats to osprey in the LTBMU include disturbance from recreation activities (e.g., boating, camping, etc.) and loss or degradation of habitat due to conflicts with recreation needs.

The TRPA Code of Ordinances includes a zone within a 0.25 mile radius of osprey nest sites that is to be protected from habitat manipulation while occupied by osprey.

## 4.2 Methods

Surveys conducted between 1996 and 2003 were done solely by TRPA. The LTBMU led osprey nest survey efforts between 2004 and 2011 with TRPA, CDPR and NDOW. Responsibility for these surveys was returned to TRPA in 2012 because of LTBMU budget constraints.

Regardless of who conducted surveys, osprey surveys in the LTBMU followed the TRPA protocol "TRPA Osprey Survey Protocol" (TRPA 2000). The Lake Tahoe shoreline was surveyed from aboard a TRPA patrol boat at low speed (<8 mph) approximately 75 meters from shore. Inland sites and those on the shore of Fallen Leaf Lake and Cascade Lake were surveyed shortly before or after each boat survey by hiking to vantage points near and above (if possible) nest sites, but far enough away to avoid disturbing nesting activity. Surveys were conducted monthly from May through September. Surveyors spent several minutes per visit at each active nest site to assess nest status. Surveyors visited all known extant (the tree was still standing) osprey nest sites during the initial visit in May then subsequent surveys checked all known nest trees that were confirmed to be still standing during the May survey. Since osprey nest in dead snags, it is common for nest trees to fall down. New nests were searched out concurrent with checking known nests. Digital photographs of each nest were taken in order to assist in future identification.



**Osprey in flight.**

## 4.3 Results

The LTBMU and its partners surveyed approximately 15,827- 17,411 acres per year over the summary period with the high being in 2009 and the low being in 2008 (Figure 9). No data are currently available for 2012 so this section refers only to data through 2011. Acres surveyed fluctuated depending on the number of inland sites surveyed. Survey area was calculated as 400 meters inland of the Lake Tahoe shoreline and 400 meters surrounding inland nests. There were a total of 88 known nest sites in 2011 however many of these trees had fallen down; there were 47 extant nest trees. Nest trees that were previously known or discovered to have fallen down were not surveyed. The number of known nests

ranged from 35-47 over the summary period. The number of active and known nests increased over the four year period from 22 in 2008 to 28 in 2011.

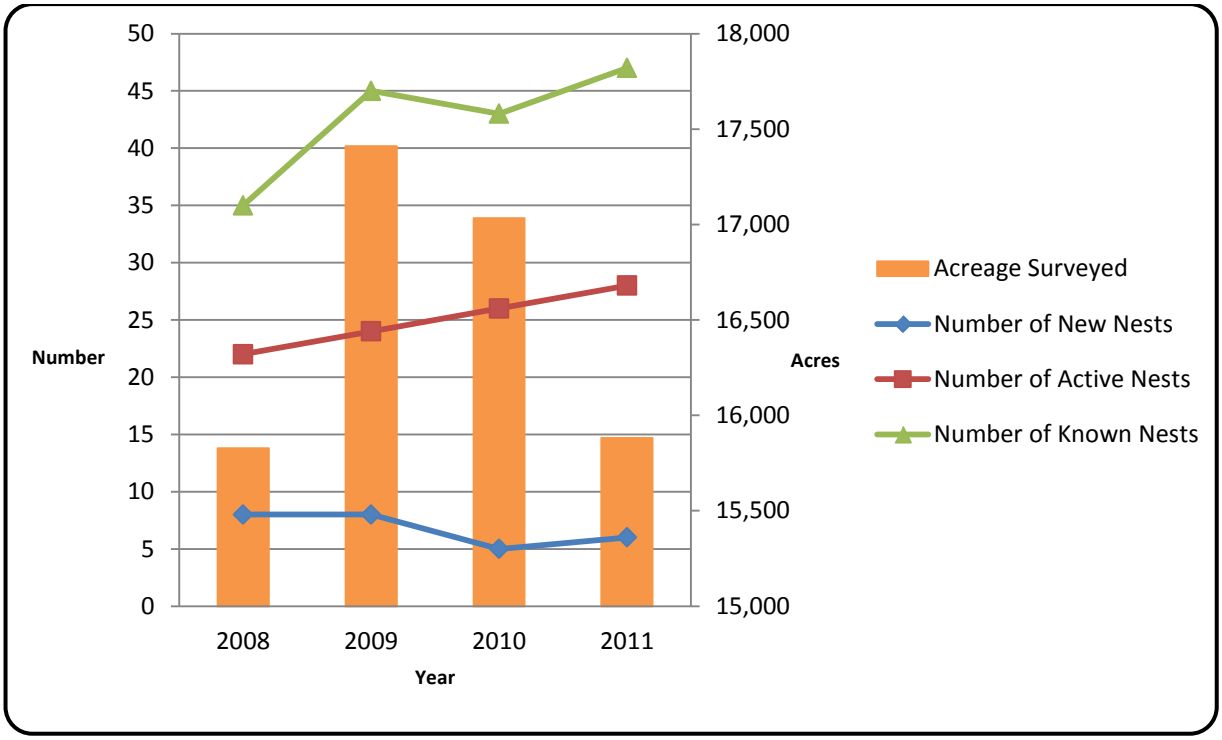



**Figure 9.** Total annual acreage (bars) surveyed for osprey 2008-2011 and number of nests, active nests and new nests found each year (lines, not standardized by acres surveyed).

## 4.4 Discussion

Based on the four years of data in the summary period the number of active nests seems to be steadily rising and this pattern holds true when data from the larger study period (1996 to 2011) are also examined. However there is some anecdotal data to suggest that while nesting attempts are on the rise, successful nests are declining precipitously (pers. comm. Lisa Fields, CDPR). The USFS/TRPA boat and land-based surveys did not attempt to determine nest success. Unlike many other raptor species, osprey fledglings look very similar to osprey adults, making it difficult to distinguish adults from fledglings and therefore nest success. Nest success can be determined from behavioral cues, but this takes more time and was not done during these surveys. If in fact nest success and recruitment are declining, the LTBMU osprey population could be in peril.

## 4.5 Future Recommendations and Needs

There is a need to conduct more extensive monitoring (or research) in order to determine if the osprey population in the LTBMU is in fact experiencing difficulty producing young. If so, results from the monitoring (or research) could inform local decisions and strategies and also be influential beyond just the osprey population. Although other aquatic associated birds of prey (bald eagle) don't seem to be showing this same trend, it is possible that osprey are experiencing an effect that could influence the bald eagle population at a later date.

However, osprey is not a Forest Service Sensitive species and due to budget constraints, these monitoring efforts are not likely to be conducted by the LTBMU.

# 5.0 Bald Eagle (*Haliaeetus leucocephalus)*

## 5.1 Species Account and Management Direction

The bald eagle, (*Haliaeetus leucocephalus*), was federally de-listed on August 8, 2007 (Federal Registrar Vol. 72, No. 130, pp. 37346-37372) and then placed on the USFS Region 5 Regional Forester's sensitive species list. The winter and nesting bald eagle population in the LTBMU is also designated as a TRPA SIS.

Bald eagles occur throughout most of North America and have undergone large population fluctuations over the past two centuries (Buehler et al. 1991; Murphy and Knopp 2000; USDA 2001). This species occurs and winters throughout California, except in desert areas. Migratory individuals from north and northeast of California arrive on their wintering grounds between mid-October and December and remain until March or early April. Most bald eagle breeding in California occurs in the northern counties (Butte, Lake, Lassen, Modoc, Plumas, Shasta, Siskiyou, and Trinity counties), typically at low elevations; breeding in the high Sierra Nevada is rare (USDA 2001). Bald eagles have been recorded in the Lake Tahoe Basin as far back as 1874. CDFG records show that bald eagle nested in the LTBMU in 1971. That same nest was active in 1967 and 1970. One of the current nests (EMB16) was first located in 1994. Detections indicate that the Lake Tahoe Basin is used year-round by bald eagles; however, use occurs primarily during fall and winter months in correspondence with kokanee salmon (*Oncorhynchus nerka*) spawning activity (Murphy and Knopp 2000). Most of the bald eagles sightings in the LTBMU have occurred along undeveloped shorelines (east and west shores of Lake Tahoe and at Fallen Leaf and Marlette Lakes) and south shore marshes (Laves and Romsos 2000).


**Sunrise at Emerald Bay**

The Recovery Plan for the Pacific Bald Eagle (USFWS 1986) states that the main threats to this species in Sierra Nevada Mountains (Zone 28) are disturbance at wintering grounds and loss of potential nesting habitat to logging or development. The Plan's proposed management directions are maintenance of winter habitat and evaluation of potential reintroduction/expansion of 'breeders'. The most urgent site-specific task (1.3211) identified for the Forest Service in the Sierra Nevada Mountains is to prohibit logging of known nest, perch, or winter roost trees (USFWS 1986). Bald eagles are also sensitive to human/recreation disturbance.

The 1988 LRMP directs the forest to identify potential bald eagle nest sites and manage them to encourage reestablishment of four pairs. The LTBMU manages approximately 370 acres of the Taylor Creek and Tallac Creek wetlands and meadows north of Highway 89 as bald eagle wintering habitat from October 15 through March 15 annually. TRPA also has a 0.5 mile buffer from active nests in which no habitat manipulation may occur.

## 5.2 Methods

The LTBMU conducted two types of bald eagle surveys during the summary period, nest surveys and mid-winter counts. Nest surveys were conducted in conjunction with osprey surveys and therefore followed the same protocol (see section 4.0 above). Additionally, the LTBMU hosted the annual mid-winter bald eagle count (1979-2011). In 2012 the count in the LTBMU was led by TINS. The mid-winter bald eagle count is an ongoing effort throughout California and led by the Army Corp of Engineers (ACE) to assess the status of bald eagle populations in California, and to contribute to the National Midwinter Bald Eagle Survey. The count consists of participants located at 29 established sites around Lake

Tahoe and Fallen Leaf Lake (Figure 11). Participants watch for bald eagles from 9:00 AM to 12:00 PM on one day in early January. Participants were recruited by the LTBMU (or TINS) from local agencies and the community. Volunteers recorded the time, direction of flight, and age-class of all bald eagles detected. The data was reviewed to determine whether multiple observers may have recorded the same bald eagle (based on time and direction of flight) before a summary report was distributed to participants and ACE.

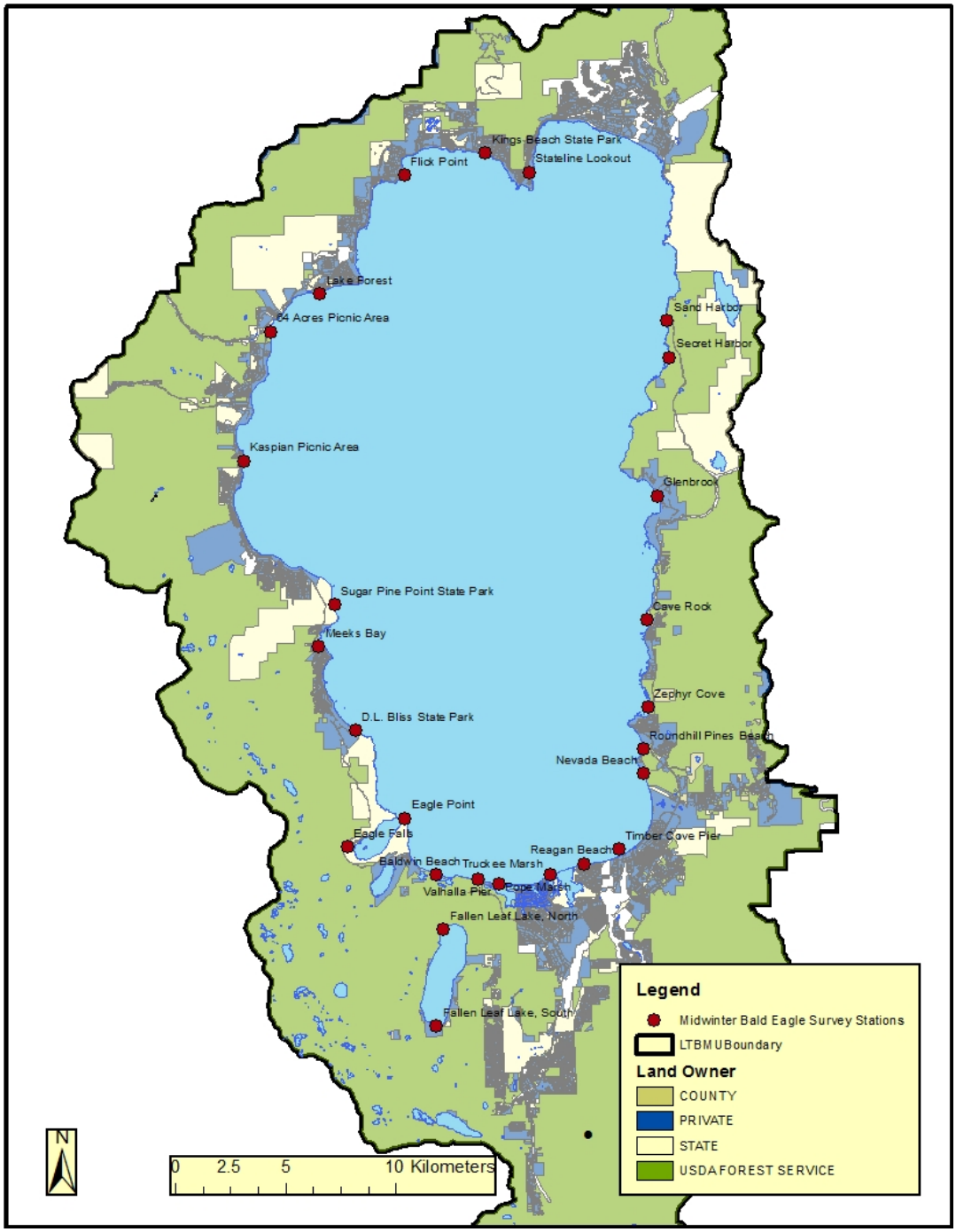



**Figure 11**. Survey locations for the midwinter bald eagle survey.

## 5.3 Results

There were three known bald eagle nests in the LTBMU during the summary period. Only one was on USFS land. That nest is near Marlette Lake and has not been known to be active since 2000. A second nest near Marlette Lake is in Lake Tahoe Nevada State Park. It was discovered in 2000 but was never known to be active. The third nest is on CDPR land in Emerald Bay. During the summary period, this nest was active from 2008-2010 (Table 7) and fledged two juveniles in 2008 and 2010 but failed in 2009. A fourth nest was built in Sugar Pine Point State Park in 2012 but there was no reproductive attempt made.

**Table 7**. Active bald eagle nests and juveniles fledged in the LTBMU 1994-2012.

| Year | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |
|---|---|---|---|---|---|---|---|---|
| Active Nests | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 |
| Juveniles Fledged | 2 | 2 | 0 | 0 | 0 | 2 | 0 | 0 |
| Year | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
| Active Nests | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 |
| Juveniles Fledged | 1 | 2 | 2 | 2 | 0 | 2 | 0 | 0 |

The mid-winter bald eagle count detections have shown high interannual variability, but this may be more a function of the survey effort than the population (Figure 12). The mid-winter count is conducted regardless of weather and is almost completely volunteer driven, so there is also high interannual variability in the amount of effort.

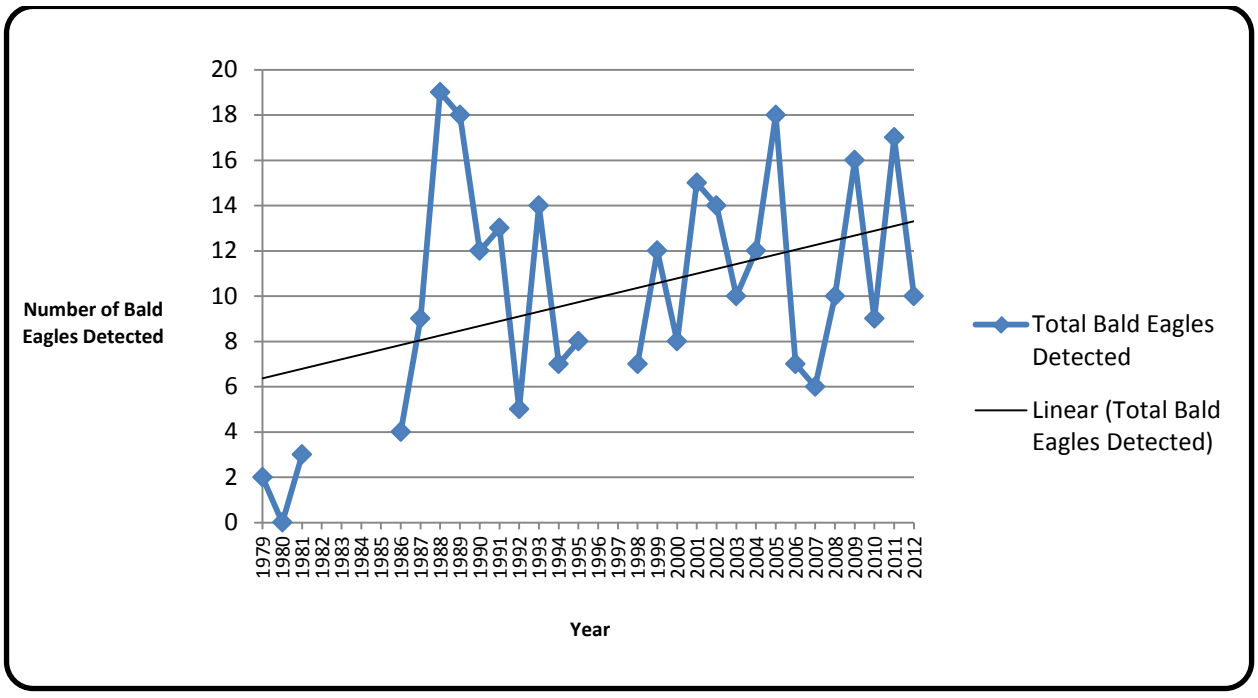



**Figure 12**. Total bald eagles detected (adults, juveniles, and unknown) during the mid-winter bald eagle survey 1979-2012. Gaps indicate years when the survey was not conducted.

## 5.4 Discussion

The Emerald Bay nest was the only bald eagle nest known to be active in Lake Tahoe during the summary period. It has been consistently active and has consistently produced young. The establishment of the new territory at Sugar Pine Point State Park is promising. Because so many partner agencies take part in bald eagle surveys, we have data for bald eagle on lands outside of the LTBMU that can help us better understand the status of the bald eagle in the Lake Tahoe Basin.

ACE reports the nationwide wintering population (lower 48 states) is increasing, with the California state population stable (http://ocid.nacse.org/nbii/eagles/). The large fluctuations in the number of LTBMU bald eagle winter detections from year to year was expected, not only because of natural fluctuations in the population but also due to differences in weather conditions (the survey protocol has no weather restrictions) and the experience level of the volunteers.

## 5.5 Future Recommendations and Needs

In the future, continuing the nest surveys and mid-winter bald eagle counts on USFS lands and partner agency lands would continue to inform management regarding the status of bald eagle in the Lake Tahoe Basin, including adherence to the LTBMU LRMP and the Pacific Bald Eagle Recovery Plan (USDA 1988; USFWS 1986). We recommend that if osprey surveys are discontinued, bald eagle nest surveys continue because bald eagle is a sensitive species.

Adherence to the LRMP and the bald eagle recovery plan could benefit from additional data on bald eagles and more rigorously collected data to gain perspective on potential population trends.

Conducting multiple mid-winter surveys in the 370-acre managed bald eagle winter habitat can help us understand how bald eagles use this habitat and how many we see on an annual basis. The LTBMU and partner agencies already share survey duties and data but the LTBMU could benefit from reaching out to other adjacent forests to collect data on the numbers of eagles, nest types and locations, and migration data (e.g. peak time of year). We could improve our understanding of the bald eagle population around the Lake Tahoe Basin if we had spatial data for where the mid-winter bald eagles are predominantly located during the mid-winter counts. These items could be accomplished with minimal additional funds.

The Lake Tahoe Basin could benefit greatly from a better understanding of how our summer population of bald eagles move and/or use the landscape during the fall, winter, and spring. However, this is potentially costly and infeasible given budget conditions.

# 6.0 Willow Flycatcher (*Empidonax trailii)*

## 6.1 Species Account and Management Direction

The willow flycatcher (*Empidonax trailii*) is a FSS on the LTBMU.

Historically, this species likely occurred in suitable habitats throughout California (Grinnell and Miller 1944) and portions of Nevada including the central coast, central Valley, Sierra Nevada, and Great Basin (summarized in USDA 2001). Willow flycatchers were common in the Sierra Nevada until as recently as 1910 and locally abundant through 1940 (Ibid, 2001). However, this species has declined precipitously in the Sierra Nevada since 1950 (Green et al. 2003). Livestock grazing, predation, and human activity have all been considered threats to flycatcher nesting habitat. In the Lake Tahoe Basin, the willow flycatcher population declined from 1997-2010 (Mathewson et al. 2011). There is some level of uncertainty about the ability of the local population to rebound (Mathewson et al. 2012). Multiple factors likely contributed to the decline including poor quality of meadow habitat, shortened breeding-season length and stochastic weather events, the initial small population size, and low reproduction that influenced dispersal dynamics (Mathewson et al. 2011).

Suitable habitat (i.e. the combination of resources and environmental conditions required to survive and reproduce) for this species in the Sierra Nevada is defined by site elevation, shrub coverage, foliar density, wetness, and meadow size

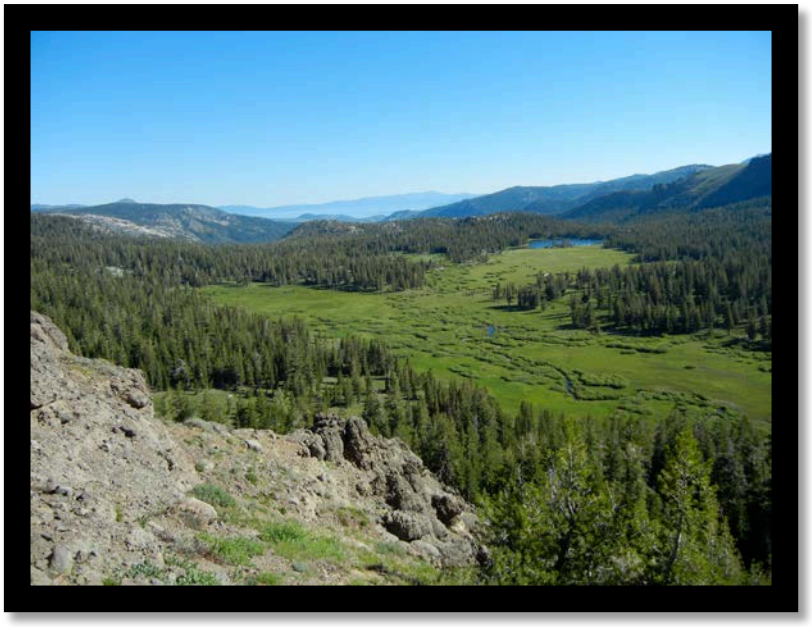
(summarized in Green et al. 2003). Known willow flycatcher sites range in elevation from 1,200 to 9,500 feet, though most (88%, 119 of 135) are located between 4,000 and 8,000 feet (Stefani et al. 2001). Willow flycatchers are closely associated with meadows that have high water tables in the late spring and early summer, and abundant shrubby, deciduous vegetation (especially Salix spp.). Sites are "significantly more likely to support multiple willow flycatchers, and result in successful breeding efforts, as riparian shrub cover in meadows and willow flycatcher territories increases" (Bombay 1999 as cited in USDA 2001).

Current management direction for this species is described in the LRMP (USDA 1988), as amended by the Sierra Nevada Forest Plan Amendment (USDA 2004) which directs the LTBMU to survey occupied and historically occupied sites on a 4-year cycle. In addition, timber thinning, prescribed fire, restoration, grazing, utility work and road/trail building around active nests and in occupied habitat during the nesting season are prohibited.

## 6.2 Methods

Willow flycatcher surveys in the LTBMU go back to 1992. It is unknown what survey method was used prior to 2000. Since 2000 the protocol "A Willow Flycatcher Survey Protocol for California" (Bombay et al. 2003) has been used. Land and Resource Management Plan and project-level surveys were conducted on the LTBMU during the summary period. Land and Resource Management Plan surveys are those that are not associated with a proposed project but are conducted because of our management direction. The Sierra Nevada Forest Plan Amendment Record of Decision (USDA 2004) (SNFPA ROD) specifies that occupied sites should be surveyed on a 4-year cycle with the site being surveyed the first year. Second year surveys would be conducted at those sites where willow flycatcher were not found the first year. No surveys are conducted the third and fourth years. An occupied site is one where a willow flycatcher is observed between 1 June and 15 July. Additionally, the LTBMU was included in the Willow Flycatcher Demography Study conducted by the Tahoe National Forest (WFDS).

Willow flycatcher surveys in the LTBMU were conducted during all of the summary period years using the USFS Region 5 protocol "A Willow Flycatcher Survey Protocol for California" (Bombay et al. 2003). This protocol specified three survey periods: period 1 = 1 June-14 June, period 2 = 15 June-25 June and period 3 = 26 June-15 July. Each survey site had to be visited during the second survey period and either the first or third periods with a minimum of five days between surveys of each site. Surveys began approximately 1 hour before sunrise and ended at or by 10:00 AM. Willow flycatcher songs were broadcast approximately every 50 meters within suitable habitat or 30 meters in areas of dense vegetation.



**Willow flycatcher habitat at Meiss Meadows**

Surveys conducted in the LTBMU by the WFDS also searched for and monitored nests in addition to following the Region 5 protocol. If an LTBMU biologist identified an active site, follow up surveys were continued by the WFDS team and assessed for reproductive effort and outcome. Male willow flycatchers that did not pair with females were monitored until they were no longer detected on their territory. Territories were mapped at monitoring sites using standard territory mapping techniques (Ralph et al. 1993) and then monitored to determine reproductive status. Each territory was monitored for 30-120 minutes every 5-7 days. When possible, pairing status, nest building, incubation and food deliveries were monitored. After hatching, nests were monitored at least three times to determine fledging and how long fledglings remained within the territory. Adults

were banded with individual combinations of color bands and a uniquely numbered USGS metal band. Nestlings were banded with colored cohort bands and a uniquely numbered USGS metal band.

## 6.3 Results

Survey effort for willow flycatcher during the summary period was not consistent; acres of habitat surveyed and occupied sites surveyed varied annually (Figure 13 and Table 8) depending on partner agency priorities, the number of projects requiring surveys, and amount of available funding.

Between 156 and 296 acres were surveyed each year over the summary period (Figure 13). Survey acreage was calculated as a 50 meter radius around each call station. Survey acreage included surveys conducted by LTBMU, the WFDS team, and California Department of Fish and Wildlife (CDFW). Additional surveys have been conducted by TINS and AECOM (a consulting firm) but we only received sporadic data from these organizations. The LTBMU was included in the WFDS study from 1997-2010. Surveys in the LTBMU after 2010 did not include nest searching or nest monitoring. There were 1-10 (mean = 6, SD = 4) adults detected annually over the summary period and 2-4 (mean = 3, SD = 1) reproductive territories (a territory where a pair was present and a nest was built) (2008-2010). Reproduction was not assessed in 2011 or 2012. Reproductive success and fledgling numbers are not presented in this report because all of that data was reported to us from partners and the data is sporadic and sometimes unclear.

There were 13 known occupied willow flycatcher sites prior to the summary period; two additional sites (Mattole Road and Meeks Meadow) were identified during the summary period (Table 8, Appendix D). All known occupied sites were surveyed at least once during the summary period with the exception of Antone Meadows. This site is on CDPR property. CDPR does not typically conduct willow flycatcher surveys in the LTBMU.

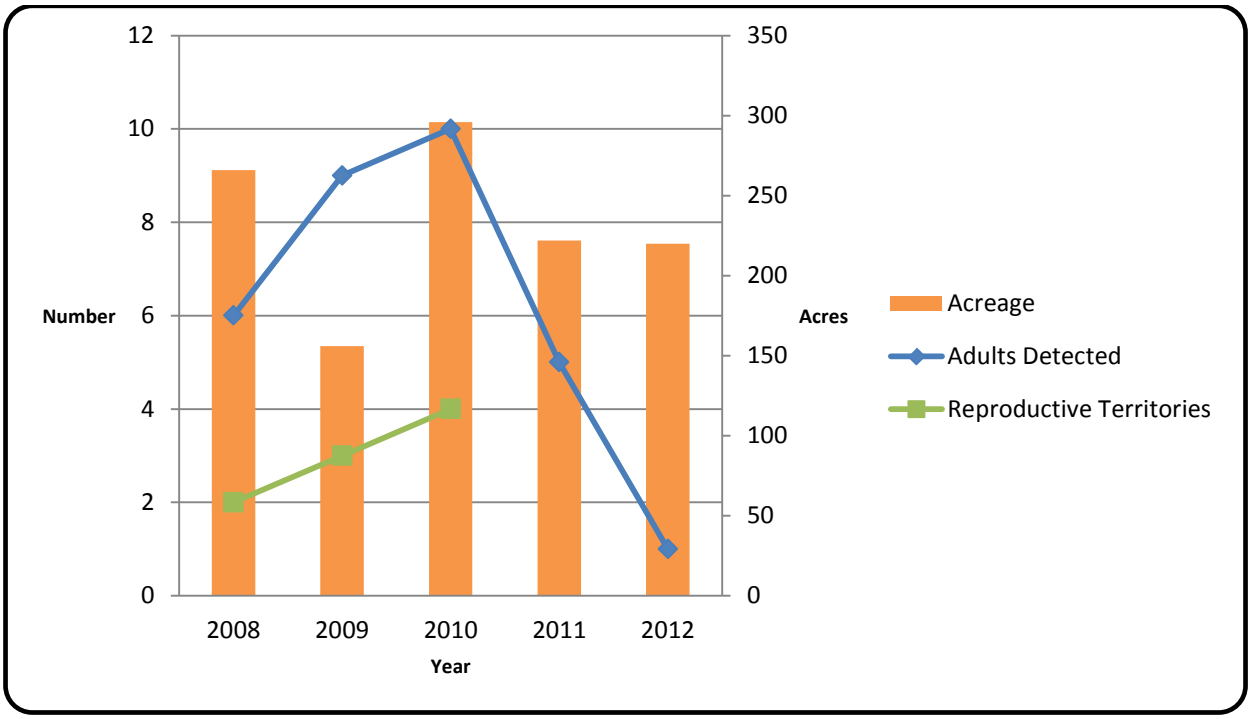



**Figure 13.** Total annual acreage (bars) surveyed for willow flycatcher 2008-2012 and adults detected (2008-2012) and reproductive territories (2008-2010) (lines, not standardized for survey effort).

**Table 8**. Willow flycatcher occupied sites surveyed on the LTBMU ([a] = LRMP survey, [b] = project survey, [c] = WFDS) and activity status during the summary period.

| | 2008 | | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Location | Detection | Reproductively Active | Detection | Reproductively Active | Detection | Reproductively Active | Detection | Reproductively Active | Detection | Reproductively Active |
| Antone Meadows | not surveyed | | not surveyed | | not surveyed | | not surveyed | | not surveyed | |
| Blackwood Canyon | yes[c] | no | yes[c] | no | no[c] | no | no[a] | no | not surveyed | |
| Cookhouse Meadow | not surveyed | | not surveyed | | not surveyed | | not surveyed | | no[a] | no |
| Grass Lake | no[a] | no | not surveyed | | no[c] | no | not surveyed | | not surveyed | |
| Lily Lake | no | no | not surveyed | | not surveyed | | yes[a] | no | no[a] | no |
| Mattole Road | not surveyed | | not surveyed | | yes[ac] | 1 territory | yes[a] | 1 territory | not surveyed | |
| Meeks Meadow | not surveyed | | not surveyed | | yes[a] | no | no[a] | no | no[b] | no |
| Morton Street | not surveyed | | not surveyed | | no[a] | no | no[a] | no | not surveyed | |
| SLT Airport | yes[a] | no | not surveyed | | not surveyed | | no[a] | no | yes[a] | N/A |
| Tallac Creek | yes[c] | 1 territory | yes[c] | 1 territory | yes[c] | 1 territory | not surveyed | | not surveyed | |
| Taylor Creek | yes[c] | 1 territory | yes[c] | 2 territories | yes[c] | 2 territories | not surveyed | | not surveyed | |
| Trout Creek | no | no | not surveyed | | not surveyed | | no[a] | no | no[a] | no |
| Uppermost Upper Truckee | yes[c] | no | yes[c] | no | yes[c] | no | not surveyed | | not surveyed | |
| Ward Canyon | no[a] | no | no[a] | no | not surveyed | | not surveyed | | no[a] | no |
| Washoe Meadows | no[a] | no | no[a] | no | no[c] | no | not surveyed | | not surveyed | |

## 6.4 Discussion

### *Detections*

Acres surveyed, the number of adults detected, and the number of reproductive territories were highest in 2010. The acres surveyed decreased considerably in 2011 and 2012 because the WFDS study ended in 2010. There were no known reproductive territories in 2011 or 2012 because in the absence of WFDS, there were no nest surveys. Still, in 2011 and 2012 the acreage surveyed was not as low as in 2009 yet the number of willow flycatchers detected decreased precipitously from 2010 to 2011 and again to 2012. Moreover the number of territories surveyed in 2011 and 2012 were not substantially different than the number surveyed in 2008 and were the same as in 2009. This decrease could be explained by territories that were selected for survey in 2011 and 2012. The WFDS team surveyed the sites that were most reliably occupied and the sites that were reproductively active. Once that study ended those sites were added into the four year survey rotation detailed in the SNFPA ROD (USDA 2004) so, the most active sites were not surveyed in 2011 and 2012. Weather could have also influenced our results. The winter of 2010/2011 was particularly long and wet with a long-lasting snowpack and snow continuing to fall well into June. These repeated late storms could have destroyed initial nesting efforts for the season. However, the winter of 2011-2012 was mild and we still saw a decrease in the number of adults detected.

### *Territories*

All known occupied sites were surveyed at least once during the summary period with the exception of Antone Meadows. This site is on CDPR land. CDPR rarely conducts willow flycatcher surveys in the LTBMU. Antone Meadows, Cookhouse Meadows, Morton Street, Trout Creek, Ward Canyon and Washoe State Park are all sites that are included as occupied sites because they had detections during the nesting season (as per the definition in the SNFPA ROD) but they have all only had 1 to a few detections and none in recent history. These and other sites without detections during the summary period are not discussed further here but information on these sites can be obtained by contacting the LTBMU Supervisor's Office.

*Blackwood Canyon:* Blackwood Canyon was a frequently active site since 2000 and had at least one reproductive territory four years between 2000 and 2007. There were a few detections in 2008 and 2009 but no known reproduction

occurred. This site was surveyed in all of the summary period years except 2012. There were no detections in 2010 or 2011.

*Lily Lake:* Lily Lake was never known to be a reproductively active site but had detections in 2002, 2003 and 2011. The summary period fell in the middle of the survey rotation for this site so it was surveyed in 2008, 2011 and 2012. The 2011 detection however was an incidental detection made by a TINS biologist. There were no detections during protocol surveys during the summary period.

*Mattole Road:* Mattole Road is a new occupied site discovered during the summary period. A singing male was discovered by two separate incidental detections during 2010. These detections were followed up by biologists from the LTBMU and WFDS. The territory was known to have nested but the outcome was unknown. The same territory was detected in 2011 but reproductive effort was unknown since nesting was not surveyed that year. This site was not surveyed in 2012.

*Meeks Meadow:* Meeks Meadow is another new occupied site discovered during the summary period. There were three incidental detections made by non-forest service biologists in 2010, two by Point Blue Conservation Science (PBCS, formerly Point Reyes Bird Observatory) and one by TINS. Based on these detections the site was surveyed in 2011 and 2012 but no further detections were made.

*South Lake Tahoe Airport:* Willow flycatchers were detected at the South Lake Tahoe (SLT) Airport site sporadically since 2007 but no known reproductive effort has occurred.

*Tallac Creek:* Tallac Creek has been an occupied site since 2003 and has been one of the most reproductively active sites in the LTBMU. Since 2008 there were 1-2 reproductive territories each of the years it was surveyed during the summary period (2008-2010). While it was not surveyed in 2011 a TINS biologist had three incidental detections in the area.

*Taylor Creek:* Taylor Creek was first occupied in 1992 and had 1-2 reproductive territories each year from 2008-2010.

*Uppermost Upper Truckee:* Uppermost Upper Truckee has been an active reproductive site since 2000 (first detection in 1999). This site had up to 3 reproductive territories 2000-2003; however there has been no reproduction evident since 2004. Since 2005 there was primarily only one male at the site (there was one female detected in 2011 but it was unclear whether she was paired with the male or not.

## *Population Trends*

Population trend data presented here come from an internal report and publications produced by the WFDS (Mathewson et al. 2011 and Mathewson et al. 2012).

The demography study found that the willow flycatcher population south of Lake Tahoe (this includes several sites within the LTBMU but also several sites south of the Lake Tahoe Basin) has declined by 14% since 1997, there is an increasing trend of sites being occupied by single males as opposed to reproducing pairs and the mean annual cowbird parasitism rates were15-18%. Relative to populations of willow flycatchers in lower elevation and non-mountainous regions, flycatchers in the Lake Tahoe Basin and other high elevation regions are constrained by the amount of time available to nest within a season. These variables add up to a declining trend in this region. The small size makes the population susceptible to stochastic effects that might reduce the population to sizes too low for recovery. Urbanization in the area has removed suitable habitat creating holes between large meadow systems that are too great to allow for dispersal from other regions. Restoration projects already planned and/or implemented in the basin should improve habitat, although much of the habitat lost to urbanization will never be replaced. In order to facilitate dispersal future restoration projects should occur in geographically similar locations when possible.

Several occupied willow flycatcher sites have been the subject of completed or planned restoration projects. These projects are restoring hydrologic function to the creeks and restoring or protecting botanical habitat. A large multi-reach river restoration occurred in Blackwood Canyon (multiple reaches implemented 2003-2012). While this project did not include the section of the creek where the willow flycatcher habitat occurs it may still have a long-term beneficial effect on the habitat. The Cookhouse Meadow restoration project was implemented in 2005-2006 and increased over-bank

flooding and meadow wetness by rerouting and regrading the stream channel. Additionally, willow stakes were planted. While this hasn't resulted in willow flycatcher presence yet, it could[2]. Willow flycatcher were detected at this site in 2002 but at no other time. The SLT Airport survey site is within a larger Upper Truckee River (Sunset Reach) restoration project. Implementation began in 2013 and is expected to be completed in 2016. Similar to the Cookhouse Meadow project, this project will reroute and regrade the channel (but on a much larger scale than the Cookhouse Meadow project) thereby increasing over-bank flooding and meadow wetness. All of these projects should improve willow flycatcher habitat but it is yet to be seen if that will result in more detections and reproduction in those sites.

## 6.5 Future Recommendations and Needs

Willow flycatcher surveys in the LTBMU have been ongoing since 1992 and should continue in order to inform management activities and decisions. However, surveys have primarily been related to project activity. A basin wide assessment of suitable habitat and occupancy has never been undertaken. It would be a good idea to plan and implement such a project. Post-restoration monitoring of the restoration projects should occur in order to determine the efficacy of those efforts on increasing willow flycatcher presence.

# 7.0 Townsend's Big-eared Bat (*Corynorhinus townsendii)*

## 7.1 Species Account and Management Direction

Townsend's big-eared bat (*Corynorhinus townsendii*) is a FSS on the LTBMU.

Townsend's big-eared bat occurs "throughout western North America from British Columbia to the central Mexican highlands, with isolated populations reaching east in the United States to the Ozarks and Appalachia"(Pierson and Rainey 1998), and occurs "in a variety of habitats, including desert scrub, sagebrush, chaparral, and deciduous and coniferous forests" (Minor and Stokes 2005). The historic and current range in California is not understood with great accuracy or precision. This species may occur from sea level to over 10,000 feet (Fellers and Pierson 2002; Gellman and Zielinski 1996; Kunz and Martin 1982). Caves or cave surrogates (e.g., abandoned mines and buildings, and lava tubes) are typically used for roosting (Barbour and Davis 1969; Graham 1966; Kunz and Martin 1982) though roosting in tree hollows has been reported in coastal California habitats (Fellers and Pierson 2002; Gellman and Zielinski 1996).

The primary threats facing this species throughout its range are disturbance and destruction of roost sites, timber harvest practices, and loss of riparian habitat (Piaggio 2005). However, the largest emerging threat to all cave-roosting species is white-nose syndrome. There is a grave concern that it could spread to the western states and California. As of 2012, the U.S. Fish and Wildlife Service records suspected detections as far west as Oklahoma (http://www.fort.usgs.gov/wns/). This disease has rapidly spread throughout the eastern US and Canada since its discovery in 2006.

There is no formal management direction for this specific species but the LTBMU implements a Limited Operating Period (LOP) between 1 May and 31 August for any activities that have potential to disturb possible roosts.

## 7.2 Methods

The Forest Service initiated an assessment of possible roosts for bat habitat suitability in 2008. During the summary period, we conducted LRMP surveys at potentially suitable roost structures. Land and Resource Management Plan surveys for this species are surveys that are not associated with a particular project but are intended to enhance our knowledge of the species on the LTBMU. It should be noted that survey protocols continued to evolve throughout the summary period.

Following detections of Townsend's big-eared bat made by Mike Morrison and Kathi Borgman in 2007, the Forest Service initiated plans to assess mines for bat habitat suitability and conduct surveys where appropriate during 2008. In 2008, eight potentially suitable mines were visually surveyed during daylight hours with the intent to categorize them as suitable or unsuitable for cave/mine dwelling bat roosting habitat (Appendix E). Suitability was based on mine entrance

[2] A single willow flycatcher was detected in Cookhouse Meadow during surveys in 2013.

size, accessibility, airflow, evidence of internal features, standing water and visual sign of bat presence (Sherwin et al. 2009). Mines that were determined to be suitable (three out of the seven) were surveyed using the protocol detailed in Tuttle and Taylor (Tuttle and Taylor 1998) (Appendix E). These mines received two visits between mid-June and early August. Two observers, positioned at least 15 feet from the mine entrance visually surveyed for two and a half hours beginning 30 minutes prior to sunset. Two dim red lights were positioned across the entrance, which aided one biologist in naked eye observation, while the other used night vision binoculars. Surveyors also listened for wing beat sounds. Approximate numbers of individuals detected were tallied and recorded.

In 2009, surveys were conducted at the same locations that were identified as suitable habitat in 2008 using a Pettersson ultrasonic detector (model D240X) and a Sony voice-activated tape recorder to collect bat vocalizations to be assessed later for bat species composition. In addition to the historic mine locations surveyed in 2008, the 2009 surveys also included the historic Newhall house on the east shore of the lake. Species identity from the echolocation call was determined using Sonobat. Sonobat translates recorded sounds into interpretable sonograms (visual pictures of the frequency, time and amplitude components of a sound) that can be identified to species. It enhances harmonic elements of bat calls so they can be examined and compared to known species calls for identification. In order to identify bats to species with some level of confidence, analysis was conducted independently by two separate LTBMU biologists. Only those species that were identified by both biologists were included in the results. To further improve rigor of results, only those calls with 0.8 quality (one being the highest) or higher were analyzed. Despite these standards, data from 2009 should be considered as preliminary due to the inexperience of those conducting the analysis.


**Wildlife crew members, Mike Robison and Leslie Loveland, ready for a visual emergence survey at the Taylor Creek Visitor Center.**

For the 2010 through 2012 seasons the LTBMU internal protocol "Townsend's Big-eared Bat in the Lake Tahoe Basin" (LTBMU internal document) was used for surveys. This protocol required both acoustic sampling (for species identity) and visual emergence surveys (for number of individuals) at each known or suspected roost. Acoustic surveys at known roosts were conducted three times between 15 July and 15 August with at least five days between surveys. Surveys at suspected roosts consisted of nine surveys between 1 June and 31 August. The reason for the greater number of surveys at suspected roosts was to increase the chances of detecting Townsend's big-eared bat if they were present. This species can be difficult to detect using acoustic methods however the alternative, internal visual surveys are not feasible to use in most of our locations. Acoustic surveys avoided the five nights surrounding the full moon (the two nights prior, the night of the full moon and the two nights after the full moon). Acoustic surveys began one half hour before sunset and continued for four hours. These surveys used a Pettersson ultrasonic detector which downloaded the data directly to a digital recorder for later analysis using Sonobat. Visual emergence surveys were conducted in concurrence with acoustic surveys and began one half hour prior to sunset and continued for two hours past sunset. These surveys used an infrared spotlight and night vision binoculars to count individual bats as they exited the roost. One location (Newhall House) was consistently difficult to survey using this protocol due to multiple exit points, so in 2011 and 2012 this site was surveyed by entering the building and visually estimating the number and species of the bat colony and then searching for individual Townsend's big-eared bats. This was possible because Townsend's big-eared bat do not roost in dense clumps but rather singly on beams and walls, making them easy to identify.

## 7.3 Results

Of the eight sites investigated in 2008, three were determined to be possible bat habitat, Tahoe Treasure I and II and Mountain Top Mine. The three sites found to provide habitat had intact adits that provide cave-like habitat. Over the course of the summary period four other sites (all Forest Service buildings) were surveyed because they were reported to have bat colonies (Table 9). Newhall House and Old Mill are both unoccupied historic buildings. Newhall House is a house with open roof beams on the east shore. Old Mill is a house near Fallen Leaf Lake that was once part of a lumber mill. Taylor Creek Visitor Center and Valhalla Boat House are both human occupied buildings on the south shore that have sizeable bat colonies in the rafters.

**Townsend's big-eared bat**

**Table 9.** Bat habitat on the LTBMU that was surveyed ([a] = LRMP survey, [b] = project survey), had detections and where Townsend's Big-eared bats were detected during the summary period.

| | 2008 | | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Bats Detected | Townsend's Big-eared Bat Detected | Bats Detected | Townsend's Big-eared Bat Detected | Bats Detected | Townsend's Big-eared Bat Detected | Bats Detected | Townsend's Big-eared Bat Detected | Bats Detected | Townsend's Big-eared Bat Detected |
| Tahoe Treasure I | yes[a] | no | yes[a] | yes | yes[a] | no | yes[a] | no | yes[a] | no |
| Tahoe Treasure II | yes[a] | no | yes[a] | yes | yes[a] | no | not surveyed | | not surveyed | |
| Mountain Top Mine | no[a] | no | yes[a] | no | not surveyed | | not surveyed | | not surveyed | |
| Newhall House | not surveyed | | yes[a] | yes | yes[a] | no | yes[a] | no | yes[a] | no |
| Taylor Creek Visitor Center | not surveyed | | not surveyed | | yes[a] | no | not surveyed | | not surveyed | |
| Valhalla Boat House | not surveyed | | not surveyed | | yes[a] | no | not surveyed | | not surveyed | |
| Old Mill | not surveyed | | not surveyed | | yes[b] | no | not surveyed | | not surveyed | |

*Tahoe Treasure Adits and Newhall House:* Townsend's big-eared bat was detected acoustically at both of the Tahoe Treasure mine adits (Figures 14 and 15) and at Newhall House in 2009. Because echolocation data was recorded outside of these structures, it can't be determined if the species was roosting in the structure or simply foraging or moving through the area. Internal surveys of roosting bats were never conducted at the Tahoe Treasure mine adits because of safety concerns but were conducted at Newhall house during 2011 and 2012. Townsend's were not identified inside the structure during the 2011 and 2012 surveys. However, the Newhall house is home to the largest known bat roost in the LTBMU with approximately 300-400 bats (Figure 16). This colony was identified from internal surveys during 2011 and 2012 and is likely comprised of little brown bats (*Myotis lucifugus*) or Yuma myotis (*Myoits yumanensis)* or some combination of the two species. Along with the Valhalla Boat House Theater, Newhall House had one of the highest species diversity of the sites surveyed (11 species) (see Valhalla Boat House Theater section below). Bat species identified at Newhall house and both Tahoe Treasure mine adits during the summary period are shown in Table 10. Tahoe Treasure mine adit II was not surveyed during 2011 and 2012 because of running water over the adit entrance. The water running over the entrance and/or through the adit creates noise that obscures the bat echolocation calls when using the Petterson ultrasonic detector. Additionally, it is thought that bats will not fly through the water to enter the adit (J. Szewczak, pers. comm.).

**Figure 14.** The Tahoe Treasure II adit opening.

**Figure 15.** The Tahoe Treasure I adit opening. A bat accessible grate was installed in 2011.

**Figure 16.** The bat colony inside Newhall House.

*Mountain Top Mine:* Although the Mountain Top Mine did have a few bat detections in 2009, a visit in spring 2010 determined that the already small mine openings had collapsed further and no longer provided bat habitat. In the summer/fall of 2010 the remains of this mine were filled in.

*Taylor Creek Visitor Center:* Taylor Creek Visitor Center and Valhalla Boat House were both found to contain sizeable bat colonies. However, the habitat at these sites was not suitable for Townsend's big-eared bat because they both have closed beam rafters, so they have not been further surveyed. The colony at Taylor Creek Visitor Center was approximately 70-100 individuals and was thought to be comprised primarily of little brown bats even though external recordings also detected several other species (see Table 10). This area was near a large marsh, so these other species may well have been foraging in the area but be unassociated with the roost. Individuals collected (due to the open beam construction bats occasionally find their way into the attic office room) from inside the building have all been little brown bats.

*Valhalla Boat House:* Valhalla Boat House is a historic building that is currently used as a small theater. Although exit surveys detected approximately the same number of individuals as those at the visitor center, this site, along with Newhall House had higher species diversity than the other sites surveyed (see Table 10). There were 11 species found at this location and at Newhall House. The other five site's combined species diversity ranged from one to eight species.

*Old Mill:* Old Mill was surveyed as part of an effort to determine if this building should be demolished or repaired. Bats were found exiting the building during roost exit surveys but Townsend's big-eared bat was not identified. One to five bats were found leaving this roost over the course of three surveys.

**Table 10**. Bat species found in sites surveyed on the LTBMU during the summary period.

| | Townsend's Big-eared Bat *(Corynorhinus townsendii)* | Little Brown Bat *(Myotis lucifugus)* | Silver-haired Bat *(Lasionycteris noctivagans)* | California Bat *(Myotis californicus)* | Western Small-footed Bat *(Myotis ciliolabrum)* | Fringed Bat *(Myotis thysanodes)* | Western Long-eared Bat *(Myotis evotis)* | Long-legged Myotis *(Myotis volans)* | Yuma Bat *(Myotis yumanensis)* | Mexican Free-tailed Bat *(Tadarida brasiliensis)* | Big Brown Bat *(Eptesicus fuscus)* | Hoary Bat (*Lasiurus cinereus)* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tahoe Treasure I | 2009 | 2010, 2011 | 2009 | 2010, 2011 | 2011 | | 2010, 2011 | | | 2009, 2010, 2012 | | 2009 |
| Tahoe Treasure II | 2009 | 2010 | 2009 | | | | | | | 2009 | | 2009 |
| Mountain Top Mine | | | | | | | | | | 2009 | | |
| Newhall House | 2009 | 2010, 2011 | 2009, 2011 | 2011 | | 2010 | 2010 | 2010, 2011 | 2010, 2011 | 2009 | 2010 | 2009 |
| Taylor Creek Visitor Center | | 2010 | 2010 | 2010 | | 2010 | | 2010 | 2010 | 2010 | | |
| Valhalla Boat House | | 2010 | 2010 | 2010 | 2010 | 2010 | 2010 | 2010 | 2010 | 2010 | 2010 | 2010 |
| Old Mill | | 2010 | 2010 | 2010 | | | | | | | | |

## 7.4 Discussion

There isn't a lot of suitable roosting habitat for Townsend's big-eared bat in the LTBMU given that the species is strongly associated with cave and cave-surrogate habitat (e.g., mines). The LTBMU is primarily made up of granitic substrates which are not conducive to the formation of caves and there are relatively few mines. Although Townsend's have been found to roost in hollows of large decadent trees in the Pacific Northwest (Pierson and Fellers 1998), large decadent trees are relatively uncommon in the LTBMU compared to the Pacific Northwest, partially because of the difference in dominant tree species (redwood trees can grow substantially larger than the tree species in the LTBMU) and partially because many of the trees in the LTBMU are secondary growth following heavy logging during the Comstock Era.

Surveys for Townsend's have brought us a better understanding of bat populations in general in the LTBMU. Although we already had a dataset from the 2002-2005 Multi-Species Inventory and Monitoring project (MSIM) and the 2004-2009 restoration monitoring effort both of these were solely aimed at species composition in general habitat. The surveys during the summary period have given us a better idea of population numbers and species composition at cave/cave-surrogate sites.

The MSIM project surveyed bats using mist-netting and acoustic sampling in 2001 and 2002. They found 11 species of bats (big brown bat *(Eptesicus fuscus)*, hoary bat *(Lasiurus cinereus)*, silver-haired bat *(Lasionycteris noctivagans)*, long-eared myotis *(Myotis evotis)*, little brown bat *(Myotis lucifugus)*, fringed myotis *(Myotis thysanodes)*, long-legged myotis *(Myotis volans)*, Yuma myotis *(Myotis yumanensis)*, California myotis *(Myotis californicus)*, western red bat *(Lasiurus blossevillii)* and hoary bat *(Lasiurus cinereus)*) at 22 sites throughout the Lake Tahoe Basin. Sites were classified as either lentic (near or over lakes or ponds), lotic (near or over flowing water), forest or meadow.

The restoration monitoring effort consisted of multi-species surveys at 12 sites (six sites planned for restoration and six control sites) over six years (each site was surveyed one to three years). Bat surveys were conducted in 2004, 2006 and 2007-2009. Over the span of the six years and 12 sites 14 species were detected. In addition to the 11 species previously identified by the MSIM project, these surveys also identified long-eared myotis *(Myotis evotis)*, Mexican free-tailed bat *(Tadarida brasiliensis)*, pallid bat *(Antrozous pallidus)*, Townsend's big-eared bat *(Corynorhinus townsendii)*, spotted bat *(Euderma maculatum)*, and western pipistrelle *(Pipistrellus Hesperus)*.

## 7.5 Future Recommendations and Needs

We have evaluated all potential structures on USFS lands that could be considered suitable habitat for Townsend's big-eared bats and have identified calls of this species at three of these sites. We recommend continuing to place echolocation recorders at these sites periodically. However, because we have not identified Townsend's at these sites since 2009 and are not currently learning new information about the bats using the sites we survey, we may find more value in placing echolocation recorders in suspected foraging habitat, especially foraging habitat near recently completed restoration projects where pre-restoration bat surveys have been conducted.

# 8.0 Pacific Marten (*Martes caurina)*

## 8.1 Species Account and Management Direction

The Pacific marten (*Martes caurina*) is a Region 5 FSS and an MIS for the late seral, closed canopy coniferous forest habitat component on the LTBMU.

In California, marten occur in the southern Cascades and northern Sierra Nevada south to Tulare County. Historically, martens were understood to be well distributed throughout the Cascades and northern Sierra Nevada but recent surveys suggest that the populations are now fragmented, distribution is reduced, and suitable habitat has also been reduced and isolated in parts of the range (Kirk and Zielinski 2009; Spencer and Rustigian-Romsos 2012; Zielinski et al. 2005). In a study of marten in northeastern California, north of the LTBMU, Kirk and Zielinksi (2009) reported that marten populations detected are associated with areas that contain the largest amount of reproductive habitat consisting of

mature, old forest. The highest density of detections was located in the largest protected area in the study region. Habitat and occupancy models that encompass the Sierra Nevada and Cascade Ranges developed by Spencer and Rustigian-Romsos indicate that habitat connectivity for marten is fragmented north of the Plumas National Forest where martens appear to be restricted to isolated or semi-isolated high elevation areas (consistent with Kirk and Zielinksi (2009)) whereas south of the Plumas, habitat connectivity does not appear to be greatly limiting for martens although the authors suggest that Interstate 80 may be a significant barrier to movement.

In the Sierra Nevada, this species is known to inhabit high elevation (4,500-10,500 feet) late-successional, mature red fir, lodgepole pine and mixed conifer forests with large, decadent live trees and snags, and complex physical structure near the ground comprised of an abundance of large dead and downed wood (Buskirk and Powell 1994; Zielinski et al. 2013). Marten can inhabit younger forests if important elements of the mature forest are still present, especially structures for resting and denning (Purcell et al. 2012; Zielinski et al. 2013). Riparian areas, especially near mature forest, are important for foraging (Zielinski et al. 2013). The abundant large trees and dead-wood structures associated with marten presence provide prey resources, resting structures, and escape cover (Zielinski et al. 2013). Rest structures typically include snags, logs, and stumps; trees and snags used for resting are often the largest available (>35 inches in diameter) (Purcell et al. 2012). Rest structures vary with season such that above-ground cavities are used in summer and subnivean logs, snags, and stumps are used during the winter (Zielinski et al. 2013). Den structures typically include arboreal cavities in live trees, snags (Bull and Heater 2000; Gilbert et al. 1997; Raphael and Jones 1997) and logs, rock crevices and red squirrel middens (Ruggiero et al. 1998). Resting and denning structures may be the most limiting resource for marten because they generally use only trees and snags greater than 30" DBH (Purcell et al. 2012).

Some of the threats facing martens include habitat loss and fragmentation, especially clear-cutting, fuel reduction treatments, and wildfire (Zielinski et al. 2013). Under the current direction (LRMP as amended by the Sierra Nevada Forest Plan Amendment), marten den sites are 100-acre (259-meter) buffers consisting of the highest quality habitat in a compact arrangement surrounding the den. These den site buffers are protected from disturbance from vegetation treatments with an LOP (1 May – 31 July).

**Four marten at a camera station.**

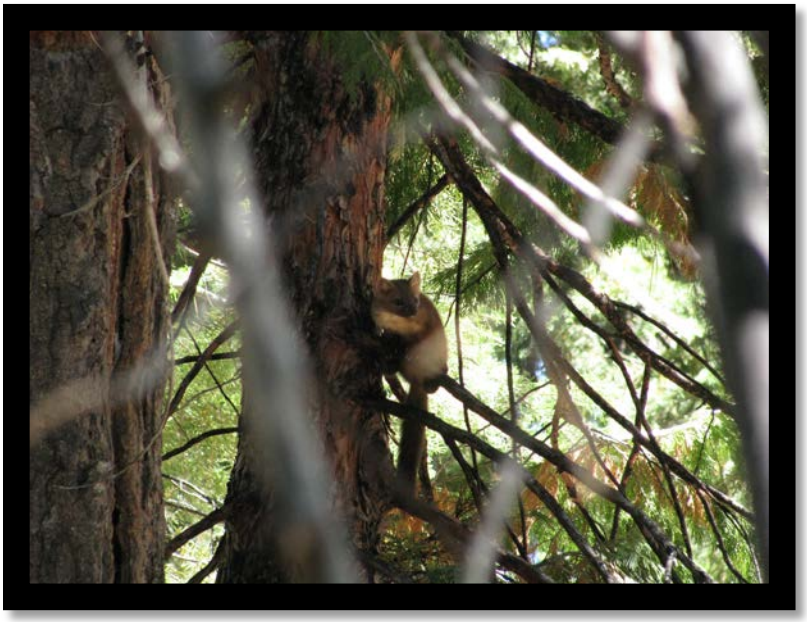
Surveys in the LTBMU have occurred sporadically in the Lake Tahoe Basin. The Pacific Southwest Research Station of the Forest Service (PSW) has conducted broad carnivore surveys in the Sierra Nevada, during which multiple detections of marten were reported. In addition, PSW is in the process of studying marten populations at ski resorts in the Lake Tahoe area. Slauson et al. (2008a) analyzed data from several marten surveys that were conducted in the LTBMU between 1993 and 2005 and found that marten were detected at 36% of all sample units that were surveyed, occupying areas supporting mesic conifer forest typically dominated by red fir, white fir, western white pine, and lodgepole pine (Slauson et al. 2008a). The majority of detections were made in the western (50% of sites) and southern (31% of sites) regions of the LTBMU. Detections in the northern and eastern portions of the LTBMU were scarce despite 30% of the total survey effort occurring in these two areas, and the authors suggested that these areas may have supported less suitable habitat conditions (e.g., open canopy) due to drier conditions, and development that has altered the composition and connectivity of suitable habitat along the transition from mesic to xeric forest types from west to east in the Lake Tahoe Basin (Slauson et al. 2008a). Slauson et al. (2008a) stressed the importance of the west shore as the only known linkage for populations north and south of the LTBMU.

## 8.2 Methods

Systematic surveys for marten were not conducted during the summary period. However, incidental observations were made during the summary period that can inform management and are described in the Results and Discussion sections. Systematic surveys were conducted by PSW during the summary period but these data have not yet been synthesized or published and are not reported here.

## 8.3 Results

Before 2008, Pacific marten had been surveyed several times at various locations throughout the LTBMU and a synthesis of these studies determined that marten were well distributed in the LTBMU, particularly in habitat on the west and south shore areas (Slauson et al. 2008a). Organized surveys were not conducted by LTBMU biologists during the summary period. However, during this period three marten dens were confirmed. Two dens were identified in Sugar Pine Point State Park and Page Meadows on the west shore. The dens were in close proximity to goshawk nests and discovered incidentally during goshawk nest surveys. The third den was incidentally discovered adjacent to Fallen Leaf Lake by a PSW biologist working in the LTBMU and reported to LTBMU biologists. The Sugar Pine Point State Park and Fallen Leaf Lake dens were confirmed as maternal dens by the presence of an adult and at least one juvenile going in and out of the den in plain view of the biologists present. At the Page Meadows den only one individual was detected and that individual was not positively identified as a juvenile. This den is a suspected maternal den but was not verified. The dens were identified in the following California Wildlife Habitat Relationship (CWHR) types (Mayer and Laudenslayer 1988): Sierra Mixed Conifer 4M (Sugar Pine Point State Park), Jeffrey Pine 5M (Fallen Leaf Lake), White Fir 4D (Page Meadows).



**Marten kit at the Fallen Leaf Lake den. Photo courtesy of USFS PSW.**

## 8.4 Discussion

In 2008 a monitoring protocol for marten in the LTBMU was completed by PSW (American Marten Population Monitoring in the Lake Tahoe Basin (Slauson et al. 2008a). Unfortunately, this protocol has proved to be prohibitively expensive and has not been implemented even one of the four years prescribed (The monitoring plan suggests sampling be repeated every three years over a 10 year period for a total of 4 sampling seasons.).

Prior to 2010 no marten dens had been identified in the LTBMU despite the fact that many marten had been incidentally detected throughout the LTBMU. Unfortunately, surveys to find and confirm dens can be prohibitively costly because they generally require the use of radiotelemetry to track individuals to den sites.

Interestingly, the three confirmed marten dens identified in the LTBMU during the summary period were found in habitat that is considered moderate capability denning habitat (Sierra Mixed Conifer 4M and White Fir 4D) and moderate capability foraging habitat (Jeffrey Pine 5M) according to CWHR (CDFW 2005). Although some types of high capability denning habitat are rare in the LTBMU (Sierra Mixed Conifer 6) other types are more common (Red Fir and Lodgepole Pine 4M, 4D). We do not interpret these results to suggest that marten preferentially select den sites in moderate capability habitat. In fact, recent research at ski resorts in the Lake Tahoe Basin suggests that females may not tolerate the breadth of habitats that males can tolerate (Slauson K. personal communication). We also do not know the

success of these dens, and recognize that martens use multiple dens. Therefore, these results indicate that marten in the LTBMU are using moderate capability habitat for denning but we lack the data to suggest that this habitat is selected preferentially.

## 8.5 Future Recommendations and Needs

There is a need to better understand the habitat marten are using for denning on the LTBMU (and elsewhere in their range). Continuing to partner with researchers that are studying marten in the LTBMU will substantially improve our understanding of marten, particularly the thresholds that females are exhibiting towards habitat changes. We can also benefit from research that is ongoing in adjacent forests such as the Sagehen Experimental Forest on the Tahoe National Forest (Martin and Barrett 1991; Moriarty et al. 2011) (http://www.fs.fed.us/psw/topics/wildlife/mammals/index.shtml#carnivore) and the Lassen and Plumas National Forests (Kirk and Zielinski 2009). Lastly, in the absence of doing trapping and radio telemetry we recommend the use of camera stations in areas where we have received reports of incidental sightings.

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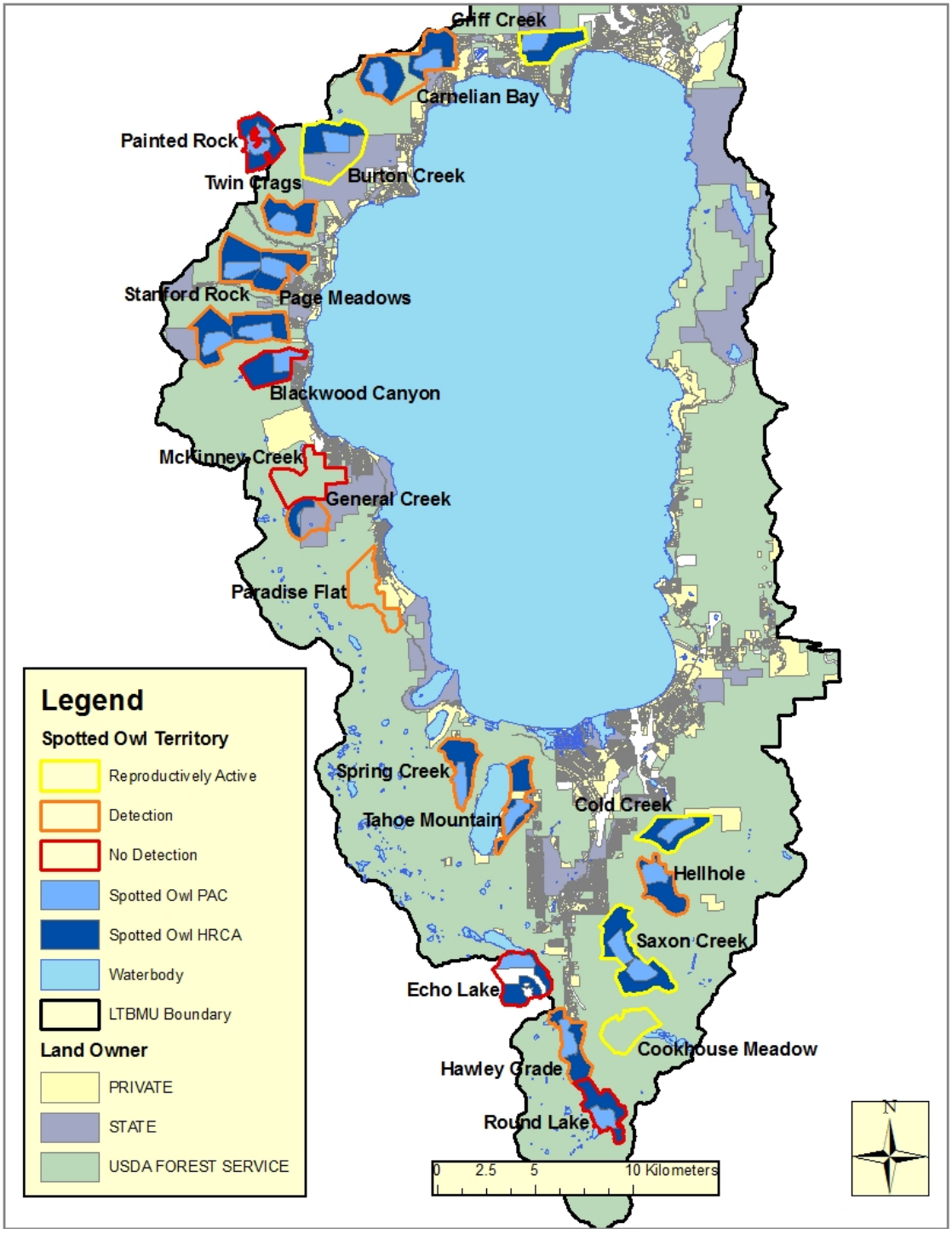
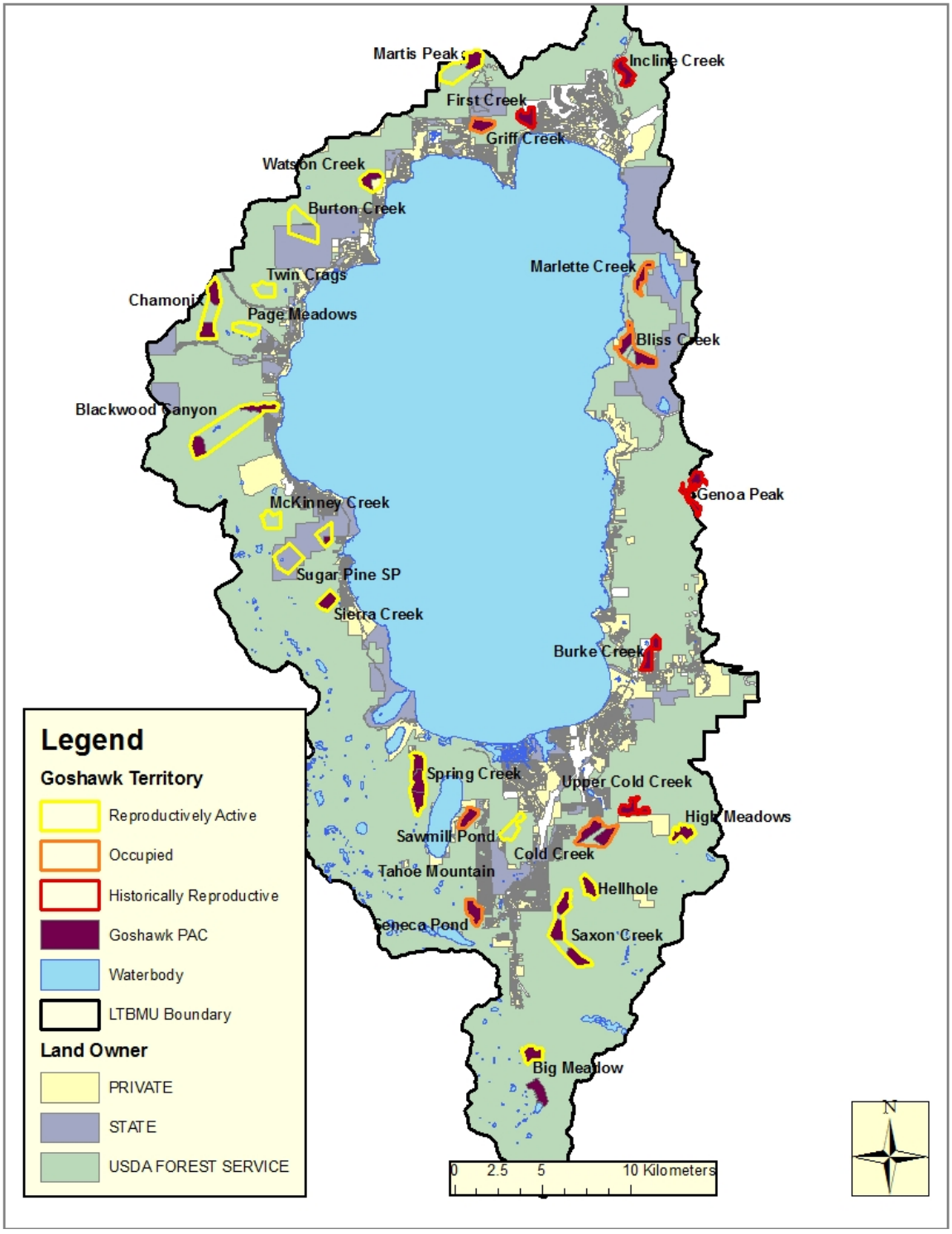
# Appendix A.

A representation of the known spotted owl territories in the LTBMU. The territory is based on the HRCA boundary/boundaries where possible. Although, the HRCA boundary is not necessarily the territory boundary, it is the best approximation available based on detection and nest location and habitat quality. Territories are color coded by the level of activity found in the territory during the summary period.



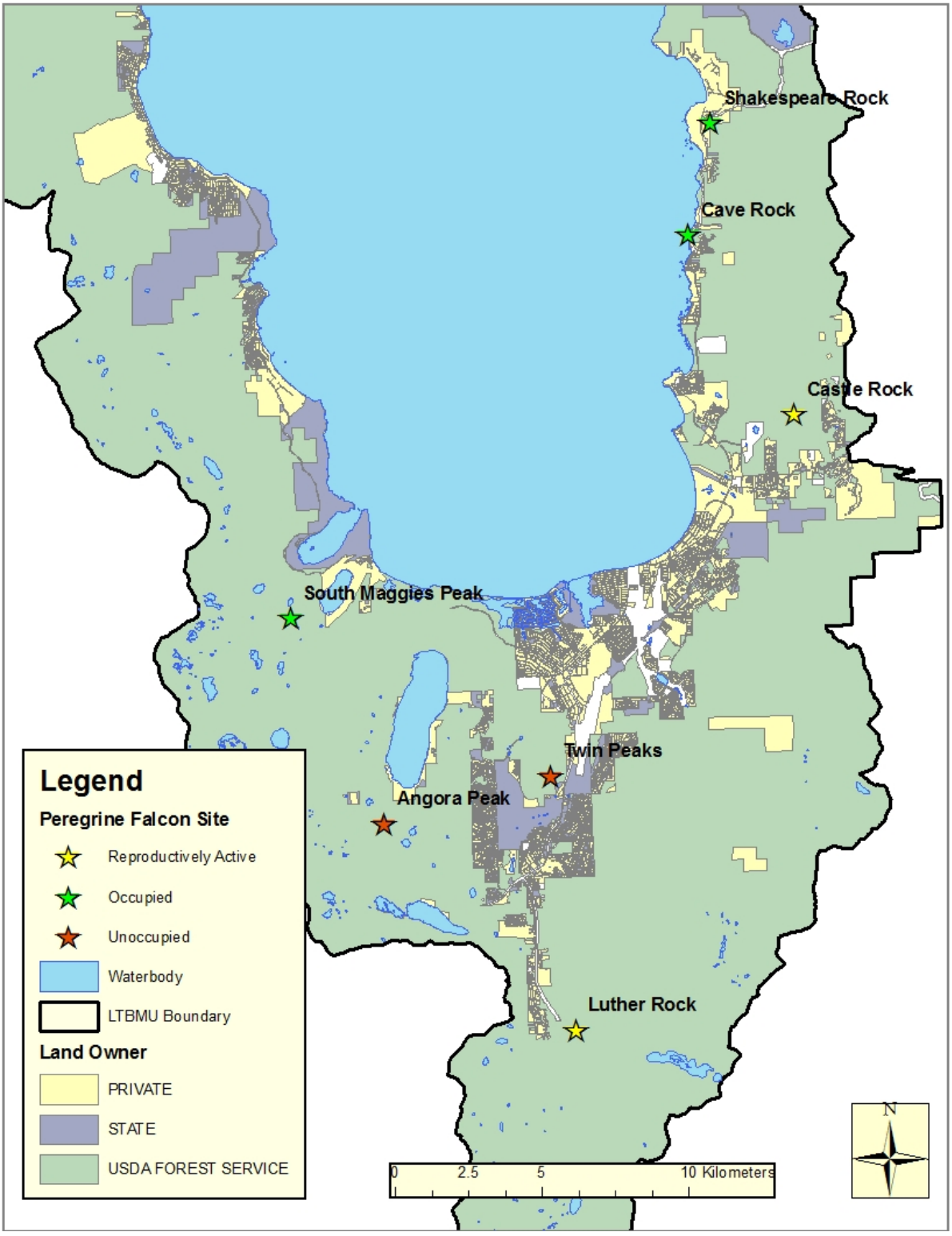
# Appendix B.

A representation of the known northern goshawk territories in the LTBMU. The territory is based on the PAC boundary/boundaries where possible. Although, the PAC boundary is not necessarily the territory boundary, it is the best approximation available based on detection and nest location and habitat quality. Territories are color coded by the level of activity found in the territory during the summary period.



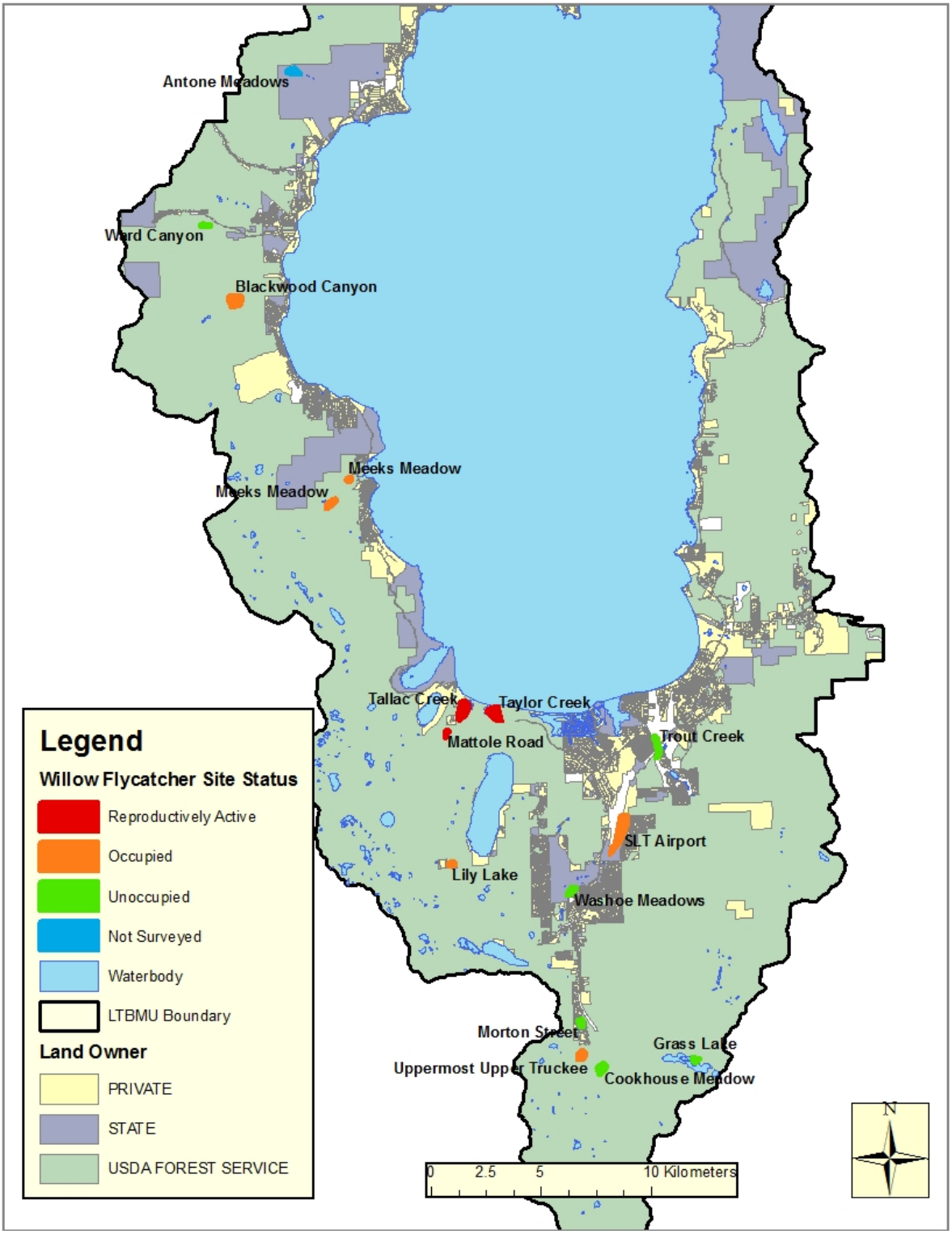
# Appendix C.

A map showing the peregrine falcon sites in the LTBMU. Sites are color coded by the level of activity during the summary period.



# Appendix D.

A representation of the known willow flycatcher sites in the LTBMU. The site boundaries are based on detections, nest location and habitat quality. Sites are color coded by the level of activity during the summary period.



# Appendix E.

Areas searched for suitable mine habitat in 2008 and mines surveyed in 2008 and 2009 in the LTBMU.