

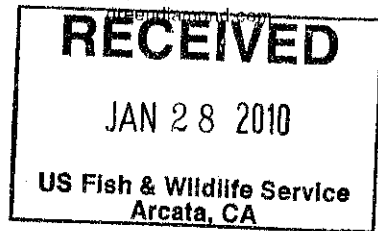
**GREEN DIAMOND
RESOURCE COMPANY**

California Timberlands Division

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January 28, 2010

Mr. Randy Brown
Deputy Field Supervisor
U.S. Fish and Wildlife Service
1655 Heindon Road
Arcata, CA 95521

Dear Mr. Brown:

Enclosed please find a copy of Green Diamond Resource Company's Endangered Species permit report (TE057043-2). The report provides the details of compliance with the permit for the period September 1, 2008 – September 1, 2009. If you have any questions or comments regarding the report, please feel free to contact me at (707) 668-4437.

Sincerely,

Keith Hamm
Terrestrial Wildlife Biologist

**STATUS OF NORTHERN SPOTTED OWLS
IN MANAGED YOUNG GROWTH TIMBERLANDS IN
NORTHERN CALIFORNIA
1990-2009**

Annual report submitted to the Office of Management
Authority and
the U.S. Fish and Wildlife Service in fulfillment of the
requirements of Endangered Species permit,
TE057043-3, issued to Green Diamond Resource
Company, Korb, California 95550

And

The California Department of Fish and Game

January 28, 2010

Spotted Owl Studies

Green Diamond's spotted owl studies from 1989 through 1991, which included a two-year graduate study of the owls' habitat, provided a firm biological basis for the conservation strategy of the HCP. The demographic portion of these studies, which were continued in 2009, addressed population density, reproductive success, site occupancy, population turnover rates, and other demographic information pertaining to the owls.

The objectives of Green Diamond's continuing owl studies are to monitor the efficacy of the HCP through:

- Estimating distribution and population density of northern spotted owls through direct counts of banded birds in large tracts of managed young-growth forests in northern California.
- Estimating demographic parameters (reproductive success, survival rates, site occupancy, and turnover rates) to determine viability of this population.
- Assessing the long-term dynamic relationship between owl distribution, habitat loss through timber harvest, and habitat gain through forest growth.
- Assess the potential impact on spotted owl viability from barred owls, West Nile Virus or other new threats

A. Materials and Methods

1. Site occupancy/ status

Surveys for spotted owls were conducted by spot calling. The sites were classified as follows:

Confirmed - history of responses in a consistent location and owl(s) seen at the same location during at least one daytime follow-up.

Unconfirmed - history of nighttime responses in a specific area, but daytime follow-ups either not done, not successful, or successful without establishing a consistent activity center.

Possible - multiple new nighttime responses in a general area, but not in a consistent location; daytime follow-ups not attempted or not successful.

We checked owl sites located in 2008 for occupancy in 2009. A site was considered occupied in 2009 if owls were detected at the same roost and/or nest site from previous years. A site was considered unoccupied in 2009 if it previously was a confirmed site, but not occupied for the first time in 2009. If a site was occupied early in the 2009 season,

but apparently unoccupied later in the season, it was considered occupied in 2009. Such a site will not be considered unoccupied unless it is still unoccupied in 2010.

We categorized new sites in 2000 according to their survey history. A site was designated as a "newly discovered" site if it had been found in 2009 in an area that had not been surveyed or had inadequate survey coverage prior to 2009. A site was classified as a "newly colonized" site if it had been found in 2009 in an area that had been adequately surveyed prior to 2009, but no owls had been previously detected in the area. A site was classified as recolonized if it had been occupied in one or more previous years, unoccupied for one or more years prior to 2009 and then occupied again in 2009.

2. Spotted owl banding

When we located unbanded owls or owls banded with cohort auxiliary leg bands (owls banded as juveniles with a color band identifying the year in which they were banded) in follow-up visits, we used bait mice or artificial lures to attract the owls within range of capture. All age classes of spotted owls were primarily captured using a snare pole. Once we captured an owl, we placed a USFWS band on one of its legs and an auxiliary colored leg band on the other. The following measurements were usually taken: wing cord, body mass, length of tarsus, length of footpad, and tail length. If conditions permitted, toe, claw, bill length and bill depth also were measured. The age class of the owl was recorded. Subadults (one or two year old owls) were distinguished from adults (greater than two years old) by having pointed retrices. One-year-old (S1) and two year old (S2) subadults were distinguished using the methods of Moen et al. (1991). We also checked the owls for molt, previous or current injuries, parasites, and presence of brood patches for females. We released the owls immediately after they were banded and measured.

3. Turnover

Adult and subadult owls banded or resighted in one year were used to determine turnover rates in the subsequent year. We considered owls to be "missing" if they were banded or resighted at least once during one season, but not resighted the next year. If an owl disappeared in the same season in which it was earlier banded or resighted, it was reported as missing the next season if its whereabouts were still unknown. Owls that were present at a site but could not be positively resighted were excluded from the analysis. New recruits were defined as owls that became territorial for the first time.

4. Reproductive success

We designated pair status by observing a male and female in close proximity (less than 1/4 mile) in any of the following contexts: roosting, vocalizing, nesting, delivering prey, or tending young. An owl was judged to be single if the same owl was observed on three or more occasions in the same general area without detecting an owl of the opposite gender.

We judged pairs to be nesting if the female was observed incubating eggs or brooding young between April 1 and May 31. In some instances, incubation was determined in late

March but a second visit was generally conducted prior to May 31 to confirm nesting. We determined reproductive success of nesting owl pairs that were monitored to protocol from June 1 August 31. Pairs were considered to have successfully nested if at least one owlet was observed to have fledged. In special circumstances, the location and stage of development of an owlet found dead were evaluated to determine whether the owlet had fledged.

5. Juvenile dispersal

Owls banded as juveniles were assigned to the appropriate age class when they were recaptured. We used locations of spotted owls banded as juveniles (both within and outside the Green Diamond study area) and recaptured as adults or subadults to measure juvenile dispersal distances. Distances were determined for juveniles: 1) dispersing within Green Diamond's study area and 2) dispersing from Green Diamond's study area to another area or dispersing from another area to Green Diamond. Other study areas included the Willow Creek Study Area, Hoopa Reservation, Humboldt Redwood Company, Redwood National Park and regional studies in Oregon.

6. Owl density

Large areas (typically greater than 50,000 acres) completely surveyed for spotted owls and owl locations were mapped on a GIS database. GIS programs determined the acreage of thoroughly surveyed areas that included a northern and a southern study area. Once the owl sites were plotted, the number of sites in the surveyed areas was determined. The sites were classified into those occupied by paired or single owls. It was assumed that a single owl occupied the site 1) if it was confirmed that a single bird was at the site, or 2) if the pair status of the site was unknown. The total number of territorial owls associated with the sites in completely surveyed areas was used to calculate overall owl density and density of owls in the northern and southern areas. The density study area on and adjacent to Green Diamond ownership is shown in Figure 1.

7. Demography

Green Diamond Resource Company has been conducting a demography study on Northern Spotted Owls since 1990 to monitor trends in the owl's population within Green Diamond's ownership. In January 2009, Green Diamond biologists attended a workshop convened in Corvallis, Oregon to analyze demographic data on Northern Spotted Owls. The workshop was attended by biologists from 11 study areas throughout Washington, Oregon and California along with a large contingent of biometricians and statisticians from several academic and research institutions across North America. Most of the study areas were on federal lands or a mix of federal, state and private lands, with only one entirely on private lands and one on Indian Reservation lands. The results of this workshop will be in a report due out in 2009.

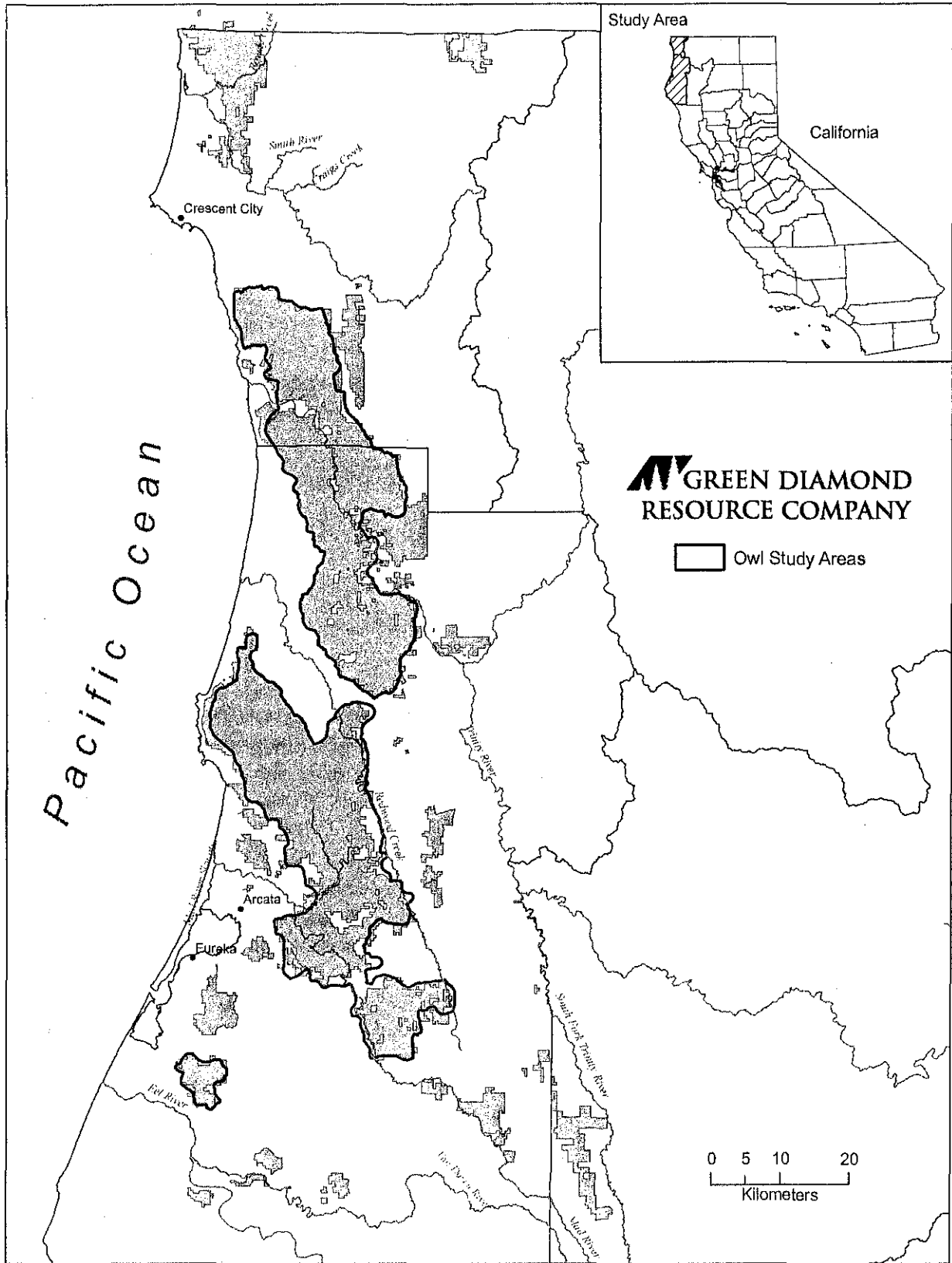


Figure 1. Location of Green Diamond density study area for northern spotted owls in northern California

8. Barred Owls

During surveys and site visits for spotted owls, Green Diamond biologists note the incidental detection of barred owls on or adjacent to the ownership. In 2009, GDRCo began conducting barred owl specific surveys in select areas within the spotted owl density study area. Surveys were conducted using electronic solid state callers (Wildlife Technologies) with a variety of barred owl vocalizations. These species specific surveys may result in additional barred owl detections when compared to historical incidental detections from spotted owl survey efforts. The results of these surveys will be reported in the future as we transition to more focused survey efforts for this species.

9. West Nile Virus

In 2004, 2005, 2006 and 2008, Green Diamond participated in a collaborative arrangement with Dr. Alan Franklin who is conducting spotted owl research on the Willow Creek Study Area. This collaborative work involved collecting blood samples from northern spotted owls to test for the presence of West Nile Virus. There were no collections in 2009.

B. Results

1. Site occupancy

In 2009, a total of 120 owl sites were located in the Green Diamond study area (Table 1). Of these sites, 78 had confirmed activity centers and 42 had unconfirmed activity centers. Ninety-one sites (75.8%) were occupied by pairs, 7 (5.8%) were occupied by single owls and 17 (14.2%) were occupied by owls with unknown social or reproductive status. Thus, a minimum of 206 territorial owls were on the study area in 2009. The annual variation in confirmed, unconfirmed and possible owl sites is shown in Table 2.

Of the sites occupied in 2008, 88% were occupied in 2009. Owl sites occupied in 2009 that were not accounted for in 2008 included three recolonized sites and two newly colonized sites (Table 3). Since 1994, there were 50 sites considered newly colonized. There were two newly discovered sites in 2009.

2. Reproductive success

Thirty-seven pairs at 66 sites (56%) monitored during the nesting season attempted nesting (Table 4). Seventeen nesting pairs successfully fledged a minimum of 37 owlets, for a reproductive success rate of 0.56 owlets fledged per monitored site. To date, five pairs have made seven nesting attempts in nest boxes. Five attempts were successful and six owlets were fledged.

The trend in the number of owlets fledged per monitored pair from 1990-2009 is shown in Figure 2. The equation of the straight line relating owlets fledged per monitored pair versus year was estimated as: $\text{owlets fledged/monitored pair} = 27.857 - 0.0136 \cdot \text{year}$. The slope of the regression line is -0.0136 with a standard error of 0.009. Due to this relatively

high annual variation, the significance test that the slope is zero resulted in a t-value of -1.61 with $P = 0.13$.

Table 1. Status of northern spotted owls, Green Diamond study area, 2009.

| Activity Center | Nesting pairs (n) | Non-nesting pairs (n) | Breeding Status unknown pairs (n) | Singles (n) | Social status unknown (n) | Total sites (n) | Fledged owlets (n) |
|-----------------|-------------------|-----------------------|-----------------------------------|-------------|---------------------------|-----------------|--------------------|
| Confirmed | 37 | 14 | 20 | 6 | 1 | 78 | 37 |
| Unconfirmed | 0 | 0 | 20 | 1 | 16 | 42 | 0 |
| Total | 37 | 14 | 40 | 7 | 17 | 120 | 37 |

Table 2. Annual variation in northern spotted owl sites, Green Diamond study area, 1990-2009.

| Year | Sites | | | Total |
|------|-----------|-------------|----------|-------|
| | Confirmed | Unconfirmed | Possible | |
| 1990 | 79 | 7 | 1 | 87 |
| 1991 | 136 | 6 | 2 | 144 |
| 1992 | 156 | 15 | 18 | 189 |
| 1993 | 161 | 24 | 15 | 200 |
| 1994 | 161 | 22 | 5 | 188 |
| 1995 | 127 | 36 | 3 | 166 |
| 1996 | 135 | 20 | 0 | 155 |
| 1997 | 125 | 42 | 3 | 170 |
| 1998 | 172 | 14 | 3 | 189 * |
| 1999 | 144 | 24 | 0 | 168 * |
| 2000 | 140 | 23 | 0 | 163* |
| 2001 | 126 | 35 | 1 | 162 * |
| 2002 | 122 | 34 | 1 | 157 * |
| 2003 | 112 | 34 | 0 | 146 * |
| 2004 | 112 | 29 | 0 | 141 |
| 2005 | 107 | 16 | 0 | 123 |
| 2006 | 93 | 35 | 0 | 128 |
| 2007 | 81 | 26 | 0 | 107 |
| 2008 | 80 | 19 | 0 | 99 |
| 2009 | 78 | 38 | 4 | 120 |

* Expansion year where property acquisition (~74,000 acres) accounted for 14 additional owl sites.

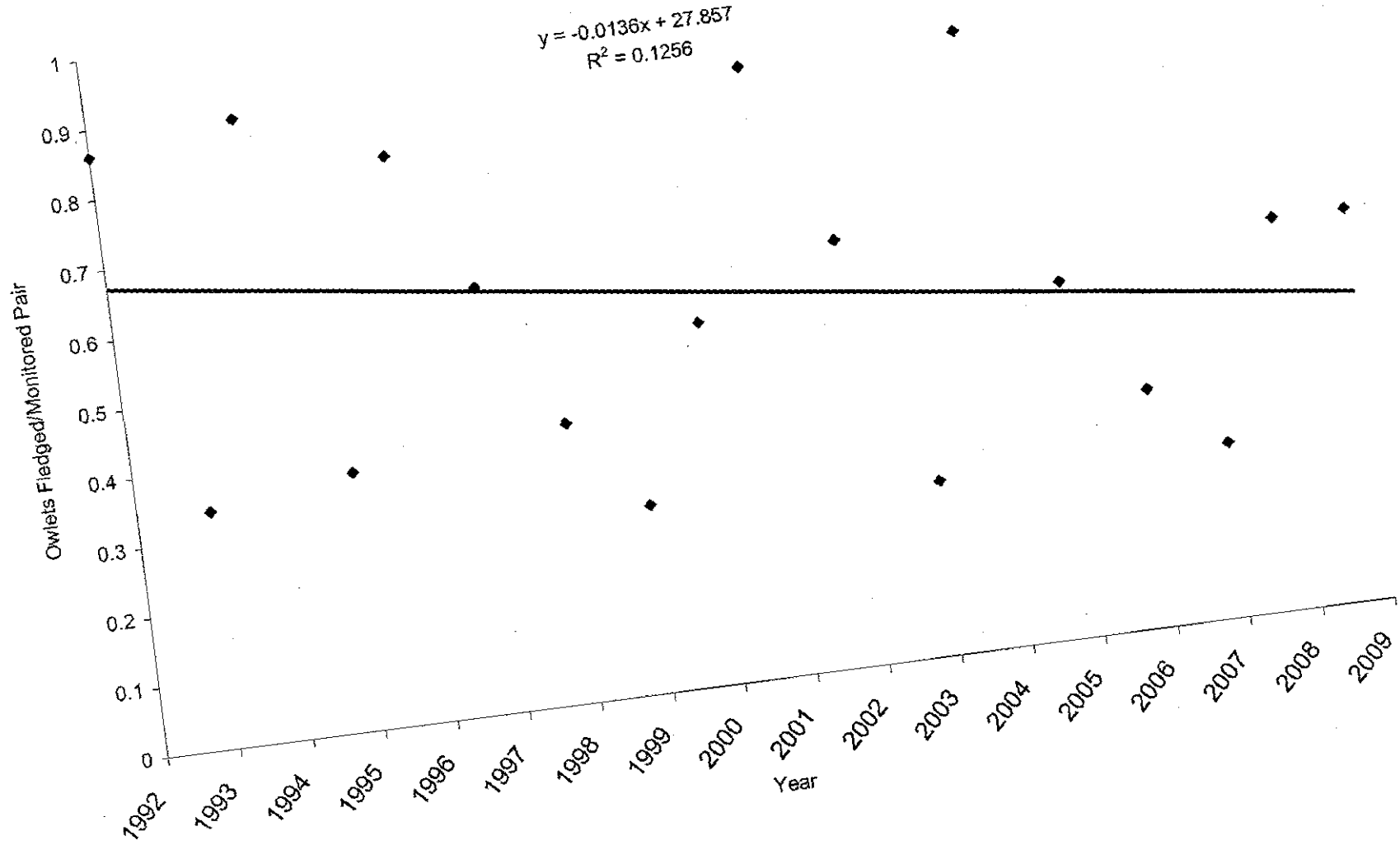
Table 3. Site occupancy of northern spotted owls, Green Diamond study area, 2009.

| Pair Status | Sites occupied in 2008 | Sites Located in 2009 | | | |
|-------------|------------------------|---------------------------------|-----------------------|-------------------|--------------------------------|
| | | Sites occupied in 2008 and 2009 | Sites Newly Colonized | Sites Recolonized | Sites Newly Discovered in 2009 |
| Paired | 78 | 73 | 0 | 5 | 2 |
| Single | 6 | 7 | 0 | 2 | 0 |
| Unknown | 15 | 7 | 0 | 2 | 0 |
| Total | 99 | 87 | 0 | 9 | 2 |

Table 4. Reproductive success of northern spotted owl pairs monitored from 1990 - 2009, Green Diamond study area.

| Year | # Sites monitored | # Pairs not nesting | # Pairs nesting | # Pairs successful | # Fledged owlets | # Owlets fledged/ monitored site |
|--------------|-------------------|---------------------|-----------------|--------------------|------------------|----------------------------------|
| 1990 | 56 | 18 | 38 | 29 | 46 | 0.82 |
| 1991 | 101 | 45 | 56 | 47 | 70 | 0.69 |
| 1992 | 126 | 39 | 87 | 73 | 109 | 0.86 |
| 1993 | 92 | 56 | 36 | 20 | 31 | 0.34 |
| 1994 | 131 | 46 | 85 | 76 | 117 | 0.89 |
| 1995 | 106 | 59 | 47 | 30 | 39 | 0.37 |
| 1996 | 117 | 40 | 77 | 62 | 95 | 0.81 |
| 1997 | 94 | 54 | 40 | 35 | 57 | 0.61 |
| 1998 | 100 | 49 | 51 | 29 | 40 | 0.40 |
| 1999 | 111 | 86 | 25 | 20 | 30 | 0.27 |
| 2000 | 120 | 60 | 60 | 40 | 62 | 0.52 |
| 2001 | 114 | 40 | 74 | 58 | 99 | 0.87 |
| 2002 | 112 | 53 | 59 | 43 | 68 | 0.61 |
| 2003 | 91 | 71 | 20 | 16 | 23 | 0.25 |
| 2004 | 94 | 34 | 60 | 51 | 83 | 0.88 |
| 2005 | 98 | 37 | 61 | 32 | 50 | 0.51 |
| 2006 | 71 | 44 | 27 | 18 | 24 | 0.34 |
| 2007 | 67 | 55 | 12 | 10 | 17 | 0.25 |
| 2008 | 77 | 25 | 33 | 26 | 43 | 0.56 |
| 2009 | 66 | 17 | 37 | 23 | 37 | 0.56 |
| Overall Mean | | | | | | 0.59 |

Figure 2. Trend in the number of owlets fledged per monitored pair, 1992-2009



3. Spotted owl banding

Fourteen adults, 12 subadults and 24 juvenile spotted owls were captured and banded on the Green Diamond study area in 2009 (Table 5). Combined with 1990-2008 banding totals, 736 (43.6%) adults and subadults, 952 (56.4%) juveniles and one unknown gender subadult, for a total of 1689 owls have been banded. Of all non-juvenile owls that were banded on the Green Diamond study area through 2009, 30.7% were subadults and 69.3% were adults. From 1990-2009, 54 owls recaptured on the Green Diamond study area were originally banded on other study areas such as the Willow Creek Study Area, Redwood National Park, Hoopa Reservation, and Humboldt Redwood Company lands (Table 6). These 54 owls included with the 1689 owls reported above combine for a grand total of 1743 individual owls captured on the Green Diamond study area. There were a total of nine recaptures of juveniles in 2009, for a total of 279 juveniles banded on the Green Diamond study area that were later recaptured within the Green Diamond study area (Table 7).

4. Juvenile dispersal

Three hundred twenty-one juveniles were known to have dispersed within, to, or from the Green Diamond study area between 1990 and 2009. Dispersal distance information for 304 of these owls ranged from 0.5 to 93 miles, with a mean of 9.2 miles. Dispersal distances for eight females and 9 males were unknown. Dispersal distances of 152 males ranged from 0.5 to 93 miles, with a mean of 7.7 miles. One hundred forty-seven females dispersed an average of 10.4 miles, with a range of 0.8 to 87.4 miles. The gender of five owls was unknown. Owls dispersing within the Green Diamond study area (n=214) dispersed an average of 6.7 miles while those dispersing to or from the study area averaged 15.1 miles (n=91).

Table 5. Age and gender of northern spotted owls banded on the Green Diamond study area, 1990-2009.

| Years | Gender | Age | | | Total |
|-----------|---------|--------|-----------|-----------|-------|
| | | Adults | Subadults | Juveniles | |
| 1990-2008 | males | 270 | 99 | - | 369 |
| | females | 226 | 114 | - | 340 |
| | unknown | - | 1 | 928 | 929 |
| Subtotal | | 496 | 214 | 928 | 1638 |
| 2009 | males | 12 | 7 | - | 19 |
| | females | 2 | 5 | - | 7 |
| | unknown | - | - | 24 | 24 |
| Subtotal | | 14 | 12 | 24 | 50 |
| Total | | 510 | 226 | 952 | 1688 |

Table 6. Age and gender of northern spotted owls banded as juveniles by Willow Creek Study Area, Humboldt Redwood Company, Hoopa Indian Reservation studies or Oregon Bureau of Land Management and recaptured as territorial owls on the Green Diamond study area 1990-2009.

| Gender | Age | | | Total |
|---------|--------|--------------------|--------------------|-------|
| | Adults | 1st year Subadults | 2nd year Subadults | |
| Males | 14 | 1 | 9 | 24 |
| Females | 8 | 11 | 11 | 30 |
| Total | 23 | 12 | 20 | 54 |

Table 7. Recaptures of juveniles banded on the Green Diamond study area 1991-2009. Parentheses indicate number of recaptures of juveniles banded by Green Diamond and captured on other study sites.

Year of recapture with the number of recaptures in the column below

| Cohort | # banded | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | Total | % recapture |
|--------|----------|------|------|-------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|---------|-------------|
| 1990 | 38 | 5 | 1 | 3 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 28.9 |
| 1991 | 64 | | 6 | 5 | 8 | 1 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 35.9 |
| 1992 | 95 | | | 11 | 7 | 8 | 4 | 1 | 1 | 2 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 36 | 36.8 |
| 1993 | 27 | | | | 10 | 1 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 51.9 |
| 1994 | 103 | | | | | 15 | 6 | 6 | 5 | 7 | 1 | 3 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 45 | 43.7 |
| 1995 | 37 | | | | | | 2 | 2 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 19.4 |
| 1996 | 76 | | | | | | | 8 | 3 | 3 | 2 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 25.9 |
| 1997 | 50 | | | | | | | | 6 | 5 | 5 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 19 | 38.0 |
| 1998 | 36 | | | | | | | | | 2 | 5 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 25.0 |
| 1999 | 23 | | | | | | | | | | 3 | 3 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 8 | 34.8 |
| 2000 | 52 | | | | | | | | | | | 7 | 1 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 11 | 21.2 |
| 2001 | 82 | | | | | | | | | | | | 6 | 9 | 7 | 1 | 1 | 0 | 0 | 0 | 24 | 29.3 |
| 2002 | 53 | | | | | | | | | | | | | 3 | 7 | 5 | 3 | 0 | 0 | 0 | 18 | 33.9 |
| 2003 | 19 | | | | | | | | | | | | | | 1 | 1 | 0 | 1 | 0 | 0 | 3 | 15.8 |
| 2004 | 67 | | | | | | | | | | | | | | | 7 | 3 | 4 | 1 | 3 | 18 | 26.9 |
| 2005 | 45 | | | | | | | | | | | | | | | | 1 | 1 | 3 | 3 | 8 | 17.8 |
| 2006 | 17 | | | | | | | | | | | | | | | | | 0 | 1 | 0 | 1 | 5.9 |
| 2007 | 14 | | | | | | | | | | | | | | | | | | 1 | 0 | 1 | 7.1 |
| 2008 | 30 | | | | | | | | | | | | | | | | | | | 3 | 3 | 12.5 |
| Total | 928 | 5 | 7(3) | 19(1) | 26(8) | 25(10) | 16(2) | 18(2) | 15(2) | 23(3) | 17(3) | 19(7) | 10(2) | 15(1) | 17(6) | 18(2) | 8(1) | 6(1) | 6 | 9 | 279(50) | 30.1 |

5. Turnover

a. Missing owls

In 2009, nine non-juvenile territorial owls (four males and five females) were found at sites different from those that they occupied in 2008 (Table 8). An additional 48 banded non-juvenile territorial owls present in 2008 were not resighted in 2009 (Table 8).

b. New recruits

Thirteen of the new recruits into the territorial population were subadults and 17 were adults (Table 9). Of the 13 subadults, six were females and seven were males. Four of the adults were females and 13 were males. The cumulative total of new recruits of known age class was 268 subadults (48%) and 286 adults (52%).

6. Owl density

An estimated 395,109 acres (88%) of Green Diamond Resource Company timberlands have been surveyed to date. This acreage includes numerous blocks of land that are typically surveyed for owls, but are too small and isolated to use in our density estimates. For estimating density, we use 3 large contiguous blocks of land; one in the northern area and 2 in the southern area. The northern study area had 18 owl sites occupied by 32 owls within 164,445 acres, or 0.20 territorial owls/1000 acres. The southern study area had 82 owl sites occupied by 142 owls within 197,239 acres, or 0.72 territorial owls/1000 acres. Thus, a total of 100 owl sites occupied by a minimum of 174 owls were within 361,684 acres, for an overall density of 0.48 territorial owls/1000 acres. The total number of spotted owl sites on the density study area is shown in Figure 3. In 1998, Green Diamond acquired approximately 70,000 acres of timberland in Humboldt County. This area was included in the density study area as a one time expansion. The increase in the number of sites in 1998 as shown in Figure 3 is a reflection of this expansion.

7. Demography

In January 2009, Green Diamond biologists attended a workshop convened in Corvallis, Oregon to analyze demographic data on Northern Spotted Owls. The workshop was attended by biologists from 11 study areas throughout Washington, Oregon and California along with a large contingent of biometricians and statisticians from several academic and research institutions across North America. The results of this workshop will be in a report due out in 2009.

8. Barred Owls

The pilot study portion of the removal experiment being conducted with the California Academy of Sciences, and the switch to barred owl specific calling surveys prevent meaningful comparison of barred owl detections to previous years. Green Diamond will be conducting occupancy level barred owl surveys within the density study area starting in

2010, and this will provide future information on trends in barred owl detections and occupancy.

9. West Nile Virus

In 2009, we did not collect blood samples or oral swabs from spotted owls. We are not aware of any samples collected to date with the presence of WNV antibodies.

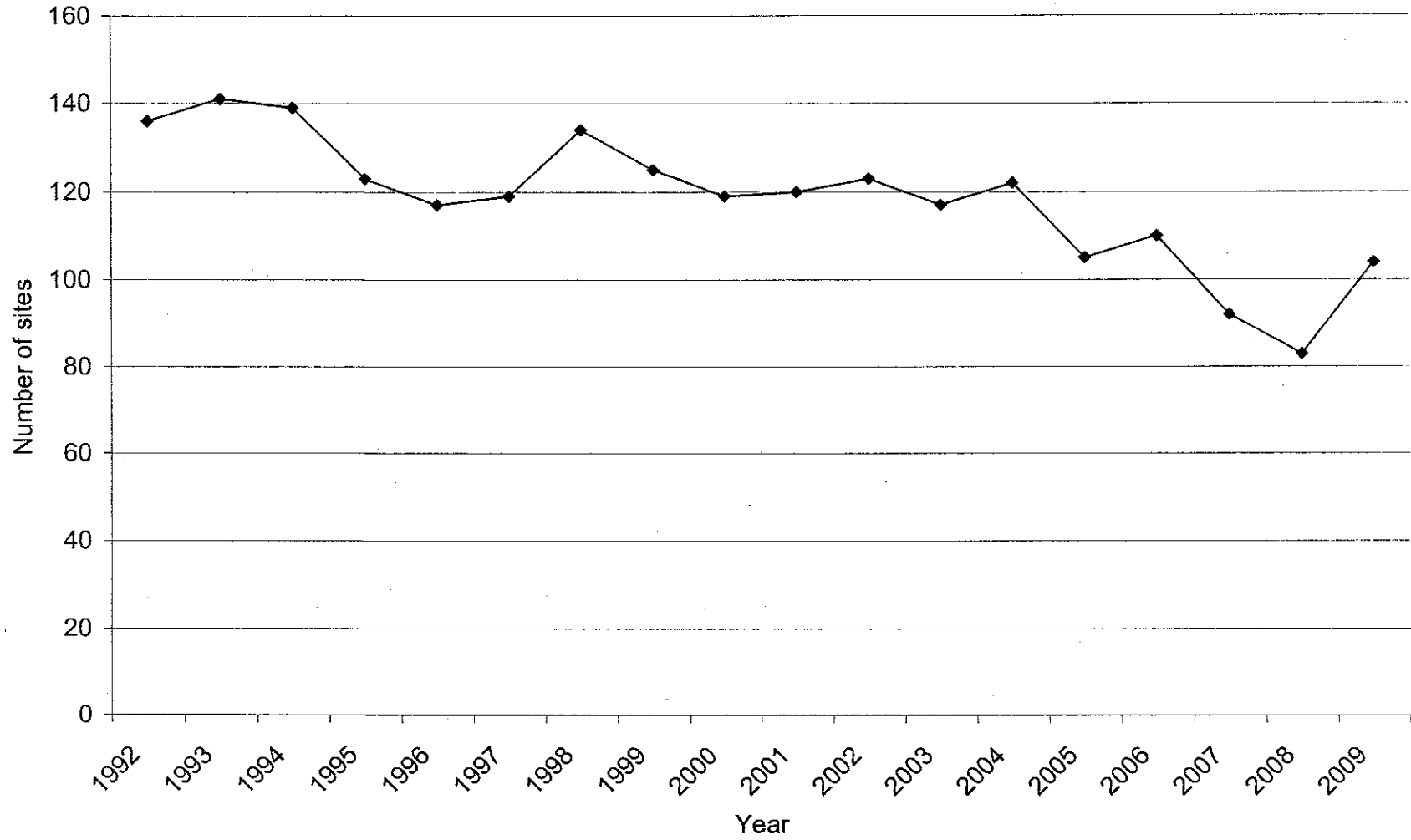
Table 8. Turnover rates of individual northern spotted owls, Green Diamond study area, 2009.

| Gender | Banded or Resighted in Previous Year and Resighted in Current Year n (%) | Banded or Resighted in Previous Year Not Resighted in Current Year n (%) | Resighted at Site Different from that of Previous Year n |
|--------------|---|---|---|
| males | 57 | 20 | 4 |
| females | 47 | 28 | 5 |
| Total | 104(68) | 48 (32) | 9 |

Table 9. Gender and age class of northern spotted owl new recruits, Green Diamond study area 1991-2009.

| Year | Gender | Age | | Total (n) |
|-------------------------------|----------|--------------------|-----------------|--------------|
| | | Subadults n (%) | Adults n (%) | |
| Cumulative Total 1991-2008 | Males | 111 | 161 | 272 |
| | females | 144 | 108 | 252 |
| | subtotal | 255 (49) | 269 (51) | 524 |
| | 2009 | males | 7 | 13 |
| | females | 6 | 4 | 10 |
| | subtotal | 13 (43) | 17 (57) | 30 |
| Total | | 268 (48) | 286 (52) | 554 |

Figure 3. Total number of spotted owl sites on Green Diamond density study area, 1992-2009



C. Discussion

The trend in the total number of owl sites (confirmed, unconfirmed and possible) in the density study area provided the most accurate estimate of the real trend in total owl sites for the entire ownership, because peripheral areas and isolated parcels of ownership tended to have less consistent survey effort across the entire parcel. Surveys and site visits outside of the density study area were based on owl territories and fit within the demographic study area conducted by Green Diamond. The apparent initial increase from 1990-1993 was the result of a "learning curve" associated with field crews becoming familiar with the study area and documenting all perennial owl sites. The peak in total owl sites occurred in 1993-1994 followed by a decline until 1998, a relatively stable period through 2004 and further decline through 2008. In 1998, the apparent increase in sites was a result of an expansion in the size of the density study area and a resultant increase in sites. In 2009, there was an increase in the number of sites within the density study area. This apparent increase in the number of sites is likely a combination of several factors such as barred owl removal and use of electronic callers with a variety of spotted owl and barred owl vocalizations which may have increased the detection probability of some spotted owls.

The negative trend in number of owlets fledged per monitored pair (fecundity) although not significant is one of several potential factors that could have contributed to the overall decline during the study period. The apparent decrease could be partially due to the net reported displacements (47) that occurred during this time period. However, the number of owl sites has declined similarly in areas with and without significant timber harvest indicating other factors were involved. Additional analyses using mark-recapture data with covariates such as weather, habitat elements, barred owls and timber harvest are necessary to assess the factors responsible for the trend in owl sites. The direct competitive interactions with the barred owl and recent disease factors such as West Nile virus may further contribute to declining trends in the spotted owl population that are not easily identified.

A fundamental premise of the spotted owl HCP is that owl sites lost through timber harvest will be replaced in other areas as stands mature and become suitable for occupancy by owls. However, newly colonized owl sites (56) within the density study area have not offset the number sites that were abandoned (125) since 1992. We continue to locate sites within the density study area that were not discovered during the normal course of survey effort conducted each year. These newly discovered sites are often located in habitat that was considered marginal or within areas adjacent to known spotted owl territories. In the latter case, surveys around known territories are avoided to prevent excessive calling at known sites unless the resident spotted owls can not be located during daytime site visits. Since 1992, we have located 34 newly discovered sites within the density study area. We continue to refine our survey effort and identify new areas to survey for colonization by spotted owls.

The 17-year period that the HCP has been implemented provides a relatively brief view of the dynamics of the owl population on Green Diamond's ownership, and it would be expected that stochastic population fluctuations would occasionally lead to a lack of concordance between available habitat and the size of the population. Another plausible

explanation for the difference in newly colonized sites and net reported displacements may be related to the distribution of stand ages throughout Green Diamond's ownership and our current definitions of owl habitat that have discrete thresholds through which stands transform from "non-habitat" to "habitat." Excluding the LP acquisition, there has been a slight upward trend in the amount of suitable (> 30 years) owl habitat. However, simply tracking stands transitioning from one age class to another may not adequately predict suitable owl habitat on the landscape, if a high proportion of stands have recently matured into age classes defined as suitable owl habitat. "Real owl habitat", whether foraging, roosting or nesting, most likely develops gradually through time and a simplistic accounting of the proportion of the landscape in different age classes may not accurately reflect the real amount of habitat at any point in time. The use of spatially explicit models incorporating foraging and nesting site selection will provide insight into the matrix of habitat ages, types and components necessary to support owls on the landscape and further refine our definitions of owl habitat. Continued monitoring of the population and analyses of how timber harvest has affected the owl population will lend insight to future management of the forests within Green Diamond's ownership.

D. Future Studies

1. Owl studies

Surveys, banding, and monitoring of spotted owls will continue in 2009 to evaluate the efficacy of the HCP and to estimate the rate of population change. In addition to the owl studies, several other studies will continue or be initiated. The results of these studies may have implications for Green Diamond's conservation strategy for owls. For example, if a particular habitat component is found to be important to another sensitive species, and also provides habitat for owls, habitat retention areas could be designed to benefit both species.

2. Prey Base studies

Since 2004, Green Diamond has been conducting a property-wide trapping effort to index the abundance of dusky-footed woodrats. This effort is planned to continue in 2010 and eventually will be used as a covariate in future analyses of spotted owl occupancy or for modeling trends in survival and fecundity.

3. Barred owls

A more focused survey effort in 2009 has revealed that barred owls are likely to occupy more areas than previously thought based on the results of property-wide spotted owl surveys. Preliminary results suggest that focused barred owl surveys using a variety of calls over a longer time period at each survey station may be required to more accurately track occupancy by barred owls. This effort will be expanded in 2010 and will provide better information on this species in the future.

F. Literature Cited

Moen, C. A., A. B. Franklin, and R. J. Gutierrez. 1991. Age determination of subadult northern spotted owls in northwest California. *Wildlife Society Bulletin* 19:489-493.