Point Blue

Northern Spotted Owl Monitoring on Marin County Parks and Marin Municipal Water District Lands, 2020 Report

Report to Marin County Parks & Marin Municipal Water District
2020

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Report prepared for Marin County Parks and the Marin Municipal Water District

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Cover Photo: Northern Spotted Owl (*Strix occidentalis caurina*) nestlings in coast redwood (*Sequoia sempervirens*) tree in Marin County, by Danaé Mouton.

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INTRODUCTION

The Northern Spotted Owl (NSO; *Strix occidentalis caurina*), ranging from southern British Columbia to Marin County, California, is one of three subspecies of the Spotted Owl. It is a year-round resident found primarily in older, coniferous forests. The NSO was listed by the U.S. Fish and Wildlife Service (USFWS) as a Federally Threatened subspecies in 1990, with declines mostly attributed to habitat loss. The NSO was also listed as Threatened under California's State Endangered Species Act more recently, due to continued declines (Forsman et al. 2011, USFWS 2011, Dugger et al. 2016). The USFWS now identifies habitat loss and competition from the Barred Owl (*Strix varia*) as the two primary threats to the continued survival of the NSO. The historic range of the Barred Owl was in eastern North America, but after a relatively recent range expansion westward that now includes the entire range of the NSO, their presence has caused displacement of NSO, they compete with NSO for space and food, and they negatively impact NSO demographics (Gutiérrez et al. 2007, USFWS 2011, Wiens et al. 2014, Dugger et al. 2016).

NSO in Marin County are not impacted by commercial tree harvesting operations as in many other parts of their range, but they face other potential threats including habitat loss from development or potentially from high-severity wildfire, noise and/or other disturbance by humans (e.g., construction, landscaping noise, traffic), rodenticide poisoning, climate change, and genetic isolation (Barrowclough et al. 2005, Stralberg et al. 2009, Klein and Merkle 2016, Ganey et al. 2017). Sudden Oak Death (*Phytophthora ramorum*) may also impact NSO (positively or negatively) by changing forest structure and food availability; the dusky-footed woodrat (*Neotoma fuscipes*), a primary prey of the NSO in Marin County, depends on oaks for food and shelter, and their abundance has been found to be negatively correlated with Sudden Oak Death (Swei et al. 2011). Additionally, while the invasion of Barred Owls in Marin County has not yet reached the high densities documented in other parts of the NSO range (Jennings et al. 2011, Cormier 2019), an increase in Barred Owl numbers could pose a serious threat to the NSO population in Marin (e.g., Wiens et al. 2014, Dugger et al. 2016). In 2020, Point Blue inventoried Barred Owls on Marin County Parks lands; that study and its results are summarized in a separate report (Duncan and Cormier 2020), but some elements referred to herein.

Since 1997, biologists from Point Blue Conservation Science (hereafter Point Blue) have been monitoring NSO in Marin County. Marin County Parks (MCP) and Marin Municipal Water District (MMWD) have contracted Point Blue to survey NSO annually since 1999. Surveys are primarily on MMWD and MCP lands, but also include sites on nearby private, municipal, state, and national park lands, because protections for NSO may extend beyond land ownership boundaries. The purpose of these surveys is (1) to monitor the population for trends in

occupancy and reproductive success over time and (2) to determine occupancy and nesting status at sites where proposed management activities may occur, so that disturbance to NSO is avoided.

In 2020, Point Blue biologists continued to monitor occupancy, nesting, and reproductive status for known NSO sites (i.e., sites that have been surveyed in the past and that have had resident pairs of NSO) on MCP and MMWD and nearby lands. We also conducted inventory surveys - based on management plans in areas of no known historical NSO nesting – at one other location, a site which has been surveyed in previous years both with and without NSO detections but with no confirmed pairs or nesting. This report includes a summary of results for 41 known sites and 1 inventory area, plus 2 new sites that were confirmed incidentally in 2020 and subsequently monitored, for a total of 44 sites.

METHODS

Study sites

In 2020, we surveyed a total of 41 known sites (in this report, a "known site" includes sites that have been occupied by a pair of NSO in at least one previous year) on or adjacent to MCP or MMWD lands in Marin County. We incidentally confirmed the presence of two additional pairs during the season, and include results for those pairs with the 41 known sites (thus, n = 43): one new pair was located in 2019 and thought to be a historic pair that moved, but we confirmed this year that there are two pairs and that the original area was still occupied; and the second new pair was first detected during Barred Owl inventory surveys we conducted on MCP lands in June and July (Duncan and Cormier 2020). We also surveyed one inventory area; inventory surveys are done in areas with proposed management activities near potential NSO habitat, or in areas where the land manager had an interest in knowing the status of NSO in the area, and are in areas that have not previously been classified as being occupied by a pair of NSO. The inventory area surveyed in 2020 had also been surveyed in 2018 and 2019. For MMWD management projects, separate letters are provided for each project summarizing NSO results for that year; results from those sites – which include inventory and/or known sites – are also included in this report.

Because NSO are sensitive to disturbance, I do not present specific site names or location information in this report. Instead, results from each NSO site are provided to MMWD and MCP in supplemental tables to this report, and in annual Geographic Information System (GIS) and other data files.

Data Collection

At all known sites and inventory areas, we assessed occupancy (if owls are present and resident/territorial), nesting status (nesting versus non-nesting since not all pairs nest every year), and reproductive status (number of young produced); see Status Designations below for more details. For every survey, we completed site search forms (including weather, survey times, owl detection information, and a detailed narrative) and maps (showing search area and location of any owls – including non-NSO – detected). For each known site or inventory area, we completed status forms (detailing occupancy, nesting, and reproductive outcome for the year, age of owls detected, and supporting information), and vegetation measurements for nest trees. All data, including spatial information, are submitted to MCP and MMWD. Data are also submitted to the California Department of Fish and Wildlife's California Natural Diversity Database by National Park Service (NPS) staff after Point Blue and NPS data have been merged into one county-wide database. NPS conducts independent surveys from Point Blue, including at Point Reyes National Seashore, Golden Gate National Recreation Area, Muir Woods National Monument, Mount Tamalpais State Park, and Samuel P. Taylor State Park (Ellis 2020).

Status Designations

Occupancy refers to whether an owl is detected or not at a given site. Occupancy surveys in 2020 followed the six-visit per year USFWS protocol (USFWS 2012) to determine whether owl(s) were present. For sites where owl(s) were detected at least once in 2020 (occupied), we determined residency status – whether owls were territorial – based on Marin and USFWS protocols (Press et al. 2010, USFWS 2012). For sites where NSO have not been detected early in the season, we add 5-minutes of Barred Owl playback to our 10-minute NSO nighttime calling stations on the fifth and sixth visits, to determine if Barred Owls may be present (USFWS 2012). There are slight differences between the two protocols, and results from the Marin Protocol are presented in this report including in tables/figures; however, occupancy status differences between the two protocols are noted below and in the text of the results section. Occupancy categories are summarized as follows (for more details see Press et al. 2010, and USFWS 2012):

- Territorial Pair (hereafter, Pair) = male and female heard in close proximity (male and female detections must be on the same visit for the USFWS protocol, and on two occasions but not necessarily on the same visit for the Marin protocol), and/or nesting is confirmed;
- Resident Single = response by a single owl on three or more occasions in the same year or over subsequent years, with no response by an owl of the opposite sex (same definition for both protocols);

- Two Birds/Pair Status Unknown ("Pair Unknown") = male and female detected but pair status not confirmed (i.e., does not meet the above criteria for Pair) and at least one owl meets Resident Single requirements (same definition for both protocols);
- Single Unknown = a single owl is detected but does not meet the above criteria for Resident Single (this category is specific to the Marin protocol and not part of USFWS protocol; in the USFWS protocol, these sites would be classified as Unknown);
- Unknown = male and/or female detected, but did not meet the above criteria; in the USFWS protocol, this category includes the Single Unknown classifications from the Marin protocol (above).
- Unoccupied = a site is considered unoccupied after 2 years of surveys consisting of 6 nighttime visits each year with no NSO response (USFWS 2012). However, for sites surveyed for disturbance-only management projects (e.g., no planned habitat modification), 6 visits with no response in one year is sufficient, and the management action can take place until the start of the next breeding season, but the site is still officially classified as "Unknown" until after a second year with no detections (USFWS 2012). In this report, any site with no response in 2020 is classified as "unoccupied" but specified if it is considered unoccupied for 2020 only, or if 2020 was the second unoccupied year of two consecutive years.

Occupancy is presented from 1999 to 2020 as the percent of sites with each status: Pair, Resident Single, Unknown Combined (includes sites with Pair Unknown, Single Unknown, and Unknown status), or Unoccupied (single current year with no detections). Because not all sites have been surveyed each year, and because in some years we surveyed more areas where pairs are less likely to occur (e.g., inventory surveys in marginal habitat), only sites that met Pair status at least once (this year or historically) are included in the occupancy breakdown.

For most sites, we used the Marin protocol to determine nesting and reproductive status, and whenever possible we attempted to gather nesting and reproductive information without the use of mice (Press et al. 2010). The Marin protocol attempts to minimize "mousing" owls to avoid habituating them to being fed, since the owls in Marin County are often in close proximity to humans, residential areas, and heavily-used trails and roads. For sites with planned management activities (e.g., noise disturbance), we followed the USFWS protocol to determine nesting status, which included conducting mousing surveys if nesting status could not be determined without the use of mice by early April (USFWS 2012), as opposed to late April for sites without planned management activities (Press et al. 2010). To compare nesting status for sites with pairs from 1999 to 2020, we determined the percent of pairs that nested successfully, had a failed nest, had a nest with unknown outcome, were non-nesting, or where nesting status was unknown, per the Marin Protocol (Press et al. 2010). Nesting status was usually the same

between Marin and USFWS protocols. However, there are two common scenarios when status designations differed between the two protocols: 1) for nests suspected as failed, the USFWS protocol requires mousing adult NSO to confirm they do not have young, and the Marin protocol only includes mousing to confirm a nest failure in specific situations, and 2) to confirm a pair is non-nesting without the use of mice, the USFWS protocol requires watching the female roost (not on a nest) on two occasions in April, with the two visits separated by 3 weeks, while the Marin protocol requires watching a female roost on one visit anytime between April 15 and May 1; these mostly-overlapping periods are both when nesting females would be incubating eggs or brooding small young except that not all Marin nests have been initiated by the first few days of April, so the first of the two USFWS roost watches is never used as sole evidence of non-nesting (see protocols, Press et al. 2010 and USFWS 2012, for more detail).

Fecundity

Fecundity is a productivity measure commonly used with NSO data that can be compared across studies (e.g., Anthony et al. 2006, Dugger et al. 2016); it is defined here as the total number of female young produced per territorial female. Fecundity was calculated by dividing the total number of young that fledged from nests by 2 (assuming a 1:1 sex ratio of young), and then dividing that number by the total number of territorial females (paired and resident single females). Fecundity is presented from 2000 to 2020, excluding 1999 when a large proportion of nesting pairs had unknown nesting outcomes.

Wildlife Rehabilitation

Due to the regular occurrence of NSO in Marin County being taken to the local wildlife rehabilitation center (typically 1-5 individuals per year), WildCare in San Rafael, by members of the public, I present the number of NSO collected to date this year from MMWD or MCP lands. If NSO are collected from MMWD or MCP lands, Point Blue communicates immediately to the agency staff as soon as Point Blue is notified. Point Blue works with WildCare personnel to band all NSO before release, if individuals are releasable and have fully grown legs.

Permit Requirements

Activities presented in this report were conducted under USFWS Native Endangered & Threatened Species Recovery permit TE807078-18, and under a Memorandum of Understanding with CDFW SC-012260. For reporting requirements of our permits, I also present the number of birds banded this year, planned future activities, and report any incidental take.

Personnel

All 2020 surveys were conducted from March through June by Point Blue personnel trained in NSO survey protocols: Margaret Brown, Renée Cormier, Preston Duncan, Danaé Mouton, and Caroline Provost.

RESULTS

Occupancy at inventory areas. Our only inventory area this year was classified as occupied by a Resident Single Male NSO. This was the third year the site was surveyed: in 2018, no NSO were detected, and in 2019, the site was classified as Single Unknown (a male was detected on two visits).

Occupancy at known sites. Of the 43 known sites surveyed in 2020 (41 previously-known and 2 new sites confirmed in 2020), 38 (88%) were occupied by pairs, 3 (6%) by Resident Single Males, and 1 (2%) site had Unknown Status (Pair Unknown; Figure 1). One site was Unoccupied in 2020 but we detected a NSO at the site in 2019, so this is the first of two years needed to classify the site as Unoccupied by USFWS protocols (this site would be listed as Unknown under USFWS protocol). There were only two sites where the occupancy status differed between USFWS (2012) and Marin (Press et al. 2010) protocols in 2020: one site met pair status by the Marin protocol but pair unknown by USFWS protocol, and another site had the opposite designations (pair unknown by the Marin protocol and pair by the USFWS protocol).

Nesting and Reproduction. Of the 38 sites that were occupied by pairs in 2020, 27 (71%) were known to attempt nesting, a rate higher than the 1999 to 2020 study average (62%; Figure 2). Twenty-five (93%) of 27 nests were successful (i.e., produced at least one fledgling), also above the 2000 to 2020 average (78%; excluding 1999 when nesting outcome was unknown for 25% of pairs surveyed; Figure 2). Fecundity (0.5) in 2020 was also above to the 2000 to 2020 study average (0.4; Figure 3).

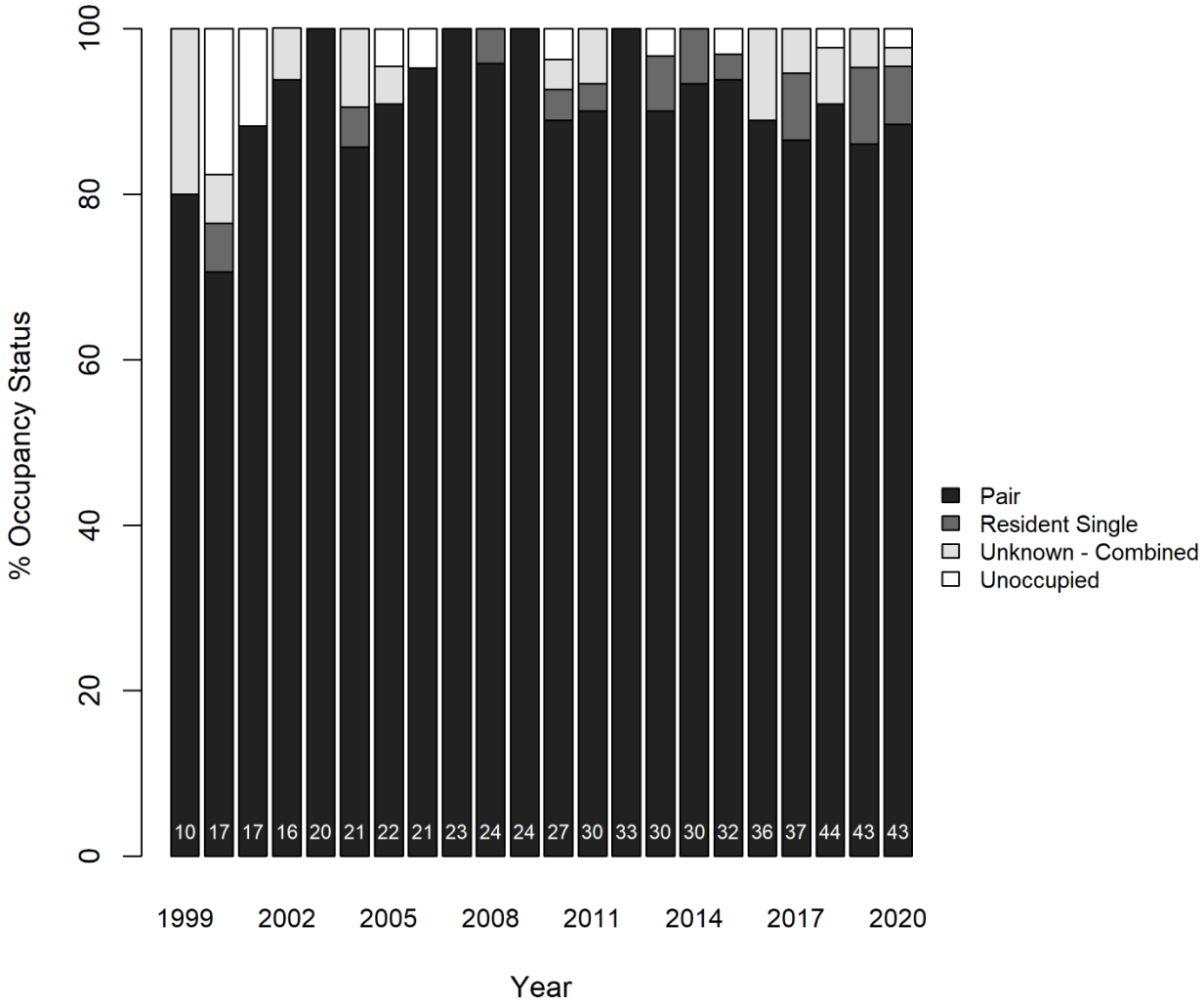

Figure 1. Northern Spotted Owl occupancy status for known sites surveyed by Point Blue Conservation Science in Marin County (1999 to 2020). Because not all sites have been surveyed each year, and because in some years we survey more areas where pairs are less likely to occur, only sites that have been occupied by a pair at least once during the study period, including the current year, are included. Sample size for each year is shown at the base of each bar. The Unknown - Combined category includes sites classified as Pair Unknown, Single Unknown, and Unknown (see methods for detail).

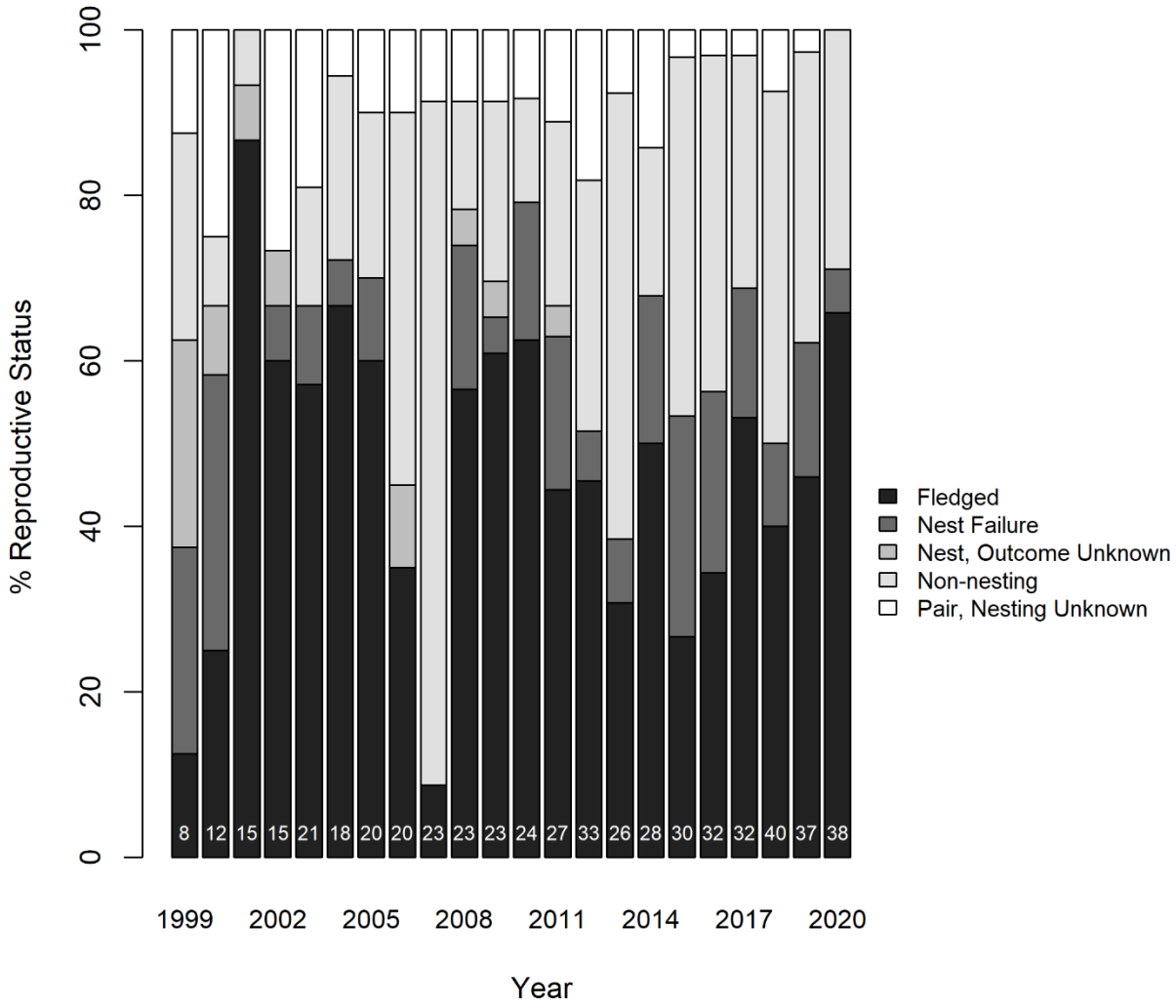

Figure 2. Reproductive status for Northern Spotted Owl pairs surveyed by Point Blue Conservation Science in Marin County (1999 to 2020). Sample size for each year is shown at the base of each bar.

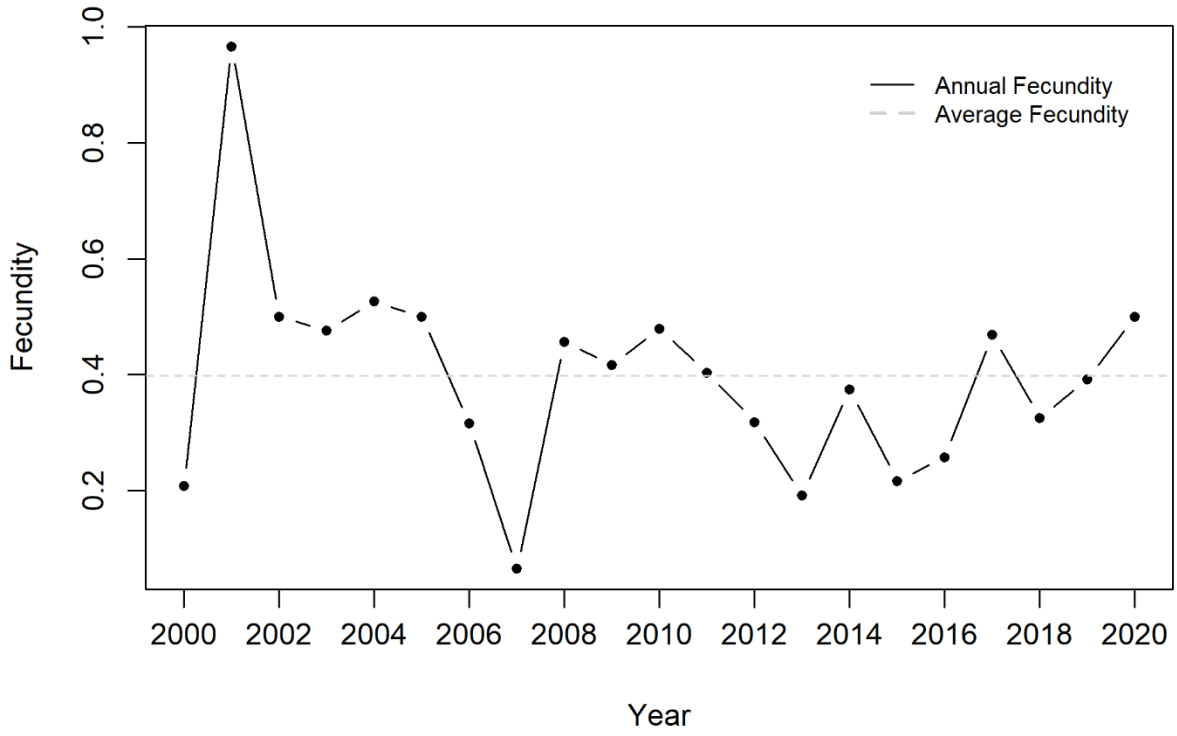

Figure 3. Annual fecundity (the number of female young produced per territorial female) for Northern Spotted Owls monitored by Point Blue Conservation Science in Marin County (2000-2020). Annual sample size of territorial females varies from n=12 to n=40. The study average (dashed horizontal gray line) is also shown.

Barred Owls. Two Barred Owls were detected during 2020 Point Blue NSO surveys: one was visually detected in March at a site on MCP land in the San Geronimo Valley, and another individual was heard at night in April at a site on private property in Mill Valley. At the site in San Geronimo, we had consistently detected a Barred Owl there in 2019, but after the detection in March 2020, we did not have additional Barred Owl detections at that site; we only detected 1 male NSO (Resident Single status) there during the season. The site in Mill Valley with the Barred Owl detection was the same site where we detected a Barred Owl on a late-season survey in 2019; this year, that site was occupied by a pair of NSO who had a successful nest with two young. We did not determine the sex of either Barred Owls during surveys, but we confirmed there was a female Barred Owl at the Mill Valley site, after receiving a recording from a local homeowner, which we suspect was the same individual we detected.
In addition to the Barred Owls detected during NSO surveys, through the Barred Owl-specific inventory surveys conducted throughout certain MCP Open Space Preserves, only one

additional Barred Owl was detected, and results from those surveys are presented in a separate report (Duncan and Cormier 2020). The NPS crew had reduced survey effort for NSO surveys in 2020 due to the COVID-19 pandemic, but they did detect single Barred Owls at three NSO sites (T. Ellis/NPS, personal communication). No pairs of Barred Owls were confirmed in 2020 during Marin NSO surveys, although it is possible that some were missed since these represent incidental detections.

NSO taken to wildlife rehabilitation centers. Between 19 November 2019 (the date we reported through in the 2019 NSO report, Cormier 2019) and 22 December 2020, four NSO were taken to WildCare wildlife rehabilitation center by members of the public. One was collected on or near an Open Space Preserve in the San Geronimo Valley in late-March; the owl was treated for a wound with at least one severed tendon, but it did not recover and was eventually euthanized; communications among WildCare, Point Blue, and MCP staff occurred throughout treatment. The other three NSO were not from or near MMWD or MCP lands.

Recovery Permit Activities

This section details information required for Point Blue's USFWS Recovery Permit TE807078 and our Memorandum of Understanding with CDFW SC-012260 (additional data will be submitted to the CNDDB database, per permit requirements of both agencies; and this report and components from it will also be submitted to the USFWS Recovery Office).

Banding activities in 2020. In 2020 no NSO were banded under our permits.

Planned future activities. We plan to conduct the same work in 2021 with some shifts in sites monitored based on management needs, although most sites will remain the same.

Incidental Take. There was no incidental take in 2020 to report.

Dead NSO collected. No dead NSO were collected in 2020.

DISCUSSION

Occupancy. The proportion of known sites occupied by pairs of NSO in 2020 was high (88%), and similar to the 1999-2020 study average (91%). Of the five known sites that did not meet pair status in 2020, four are sites for which pairs have been detected in some but not all survey years; these sites may be of marginal quality (e.g., in habitat or landscape characteristics) for NSO, and more likely to transition in and out of pair occupancy (Blakesley et al. 2005). The fifth known site that did not meet pair status has been occupied by a pair every year since surveys began in 2000, except 2019 and 2020, when it was only occupied by a Resident Single NSO. This

site was also occupied by a Barred Owl in 2019 and 2020 (although the Barred Owl was only detected on the first 2020 survey in March, and not subsequent surveys), and Barred Owls are known to diminish detectability of NSO and have a negative effect on occupancy (Olson et al. 2005). It is possible that either a second NSO at the site went undetected, or that it was no longer present in the area.

A Resident Single male NSO was also detected at our one inventory area for 2020. Detections of NSO in new locations and at sites that are not surveyed each year highlight the importance of NSO surveys in areas with appropriate habitat where proposed management activities are planned. Additionally, detections of NSO in new survey areas can increase our understanding of the local population, and the habitats and other landscape features associated with them.

Nesting and Reproduction. The proportion of pairs that attempted nesting, the proportion of successful nests, and fecundity were all above average in 2020. In fact, fecundity was higher than any year since 2005 (when it was also 0.5) and only two years had higher fecundity since the study began (2001 and 2004). The likelihood of a successful nest and the number of young produced can depend on a variety of factors, including predator abundance, food availability (Courtney et al. 2004), weather (Olson et al. 2004), or a combination of these or other factors (Franklin et al. 2000, Rosenberg et al. 2003). In a previous broader NSO analysis, fecundity ranged from 0.306 to 0.560 depending on geographic region, and on the California coast – including Marin County – it averaged 0.442 (Anthony et al. 2006). Forsman et al. (2011), in a long-term demographic study of NSO, found a declining trend in fecundity at long-term study sites in Washington, Oregon, and northern California; however, given the high variability of fecundity, the models showing demographic change in that study were better explained by declining adult survivorship, due in part to invasion of Barred Owls. The Marin population on MCP and MMWD lands also experiences high variability in fecundity year-to-year, although more of the below-average rates have occurred in recent years; therefore, having a relatively high year for fecundity in 2020 is encouraging.

Barred Owls. Point Blue and NPS (T. Ellis/NPS, personal communication) detected Barred Owls in 6 geographically distinct locations in Marin County this year, which may represent 6 different individuals. Nevertheless, we continue to detect relatively low numbers of Barred Owls in Marin County to date (Jennings et al. 2011). However, an increase in this species would likely threaten the local NSO population through competition for space and food (Wiens et al. 2014, Dugger et al. 2016). A growing number of studies have found negative effects of Barred Owls on NSO, including on occupancy, fecundity, and apparent survival (Kelly et al. 2003, Olson et al. 2004, Olson et al. 2005, Anthony et al. 2006, Forsman et al. 2011, Wiens 2012, Dugger et al. 2016). Additionally, Barred Owls tend to have a more diverse diet than NSO, likely reducing their

sensitivity to declines in one prey species, and they produce more young than NSO, and have higher survival (Wiens et al. 2014). Holm et al. (2016) suggested that Barred Owl range expansion could also have significant direct and indirect effects on local food webs within the NSO range, putting pressure on not only a larger array of prey species than NSO, but also on diurnal and nocturnal avian predators. We continue to follow the USFWS NSO protocol (USFWS 2012) to increase our ability to detect Barred Owls by conducting late-season playback surveys for Barred Owls when NSO were not detected. However, because we detect NSO at most sites that we monitor, Barred Owl-specific surveys are therefore not triggered at most sites, limiting our ability to detect Barred Owls (Wiens et al. 2011). Additional surveys that are specific to Barred Owls can increase our detection likelihood of this species, if present, and at least one year of inventory surveys would be useful to gather baseline data throughout MMWD lands in the near future, like we did on MCP lands in 2020 (Duncan and Cormier 2020). Barred Owl surveys could then be repeated in the future to assess any change in their numbers.

Conclusions. NSO surveys on MMWD and MCP lands documented pairs at most known sites in 2020 and a resident owl was detected in the one inventory area surveyed, with occupancy similar to the study period average. Nesting rates, the proportion of successful nests, and fecundity were all higher in 2020 than the study average. Although we detected two Barred Owls in 2020 plus a third individual during a Barred Owl inventory study on MCP lands, and NPS also had three disjunct detections as well, the known number of this species is still low in Marin County compared to other parts of the NSO range; however, these numbers, combined with the limited amount of Barred Owl playback surveys that are triggered by NSO surveys given the preponderance of NSO in the county, suggest that continued Barred Owl surveys, particularly on MMWD lands, may be warranted. Monitoring NSO in Marin County during the breeding season is an essential component to evaluating their population health and ensuring that management activities do not negatively impact owls, including where management activities are slated to occur.

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