



Northern Spotted Owl Monitoring at Crater Lake National Park

2021 Annual Report



ON THE COVER

Snag used as a nest location for Spotted owls.

Photograph by NPS.

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This annual report is intended for the timely release of basic data sets and data summaries. Care has been taken to assure accuracy of raw data values, but a thorough analysis and interpretation of the data has not been completed. Consequently, the initial analyses of data in this report are provisional and subject to change.

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This report along with previous years reports are available to NPS employees in digital format at <https://irma.nps.gov/DataStore/Reference/Profile/2204667>

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Executive Summary

The 2021 field season marked the 30th year of the Northern spotted owl (*Strix occidentalis caurina*) monitoring project at Crater Lake National Park. This project attempts to locate spotted owls within the Park, and determine pair, nesting, and reproductive status of owls observed. With this data we can continue to contribute to the USFWS Spotted Owl Recovery Plan, identify potential concerns with this federally threatened species, and guide management activities that may impact spotted owls within the Park.

Crater Lake National Park has monitored spotted owls since 1978; it was not until 1992, however, that a concerted effort was put into the program. Starting in 1992, the Wildlife Team (comprised of permanent and seasonal staff at Crater Lake National Park) has surveyed the park for spotted owls using standardized field sampling methods that included broadcast calls and mousing to determine spotted owl presence and nesting status. In 1993, the wildlife team documented the first barred owl (*Strix varia*) known to occupy the park. Since that time, we have continued to track the presence of spotted and barred owls during our survey efforts. Presently, broadcast call surveys follow the 2012 revised version of the USFWS 2011 “Protocol for Surveying Proposed Management Activities that may Impact Northern Spotted Owls”. Starting in 2013, the Wildlife Team, began utilizing acoustic survey methods, in addition to broadcast call surveys, to sample spotted and barred owls. Methods used to conduct the acoustic sampling are outlined in the Crater Lake National Park Biological Sound Station Protocol (citation). In addition to spotted and barred owls, this method gives us the opportunity to track the distribution of all owl species within the Park.

In 2021, the wildlife team performed 21 surveys using broadcast calling methods at 8 known NSO owl activity centers, 9 surveys in 4 areas with high quality spotted owl habitat and 37 compliance surveys at 8 areas where some type of management activity (e.g., prescribed burning, forest rehabilitation, road work, etc.) was planned within the Park. We documented spotted owls at two sites, Grayback Ridge and Thousand Springs, during the broadcast call sampling effort. This is the first year since 2018 that spotted owls have been documented in the park using this method. During these surveys a barred owl was documented at the Grayback Ridge activity center and at the East Timber Crater RX compliance site. Field crews also observed a barred owl at the Bear Bluff activity center site, but not during a field survey.

In addition to the broadcast call surveys, 16 sites were surveyed using the acoustic sampling method. Acoustic methods were used to sample 5 known spotted owl activity centers and 11 areas that are not known spotted owl activity centers but contain high quality spotted owl nesting habitat. During acoustic sampling, spotted owls were documented at 6 locations, including 2 known owl activity centers (Thousand Springs and Grayback Ridge) and 4 areas with spotted owl habitat (Castle Point Trail, Crater Creek, Union Creek Springs, and Whitehorse Bluffs). Barred owls were documented at 13 locations including Castle Point Trail, Crater Creek, East Timber Crater, Grayback Ridge, North Timber Crater, South Fork Crater Creek, Thousand Springs, Union Creek Spring, West Bear Bluffs, West Oasis Butte, West Timber Trail Junction, West Trapper Creek, and Whitehorse Bluffs.

Introduction

The spotted owl (*Strix occidentalis*) is a carnivorous raptor whose historical home range spans from British Columbia, heading south through Washington, Oregon, California and into Mexico (Gutierrez et al. 1995). There are three subspecies of spotted owl in North America. The northern spotted owl (*Strix occidentalis caurina*) resides mainly in western Canada, Washington and Oregon; whereas the California (*Strix o. occidentalis*) and Mexican (*Strix occidentalis lucida*) spotted owl mainly inhabit their geographical namesakes. In 1990, the Northern spotted owl was placed on the endangered species list as a federally threatened species (USDI 1990). Habitat loss via logging of old growth forests and wildfires, as well as the continually expanding range of the barred owl (*Strix varia*) have put tremendous pressure on spotted owls throughout much of their range (USFWS 2011a). In 2012, the Environmental Protection Information Center submitted a petition requesting the status of the Northern spotted owl be changed from “threatened” too “endangered”. The US Fish and Wildlife Service (USFWS), in their 12-month finding, made the determination that reclassifying of the northern spotted owl from a threatened species to an endangered species is warranted but precluded by higher priority actions (USFWS 2020). In addition to the listing determination, USFWS amended the critical habitat for northern spotted owl by removing 3,472,064 acres from previously designated critical habitat (USFWS 2021). Prior to this amendment going into effect, the USFWS withdrew the ruling and instead proposed to exclude approximately 204,294 acres from the previously designated critical habitat (USFWS 2021).

In compliance with the Endangered Species Act, Crater Lake National Park (CRLA) has the responsibility to protect listed species and does so by annually monitoring spotted owl known sites and areas of high-quality spotted owl habitat. In addition, areas where Park management actions may have an impact on spotted owls or their habitat (e.g. nesting disturbance associated with noise, tree removal, fuels reduction activities, etc.) are surveyed to ensure spotted owls will not be negatively affected by these actions. Crater Lake National Park has monitored spotted owls since 1978; it was not until 1992, however, that a concerted effort was put into the program. Since 1992, broadcast surveys have been conducted annually following USFWS protocols. Starting in 2013, we began implementing passive acoustic survey methods, in concert with broadcast calling methods, to better understand this species and its competitors. Through these surveys, northern spotted owl population trends, distribution, and potential threats are better understood, assisting in the management of the species within CRLA and elsewhere throughout their range.

Habitat loss and barred owl expansion have been noted as the main reasons for the decline of spotted owls (Dugger et al 2016, Gutierrez, et al 2007, USFWS 2011). Both factors are having impacts on spotted owls at CRLA. The barred owl is native to the Eastern United States and Canada (Mazur and James 2000). Historically, it is thought the Great Plains separated the two species and the home ranges of barred and spotted owls did not overlap. Sometime in the early 1900’s, barred owls expanded their range considerably. Colonization was documented in the midwestern US and central Canada (Livezey 2009a). Eventually, barred owls spread north to Alaska and south through the Pacific Northwest. The first barred owl in Oregon was documented in 1974 and since then they have colonized historical spotted owl habitat (Kelly et al. 2003, Mohren 2017). The first recorded barred owl in CRLA was in 1993 at the Maklaks Crater spotted owl activity center. Since then, barred owls have expanded throughout the spotted owl range within the Park. The future of spotted owls is threatened by barred owls through competition, exclusion, and hybridization (Gutierrez et al. 2006, Dugger et al. 2017).

Additionally, over the last decade, 8 large wildfires have had a significant impact on four known spotted owl activity centers and much of the spotted owl habitat on the west side of CRLA. Approximately 37% of the parks forested and meadow habitat has been impacted by these wildfires. Two of the four impacted activity centers (Boundary Springs, and Red Blanket) are no longer viable sites for spotted owls. The other two activity centers (Crescent Ridge and Little Copeland Creek) were surveyed to determine fire impacts and it was concluded that Crescent Ridge and the area north of Little Copeland Creek still contain viable owl nesting and roosting habitat.

Study Area

Crater Lake National Park is located on the crest of the southern end of the Cascade Mountain Range. Average monthly temperatures range from 50 °F in May and peaking at 69 °F in August, with precipitation ranging from 3.3” in May dropping to 0.97” in August. Historically, suitable spotted owl habitat made up approximately 21,933 acres at Crater Lake National Park (2011 Fire Management Plan Biological Assessment); however, with recent large wildfires, approximately 4200 acres of spotted owl habitat has been adversely impacted (Mohren et al. 2017). This habitat consists of mature mixed conifer forest dominated by Douglas fir (*Pseudotsuga menzisei*), mountain hemlock (*Tsuga mertensiana*), white fir (*Abies concolor*), Shasta red fir (*Abies magnifica* var. *shastensis*), and ponderosa pine (*Pinus ponderosa*). Elevations of owl sites fall between 1372 m–2048 m. Known spotted owl activity centers lie primarily on the western and southern portions of the park.

Methods

In 2021, the Wildlife Team utilized two methods for surveying spotted and barred owls; one is based on broadcast call survey methods (USFWS 2011b) and the other is focused on passive acoustic survey methods (Mohren 2015).

Broadcast Calling Methods

Broadcast calling methodologies follow the guidance delineated in the 2012 revised version of the USFWS’s “Protocol for Surveying Proposed Management Activities that may Impact Northern Spotted Owls” (USFWS 2011b). CRLA has a variety of projects being conducted within its boundaries, such as fuels treatments, road/trail work, vegetation rehabilitation, etc. For any such project that may have an impact on spotted owls or their habitat, 3-6 surveys per project were conducted to ensure overall fitness and that breeding activity is not negatively affected as defined in the protocol. We also conducted 1-6 surveys at each known spotted owl activity center which is dependent on crew availability, workload priorities, and owl activity. In general, crew members hike to the assigned survey locations. Each survey area has previously established waypoints where a broadcast call of a northern spotted owl is played. Calls were done at intervals >500 m apart and waypoints were dispersed through activity centers and project areas that included suitable habitat. Spotted owl calls were broadcasted using a broadcast wildlife caller for 10 minutes at each waypoint.

If a spotted owl response was heard, we attempted to locate the individual and determine its reproductive status. Metrics to be documented were as follows: occupancy, pair status, nesting status, reproduction and nest tree/habitat characteristics. These were determined using Forsman’s “Standardized Protocols for Gathering Data on Occupancy and Reproduction in Spotted Owl Demographic Studies” and Seaman’s “Standards and Guidelines for Determining Pair, Nesting, and Reproductive Status of Spotted Owls in National Parks” (Seaman 1993, Forsman 1995). Once the owl was found, we would “mouse” it according to protocol, as well as determine demographic information such as age and sex. After successfully ‘mousing’ and collecting all required data, the nest site would quickly be vacated to avoid further disturbance. If a barred owl or other predatory raptor species was observed, that call point would be skipped to reduce risk of predation on the spotted owl. Additionally, in cases of inclement weather (rain, high winds, snow), surveys were not conducted.

Acoustic Survey Methods

Passive acoustic sampling methods followed the methods outlined in the CRLA Biological Sound Station Protocol (Mohren 2015). In general, we utilized acoustic sampling methods to sampled areas of know spotted and barred owl activity and areas the park currently has designated as spotted owl nesting habitat. An acoustic recording device (Song Meter SM4) was used to sample each selected area. Song Meter SM4 units (Figure 1) were secured to a tree, approximately 60-70 inches above the ground, using wire and chain. Song Meter SM4 were programmed to start sampling 3 hours before sunset and continue until 3 hours after sunrise. The overall goal was to sample each site for a minimum of 3 weeks.



Figure 1. The Song Meter SM4 Acoustic monitoring units used in 2021

Once the data was collected from the field, we filtered the data using a USFS-developed Shiny-based desktop application that is used to process the audio data into 51 sound classifications. We then analyzed the song files that classified as owl species using Kaleidoscope Pro software, using non-bat analysis mode with signal parameters consisting of a Hz range of 250-1800, detection length of 0.5-7.5 seconds, and a maximum inter-syllable gap of 2 seconds. Each spectrograph was examined to determine if spotted, barred or other owl species were present at the site (Figure 2).

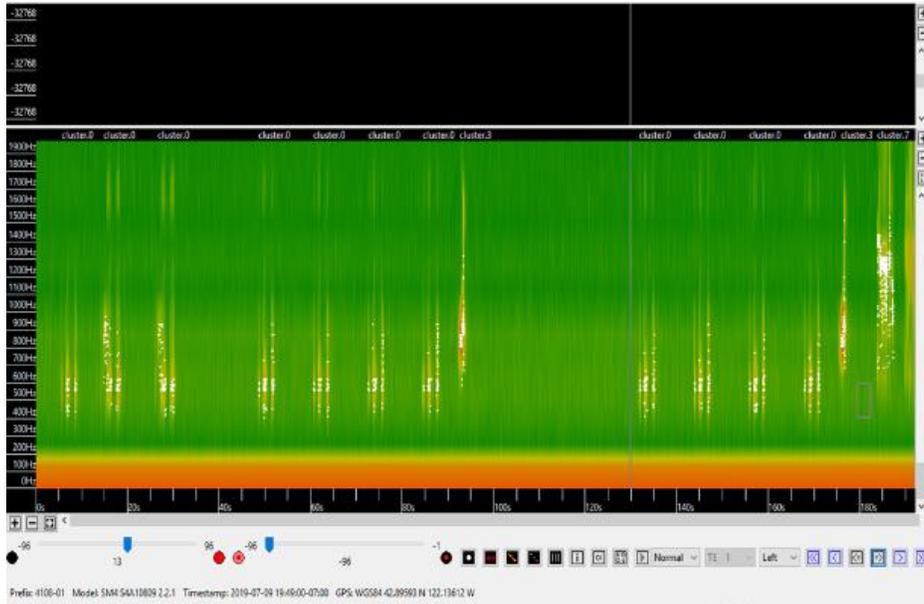


Figure 2. Northern spotted owl spectrogram in the Kaleidoscope Pro software.

Results

In total, we sampled 26 locations in 2021 using broadcast and/or acoustic survey methods at CRLA. We documented spotted owls at 6 location (Castle Point Trail, Crater Creek, Grayback Ridge, Thousand Springs, Union Creek Springs, and Whitehorse Bluffs) and barred owls at 15 locations (Bear Bluffs, Castle Point Trail, Crater Creek, East Timber Crater RX, Grayback Ridge, North Timber Crater, South Fork Crater Creek, Thousand Springs, Union Creek Spring, West Bear Bluffs, West Oasis Butte, West Timber Trail Junction, West Trapper Creek, and Whitehorse Bluffs). Details of the sampling effort are provided below.

Broadcast Call Surveys

In 2021, broadcast surveys started on April 12th and were concluded on July 27th. We completed 30 surveys at 12 known spotted owl activity centers or areas with high quality spotted owl habitat. Surveys were completed at the Bear Bluffs, Bybee Creek, Castle Creek, Castle Point, Crater Creek, Crater Peak, Crescent Ridge, Greyback Ridge, South Fork Crater Creek, Thousand Springs, Union Creek Springs, and West Bear Bluffs locations. Spotted owls were detected at Greyback Ridge and Thousand Springs. A barred owl was also detected at Grayback Ridge.

All project areas where compliance surveys were required were surveyed. We completed 37 surveys at 8 compliance locations. Target survey numbers were met at all sites. No spotted owls were detected during these surveys and 1 barred owl was detected at Timber Crater RX site.

Acoustic Surveys

We sampled a total of 16 sites that ranged in size from 0.16 to 8.81 km² (Table 1). At these 16 locations, a total of 32 sound stations were deployed at 5 known owl activity centers and 11 areas containing spotted owl nesting habitat. Acoustic surveys started on May 26th and were concluded on September 16th. We collected 12,739 hours of sound data with an average of 17.12 days surveyed per station.

The goal was to have each station record for a total of 14 days, and in many cases, units are left in the field longer depending on the availability of the crew to recover the units (Table 2). There were 3 stations that did not meet the 14-day goal. One unit had the batteries die before the 14 days and 2 units were pulled a day early because we were beyond the end-of-season cutoff date.

Table 1. Sites sampled in 2021 along with the polygon size used to determine where to place acoustic stations at each site.

Agency	Site Type	Site	Area (km2)
CRLA	Known NSO Activity Center	Bear Bluff	0.53
CRLA	Known NSO Activity Center	Crater Creek	3.98
CRLA	Known NSO Activity Center	Crater Peak	1.98
CRLA	Known NSO Activity Center	Grayback Ridge	8.81
CRLA	Known NSO Activity Center	Thousand Springs	0.16
CRLA	NSO Habitat	Cascade Spring	1.99
CRLA	NSO Habitat	Castle Point Trail	3.16
CRLA	Compliance Site	East Timber Crater Rx	4.06
CRLA	NSO Habitat	North Timber Crater	6.52
CRLA	NSO Habitat	South Fork Crater Creek	3.64
CRLA	NSO Habitat	Union Creek Spring	2.19
CRLA	NSO Habitat	West Bear Bluff	1.49
CRLA	NSO Habitat	West Oasis Butte	3.01
CRLA	NSO Habitat	West Timber Trail Junction	3.31
CRLA	NSO Habitat	West Trapper Creek	2.25
CRLA	NSO Habitat	Whitehorse Bluffs	1.79

We recorded spotted owls at 6 sites and barred owls at 13 of the sites sampled (Table 2). All sites sampled contained at least one sampling location that recorded for the 14-day goal. Flammulated owls (*Otis flammeolus*) were documented at 4 stations at 4 sites; Great Gray owls (*Strix nebulosa*) were documented at 2 stations in 1 site; Great horned owls (*Bubo virginianus*) were documented on 17 stations at 13 sites; Northern pygmy owls (*Glaucidium californicum*) were documented on 3 stations at 3 sites; and Northern saw-whet owls (*Aegolius acadicus*) were documented at 5 stations at 4 sites.

Table 2. Number of days deployed, and species observed at sound stations used to sample at Crater Lake National Park in 2021.

Site	Location	Days Surveyed	Owl Species
Bear Bluff	AC-BEBL-A	26	Flammulated Owl, Northern Pygmy Owl, Northern Saw-whet Owl
	AC-BEBL-B	13	Great Horned Owl
Cascade Spring	AC-CASP-A	15	Great Horned Owl
	AC-CASP-B	15	Great Horned Owl, Northern Pygmy Owl, Northern Saw-whet Owl
Castle Point Trail	AC-CAPO-A	23	Barred Owl
	AC-CAPO-B	28	Barred Owl, Great Horned Owl, Spotted Owl
Crater Creek	AC-CRCR-A	15	Barred Owl
	AC-CRCR-B	15	Spotted Owl
Crater Peak	AC-CRPE-A	19	Flammulated Owl, Great Horned Owl, Northern Saw-whet Owl
	AC-CRPE-B	15	Great Horned Owl
East Timber Crater RX	AC-EATC-A	18	Barred Owl, Flammulated Owl
	AC-EATC-B	18	Barred Owl, Great Horned Owl
Grayback Ridge	AC-GRRI-A	19	Barred Owl, Great Horned Owl, Spotted Owl
	AC-GRRI-B	19	Barred Owl, Spotted Owl
North Timber Crater	AC-NOTC-A	25	Barred Owl
	AC-NOTC-B	15	Barred Owl, Flammulated Owl, Great Horned Owl
South Fork Crater Creek	AC-SFCC-A	15	No Owls
	AC-SFCC-B	15	Barred Owl, Great Horned Owl
Thousand Springs	AC-THSP-A	15	Barred Owl, Great Horned Owl, Northern Saw-whet Owl, Spotted Owl
	AC-THSP-B	15	Barred Owl, Great Horned Owl, Northern Saw-whet Owl, Spotted Owl
Union Creek Spring	AC-UNCS-A	15	Spotted Owl
	AC-UNCS-B	15	Barred Owl, Great Horned Owl, Spotted Owl
West Bear Bluff	AC-WBBL-A	15	Barred Owl, Great Horned Owl
	AC-WBBL-B	15	Barred Owl
West Oasis Butte	AC-WEOB-A	24	Barred Owl, Great Gray Owl, Great Horned Owl, Northern Pygmy Owl
	AC-WEOB-B	28	Great Gray Owl, Great Horned Owl
West Timber Trail Junction	AC-WTTJ-A	14	Barred Owl
	AC-WTTJ-B	14	Barred Owl, Great Horned Owl
West Trapper Creek	AC-WETC-A	13	Barred Owl
	AC-WETC-B	13	Barred Owl
Whitehorse Bluffs	AC-WHBL-A	14	Barred Owl, Spotted Owl
	AC-WHBL-B	15	Barred Owl

Site Specific Summaries

The following is a description of each site surveyed for the 2021 season.

1. **Bear Bluff** (Activity Center) – Three field surveys were conducted (6/17, 7/6, 7/22) at this site using the broadcast call method. Two acoustic units were used to sample this site between June 17th and September 16th. Acoustic units ran for 26 days at station BEBL-A and 13 days at station BEBL-B. No spotted or barred owls were detected during the surveys, however a field crew member did observe a barred owl while hiking in the area for another project.
2. **Bybee Creek** (Activity Center) - Two field surveys were conducted (6/17, 6/30) at this site using the broadcast call method. No acoustic units were deployed at this site in 2021. No spotted or barred owls were detected during the surveys.

3. **Cascade Spring** (NSO Habitat) - Two acoustic units were used to sample this site between July 19th and August 26th. Both units sampled for 15 days, and no spotted or barred owls were detected. No field crew surveys using broadcast calling methods were conducted at this site in 2021.
4. **Castle Creek** (Activity Center)- One field survey was conducted at this site (6/10) using the broadcast call method. No owls were documented, but a Northern Goshawk did respond at one of the call points. No acoustic units were deployed at this site in 2021.
5. **Castle Point Trail** (NSO Habitat) - Two field surveys were conducted (7/7, 7/21) at this site using the broadcast call method and no owls were documented. Two acoustic units were used to sample this site between June 2nd and July 7th. CAPO-A station was surveyed for 15 days, and CAPO-B station was surveyed for 23 days. Barred owls were recorded on both units and a spotted owl was documented at CAPO-B.
6. **Crater Creek** (Activity Center) – Two field surveys using broadcast survey methods were conducted at this site (6/22, 7/8); no owls were detected. Two acoustic units were used to sample this site between June 22nd and July 7th and both units sampled for 15 days. A spotted owl was documented at Station CRCR-B and barred owls were documented at station CRCR-A.
7. **Crater Peak** (Activity Center)- Three field surveys were conducted using broadcast survey methods at this site (6/24, 7/13, 7/21). Two acoustic units were used to sample this site between June 24th and July 13th. Crater Peak acoustic unit A sampled for 19 days. The Crater Peak acoustic unit B failed after one day and so was redeployed from July 14th through July 29th and therefore sampled for 15 days. No spotted or barred owls were documented during these surveys.
8. **Crescent Ridge** (Activity Center) – Two field surveys using broadcast survey methods were conducted (6/10, 6/21) at this site in 2021 and no spotted or barred owls were detected. No acoustic units were deployed at this site in 2021.
9. **East Rim Road** (Compliance survey) – Three field surveys using broadcast survey methods were conducted along the East Rim Road RX on 6/15, 6/23, and 7/1. No owls were detected. No acoustic units were deployed at this site in 2021.
10. **East Timber Crater Rx** (Compliance survey) – Six field surveys were completed using broadcast survey methods at this site in 2021 (6/3, 6/14, 6/24, 7/6, 7/20, 7/27). An unknown Strix species was observed on the fifth visit, but field crews could not get close enough to identify the bird to species. On the same visit, a barred owl responded to the playback call. Two acoustic units were used to sample this site between June 3rd and June 21st. Both units sampled for 18 days, and barred owls were documented at both stations.
11. **Grayback Ridge** (Activity Center) – Two acoustic units were used to sample this site between June 24th and July 13th. Both acoustic units sampled for 19 days. Three field surveys

using broadcast survey methods were conducted at this site (6/24, 7/13, 7/26). Field crews and the acoustics documented spotted and barred owls at this site.

12. **Highway 62S Pole Creek** (Compliance survey) – Six field surveys using broadcast survey methods were conducted along Highway 62 near the Pole Creek area (5/27, 6/7, 6/15, 6/29, 7/6, 7/15). No spotted or barred owls were detected. No acoustic units were deployed at this site in 2021.
13. **Highway 62 South** (Compliance survey) – Four field surveys using broadcast survey methods were conducted along Highway 62 South (5/6, 5/18, 6/2, 6/21). No owls were detected. The survey area was extended beyond the historical survey area to better sample the Wildcat known spotted owl activity center located on USFS managed lands. No acoustic units were deployed at this site in 2021.
14. **Highway 62 Switchbacks** (Compliance survey) – Six field surveys using broadcast survey methods were conducted in 2021 (4/12, 4/21, 5/27, 6/7, 6/15, 6/23). No spotted or barred owls were detected. No acoustic units were deployed at this site in 2021.
15. **Highway 62 West** (Compliance survey) – Three field surveys (6/7, 6/23, 7/7) using broadcast survey methods were conducted along Highway 62 West. No spotted or barred owls were detected. No acoustic units were deployed at this site in 2021.
16. **Munson Valley Road RX** (Compliance survey) – Three day surveys using broadcast survey methods were completed (5/11, 5/17, 6/2) and no spotted or barred owls were detected. No acoustic units were deployed at this site in 2021.
17. **North Entrance Road RX** (Compliance Survey) – Six field surveys using broadcast survey methods were completed (6/2, 6/14, 6/22, 6/30, 7/7, 7/15) and no spotted or barred owls were detected. No acoustic units were deployed at this site in 2021.
18. **North Timber Crater** (NSO Habitat) - Two acoustic units were used to sample this site between June 24th and July 19th. Acoustic unit A sampled for 25 days, and Acoustic unit B sampled for 15 days. Barred owls were documented at both locations. No broadcast call surveys were conducted at this location.
19. **South Fork Crater Creek** (NSO Habitat) - Two field surveys using broadcast survey methods were conducted at this site (6/8, 6/16). Two acoustic units were used to sample this site between June 8th and June 23rd. Both acoustic units sampled for 15 days. No spotted or barred owls were detected using either sampling method.
20. **Thousand Springs** (Activity Center) – Five field surveys using broadcast survey methods were conducted at this site (5/26, 6/2, 6/14, 6/17, 6/22). On the fifth revisit, a Spotted Owl was detected but further visitation to the site was discontinued as barred and spotted owls were documented simultaneously on our acoustic data. The two acoustic units used to sample

this site were deployed between June 26th and July 10th and recorded for 15 days. Both units documented spotted and barred owls.

21. **Union Creek Springs** (NSO Habitat) - Three field surveys using broadcast survey methods were conducted at this site (6/23, 6/30, 7/13) and no spotted or barred owls were documented. Two acoustic units were used to sample this site between June 15th and June 30th and recorded for 15 days. We recorded spotted owls on UNCS-A and UNCS-B stations and barred owls on the UNCS-B station.
22. **West Bear Bluff** (NSO Habitat)- Two field surveys were completed using broadcast survey methods (7/8, 7/20), but no owls were detected. Two acoustic units were used to sample this site between June 14th and June 29th. Both acoustic units sampled for fifteen days and recorded barred owls
23. **West Oasis Butte** (NSO Habitat) - Two acoustic units were used to sample this site between June 14th and July 15th. Acoustic unit WEOB-A sampled for 24 days, and WEOB-B sampled for 28 days. No spotted owls were documented, and barred owls were documented at WEOB-A. It should be noted that a Great Gray owl was documented at this site. No broadcast call surveys were conducted at this location.
24. **West Timber Trail Junction** (NSO Habitat) - Two acoustic units were used to sample this site between July 19th and September 13th. Both acoustic units sampled for 14 days and documented barred owls. No broadcast call surveys were conducted at this location.
25. **West Trapper Creek** (NSO Habitat) - Two acoustic units were used to sample this site between June 29th and July 13th. Both acoustic units sampled for 13 days and documented barred owls. No broadcast call surveys were conducted at this location.
26. **Whitehorse Bluffs** (NSO Habitat) - Two acoustic units were used to sample this site between July 21st and August 3rd. Acoustic unit A sampled for 14 days, and unit B sampled for 15 days. Spotted owls were documented at the WHBL A station and barred owls were recorded at both stations. No broadcast call surveys were conducted at this location.

Discussion

This year a larger field crew gave us the ability to deploy more acoustic recording units than in 2020. The adoption of acoustic sampling efforts has accommodated the discontinuation of night surveys, which were in question due to safety concerns. Acoustic sampling can record during the night hours when owls are most active, and a follow-up field survey can be completed if a spotted owl is detected.

Though more areas were surveyed, spotted owls were not detected in any new territories. We continue to document spotted owls at the Thousand Springs and Grayback Ridge locations and every

effort should be made to protect these areas from disturbance or habitat loss. We are consistently documenting spotted owls annually at the Castle Point Trail, Union Creek Springs, and Whitehorse Bluffs sites but to date have not discovered a nesting location at these sites, although nesting is suspected. These sites are difficult to access making field crew sampling challenging. A concerted effort to document nesting locations at these sites should be a priority to ensure protection from wildfires, new trail development, and general disturbance activities.

Barred owls continue to be one of the main factors contributing to the decline in northern spotted owls. Within the Park, barred owls were documented at every study site that also contained a spotted owl. Throughout the Western United States, barred owls continue to extirpate spotted owls throughout much of their home range (Franklin et al, 2021). From our results regarding barred and spotted owl detection, that is likely the case in CRLA. Van Lanen et al. (2011) states that when spotted and barred owls interact, the barred owl assumes the dominant role. Weins (2012) reported barred owls chasing spotted owls out of shared core-use areas. It is likely that as barred owls continue to disperse though out CRLA, they have systematically displaced resident spotted owl populations.

Barred owls have biological advantages that have allowed them to outcompete spotted owls. Barred owls are larger than spotted owls, exhibit more aggressive behavior, have more generalist diets, and have smaller territory sizes so that they can densely pack into spotted owl habitat. Though the conflict between spotted and barred owls has been well documented, the interactions between barred owls and other species as they expand their territories has not been as well studied. Due to the efficacy of acoustic sampling, acoustic units could be deployed beyond spotted owl habitat to better understand barred owl presence and interactions within the Park.

Barred owl management plans are limited at this time, though there is a major effort ongoing to develop a generally accepted strategy. One field study conducted by the USGS (2019) removed barred owls lethally and using live capture methods. Barred owls that were live captured were rehomed, though the study found it difficult to find a place for all specimens. After removal, some study sites were “rapidly recolonized” by new barred owls. All sites needed to be revisited to prohibit new barred owls from moving back into the area. Though the study overall showed that barred owl removal was beneficial for spotted owl recolonization, this is a new method of control where long-term impacts have not been documented. It would be difficult to implement this specific strategy within Crater Lake. There are very limited roads and trails in the park and backcountry travel in Crater Lake is notably difficult. The logistics and planning of this strategy would be difficult to implement given the constraints of accessibility. Until better methods for barred owl control arise, Crater Lake will likely continue to see a decline in spotted owls.

Continued barred owl expansion and impacts from climate change (e.g., large scale wildfires, spring rain on snow events, etc.) work in concert to negatively impact spotted owls at CRLA. Several efforts are currently in progress to look at how to limit or prevent these impacts. The Crater Lake Fire Management Program is assessing and implementing fuels treatments to prevent the spread and adverse impacts of wildfires in the park (CRLA 2017). Efforts also include the NPS’s participation in developing a Barred Owl Management Strategy and the NPS’s partnership in the second phase of the Northwest Forest Plan, which focuses on acoustic sampling methods to better understand spotted and barred owl populations. The Wildlife Team at CRLA will continue to participate in these endeavors, as needed, in the hope that guidance and methods can be defined and consequently, help protect this species.

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