

Spotted Owl Observations Database Management Framework



California Department of Fish and Wildlife
Biogeographic Data Branch
California Natural Diversity Database Program

Spotted Owl Observations Database Management Framework

Table of Contents

Introduction	4
Background	4
Development.....	4
SPOWDB and the CNDDDB.....	5
Status of Spotted Owls in California	5
Purpose	5
SPOWDB Limitations	5
Contents	5
Positive Observation	5
Negative Observation	5
Activity Centers	6
Definition of ACs	7
Placement of ACs	7
Movement of ACs	8
Guidance for Interpretation and Use.....	8
Site Status of ACs	8
Data Issues, Problem-Solving, and Agency Collaboration	9
Addressing Errors.....	9
Addressing AC Placement and Site Status	9
Addressing General Database Issues	10
SPOWDB Availability	10
Source Data Acquisition	11
Sources.....	11
Contributors.....	11
How to Contribute	11
Work Flow for New Data	11
Barred Owl	12
Barred Owl Observations Database	12
How to Contribute	12
BDOWDB Limitations	12
Additional Information.....	12

Spotted Owl Observations Database Management Framework

References	13
Links	14

Recommended Citation:

CDFW. (2019). Spotted Owl Observations Database Management Framework. California Department of Fish and Wildlife. Sacramento, CA.

Web Access:

<http://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=166159>

Disclaimer:

This document describes the current status and management practices of the Spotted Owl Observations Database. These practices will be evaluated as needed to reflect future changes to spotted owl management or regulatory guidelines, and this document will be updated accordingly.

Spotted Owl Observations Database Management Framework

Introduction

This framework provides a clear, consistent, and transparent description of the Spotted Owl Observations Database (SPOWDB) and its management. It provides background and process information about the SPOWDB. The California Department of Fish and Wildlife (CDFW) will revise and update this framework as needed to capture current SPOWDB practices. Unless otherwise specified, this framework applies to both northern spotted owl (NSO; *Strix occidentalis caurina*) and California spotted owl (CSO; *Strix occidentalis occidentalis*). See Figure 1. Much of the language herein is forestry-related; however, this database is intended to be used by all parties working in spotted owl habitat.

Background

Development

The SPOWDB was created in 1973 by Senior Environmental Scientist and spotted owl expert, Gordon Gould. Around this time, spotted owl surveys were commencing statewide, in part with CDFW funding, in response to noted population declines. The first version tracked CSO and NSO observations and territories using 4x6 notecards. Over time, the database progressed through a number of formats, all of which, until recently, contained a Territories* table with activity center locations and a related Observations table containing detailed information about individual observations. In 2012, the Territories and Observations tables were merged to create a single table consisting of activity centers (ACs) and all other reported observations, which remains as the database format today. See the [Contents](#) and [Activity Center](#) sections for definitions of “observation” and “activity center”.



Figure 1. Statewide distribution of NSO and CSO data contained in the SPOWDB.

Also in 2012, the Spider Diagram was developed. The Spider Diagram displays links between observations and the AC of the site they are attributed to. See Figure 2. When banding information is not available, these associations are assigned by the SPOWDB Manager or data contributor based on distance and topography.

* By definition, a territory is an area that is actively defended by its inhabitant. However, not all territories listed in the Territories table were based on observations of birds exhibiting territorial behavior. Additionally, some observations represent foraging locations outside of the territory. For this reason, the general term “site” is subsequently used to address areas where observations were made.

Spotted Owl Observations Database Management Framework

SPOWDB and the CNDDDB

The SPOWDB was created prior to CDFW’s California Natural Diversity Database (CNDDDB), but was later incorporated as a supplemental dataset and is governed by the CNDDDB License Agreement. CDFW’s management of these datasets satisfies CDFW’s mandate to obtain access to, manage, and make available to the public the most recent natural resource information pursuant to the Significant Natural Areas Program established by Fish and Game Code section 1932.

Status of Spotted Owls in California

The NSO was listed as Threatened under the federal Endangered Species Act (ESA) in 1990. In 2016, the California Fish and Game Commission determined that listing the NSO as Threatened under the California Endangered Species Act (CESA) was warranted. The CSO is a Species of Special Concern in California and has been petitioned for federal listing under the ESA. Both subspecies are tracked in the SPOWDB.

Purpose

The SPOWDB is currently used as a centralized location for the collection, review, and reporting of CSO and NSO data for use in research and environmental review of projects including timber harvest plans (THPs) and non-industrial timber management plans (NTMPs). For timber harvesting activities, referencing NSO data in the SPOWDB is specifically addressed in the California Forest Practice Rules section 919.9 [939.9](b)(1)(d), and (c)(4) (California Code of Regulations, 2018).

SPOWDB Limitations

The SPOWDB provides the locations of reported spotted owl detections and surveys. As such, the following limitations apply:

- The absence of detection data does not necessarily mean owls are not or have not been present.
- Due to the varied nature of spotted owl surveys and reporting across the state, the SPOWDB should not be used to calculate population trends, abundance, density, etc.
- Occupancy is an annual status of presence or absence that is not tracked by the SPOWDB due to limited availability of annual survey data across the state.
- The data contained in the SPOWDB may assist with survey design and core delineation for management purposes but should not be the sole influencing factor. Project proponents should consider factors such as new survey data, habitat type, topography, and barred owl presence when proposing activities within the range of spotted owl.
- The influence of barred owls (BDOW, *Strix varia*) on spotted owl ACs is not tracked in this database. Barred owl observations can be found in the Barred Owl Observations Database (see [Barred Owl Observations Database](#) section).

Contents

The SPOWDB consists of “observations.” Broadly, these observations are either positive or negative. A positive observation, or detection, means that bird(s) were documented at a given location. A negative observation means that a survey was conducted but no birds were found. Observations can represent the following types of detections and surveys:

Positive Observation		Negative Observation
Visual detections	Incidental detections	Call point surveys
Auditory detections	Nests	Daytime surveys

Spotted Owl Observations Database Management Framework

In the SPOWDB, these observations are given one of three values in the TypeObs field: positive observation (value: POS), negative observation (value: NEG), and activity center (value: AC). The AC value is assigned to the highest-ranking positive observation (See [Activity Center](#) section below). Additionally, the TypeObs field is used to track site status. Activity centers are considered to be active unless otherwise proven to be abandoned (value: ABAN) or not valid (value: NVAC) (See [Site Status](#) section below). These values and additional attributes are visible in Figure 2. For additional field names and definitions, the metadata can be found online¹.

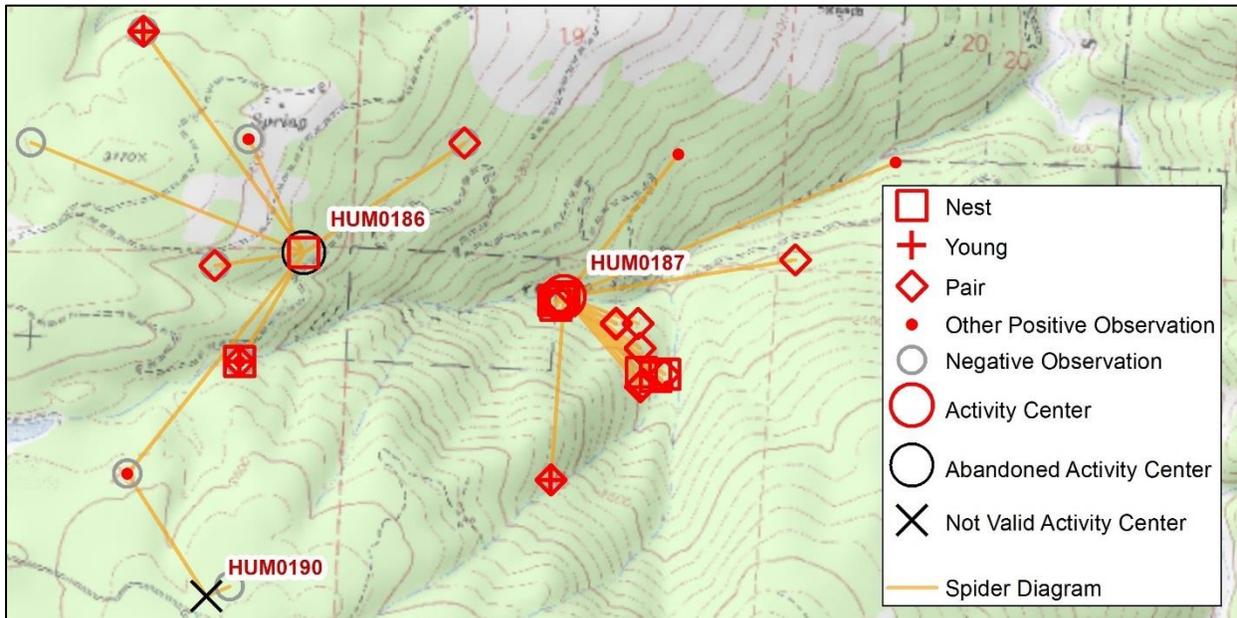


Figure 2. The SPOWDB is symbolized using the activity center status (activity center, abandoned, not valid) and negative observation values listed in the TypeObs field. Additionally, positive observations other than the AC are symbolized on the type of detection made (nest, young, pair, other positive observation). The user must review the attribute table for additional details such as date or coordinate source. The Spider Diagram shows lines connecting observations with the same MasterOwl Number.

Each observation is assigned a MasterOwl Number. The MasterOwl Number is the unique name given to each site (e.g., HUM0187 seen in the label above) and can be found in the MasterOwl field. The MasterOwl Number assignment is made by the data contributor or the SPOWDB Manager based on banding data or distance from recorded detections and topographical barriers. If an observation is near a recorded detection and there are no topographical barriers, then the observation will get the same MasterOwl Number as the nearby detection. If an observation is far from a recorded detection or there are topographical barriers and it does not meet the criteria to establish a new AC (see [Definition of AC](#)) then the observation will be given a MasterOwl value of POS (for a positive observation) or NEG (for a negative observation).

Activity Centers

While many of the guidance documents and definitions referenced below were created specifically for NSO, the SPOWDB applies these definitions consistently to both NSO and CSO. Input from the U.S. Fish and Wildlife Service (USFWS) is not required to update ACs for CSO as it is not federally listed under the ESA.

Spotted Owl Observations Database Management Framework

Definition of ACs

As defined in the USFWS's *Protocol for Surveying Proposed Management Activities that may Impact Northern Spotted Owls* (Protocol; USFWS 2012)²:

“Spotted owls have been characterized as central-place foragers, where individuals forage over a wide area and subsequently return to a nest or roost location that is often centrally-located within the home range[†] (Rosenberg and McKelvey 1999). Activity centers are a location or point representing ‘the best of’ detections such as nest stands, stands used by roosting pairs or territorial singles, or concentrated nighttime detections.”

The Protocol defines each type of AC detection as a “status.” The Protocol AC Statuses are:

- Territorial Pair Status
 1. A male and female are detected in close proximity on the same visit
 2. A male is observed taking a mouse to a female
 3. A female is detected on a nest
 4. Young are observed with one or both adults
 5. Young are observed on their own late in season
- Two Birds/Pair Status Unknown
 1. Detection of a male and female that does not meet Territorial Pair Status and at least one owl meets Resident Single Status
- Resident Single Status
 1. Detection of a single owl in the same general area on three or more occasions within a single breeding season
 2. Detection of a single owl in the same general area over several years

Placement of ACs

Activity centers are placed at the location of the highest-ranking detection (i.e., positive observation) in a given area. All detections are ranked based on the biological significance of their Protocol AC Status (as described above). For instance, a detected Territorial Pair with a confirmed nest is ranked higher than a detection of a Resident Single. Additionally, both the Arcata USFWS Office and the Yreka USFWS Office recommend stricter seasonal restrictions for Territorial Pairs that are nesting or have unknown nesting status than for Resident Singles or Territorial Pairs with confirmed non-nesting status (AFWO 2011; YFWO 2008). Accordingly, and with further input from CDFW and USFWS, the hierarchy of detections used by the SPOWDB is:

- | | |
|-----------------|------------------------------|
| 1. Nest | 4. Daytime Resident Single |
| 2. Nest Stand | 5. Nighttime pair |
| 3. Daytime Pair | 6. Multiple Nighttime Single |

[†] A home range is the area used for nesting, roosting, and foraging. The median home range radius of NSO is 0.7 miles on the coast and 1.3 miles in the interior (USFWS 2012). The average home range radius of CSO is 1.3 miles (Gutiérrez 2017). These are provided as guidelines and actual home range size may vary based on latitude, habitat, prey availability, barred owl presence, wildfire, and other factors.

Spotted Owl Observations Database Management Framework

Movement of ACs

Generally, ACs are maintained at the most biologically relevant location and are only moved if the new data matches or surpasses the rank of the current AC. The distance of any proposed move will be measured to determine what level of review the action requires. A move of less than 1,000 feet may be completed automatically by the SPOWDB Manager without consulting USFWS and CDFW staff. A move of more than 1,000 feet with no banding information will need to be reviewed by the appropriate USFWS field office³ and CDFW regional office⁴. Based on documented values for one-half of the mean nearest-neighbor distance and estimated territory size (Hunter et al. 1995, Franklin et al. 2000, Zabel 2003), a move of over 0.5 miles will be reviewed as a potentially new NSO territory. In this case, the SPOWDB Manager will request input from USFWS and CDFW regional staff. For CSO, a shift of over 0.7 miles will be reviewed by CDFW staff as a potentially new territory (Seamans and Gutiérrez 2007, Tempel et al. 2014). If it is determined that a new territory exists, then a new MasterOwl number will be assigned to the site by the SPOWDB Manager.

Guidance for Interpretation and Use

If a nest tree is present then the AC will remain at the most recent nest, regardless of last known detection, so long as the nest tree remains and the habitat has not changed.

For data management purposes, the SPOWDB only maps one AC per site. However, a site may have multiple ACs (AWFO 2011, YFWO 2008). For example, a site may include multiple nest locations or historic nest and recent roost locations; therefore, project proponents should review all relevant data and are encouraged to contact their regional Timberland Conservation Program⁵ NSO Contact or other appropriate regional staff⁴ for assistance with addressing multiple ACs.

Site Status of ACs

Active (AC)

All sites are considered active unless they meet the criteria below for abandoned or invalid sites.

Abandoned (ABAN)

Abandonment is a permanent status indicating that the site no longer supports spotted owls and does not require protection under the ESA (YFWO 2008⁶; AFWO 2017). Project proponents may request site abandonment through CDFW and/or CALFIRE by providing an explanation and thorough site history information. This information should include:

- survey history
- current habitat conditions
- any changes to the habitat
- barred owl presence

CDFW or CALFIRE will then request Technical Assistance (TA) from the USFWS. Note: if habitat is unchanged, an abandonment determination is unlikely. If an abandonment determination is made, the TypeObs value is changed from AC to ABAN.

Spotted Owl Observations Database Management Framework

Not Valid (NVAC)

Invalidation indicates that the AC in the SPOWDB does not meet the Protocol definition of an AC, and no longer requires ESA protection. Most of the sites that meet this description were intentionally added as placeholders when there was limited survey data early in the SPOWDB's history. The SPOWDB Manager currently does not add new ACs to the database if they do not meet the protocol definition of an AC. Instead, new observations that do not meet the AC definition and are not adjacent to known ACs are entered as standalone observations.

Project proponents questioning the validity of an AC can request that the SPOWDB Manager review individual ACs to determine if they are potentially valid or potentially invalid. Survey history should be included with all review requests. Final determination criteria and authorities are as follows:

Potentially Valid

Potentially valid ACs may not meet the protocol definition of an AC and have *minimal* survey history. Due to the lack of surveys, presence may have gone undetected. For this reason, a status change should be pursued via the abandonment process described above.

Potentially Invalid

Potentially invalid ACs do not meet the protocol definition of an AC and have a *thorough* survey history. The SPOWDB Manager will consult with USFWS and CDFW for final determination. If an invalid status is determined to be warranted, the TypeObs value is changed from AC to NVAC.

Data Issues, Problem-Solving, and Agency Collaboration

Addressing Errors

If users see a potential data error, concerns should be addressed directly to the SPOWDB Manager. Users should also provide all relevant data to support their concern. The SPOWDB Manager will review the SPOWDB's source documents and the supplemental data provided by the user. If the mapped data is incorrect, the database will be updated accordingly.

Addressing AC Placement and Site Status

When addressing AC placement and/or site status, the SPOWDB manager will consult with regional CDFW and USFWS staff, as well as CALFIRE, as needed. AC issues may also be presented to the Northern Spotted Owl Interagency Working Group (NSOIWG)^{‡7} as case studies and resolved via this avenue.

Note: SPOWDB Manager involvement is not necessary for all AC placement and site status reviews. For example, if a project proponent requests a change via CDFW regional staff or CALFIRE, those entities may work with the USFWS directly to determine a mutually agreed-upon resolution. In these cases, the SPOWDB Manager is able to assist with data review upon request. At minimum, the SPOWDB Manager should be informed of agreed-upon AC movements or status changes.

[‡] The NSOIWG is a working group consisting of staff from USFWS, CDFW, and CALFIRE. The goal of the NSOIWG is to promote recovery of the NSO in California by facilitating interagency understanding and communications. Addressing NSO data and database issues is one of the group's approaches to achieving this goal.

Spotted Owl Observations Database Management Framework

Addressing General Database Issues

General database issues such as formatting and symbology will be addressed with the NSOIWG and CDFW Biogeographic Data Branch staff.

SPOWDB Availability

Updated versions of the SPOWDB and Spider Diagram are provided monthly to CNDDDB subscribers and CDFW staff. Subscribers can access them as layers in the BIOS Viewer⁸ where they can also generate Spotted Owl Reports⁹. Additionally, subscribers can download the shapefiles through the Department of Fish and Wildlife’s Data Portal¹⁰.

Users without a CNDDDB subscription may purchase Spotted Owl Reports by USGS 7.5’ quad¹¹. Report #1 lists the ACs associated with the selected quad, and Report #2 lists the observations associated with the selected quad. See Figures 3a and 3b.

Data Version Date: MM/DD/YYYY		Report #1 - Spotted Owl Sites Found Known Spotted Owl sites having observations within the search area.				
Report Generation Date: MM/DD/YYYY						
Meridian, Township, Range, Section (MTRS) searched:						
H_##N_##E Sections(##,##);						
H_##N_##E Sections(##,##);						
NOTES:						
Sample Report for Spotted Owl Database Framework						
<i>Masterowl</i>	<i>Subspecies</i>	<i>LatDD NAD83</i>	<i>LonDD NAD83</i>	<i>MTRS</i>	<i>AC Coordinate Source</i>	
HUM0187	NORTHERN	##.#####	-###.#####	H ##N ##E ##	Contributor	

Figure 3a: Report #1 – Spotted Owl Sites Found. Lists the ACs associated with the selected area.

Data Version Date: MM/DD/YYYY		Report #2 - Observations Reported List of observations reported by site.									
Report Generation Date: MM/DD/YYYY											
Meridian, Township, Range, Section (MTRS) searched:											
H_##N_##E Sections(##,##);											
H_##N_##E Sections(##,##);											
NOTES:											
Sample Report for Spotted Owl Database Framework											
<i>Type</i>	<i>Date</i>	<i>Time</i>	<i>#Adults</i>	<i>Age/Sex</i>	<i>Pair</i>	<i>Nest</i>	<i>#Young</i>	<i>Latitude DD NAD83</i>	<i>Longitude DD NAD83</i>	<i>MTRS</i>	<i>Coordinate Source</i>
Masterowl: HUM0187 Subspecies: NORTHERN											
POS	1989		2	UMUF	Y			##.#####	-###.#####	H ##N ##E ##	Quarter-section centroid
POS	1989-07-24	2030	2	UMUF	Y			##.#####	-###.#####	H ##N ##E ##	Quarter-section centroid
AC	2005		2	UMUF	Y	Y	1	##.#####	-###.#####	H ##N ##E ##	Contributor
POS	2006		1	UM				##.#####	-###.#####	H ##N ##E ##	Contributor
POS	2007		2	UMUF	Y			##.#####	-###.#####	H ##N ##E ##	Contributor

Figure 3b: Report #2 – Observations Reported. Lists all of the observations associated with the selected area.

Spotted Owl Observations Database Management Framework

Source Data Acquisition

Sources

The SPOWDB's primary data sources are datasets submitted directly to the SPOWDB Manager from contributors (noted below). Spotted owl data is also available through CalTREES¹², although online data is accessed infrequently due to time and labor requirements and current staffing limitations. As CalTREES is updated, data may become more accessible; however, project proponents should notify the SPOWDB Manager¹³ directly if ACs need to be added to or modified in the SPOWDB.

Contributors

Spotted owl data is submitted by state and federal agencies (e.g., California State Parks, USDA Forest Service), biological consultants, commercial and non-commercial foresters and biologists, researchers and the general public.

How to Contribute

As mentioned above, CalTREES is not checked for data on a regular basis. Data can be directly submitted to the SPOWDB in three ways:

1. Send data directly to the SPOWDB Manager. To ensure accurate mapping, datasets must be submitted in at least one of the following formats:
 - a. Scans of datasheets and maps or coordinates for all call points and detections.
Note: Datasheets and maps should be filled out as specified in the Recording Data section of the Protocol.
 - b. Spreadsheets with coordinates for all call points and detections
Note: Include datum information if not using NAD83
 - c. Spatial data (e.g., shapefile, geodatabase)
Note: A data entry template is available upon request.
2. Submit spotted owl data using the CNDDDB Online Field Survey form¹⁴. This option is ideal when reporting a small number of observations.
3. Notify the SPOWDB Manager of THP or NTMP number and relevant file name(s) (e.g., AM1M) for those timber harvesting plans containing spotted owl data.

Work Flow for New Data

1. See previous section: [Source Data Acquisition](#)
2. Transcribe or reformat data into SPOWDB format
3. Verify or assign MasterOwl Numbers and AC designations as necessary. See [Activity Centers](#).
4. Identify and address data concerns/errors (e.g., potential new ACs, incorrect coordinates, etc.)
 - a. Discuss with data contributor
 - b. Discuss with interagency staff
5. Upload finalized dataset into the database
6. Monthly: process the database to create the Spotted Owl Observations and Spotted Owl Observations Spider Diagram shapefiles for monthly update release. See [Data Availability](#).

Spotted Owl Observations Database Management Framework

Barred Owl

Barred Owl Observations Database

All BDOW, *Strix* hybrid (i.e., spotted owl-barred owl hybrids), or unknown *Strix* data that are submitted to the SPOWDB Manager are entered in the Barred Owl Observations Database (BDOWDB) on a quarterly basis. See Figure 4. This layer is available in the BIOS Viewer and the shapefile is available upon request.

How to Contribute

Follow the same guidelines specified in the SPOW [How to Contribute](#) section. A BDOW data entry template is also available by request. Note: BDOW data cannot be submitted via the CNDDDB Online Field Survey Form but observers may fill out and submit the PDF version¹⁵.

BDOWDB Limitations

The BDOWDB provides the locations of reported BDOW detections. As such, the following limitations apply:

- The majority of barred owl data in the BDOWDB represent incidental detections made during spotted owl surveys.
- An absence of detection data in the BDOWDB does not necessarily mean that owls are not or have not been present.
- Due to the varied nature of BDOW detections and reporting across the state, the BDOWDB should not be used to calculate population trends, abundance, density, or occupancy.
- Barred owl ACs are not tracked.

Additional Information

Additional information on BDOW in California can be found on CDFW's Barred Owl Threat webpage¹⁶.



Figure 4. Statewide distribution of mapped BDOW, *Strix* hybrid, and unknown *Strix* detections as of August 2018.

Spotted Owl Observations Database Management Framework

References

- AFWO. Mar 15, 2011. *2011 Revision of the Northern Spotted Owl Take Avoidance Analysis and Guidance for California Coast Forest District (Attachment A)*. AFWO-11B0075-11TA0069. USDI Fish and Wildlife Service, Arcata, CA.
- AFWO. Feb 8, 2017. *Service's NSO Survey Protocol and Arcata Fish and Wildlife Office's NSO Activity Center Status Review*. USDI Fish and Wildlife Service, Arcata, CA.
- California Code of Regulations, Title 14, Division 1.5, Chapter 4, Subchapter 4, Article 9, Section 919.9, Subsection (b)(1)(d) and (c)(4); Subchapter 5, Article 9, Section 939.9, Subsection (b)(1)(d) and (c)(4). 2018. Thomson Reuters, Sacramento, CA.
- Fish and Game Code, Division 2, Chapter 12, Section 1932. 2019. LawTech Publishing Group, San Clemente, CA.
- Franklin AB, DR Anderson, RJ Gutiérrez, KP Burnham. 2000. *Climate, habitat quality, and fitness in northern spotted owl populations in Northwestern California*. Ecol. Monograph. 70(4): 539-590.
- Gutiérrez RJ, PN Manley, and PA Stine. 2017. *The California spotted owl: current state of knowledge*. U.S. Forest Service General Technical Report PSW – GTR. U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, Albany, CA.
- Hunter JE, RJ Gutiérrez, AB Franklin. 1995. *Habitat configuration around spotted owl sites in Northwestern California*. Condor. 97: 684-693.
- Rosenberg DK and KS McKelvey. 1999. *Estimation of habitat selection for central place foraging animals*. J. Wildlife Mgmt. 63(3): 1028-1038.
- Seamans ME, RJ Gutiérrez. 2007. *Habitat selection in a changing environment: the relationship between habitat alteration and spotted owl territory occupancy and breeding dispersal*. Condor. 109: 566–576.
- Tempel DJ, RJ Gutiérrez, SA Whitmore, MJ Reetz, RE Stoelting, WJ Berigan, ME Seamans, MZ Peery. 2014. *Effects of forest management on California spotted owls: implications for reducing wildfire risk in fire-prone forests*. Ecol. Appl. 24: 2089–2106.
- USFWS. Jan 9, 2012. *Protocol for Surveying Proposed Management Activities that may Impact Northern Spotted Owls*. USDI Fish and Wildlife Service, Portland, OR.
- YFWO. February 27, 2008. *Attachment B: Take Avoidance Analysis-Interior*. USDI Fish and Wildlife Service, Yreka, CA.
- YFWO. May 28, 2008. *Technical Assistance for Determination of Unoccupied and Abandoned Status for Northern Spotted Owl Sites*. 8133-2008-TA-0040. USDI Fish and Wildlife Service, Yreka, CA.
- Zabel CH, JR Dunk, HB Stauffer, LM Roberts, BS Mulder, A Wright. 2003. *Northern Spotted Owl Habitat Models for Research and Management Application in California (USA)*. Ecol. Appl. 13(4): 1027-1040.

Spotted Owl Observations Database Management Framework

Links

¹ Spotted Owl Observations Database Metadata

<https://map.dfg.ca.gov/metadata/sec/ds0704.html?5.66.18>

² *Protocol for Surveying Proposed Management Activities that may Impact Northern Spotted Owls*

<https://www.fws.gov/oregonfo/Species/Data/NorthernSpottedOwl/Documents/2012RevisedNSOprotocol.2.15.12.pdf>

³ US Fish and Wildlife Service Offices

<https://www.fws.gov/offices/Directory/ListOffices.cfm?statecode=6>

⁴ California Department of Fish and Wildlife Regions

<https://www.wildlife.ca.gov/regions>

⁵ Timberland Conservation Program

<https://www.wildlife.ca.gov/Conservation/Timber>

⁶ *Technical Assistance for Determination of Unoccupied and Abandoned Status for Northern Spotted Owl Sites*

http://calfire.ca.gov/resource_mgt/downloads/USFWS%20TA%20Letter%20for%20Determination%20of%20Unoccupied%20and%20Abandoned%20Status%20for%20NSO%20Sites%205-28-08.pdf

⁷ Northern Spotted Owl Interagency Working Group

<https://www.wildlife.ca.gov/Conservation/Birds/Northern-Spotted-Owl/Working-Group>

⁸ Biogeographic Information and Observation System (BIOS)

<https://www.wildlife.ca.gov/Data/BIOS>

⁹ Tutorial for Generating Spotted Owl Reports in the BIOS 5 “CNDDDB & Spotted Owl Data Viewer”

<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=71831&inline=true>

¹⁰ Data Portal – California Natural Diversity Database (CNDDDB) – Data Updates

<https://nrm.dfg.ca.gov/cnddb/view/updates.aspx>

¹¹ CNDDDB Subscription and Report Requests

<https://www.wildlife.ca.gov/Data/CNDDDB/Subscribe>

¹² CalTREES

<https://caltreesplans.resources.ca.gov/caltrees/>

¹³ Spotted Owl Database Manager Email

owlobs@wildlife.ca.gov

¹⁴ CNDDDB Online Field Survey Form

<https://www.wildlife.ca.gov/data/CNDDDB/submitting-data#44524419-online-field-survey-form>

¹⁵ CNDDDB PDF Field Survey Form

<https://www.wildlife.ca.gov/data/CNDDDB/submitting-data#44524420-pdf-field-survey-form>

¹⁶ Barred Owl Threat

<https://www.wildlife.ca.gov/Conservation/Birds/Barred-Owl-Threat>