

Joint Oil Sands Monitoring: Environment Canada Cause and Effects Monitoring for Landbirds

Standard Operating Procedure (SOP) 3: Conducting Point Counts

This Standard Operating Procedure gives step-by-step instructions for surveying birds with multiple radius, 10-minute point counts including completion of the Point Count and Vegetation Form and Summary Form which are provided as separate documents. Procedures for locating point count sites are described in the document Sampling Design and Sampling Plan 2012, 2013.

Point counts will be conducted using a multiple radius, 10-minute point count methodology. The primary objective of the JOSM Cause and Effects Monitoring program for landbirds is to develop predictive models that identify the relationship between bird abundance and environmental variables like specific vegetation variables (forest type, leading species, crown closure), human footprint variables, moisture, elevation, and latitude/longitude. Point counts are a suitable methodology to meet this objective because they can be used to survey large study areas of interest. They do not provide a complete enumeration of all birds within a study area of interest (i.e. census) because the raw counts of individual birds recorded during a point count do not provide a measure of density unless adjusted for detection probability. There are a number of methods for evaluating and incorporating detection probabilities into analyses including: distance estimation (Buckland et al. 2001), time to detection (Farnsworth et al. 2002), double observers (Nichols et al. 2000), and multiple visits within a season (MacKenzie and Royle 2005), although each method is limited in its application. A new density estimator method (Solymos et al. 2013) is a unified model that adjusts counts for two forms of detection bias: singing rate or the probability that a bird is singing (p) using a time-removal model, and detection distance or the probability of detecting a bird at distance r from the observer given that the bird is singing (q) using distance estimation. The correction factor can then be used to transform mean counts to mean density (singing males per hectare) for each species.

The point count methodology selected for this monitoring program attempts to balance statistical rigour with practical application. The standardized point count protocol below follows recommendations by Ralph et al. (1995) and the Boreal Avian Modelling (BAM) Team. Detailed elements of the monitoring protocol, with the rationale for each element is described below (Table 1).

Table 1. Key elements and rationale of the point count protocol used for JOSM Cause and Effects Monitoring for Landbirds.

Element	Strategy	Rationale
Observation Time and Observation Time Periods	<p>10 minute point count. Record the first time a bird is observed within three time periods: 1-3 minute, 3-5 minute, 5-10 minute.</p> <p>The count period is divided into 3 time periods or intervals. As birds are detected in one interval they are considered removed from the population of birds being sampled in subsequent intervals.</p>	<p>10 minute time period minimizes missing bird species that are rare or sing or call infrequently.</p> <p>Three time periods will allow comparison with BBS data (3 minutes) and other data sources like Alberta Biodiversity Monitoring Institute (ABMI) and Boreal Avian Modelling (BAM) (5 minutes or 10 minutes) and application of the density estimator developed by Solymos et al. (2013).</p>
Distance Estimation	Distance bands of 0-50 meters, 50-100 meters, and >100 meters.	<p>Distance bands will be used to define an area for estimates of relative abundance or density and for estimating detection probability. These bands are frequently used in multi-species monitoring and will allow comparisons with other data sets.</p> <p>Observers need training in distance estimation to accurately place observations within these broad distance bands. A range-finder will be used during training and daily surveys.</p>
Bird Attributes	<p>Identify birds to species and record if the detection is visual, auditory, or both. Record flyovers and flythroughs separately. Record sex, age, activity/behaviour data.</p>	<p>Recording only primary data will allow observers to concentrate on detecting all species which is the primary objective. Recording visual versus auditory detections will</p>

		allow exploration of bias. Flyovers and flythroughs may not be breeding in the point count circle, but could be used to record the presence of all species.
One Observer	One bird observer is recommended.	Requiring two trained bird observers to visit all point count sites is a financial and logistical obstacle. There are also additional training requirements for the double-observer method. Trained observers will conduct point counts separately in order to maximize the number of point count sites surveyed instead of having observers conduct the surveys in pairs.
Distance Between Point Count Sites	350 meters	If birds are observed at distances >100 meters, a minimum distance of 350 meters is needed between point count sites to avoid double-counting individual birds. If the sampling frame is large and access and travel time is not limiting, increasing the distance between point count sites is recommended (e.g. 400 meters).
Repeat Visits	Minimum: 1 visit	<p>Management objectives and decisions regarding predictive model validation and refinement must be reviewed before making decisions about repeat visits.</p> <p>One visit is the minimum requirement. One visit will be used (1) to maximize the total number of point count</p>

		<p>sites visited, (2) to account for difficult and time-consuming access to off-road point count sites, and (3) because sufficient resources may not exist for multiple visits.</p>
<p>Observer VS ARU (audio recording unit)</p>	<p>One bird observer and one ARU (audio recording unit) is recommended.</p>	<p>Observers alone have significant bias due to various sources of observer error (identification error, distance estimation error, double-counting, miscounting). Audio recording units alone have significant bias due to: exclusion of birds observed and not heard; inability to distinguish individual birds; inability to distinguish distance to individual birds; recording analysis error (human or software); and mechanical/machine error. Observers and ARU together will maximize the identification of individual birds observed and heard (including unknown singing/calling birds which can be identified from the recording). Observer and ARU data can also be used to assess species identification error rates.</p>
<p>Vegetation and Habitat</p>	<p>Required: Location (UTM or 10TM or geographic coordinates) Ecosite Classification Habitat Type</p>	<p>Vegetation and habitat data should be collected to: locate the sample point in space and verify habitat and vegetation data used in analyses.</p> <p>The specific geographic location is needed to link the bird data to digital maps of habitat, vegetation,</p>

		<p>moisture, elevation, and soil.</p> <p>Recording observed ecosite/ecosite phase will be used (1) as a covariate in analyses, and (2) in future verification exercises.</p> <p>Recording observed habitat type and collecting key vegetation variables will be used (1) as a covariate in analyses, and (2) to verify mapped habitat types and mapped/tabular Forest Resource Inventory (FRI) data.</p>
Sampling Design and Sampling Plan	Stratified random sampling design, tailored to specific objectives.	Stratified random sampling designs are appropriate depending on specific objectives. Access rules (for ground and helicopter-based sampling) will be incorporated into the sampling plan.

1. Access or Establish Point Count Site

1.1 Access Point Count Site

Pre-determined point count sites should be accessed on time, efficiently, and in good weather conditions (see definition below).

Time period for point counts-time of year: Surveys of breeding passerines should be conducted during the last week of May, the month of June, and the first week of July (Ralph et al. 1995).

Time period for point counts-time of day: Surveys should be conducted between official sunrise (as reported by your GPS) and 4-5 hours after sunrise depending on conditions (temperature, cloud cover, wind). This is the time period during which detectability is most stable (Ralph et al. 1995).

Good weather conditions: Surveys should not be conducted when it's raining, during heavy fog or when noise from wind-blown vegetation interferes with detection because these conditions will decrease the number of birds detected during the point count (Ralph et al. 1995).

1.2 Establish A New Point Count Site

New point count sites should be created if field crew staff are unable to access a pre-determined point count site or are unable to walk to within 10-12 meters of the pre-determined point count site. This distance is within the EPE (estimated positioning error) of handheld GPS units under a forest canopy. New point count sites must be located in a habitat polygon large enough to ensure that the point count site is >175 meters from the closest stand or habitat edge. When establishing a new point count site, small linear features (e.g. seismic lines) can be ignored, but wider features (e.g. roads, pipelines) contribute edge habitat and should be avoided.

2. Complete Point Count Survey

2.1 Complete Site and Observer Fields

PC Site ID: Consisting of a two-letter code for **Geographic Location (GL)**, a three-digit **Survey Area (SA)** code, and a two-digit **Point Count Site ID Number**. Site ID's are determined prior to the field season or, if a new PC site is being established in the field, the Site ID is determined as follows:

GL and SA are determined by your location, and the PC number starts from 90 (Field Crew Lead), 80 (1st Field Technician), 70 (2nd Field Technician). For example, if the Field Crew Lead can't access the site FT12305, s/he names the new, nearby site FT12390. If s/he can't get to another site in the same SA or decides to add an additional site, the next new site is FT12391.

Easting and Northing: UTM coordinates in NAD83 datum and 10TM projection (Alberta 10TM AEP Forest Projection). Point Count Site ID coordinates are: (1) determined by GIS prior to the field season (pre-determined point count site) and saved as Points of Interest (POI), or (2) marked and saved by GPS during the field season (new point count site) and saved as Waypoints.

Date: The date the point count survey is recorded in the format DD/MM/YY.

Time: The time the point count survey is started in the format HH:MM using a 24-hr clock. The start time should synchronize with the audio recording unit's start time.

Observer: The unique ID assigned to each observer at the start of the season (usually their 2 initials).

2.2 Complete Weather Fields

At the start of the point count, record weather conditions as described below.

Temp: (°C) Record the temperature as measured by the Kestrel thermometer.

Wind: (0-5) Record wind speed using standard Beaufort scale (Table 1 at the end of this document). The Kestrel may be used to help estimate wind speed, but the wind speed within the forest is often a poor approximation of the true wind speed. Sustained wind speeds over Beaufort 3 may be unsuitable for conducting point counts (observer and habitat dependent).

Precipitation: (0-3) Record the rain conditions using the codes in Table 2. Sustained rainfall greater than code 3 (light rain) is unsuitable for conducting point counts.

Cloud: (0-3) Record the cloud cover conditions using the codes in

Table 3.

Noise: (0-4) Record the level of noise interference during the duration of the point count using the codes in

Table 4. Sustained noise levels greater than code 2 (moderate noise) are unsuitable for conducting surveys.

Overnight Rain: Record Yes or No whether the point count site received rainfall overnight.

2.3 Conduct Point Counts

2.3.1 Prepare to Conduct the Point Count

Prepare to conduct the point count by finding a comfortable standing location and situating binoculars and rangefinder in a comfortable and accessible position. Set up the audio recording unit (ARU). The time spent filling out the location, observer, and weather fields should have provided a short waiting period prior to the start of the point count to allow birds to settle down. When possible, unidentified birds should be tracked down after the point count for positive identification. No attracting devices or techniques (e.g. “pishing” should be used before or during the point count.

2.3.2 Record All Birds Seen or Heard

- Record only the minimum number of different individual birds as determined by counter-singing, spatial configuration of individuals, and individual song, call, or plumage differences. Use the species codes in Appendix 1.
- Record only the first detection of each individual bird. Known, or assumed, movement can be indicated on the point count map and may aid in keeping track of individual birds during the survey.
- In rare instances, observers may be unable to fully identify an individual bird to species. In this case, the codes in Appendix 2 are acceptable, but should be used sparingly.
- A bird flushed within 50 meters of the point count station as an observer approaches or leaves a point count site should be noted in the survey notes if this individual bird was not detected during the point count survey period.

2.3.3 Record the Direction and Distance of Each Individual Bird

- Record the direction and nearest observed distance of each individual bird by placing the observation within the corresponding quadrant and distance band on the point count map.
- Orient the point count map with North at the top of the page. Scan around the full point count circle during the survey.
- Place observations fully within a single distance band (i.e. not on the line between two bands).
- Use a laser rangefinder to aid in the estimation of distance to observed and heard individual birds.

2.3.4 Record the Time Period of Each Individual Bird

- Record the time period during which each individual bird was first detected using a time code subscript at the end of the species code (see Table 5).
- Record the exact time that unknown birds are detected in order to match the observation to the audio recording unit.

2.3.5 Record the Detection Type of Each Individual Bird

- Record the detection type for each individual bird observed using the symbol codes in Table 6. Multiple detection types can be recorded if for example a bird calling near the point count center is later observed perched in an understory shrub.

Detection Types are defined in the Sibley Field Guide to Birds (see Appendix 3):

- “Songs” are the distinctive vocalizations of most species used to establish and defend territories and to create and maintain pair bonds.
- “Calls” are generally shorter, simpler vocalizations, and each species has a variety of different calls used for different communication purposes.

2.3.6 Record the Age, Sex, and Activity of Each Individual Bird

- Record the age, sex, and activity for each individual bird observed using superscript codes (see Tables 7, 8, and 9).

- For singing birds, the age (Adult) and sex (Male) are implied and do not require additional notation. Juvenile and fledgling birds should be indicated separately using the codes in Tables 7 and 8.
- Breeding behaviour activity codes (NM, CF, DD, FG, BE) are especially important to note as they provide an indication of reproductive status (see Table 9).
- A fly-over is recorded if a bird flies over the top of the vegetation canopy, never touches down in the observer's view, and does not appear to behave in any way that would suggest a link to the habitat type within the point count radius. Indicate the direction of travel on the point count map. Exceptions to fly-overs include raptors, swallows, and swifts which should be recorded using the same procedures for other birds.
- A fly-through is recorded if a bird flies through, or under the vegetation canopy, never touches down in the observer's view, and does not appear to behave in any way that would suggest a link to the habitat type within the point count radius. Indicate the direction of travel on the point count map.
- For a flock of birds, record the estimated number of individuals.
- Record any additional notes useful for the interpretation of the preceding fields.

2.4 Complete Weather Fields

At the end of the point count, record weather conditions as described in 2.2.

3. Complete Summary Form

After completing all point counts for the day, fill out the daily log and Summary Form (point count and vegetation). Verify that all pertinent information has been recorded. Each observer will listen to each of their point count recordings to identify unknown individual birds after the field season has ended. Store all data sheets (Point Count and Vegetation Form and Summary Form) in a secure location (file box assigned to the Field Crew Lead).

4. References:

- Buckland, S.T., D. R. Anderson, K. P. Burnham, J. L. Laake, D. L. Borchers, and L. Thomas. 2001. Introduction to Distance Sampling: Estimating Abundance of Biological Populations. Oxford University Press, New York, New York, USA.
- Farnsworth, G.L., K.H. Pollock, J.D. Nichols, T.R. Simons, J.E. Hines, and J.R. Sauer. 2002. A removal model for estimating detection probabilities from point-count surveys. *Auk* 119:414-425.
- MacKenzie, D.I., and J.A. Royle. 2005. Designing occupancy studies: general advice and allocating survey effort. *Journal of Applied Ecology* 42:1105-1114.
- Nichols, J.D., J.E. Hines, J.R. Sauer, F.W. Fallon, J.E. Fallon, and P.J. Heglund. 2000. A double-observer approach for estimating detection probability and abundance from point counts. *Auk* 117:393-408.
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- Solymos, P., S. M. Matsuoka, E. M. Bayne, S. R. Lele, P. Fontaine, S. G. Cumming, D. Stralberg, F. K. A. Schmeigelow, and S. J. Song. 2013. Calibrating indices of avian density from non-standardized survey data: making the most of a messy situation. *Methods in Ecology and Evolution*. In press. DOI: 10.1111/2041-210X.12106

Table 1. Beaufort Wind Scale Codes and Descriptions

Code	Speed (km/h)	Beaufort Description
0	<2	Calm. Smoke rises vertically.
1	2 – 5	Light air, smoke drift indicates wind direction, still wind vanes.
2	6 – 12	Light Breeze, wind felt on exposed skin. Leaves rustle, vanes begin to move.
3	13 – 19	Gentle Breeze, leaves and small twigs constantly moving, light flags extended.
4*	20 – 29	Moderate Breeze, dust and loose paper raised. Small branches begin to move.
5*	30 – 39	Fresh Breeze, moderate size branches move. Small trees in leaf begin to sway.
6*	40 – 49	Strong Breeze, large branches moving, wind whistling
7*	50 – 59	High Wind, whole trees in motion. Effort needed to walk against the wind.

Table 2. Precipitation Codes

Code	Description
0	No Rain
1	Fog/Mist
2	Drizzle
3	Light Rain
4*	Moderate Rain
5*	Heavy Rain
6*	Snow

Table 3. Cloud Cover Codes

Code	Description
0	Clear Sky/Few Clouds
1	Scattered or Variable
2	Mostly Cloudy (Broken)
3	Overcast

Table 4. Noise Codes and Descriptions

Code	Description
0	No noise (<40 dB) during most of survey.
1	Very faint noise (40-45 dB) during at least half of the survey, but not missing birds.
2	Faint noise (45-50 dB), difficulty hearing birds > 100 m away; might be missing some high-pitched songs/calls of distant birds.
3*	Moderate noise (50-60 dB), difficulty hearing birds >50 m away; detection radius is probably substantially reduced.
4*	Loud/intense noise (>60 dB), difficulty hearing birds >25 m away; probably detecting only the closest/loudest birds.

Reference dB levels: softest sound a person can hear (0 dB), normal breathing (10 dB), soft whisper (30 dB), rainfall (50 dB), normal conversation (60 dB).

* Indicates conditions unsuitable for conducting point counts

Table 5. Time Period Codes

Code	Description
1	Time Period 1 (0-3 minutes)
3	After 3 minutes (3-5 min)
5	After 5 minutes (5-10 min)

Table 6. Detection Type Symbols

Symbol	Description
Circle	Singing (implied male)
Diamond	Calling (sex unknown)
Underline	Visual observation

Table 7. Age Codes

Code	Description
A	Adult
J	Juvenile
F	Fledgling
U	Unknown

Table 8. Sex Codes

Code	Description
M	Male
F	Female
P	Pair
U	Unknown

Table 9. Breeding Behaviour Activity Codes

Code	Description
CS	Counter-Singing
DC	Distress Calling
DR	Drumming
WI	Winnowing
PE	Perching
FE	Feeding/Foraging
CH	Chasing
MO	Mobbing
FT	Fly-Through (in forest)
FO	Fly-Over (above canopy)
SO	Soaring
NM	Carrying Nest Material
CF	Carrying Food
DD	Distraction Display
FG	Family Group
BE	Begging

Appendix 1. Bird Species Codes (BCR-6 Boreal Taiga Plains Master Species List)

English Name	Spp Code	English Name	Spp Code	English Name	Spp Code
Landbirds		Short-eared Owl	SEOW	Cassin's Vireo	CAVI
Gray Partridge	GRAP	Boreal Owl	BOOW	Blue-headed Vireo	BHVI
Ring-necked Pheasant	RNEP	Northern Saw-whet Owl	NSWO	Warbling Vireo	WAVI
Ruffed Grouse	RUGR	Common Nighthawk	CONI	Philadelphia Vireo	PHVI
Spruce Grouse	SPGR	Eastern Whip-poor-will	EWPW	Red-eyed Vireo	REVI
Willow Ptarmigan	WIPT	Chimney Swift	CHSW	Gray Jay	GRAJ
Rock Ptarmigan	ROPT	Ruby-throated Hummingbird	RTHU	Steller's Jay	STJA
White-tailed Ptarmigan	WTPT	Calliope Hummingbird	CAHU	Blue Jay	BLJA
Dusky Grouse	DUGR	Rufous Hummingbird	RUHU	Black-billed Magpie	BBMA
Sharp-tailed Grouse	STGR	Belted Kingfisher	BEKI	American Crow	AMCR
Greater Prairie-Chicken	GRPC	Red-headed Woodpecker	RHWO	Common Raven	CORA
Turkey Vulture	TUVU	Yellow-bellied Sapsucker	YBSA	Horned Lark	HOLA
Osprey	OSPR	Red-breasted Sapsucker	RBSA	Purple Martin	PUMA
Bald Eagle	BAEA	Downy Woodpecker	DOWO	Tree Swallow	TRES
Northern Harrier	NOHA	Hairy Woodpecker	HAWO	Violet-green Swallow	VGSW
Sharp-shinned Hawk	SSHA	American Three-toed Woodpecker	ATTW	Northern Rough-winged Swallow	NRWS
Cooper's Hawk	COHA	Black-backed Woodpecker	BBWO	Bank Swallow	BANS
Northern Goshawk	NOGO	Northern Flicker	NOFL	Cliff Swallow	CLSW
Red-shouldered Hawk	RSHA	Pileated Woodpecker	PIWO	Barn Swallow	BARS
Broad-winged Hawk	BWHA	Olive-sided Flycatcher	OSFL	Black-capped Chickadee	BCCH
Swainson's Hawk	SWHA	Western Wood-Pewee	WEWP	Boreal Chickadee	BOCH
Red-tailed Hawk	RTHA	Eastern Wood-Pewee	EAWP	Gray-headed Chickadee	GHCH
Rough-legged Hawk	RLHA	Yellow-bellied Flycatcher	YBFL	Red-breasted Nuthatch	RBNU
Golden Eagle	GOEA	Alder Flycatcher	ALFL	White-breasted Nuthatch	WBNU
American Kestrel	AMKE	Willow Flycatcher	WIFL	Brown Creeper	BRCR
Merlin	MERL	Least Flycatcher	LEFL	House Wren	HOWR
Peregrine Falcon	PEFA	Hammond's Flycatcher	HAFL	Winter Wren	WIWR
Rock Pigeon	ROPI	Dusky Flycatcher	DUFL	Sedge Wren	SEWR
Mourning Dove	MODO	Pacific-slope Flycatcher	PSFL	Marsh Wren	MAWR
Yellow-billed Cuckoo	YBCU	Eastern Phoebe	EAPH	Golden-crowned Kinglet	GCKI
Black-billed Cuckoo	BBCU	Say's Phoebe	SAPH	Ruby-crowned Kinglet	RCKI
Great Horned Owl	GHOW	Great Crested Flycatcher	GCFL	Northern Wheatear	NOWH
Snowy Owl	SNOW	Western Kingbird	WEKI	Eastern Bluebird	EABL
Northern Hawk Owl	NHOW	Eastern Kingbird	EAKI	Mountain Bluebird	MOBL
Northern Pygmy-Owl	NOPO	Loggerhead Shrike	LOSH	Townsend's Solitaire	TOSO
Barred Owl	BADO	Northern Shrike	NSHR	Veery	VEER
Great Gray Owl	GGOW	Yellow-throated Vireo	YTVI	Gray-cheeked Thrush	GCTH
Long-eared Owl	LEOW			Swainson's Thrush	SWTH

English Name	Spp Code	English Name	Spp Code	English Name	Spp Code
Hermit Thrush	HETH	Townsend's Warbler	TOWA	Brown-headed Cowbird	BHCO
Wood Thrush	WOTH	Black-throated Green Warbler	BTNW	Orchard Oriole	OROR
American Robin	AMRO	Canada Warbler	CAWA	Baltimore Oriole	BAOR
Varied Thrush	VATH	Wilson's Warbler	WIWA	Pine Grosbeak	PIGR
Gray Catbird	GRCA	Spotted Towhee	SPTO	Purple Finch	PUFI
Northern Mockingbird	NOMO	Eastern Towhee	EATO	House Finch	HOFI
Brown Thrasher	BRTH	American Tree Sparrow	ATSP	Red Crossbill	RECR
European Starling	EUST	Chipping Sparrow	CHSP	White-winged Crossbill	WWCR
American Pipit	AMPI	Clay-colored Sparrow	CCSP	Common Redpoll	CORE
Sprague's Pipit	SPPI	Brewer's Sparrow	BRSP	Hoary Redpoll	HORE
Bohemian Waxwing	BOWA	Vesper Sparrow	VESP	Pine Siskin	PISI
Cedar Waxwing	CEDW	Lark Sparrow	LASP	American Goldfinch	AMGO
Lapland Longspur	LALO	Savannah Sparrow	SAVS	Evening Grosbeak	EVGR
Smith's Longspur	SMLO	Grasshopper Sparrow	GRSP	House Sparrow	HOSP
Snow Bunting	SNBU	Baird's Sparrow	BAIS		
Ovenbird	OVEN	Le Conte's Sparrow	LCSP	<u>Shorebirds</u>	
Northern Waterthrush	NOWA	Nelson's Sparrow	NESP	American Golden-Plover	AMGP
Golden-winged Warbler	GWWA	Fox Sparrow	FOSP	Killdeer	KILL
Black-and-white Warbler	BAWW	Song Sparrow	SOSP	Spotted Sandpiper	SPSA
Tennessee Warbler	TEWA	Lincoln's Sparrow	LISP	Solitary Sandpiper	SOSA
Orange-crowned Warbler	OCWA	Swamp Sparrow	SWSP	Greater Yellowlegs	GRYE
Nashville Warbler	NAWA	White-throated Sparrow	WTSP	Lesser Yellowlegs	LEYE
Connecticut Warbler	CONW	Harris's Sparrow	HASP	Upland Sandpiper	UPSA
MacGillivray's Warbler	MGWA	White-crowned Sparrow	WCSP	Whimbrel	WHIM
Mourning Warbler	MOWA	Golden-crowned Sparrow	GCSP	Hudsonian Godwit	HUGO
Common Yellowthroat	COYE	Dark-eyed Junco	DEJU	Marbled Godwit	MAGO
American Redstart	AMRE	Scarlet Tanager	SCTA	Semipalmated Sandpiper	SESA
Cape May Warbler	CMWA	Western Tanager	WETA	Least Sandpiper	LESA
Northern Parula	NOPA	Northern Cardinal	NOCA	Short-billed Dowitcher	SBDO
Magnolia Warbler	MAWA	Rose-breasted Grosbeak	RBGR	Wilson's Snipe	WISN
Bay-breasted Warbler	BBWA	Indigo Bunting	INBU	Wilson's Phalarope	WIPH
Blackburnian Warbler	BLBW	Bobolink	BOBO	Red-necked Phalarope	RNPH
Yellow Warbler	YWAR	Red-winged Blackbird	RWBL		
Chestnut-sided Warbler	CSWA	Eastern Meadowlark	EAME	<u>Waterbirds</u>	
Blackpoll Warbler	BLPW	Western Meadowlark	WEME	Red-throated Loon	RTLO
Black-throated Blue Warbler	BTBW	Yellow-headed Blackbird	YHBL	Pacific Loon	PALO
Palm Warbler	PAWA	Rusty Blackbird	RUBL	Common Loon	COLO
Pine Warbler	PIWA	Brewer's Blackbird	BRBL	Yellow-billed Loon	YBLO
Yellow-rumped Warbler	YRWA	Common Grackle	COGR	Pied-billed Grebe	PBGR

English Name	Spp Code	English Name	Spp Code
Horned Grebe	HOGR	American Wigeon	AMWI
Red-necked Grebe	RNGR	Mallard	MALL
Eared Grebe	EAGR	Blue-winged Teal	BWTE
Western Grebe	WEGR	Cinnamon Teal	CITE
Double-crested Cormorant	DCCO	Northern Shoveler	NSHO
American White Pelican	AWPE	Northern Pintail	NOPI
American Bittern	AMBI	Green-winged Teal	GWTE
Great Blue Heron	GBHE	Canvasback	CANV
Black-crowned Night-Heron	BCNH	Redhead	REDH
Yellow Rail	YERA	Ring-necked Duck	RNDU
Virginia Rail	VIRA	Greater Scaup	GRSC
Sora	SORA	Lesser Scaup	LESC
American Coot	AMCO	Common Eider	COEI
Sandhill Crane	SACR	Surf Scoter	SUSC
Whooping Crane	WHCR	White-winged Scoter	WWSC
Bonaparte's Gull	BOGU	Black Scoter	BLSC
Franklin's Gull	FRGU	Long-tailed Duck	LTDU
Mew Gull	MEGU	Bufflehead	BUFF
Ring-billed Gull	RBGU	Common Goldeneye	COGO
California Gull	CAGU	Barrow's Goldeneye	BAGO
Herring Gull	HERG	Hooded Merganser	HOME
Caspian Tern	CATE	Common Merganser	COME
Black Tern	BLTE	Red-breasted Merganser	RBME
Common Tern	COTE	Ruddy Duck	RUDU
Arctic Tern	ARTE		
Forster's Tern	FOTE		
Parasitic Jaeger	PAJA		
Long-tailed Jaeger	LTJA		
<u>Waterfowl</u>			
Greater White-fronted Goose	GWFG		
Snow Goose	SNGO		
Ross's Goose	ROGO		
Cackling Goose	CACG		
Canada Goose	CANG		
Trumpeter Swan	TRUS		
Tundra Swan	TUSW		
Wood Duck	WODU		
Gadwall	GADW		

Appendix 2. Bird Species Codes for Incomplete Identifications

Species Code	Explanation
UNKN	Unidentified Bird
UNAH	Unidentified Accipiter Hawk
UNBH	Unidentified Buteo Hawk
UNDU	Unidentified Duck
UNEF	Unidentified Empidonax Flycatcher
UNFL	Unidentified Flycatcher
UNGU	Unidentified Gull
UNHU	Unidentified Hummingbird
UNOW	Unidentified Owl
UNCH	Unidentified Chickadee
UNSA	Unidentified Sapsucker
UNSP	Unidentified Sparrow
UNTH	Unidentified Thrush
UNVI	Unidentified Vireo
UNWA	Unidentified Warbler
UNWO	Unidentified Woodpecker
UNWR	Unidentified Wren

Appendix 3. Differentiating Songs and Calls

Here we provide guidelines for differentiating songs from calls. Most songbirds have a typical song that generally is not confused with typical call notes. An example is the Black-headed Grosbeak, whose song can be described as a high, rolling warble and whose call is a high, sharp *pik* note. Groups of birds encountered in the field that have less well-defined songs and calls include hawks and falcons, grouse and quail, owls, woodpeckers, flycatchers, jays and crows, and chickadees (particularly CBCH and BOCH). The general rule to follow for distinguishing between songs and calls for all species is to defer to vocalization descriptions in The Sibley Field Guide to Birds of Western North America with a few clarifications, described below:

Hawks and falcons: Never sing. Regard all vocalizations as **calls**.

Grouse and quail: Low hoot of SOGR and drumming of RUGR classified as **song**, all other vocalizations classified as **calls**. *Quark* of MOUQ and *Chi ca go* of CAQU classed as **songs**, all other vocalizations are **calls**.

Owls: **Songs** are defined as the typical series of hoots a male defending territory would give. This does not include any of the female and juvenile calls. The NOPO's 'submarine sonar' vocalizations and FLOW's *poop (tee hee)* are included as **songs**.

Woodpeckers: **Songs** are limited to rattles for most species. **Calls** are defined as all contact calls, drumming, and any other vocalizations. For NOFL and PIWO the similar sounding *wuk wuk wuk wuk wuk* vocalizations are classified as **songs**; all other vocalizations are **calls**.

Flycatchers: Well-defined by Sibley. Typical two and three note vocalizations from *empidonax* flycatchers are classified as **songs**.

Jays and crows: Never sing. Regard all vocalizations as **calls**.

Chickadees: **Song** includes MOCH's *cheeseburger*, and BCCH's *fee bee fee beeyee*. All other vocalizations for these two species should be classified as calls. CBCH and BOCH do not have a structured song—regard all vocalizations as **calls**. RBNU—difficult to distinguish calls from songs so regard all vocalizations as **calls**.

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