APPENDIX C. PROTOCOL SUMMARY

SUMMARY BLACK SWIFT SURVEY PROTOCOLS IN CANADA: SITE OCCUPANCY, NEST SEARCHING, AND SITE HABITAT

For complete protocol see:
Rock, C. P. G. Levesque, and W. E. Gross. 2020 [updated version 2021]. Black Swift Survey Protocols in Canada: Site Occupancy, Nest Searching, and Site Habitat. Canadian Wildlife Service, Delta, B.C. 23 pp.

Background

In Canada, Black Swifts (*Cypseloides niger borealis*) breed in mountainous habitat in the southern half of British Columbia (BC) and southwestern Alberta (AB) and may nest on the coast of BC in sea caves. Black Swift survey protocols include conducting **Site Habitat**, **Site Occupancy,** and **Nest Searching** surveys**. Consult the protocol for further explanation on survey objectives, timing, methods, equipment, safety considerations, nest site examples.**

1) Site Habitat Survey

Objectives

- Site habitat surveys are conducted at all potential breeding sites to inform our understanding of Black Swift nesting habitat and variation between years (or months) and to assess site potential before conducting occupancy surveys.

Timing/Conditions

- Site habitat surveys can be conducted at any time during the breeding season, at any point during the day, and on repeated visits.
- They can be conducted when initially scouting survey sites.

Personnel

- Surveys can be conducted by one or more individuals.

Positioning

- Surveyors should position themselves with a clear view of the potential nesting areas/features (i.e., waterfall, canyon and/or cave) and any known or suspected nests.
- Multiple site habitat surveys may be required (i.e., sites with long canyons or multiple waterfalls), complete a site habitat survey for each canyon segment/waterfall tier.
- At canyons, the length and path/layout of potential habitat sections determines observer positioning.

Methods

- For each survey location collect the following information:
  - Surveyor location relative to the feature, site feature type, substrate/rock type.
  - Habitat scoring for 6 characteristics: flow, relief, access to nest niches, shading, niches inaccessible to terrestrial predators, extent of moss (Levad et al. 2008).
  - Microclimate site attributes at the feature influencing site characteristics such as canopy cover, mist, and water temperature, light exposure.
  - Photos of the feature at various spatial extents (panoramic, landscape, site, and feature).
  - Documentation on how to access the survey location (route to site access, significant trail markers, waypoints etc.).

2) Site Occupancy Surveys

Objectives

- Detection adult Black Swifts flying into or from suitable nesting habitat or nest sites to determining site occupancy. If Site Occupancy is confirmed, conduct additional Nest Searching surveys to search for nests in the areas where birds were detected.

Timing/Conditions

- Occupancy surveys should be conducted within the incubation and nestling periods (between **25 June and 25 August).**
- A minimum of three repeat surveys are recommended per site throughout the nesting season; one survey near the end of June, one survey in mid to late July, and one survey in mid to late August.
- Once occupancy is confirmed in a given year, no further surveys are required at the site. However, additional surveys can inform colony size and nest success.
- Occupancy surveys should be conducted at dawn, beginning **30 minutes before sunrise** and ending **60 minutes after sunrise** when Black Swift adults leave their nest or roost sites to forage. Evening surveys during the final hours of daylight, beginning two hours before sunset and ending once it is too dark (~30 minutes after sunset) can also compliment dawn survey results.
- Surveys are conducted in favourable weather (winds < 19 kph; Beaufort Scale 3 or less, no or light precipitation, no fog, and minimal forest fire smoke).

Personnel

- Surveys conducted by two or more surveyors in order to increase detection rates and allow for greater and overlapping coverage of the potential habitat.
- If more than one surveyor is present, surveyors should discuss individual areas of focus and observer orientation to maximize coverage.

Positioning

- Observers are positioned downstream of waterfalls (outside of the spray zone) and below the waterfall or canyon feature to enhance the detectability of the birds against the lighter sky and the white of the waterfall (if safe to access).
- At sites with multiple waterfall tiers, either additional surveyors need to be spaced downstream from each waterfall or canyon or the surveyor(s) must complete surveys along the entire waterfall complex over multiple survey days at a minimum of 50 m intervals.

Methods

- Record start and end survey, weather conditions and light levels (i.e., sky, wind, weather conditions, moon phase, and exposure vales (EV), if using a light meter).
- Continuously monitor the waterfall feature and adjacent habitat and the sky directly above the feature for Black Swift movement by uninterrupted scanning of the area with the naked eye.
- Determine and record the number, timing, and flight path of Black Swifts flying to or from potential nesting habitat (features) or nests and bird behaviour (i.e., exiting a waterfall, seep, canyon, or cave in a direct or indirect flight path would be recorded as “fly from feature” (FFF).
- Presence and number of recreational users/pedestrian traffic, potential nest predators (e.g., corvids, raptors, small mammals), and/or other species at risk, bats, riverine birds detected before, after, or during the surveys.

3) Nest Searching

Objectives:

- Nest Searching surveys to search for nests in the areas where birds were detected. If Site Occupancy is unconfirmed, Nest Searching surveys still should be conducted because they allow for a further opportunity to detect active nests and confirm occupancy. Nest Searching surveys should not be used as a substitute to Site Occupancy surveys.

Timing/Conditions:

- Reduced water flow from **mid July to mid August** allows the best period to conduct nest searches.
- Nest searches can take place any time after sunrise to sunset, and can be conducted by one or more observers.
- Nest Searching surveys can be conducted when initially scouting survey sites.

Personnel

- Surveys can be conducted by one or more individuals.

Positioning

- Positioned with a vantage and best angles to view inside available niches to determine whether a nest is present.
- Observers will need to reposition to a new vantage point and continue scanning the substrate from different angles and locations to allow all visible substrate to be scanned for nest niches cumulatively.

Methods

- Systematically scan the potentially suitable nesting substrate with a spotting scope (binoculars should not be used as a replacement to a spotting scope).
- Observers should look for whitewash and/or green algae staining that is often on the substrate below active Blacks Swift nests.
- Handheld spotlights flash photography or infrared technology (e.g., Forward-Looking Infrared; FLIR camera) can be used in dark recesses. Confirm promising detections (i.e., thermal signatures or eye shine) using a spotting scope.
- Record the equipment used, time spent searching for nests and the total unit effort (number of observers x time period) and presence of potential nest predators.
- For any potential or confirmed Black Swift nests or roosting sites record the following:
    - Unique Nest ID (i.e., site name_province_nest#; permanently assigned), nest status (egg; nestling; 1 or 2 adult(s); 1 or 2 adult(s) + nestling; empty nest cup; unknown, active in previous year but not current year; other, explain in notes section)
    - Presence of whitewash, green algae staining, lichen (e.g., *Xanthoria elegans*), and/or moss below or near nest(s).
    - Nest characteristics including: height measured from top of falls/rim of canyon directly above the nest to nest (m), nest aspect (degrees), horizontal distance (m) and bearing (degrees) to nest from surveyor, presence (of direct sunlight on nest during survey.
    - Photographs of the nest(s). All photographs need to be downloaded, and the location(s) and assigned number(s) of the nest(s) need to be marked on the image(s) as soon as possible.
- Documented nests are reported to Canadian Wildlife Service species lead, Eric Gross (Eric.Gross@ec.gc.ca).