

# SANDHILL CRANE

## *Grus canadensis*

Original<sup>1</sup> prepared by Martin Gebauer

### Species Information

#### Taxonomy

Of the 15 crane species in the world (Sibley 1996), two breed within North America: Sandhill Crane (*Grus canadensis*) and Whooping Crane (*Grus americana*) (NGS 1999). Early literature recognized three subspecies of Sandhill Crane (AOU 1957), however, more recent literature recognizes six subspecies: Lesser (*G. canadensis canadensis*), Canadian (*G. canadensis rowani*), Greater (*G. canadensis tabida*), Florida (*G. canadensis pratensis*), Cuban (*G. canadensis nesiotis*), and Mississippi (*G. canadensis pulla*) (Walkinshaw 1973, Tacha et al. 1992) of which the first three subspecies occur in British Columbia (Cannings 1998).

The Lesser Sandhill Crane is a common migrant through British Columbia, as is the Greater Sandhill Crane and possibly the Canadian Sandhill Crane breed. The Greater Sandhill Crane is thought to be the subspecies breeding in the Lower Mainland, the Queen Charlotte Islands, Vancouver Island, the Hecate Lowlands, and interior areas of the province (Campbell et al. 1990). Some authors have questioned the splitting of Greater and Canadian Sandhill Cranes into separate subspecies since a continuum in morphology and random pairing among the supposed subspecies has been demonstrated (Tacha et al. 1992).

#### Description

These large grey birds are perhaps most often confused with the morphologically similar, but taxonomically different, Great Blue Heron (*Ardea herodias*). Sandhill Cranes can be distinguished by their large size, overall grey colouration (often stained with rusty colouration), with dull red skin on the crown and lores, whitish chin, cheek and

upper throat, and black primaries. Young are more brownish and without a bare forehead patch (Godfrey 1986; NGS 1999).

#### Distribution

##### Global

The Sandhill Crane is restricted to North America breeding primarily from the northwestern United States (e.g., northwestern California, Nevada, and Oregon) and the Great Lakes area north to Alaska, and the Northwest Territories including Baffin and Victoria Islands. Resident populations breed in the Mississippi River delta, Florida and southern Georgia, and Cuba (Tacha et al. 1992). Sandhill Cranes winter from central California, southeastern Arizona east to central Texas, in scattered areas of the Gulf Coast and southern Florida, and south to the states of Sinaloa, Jalisco, Chihuahua, Durango, and Veracruz in Mexico (Tacha et al. 1992; Howell and Webb 1995; Drewien et al. 1996).

##### British Columbia

The Sandhill Crane has a widespread breeding distribution in British Columbia, although the breeding distributions of the three separate subspecies is not well understood. Known breeding areas include much of the central Interior, the Queen Charlotte Islands, the central mainland coast, Mara Meadows near Enderby, East Kootenay, northeastern British Columbia near Fort Nelson, and at Pitt Meadows and Burns Bog in the Lower Mainland (Gebauer 1995; Cooper 1996). The Greater Sandhill Crane is thought to breed throughout most of the Interior, whereas the Canadian Sandhill Crane is thought to breed on the coast (Cooper 1996) but may also breed in the central Interior and northeast (Littlefield and Thompson

<sup>1</sup> Volume 1 account prepared by J. Cooper.

## Sandhill Crane (*Grus canadensis*)



Note: This map represents a broad view of the distribution of potential habitat used by this species. The map is based on several ecosystem classifications (Ecoregion, Biogeoclimatic and Broad Ecosystem Inventory) as well as current knowledge of the species' habitat preferences. This species may or may not occur in all areas indicated.

1979). Lesser Sandhill Cranes occur in the province in large numbers primarily during migration, but may also breed in the northeast (Cooper 1996). Stopover points for migrating Sandhill Cranes include White Lake in the south Okanagan, Lac Le Jeune in the Kamloops area, Becher's Prairie near Williams Lake, the Kispiox Valley north of Smithers, Nig Creek northwest of Fort St. John and Liard Hot Springs in north-central British Columbia (Campbell et al. 1990).

### **Forest region and districts**

Coast: Campbell River, Chilliwack, North Coast, North Island, Queen Charlotte Islands, South Island, Squamish

Northern Interior: Fort Nelson, Kalum, Mackenzie, Nadina, Peace, Prince George, Skeena Stikine, Vanderhoof

Southern Interior: 100 Mile House, Arrow Boundary, Cascades, Central Cariboo, Chilcotin, Headwaters, Kootenay Lake, Okanagan Shuswap, Quesnel, Rocky Mountain

### **Ecoprovinces and ecosections**

BOP: CLH, HAP, KIP, PEL

CEI: BUB, CAB, CAP, CHP, FRB, NAU, NEU, QUL, WCR, WCU

COM: CPR, CRU, FRL, HEL, KIM, KIR, NAB, NAM, NIM, NPR, NWL, OUF, QCL, SKP, WIM, WQC

GED: FRL, LIM, NAL

NBM: LIP, TEB, TEP

SBI: BAU, ESM, MAP, MCP, NEL, NHR, PAT, SHR

SIM: BBT, CAM, EKT, QUH, SCM, SFH, SHH, SPM, UCV, UFT

SOI: GUU, NIB, NOB, NTU, OKR, SHB, SOB, STU, TRU, (THB – eastern end only)

TAP: ETP, FNL, MAU, MUP, PEP, TLP

### **Biogeoclimatic units**

BG: all

BWBS: dk1, dk2, mw1, mw2

CDF: mm

CWH: all

ICH: all

IDF: dk1, dk1a, dk1b, dk2, dk3, dk4, mw1, mw2, mw2a

MS: all

PP: all

SBPS: dc, mc, mk, xc

SBS: dk, dw1, dw2, dw3, mc, mc1, mc2, mc3, mh, mk1, mk2, mw

### **Broad ecosystem units**

BB, BG, BS, CB, CF, ES, ME, OW, RE, SS, TF, WL

### **Elevation**

Breeding: sea level to 1220 m

Non-breeding: sea level to 1510 m  
(Campbell et al. 1990)

## **Life History**

### **Diet and foraging behaviour**

Sandhill Cranes are opportunistic foragers, feeding on both animal (primarily invertebrates) and plant foods (Walkinshaw 1973; Mullins and Bizeau 1978; Ballard and Thompson 2000). In Nebraska, cranes feeding in cornfields ate >99% corn whereas those feeding in native grasslands and alfalfa fields consumed 79–99% invertebrates (Reinecke and Krapu 1986). Invertebrates consumed by cranes in Nebraska included earthworms, beetles, crickets, grasshoppers, cutworms, and snails. In Idaho, plants made up 73% of the total food consumption of summering cranes, and insects and earthworms made up the remaining 27% (Mullins and Bizeau 1978). Large flocks of staging cranes feeding on agricultural grain crops has led to crop depredation in some areas (Tacha et al. 1985; McIvor and Conover 1994a, 1994b). Other foods taken by Sandhill Cranes include crayfish, voles, mice, frogs, toads, snakes, nestling birds, bird eggs, berries, and carrion (Cooper 1996).

### **Reproduction**

Dates for 20 clutches in British Columbia ranged from 2 May to 25 June with 50% recorded between 9 and 24 May. Clutch size ranged from one to three eggs with 84% having two eggs (Campbell et al. 1990). Dates from two nests in British Columbia

suggest an incubation period of 33–34 days (Campbell et al. 1990), more than the 28–32 days reported by Ehrlich et al. (1988). Dates for 47 broods in British Columbia ranged from 15 May to 1 September with 57% recorded between 15 June and 15 July. Sizes of 46 broods ranged from one to two young with 72% of the broods having one young (Campbell et al. 1990). Fledgling period ranges from 65 to 70 days (Ehrlich et al. 1988; Campbell et al. 1990). Replacement clutches may be laid if the first clutch is lost within an interval of about 20 days (Nesbitt 1988).

### Site fidelity

Drewien et al. (1999) found that radiomarked Sandhill Cranes of the Rocky Mountain population exhibited strong site fidelity to summer and winter grounds during successive years, and that juveniles apparently learned traditional use patterns from parents. Tacha et al. (1984) found that individuals (particularly established pairs) consistently returned to the same wintering grounds. However, preliminary data in central British Columbia suggest that site fidelity of breeding pairs between years is not strong (Cooper 1996).

### Home range

Sandhill Crane territories at Grays Lake, Idaho, with the densest known nesting concentrations, averaged 17 ha (Drewien 1973). At Malheur National Wildlife Reserve (NWR), territories averaged approximately 25 ha (Littlefield and Ryder 1968). Walkinshaw (1973) found average territory sizes ranging from 53 to 85 ha in Michigan. Territory sizes of cranes nesting in British Columbia have not been determined.

### Movements and dispersal

Three migration routes are known in British Columbia, each of which is used in spring and autumn: coastal, central Interior, and northeastern Interior. Cranes migrating along the coastal route enter British Columbia over Juan de Fuca Strait and

are occasionally seen in the Barkley Sound and Johnstone Strait regions. The main passage of migrants occurs in early April, whereas the autumn movement peaks in October (Campbell et al. 1990). Birds using the coastal route (~3500) are suspected of nesting in the coastal islands of British Columbia and southeast Alaska (Campbell et al. 1990). In the central Interior, the migration route follows the Okanagan Valley to Peachland, then over Chapperon Lake and the Kamloops area, through the central Chilcotin-Cariboo, over the Fraser Plateau following the Bulkley and Kispiox valleys, past Meziadin Lake and into southeastern Alaska. Between 22 000 and 25 000 birds are thought to use this route (Campbell et al. 1990). The main spring movement is at the end of April, with the main passage in the fall from late September to early October. Known stopover points include White Lake in the south Okanagan, Lac Le Jeune, Becher's Prairie west of Williams Lake, and the Kispiox Valley north of Hazelton (Campbell et al. 1990). In northeastern British Columbia, between 150 000 and 200 000 birds move through the Peace River area on their way to Alaskan and Siberian breeding grounds (Kessel 1984; Tacha et al. 1984), generally passing over Nig Creek and Cecil Lake (Campbell et al. 1990). Spring migration occurs from late April to early May, whereas fall migration is generally during the second and third weeks of September (Campbell et al. 1990).

After hatching, young leave the nest and forage with their parents around the perimeter of the natal wetland, primarily in sedge meadows. Once young have fledged, localized congregations occur in pre-migration staging areas (Gebauer 1995). In the fall at Burns Bog, cranes moved from roosting areas within the Bog to agricultural fields for foraging each day, moving distances of 2–4 km (Gebauer 1995). Lewis (1975) found the average distance of flight movements between feeding and roosting areas to range from 2 to 16 km.

## Habitat

Structural stage	Roosting	Nesting	Escape	Screen
1: non-vegetated or sparsely vegetated	x	x		
2: herb	x	x		
3a: low shrub	x	x		
3b: tall shrub	x	x	x	x
4: pole/sapling			x	x
5: young forest			x	x
6: mature forest			x	x
7: old forest			x	x

### Important habitats and habitat features

#### Nesting

Typical breeding habitats include isolated bogs, marshes, swamps and meadows, and other secluded shallow freshwater wetlands generally >1 ha in size surrounded by forest cover. Emergent vegetation such as sedges (*Carex* spp.), Cattail (*Typha latifolia*), bulrush (*Scirpus* spp.), Hardhack (*Spiraea douglasii*), willows (*Salix* spp.), and Labrador Tea (*Ledum groenlandicum*) are important for nesting and brood rearing (Robinson and Robinson 1976, Runyan 1978, Littlefield 1995a). Nesting wetlands are usually secluded, free from disturbance, and surrounded by forest. In coastal areas, brackish estuaries are used for rearing broods. Johnsgard (1983) and Walkinshaw (1949) identified sphagnum bogs as important nesting habitats for Greater Sandhill Cranes. Most sightings of cranes in Burns Bog were from wet and dry heathland (i.e., sphagnum) vegetation communities (Gebauer 1995).

Forested buffers around nesting marshes are likely critical for relatively small (1–10 ha) wetlands. Forests are used for escape cover by young and provide a buffer against disturbance. Although the Sandhill Crane has occasionally been reported as nesting in revegetating clearcuts (Campbell et al. 1990), clearcuts are generally not suitable habitat alternatives to wetlands.

Nests consist of large heaps of surrounding dominant vegetation, usually built in emergent vegetation or on raised hummocks over water (Melvin et al.

1990; Campbell et al. 1990). Robinson and Robinson (1976) found the average depth of water at five nests in the Pitt River Valley to be 4.3 cm in May and 13 cm in June. In Michigan, cranes selected nest sites in or near seasonally flooded emergent wetlands and avoided forested uplands (Baker et al. 1995). Nests may adjust (i.e., float) to slight increases in water level (Tacha et al. 1992).

#### Foraging

One of the most important habitat characteristics for Sandhill Cranes is an unobstructed view of surrounding areas and isolation from disturbance (Lovvorn and Kirkpatrick 1981). Typical foraging habitat includes shallow wetlands, marshes, swamps, fens, bogs, ponds, meadows, estuarine marshes, intertidal areas, and dry upland areas such as grasslands and agricultural fields. In the Interior, flooded meadows and agricultural fields provide good roosting habitat.

#### Roosting/staging

Observations of numerous roosting sites by Lewis (1975) and Lovvorn and Kirkpatrick (1981) indicated that roosts were characterized by level terrain, shallow water bordered by a shoreline either devoid of vegetation or sparsely vegetated, and an isolated location that reduces potential for disturbance by humans. These features are typical of roosting habitats in Burns Bog (Gebauer 1995) and at White Lake, Okanagan (Cannings et al. 1987).

However, Folk and Tacha (1990) noted that open terrain at roost sites was not necessarily a critical element, but that presence of shallow water was critical.

## Conservation and Management

### Status

Most breeding populations of Sandhill Crane are on the provincial *Blue List* in British Columbia; however, the Georgia Depression population is on the provincial *Red List*. The Greater Sandhill Crane (*G. canadensis tabida*) is considered *Not at Risk* in Canada (COSEWIC 2002). Other subspecies have not been assessed. (See Summary of ABI status in BC and adjacent jurisdictions at bottom of page.)

### Trends

#### Population trends

Breeding Bird Survey results for the period 1966 to 1999 indicate significant increases in Sandhill Crane populations in the United States (4.9%/yr) and in Canada (14.4%/yr) (Sauer et al. 2000). A review and synthesis of existing information supports these trends (Johnsgard 1983; Safina 1993). Drewien and Bizeau (1974) observed that the formerly abundant crane populations in the northern Rocky Mountain States were reduced to an estimated 188–250 pairs by 1944, but since that time, have increased substantially. A low 6.7% recruitment annual rate at Malheur NWR (caused primarily by coyote depredation) was probably responsible for a decline in breeding pairs from 236 in 1975 to 168 in 1989 (Littlefield 1995b). In California, a 52% increase in

breeding pairs of Greater Sandhill Crane has occurred between 1971 and 1988, whereas breeding pairs in Oregon remained stable (Littlefield et al. 1994). Lovvorn and Kirkpatrick (1981) reported a rapid increase in the eastern population of the Greater Sandhill Crane during the 1970s.

In British Columbia, population trend data are lacking, but most populations are likely stable (Fraser et al. 1999). The highest breeding densities appear to be in the Chilcotin region where recent aerial surveys found 18 nest sites in 4 days (Cooper 1996). Breeding waterbird surveys by Canadian Wildlife Service in the central Interior of British Columbia since 1987 suggest that crane populations in this area may be increasing (A. Breault, pers. comm.). Increased winter population levels in the Central Valley also suggest that populations of Greater Sandhill Cranes may be increasing in British Columbia (A. Breault, pers. comm.). The Fraser Lowland populations have declined significantly and are endangered (Gebauer 1995, 1999; Cooper 1996). South Okanagan populations have been extirpated (Cannings et al. 1987). An analysis of Breeding Bird Surveys in British Columbia for the period 1966 to 1999 did not reveal a significant trend in Sandhill Crane breeding populations (Sauer et al. 2000), however, sample sizes are likely too small to obtain significant results.

The Central Valley population of Greater Sandhill Crane (i.e., from British Columbia to California) is estimated to number between 6000 to 6800 birds (Pacific Flyway Council 1997). This population estimate is based on surveys of wintering Greater Sandhill Cranes in Oregon and northern California. Approximately half of the wintering population (i.e., between 2600 to 3400 cranes) may be breeding

Summary of ABI status in BC and adjacent jurisdictions (NatureServe Explorer 2002)

Population	BC	AK	AB	ID	MT	NWT	OR	WA	YK	Canada	Global
Georgia Depression	S1	–	–							N?	G5T1Q
All others	S3S4B, SZN	S5B	S4B	S5B,SZN	S2N, S5B	S?	S3B	S1B,S3N	S?	N5B	G5

in British Columbia. A target population of 7500 Greater Sandhill Cranes has been set by the Pacific Flyway Management Plan (Pacific Flyway Council 1997).

### **Habitat trends**

In most areas of the province, there have been few changes in habitat suitability or availability. Logging activities adjacent to breeding wetlands are likely the most important land use practice reducing habitat suitability in the province. In urbanized areas, such as the Burns Bog and Pitt Polder areas of the Lower Mainland, rapid urbanization and intensive agricultural regimes have reduce availability of isolated, relatively undisturbed habitats suitable for breeding.

### **Threats**

#### **Population threats**

At Malheur NWR in Oregon, 58 of 110 nests in one year were lost to depredation (Littlefield and Ryder 1968). At Malheur NWR in 1973 and 1974, coyotes were implicated as significant predators of eggs and chicks when only two young each year were known to fledge from 236 pairs of breeders (Littlefield 1975). Eight years of predator control at Malheur NWR resulted in a rebound in the number of breeding cranes by 1993 (Littlefield 1995a). In more heavily populated areas of the Lower Mainland, road mortality and nest depredation by coyotes may be factors. Dykes and roads have increased accessibility for predators such as coyotes at Burns Bog and Pitt Polder (Gebauer 1995) and cattle trails have improved access at Malheur NWR (Littlefield and Paulin 1990).

Collisions with power lines has been described as a major mortality factor for cranes in Colorado (Brown and Drewien 1995) and North Dakota (Faanes 1987), however, this is likely not a mortality factor in British Columbia. Lead poisoning has been reported as a mortality factor (Windingstad 1988; Franson and Hereford 1994), but again, this is likely not an important mortality factor in British Columbia, especially since the use of lead shot is gradually being phased out. Windingstad (1988) found that avian cholera, avian botulism, and

ingestion of mycotoxins (in waste peanuts) were the leading causes of non-hunting mortality in cranes. Hailstorms, lightning, and avian tuberculosis also killed cranes. Pesticides have generally not been implicated in eggshell thinning, reduced reproductive success, or mortality (Tacha et al. 1992).

Cold and wet spring conditions may also impact breeding success of Sandhill Cranes, as nests are susceptible to rising water levels (Littlefield et al. 1994). The Pacific Flyway Management Plan (Pacific Flyway Council 1997) identified poor recruitment as one of the major problems confronting the Central Valley population of Greater Sandhill Cranes.

### **Habitat threats**

In the Georgia Depression, populations have declined as spreading urbanization and intensive agriculture have encroached on wetlands. In other areas of the province, land use practices such as logging up to the edge of wetlands, draining of wetlands for agriculture, and trampling of emergent vegetation by livestock have resulted in loss of habitats (Cooper 1996). Preliminary investigations by Cooper (1996) suggest that wetlands with recent nearby clearcutting in the Chilcotin region are not used for nesting by cranes.

Littlefield and Paulin (1990) found that nesting success of cranes was lower on wetlands grazed by livestock than on ungrazed wetlands. A factor possibly causing this difference included the presence of livestock trails that improved access for mammalian predators.

Most suitable habitats (e.g., bogs and swamps) in the province are of low value for timber and agricultural purposes and are in remote areas with sparse human populations. Habitats in these areas are not currently threatened.

### **Legal Protection and Habitat Conservation**

The Sandhill Crane, its nests, and its eggs are protected in Canada and the United States under the federal *Migratory Birds Convention Act* and the provincial *Wildlife Act*. Sandhill Cranes are hunted

in other jurisdictions but are closed to hunting in British Columbia.

Several nesting areas are protected in Wildlife Management Areas (e.g., Pitt Polder, Bummers Flats in the East Kootenay) or in provincial parks (e.g., Naikoon Provincial Park, Queen Charlotte Islands) (Fraser et al. 1997). Some pairs likely nest in other parks such as Stum Lake and Tweedsmuir Provincial Park. A number of new provincial parks have been announced in the south Okanagan through the Okanagan-Shuswap Land and Resource Management Plan process. The White Lake Grasslands Park (3627 ha) protects a known migratory stopover point for Sandhill Cranes.

Under the results based code, the riparian management recommendations may provide adequate protection for some wetlands particularly larger wetlands and wetland complexes.

## Identified Wildlife Provisions

### Wildlife habitat area

#### Goals

Maintain wetlands and riparian habitats that provide breeding habitat for one or more pairs of breeding cranes that are not already protected or adequately managed through the riparian management recommendations. Protect traditional roost sites used in spring.

#### Feature

Priority for WHA establishment is for the Red-listed Georgia Depression population. Establish WHAs at wetlands not addressed under the *Riparian Management Areas Guidebook* and where breeding is known to occur.

### Size

The size of the WHA will vary depending on the size and isolation of the wetland but will generally be 20 ha (excluding wetland area). For primary migratory stopover points (e.g., Nig Creek, Kispiox Valley), a WHA should be up to 20 ha depending on particular habitat conditions of the site.

### Design

The key habitat requirements for cranes include water, nesting cover and feeding meadows (Littlefield and Ryder 1968). The WHA should include a core area and management zone. The core area should include the entire stand of emergent vegetation around the wetland plus 50 m. The management zone may be between 200–350 m depending on site-specific factors such as potential disturbances, existing tree density within management zone and characteristics of adjacent upland. Design management zone to maintain seclusion of wetland and minimize disturbance. Staging or roosting sites are generally in open areas with standing water and open fields.

### General wildlife measure

#### Goals

1. Maintain the structural integrity of emergent vegetation in and around nesting areas to provide cover and nesting habitat.
2. Maintain vegetated screen around breeding wetlands.
3. Minimize disturbance and access during the breeding season (1 April to 21 September).
4. Minimize human access to important staging areas during the migratory period (April and Sept./Oct.).
5. Restore historical water regimes to wetland areas that have been drained.



## Measures

### Access

- Do not develop any permanent roads within core area. Avoid road construction during the breeding season unless there is no other practicable option.
- Limit or reduce access during the breeding period and/or migration period by deactivating or gating roads.

### Harvesting and silviculture

- Do not harvest during the breeding season (15 April to 15 August). Consult MWLAP for site-specific times.
- Retain at least 40% of the dominant and codominant trees within core area.
- Retain as much of the understorey trees, shrubs, and herbaceous vegetation as is practicable.

### Pesticides

- Do not use pesticides.

### Range

- Plan grazing to ensure that the structural integrity of stands of emergent vegetation is maintained and nests are protected from trampling. Fencing may be required in some instances.
- Do not hay wet meadows until after 25 August to prevent mortality of young.
- Do not place livestock attractants within core area.

### Recreation

- Do not establish recreational facilities or trails.

## Additional Management Considerations

Where water control structures are in place, do not draw down water during the breeding season; encourage landowners to keep meadows wet through July.

Do not remove beaver (*Castor canadensis*) dams where dams flood areas being used by breeding cranes.

Avoid unnecessary draining of wetlands, and changes in livestock grazing regimes.

Avoid harvesting within 800 m of breeding wetlands during the breeding season. Limit access within 400 m during the breeding season and restrict recreational activities in and around habitats used for staging and breeding during periods of use by cranes.

Where possible, ensure suitable croplands (i.e., grain) are near habitats used by migratory and staging cranes.

Maintain intact shallow freshwater wetlands, and retain riparian forests adjacent to these wetlands.

Ditching and creation of compartments and impoundments in conjunction with some wetland management practices are detrimental to crane populations. Cooper (1996) recommends that: (1) structural integrity of wetlands is maintained; (2) water use permits are controlled; (3) buffer zones are established around nesting marshes; (4) building of dykes, roads, and other structures that increase flooding risk be avoided; and (5) incentives are provided to farmers and other land users to discourage draining, dyking, or filling of nesting meadows.

## Information Needs

1. Investigate the tolerance of Sandhill Cranes to logging adjacent to their wetland breeding habitats. Determination of an effective forested buffer strip is an important research question as is the effectiveness of current guidelines to protect riparian areas (e.g., *Riparian Management Area Guidelines*).
2. Concentrated inventory of potentially core breeding areas in the Chilcotin-Cariboo, Queen Charlotte Islands (e.g., Naikoon Provincial Park), northern Vancouver Island, and northeastern British Columbia using standardized methods are required to estimate breeding population size.
3. Determining the breeding range of the three subspecies in British Columbia would be of particular management interest for the Pacific Flyway Management Plan.

## Cross References

Nelson's Sharp-tailed Sparrow, Pacific Water Shrew

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