

Management Plan for the Buff-breasted Sandpiper (*Tryngites subruficollis*) in Canada

Buff-breasted Sandpiper



2022



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10 **Official version**

11 The official version of the recovery documents is the one published in PDF. All
12 hyperlinks were valid as of date of publication.

13
14 **Non-official version**

15 The non-official version of the recovery documents is published in HTML format and all
16 hyperlinks were valid as of date of publication.

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20 For copies of the management plan, or for additional information on species at risk,
21 including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC)
22 Status Reports, residence descriptions, action plans, and other related recovery
23 documents, please visit the [Species at Risk \(SAR\) Public Registry](#)¹.

24
25
26 **Cover illustration:** Buff-breasted Sandpiper at Seal River Estuary Important Bird Area
27 by © Christian Artuso

28
29 Également disponible en français sous le titre
30 « Plan de gestion du Bécasseau roussâtre (*Tryngites subruficollis*) au Canada »

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¹ www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html

41 Preface

42
43 The federal, provincial, and territorial government signatories under the [Accord for the](#)
44 [Protection of Species at Risk \(1996\)](#)² agreed to establish complementary legislation and
45 programs that provide for effective protection of species at risk throughout Canada.
46 Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent
47 ministers are responsible for the preparation of management plans for listed species of
48 special concern and are required to report on progress within five years after the
49 publication of the final document on the SAR Public Registry.

50
51 The Minister of Environment and Climate Change and Minister responsible for the Parks
52 Canada Agency is the competent minister under SARA for the Buff-breasted Sandpiper
53 and has prepared this management plan, as per section 65 of SARA. To the extent
54 possible, it has been prepared in cooperation with other federal government
55 departments, Provinces/Territories, Wildlife Management Boards, and Aboriginal
56 organizations as per section 66(1) of SARA.

57
58 Success in the conservation of this species depends on the commitment and
59 cooperation of many different constituencies that will be involved in implementing the
60 directions set out in this plan and will not be achieved by Environment and Climate
61 Change Canada and the Parks Canada Agency, or any other jurisdiction alone. All
62 Canadians are invited to join in supporting and implementing this plan for the benefit of
63 the Buff-breasted Sandpiper and Canadian society as a whole.

64
65 Implementation of this management plan is subject to appropriations, priorities, and
66 budgetary constraints of the participating jurisdictions and organizations.

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² www.canada.ca/en/environment-climate-change/services/species-risk-act-accord-funding.html#2

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The development of this management plan was largely informed by the Conservation Plan for the Buff-breasted Sandpiper (*Tryngites subruficollis*) published in 2010 by Richard Lanctot and colleagues. On October 23, 2019, experts met in Panama City, Panama to lay the groundwork for a full life-cycle conservation plan for the Buff-breasted Sandpiper. The Panama City workshop was an opportunity to align conservation targets and strategies between the Management Plan for the Buff-breasted Sandpiper (*Tryngites subruficollis*) in Canada and the full life-cycle conservation plan.

117 **Executive Summary**

118

119 The Buff-breasted Sandpiper (*Calidris subruficollis*, formerly *Tryngites subruficollis*) is
120 an arctic-breeding shorebird. The species nests on the upland coast of the Yukon,
121 Northwest Territories, Nunavut and Alaska before migrating along the Midcontinental
122 flyway to the coast of Argentina, Uruguay, and Brazil where birds stay during the boreal
123 winter.

124 The species was assessed as Special Concern by COSEWIC in 2012 and listed under
125 Schedule 1 of the *Species at Risk Act* in 2017. Globally, the IUCN Red List has
126 categorized the species as Near Threatened since 2004. As a long-distance migrant,
127 the Buff-breasted Sandpiper is protected under the *Migratory Birds Convention Act* in
128 Canada and the *Migratory Bird Treaty Act* in the United States.

129 The Buff-breasted Sandpiper population is estimated at 56,000 individuals (range:
130 35,000–78,000; Lanctot et al. 2010), 75% of which are thought to breed in Canada
131 (Donaldson et al. 2000). After massive declines during the early 1900s caused by
132 hunting in Canada and the United States, the species appears to be still declining today.
133 The scale of the decline is uncertain due to the challenges in surveying the species and
134 the current lack of data.

135 The exact causes of this decline are unknown. A combination of factors resulting in
136 habitat loss or poor habitat quality on the migratory and wintering grounds are likely
137 driving the decline. Those factors include conversion of natural areas to agriculture,
138 pesticide exposure, wind turbines, resource extraction, and climate change.

139 The management objective for the Buff-breasted Sandpiper is to maintain the
140 population size of the species over a period of 10 years ranging from 2026 to 2036. The
141 baseline for this management objective will be a more reliable and accurate population
142 estimate obtained within the next 5 years (2021–2026).

143 The broad strategies identified in this management plan aim to conserve habitat,
144 monitor the population and distribution of the species, and understand characteristics of
145 non-breeding habitats through research. Much of this habitat is outside of Canada, so
146 supporting international conservation and research efforts should play a key role in
147 Canada's conservation strategies for the species.

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1. COSEWIC* Species Assessment Information

Date of Assessment: May 2012

Common Name (population): Buff-breasted Sandpiper

Scientific Name: *Tryngites subruficollis***

COSEWIC Status: Special Concern

Reason for Designation:

The Canadian Arctic supports about 87% of the North American breeding range of this shorebird and about 75% of its global population. The species was once common and perhaps even abundant historically, but it suffered severe declines stemming from intensive market hunting in the late 1800s and early 1900s. By the 1920s, it was thought to be at the brink of extinction. Its population has grown since hunting was banned in North America, but numbers remain much lower than those before hunting began. There is evidence for population decline in recent decades, and many conservation organizations consider the species to be of concern throughout its range. However, this species is difficult to monitor effectively, and data necessary to estimate population trends are currently lacking. Outside the breeding period, loss and degradation of its specialized grassland habitat, both on its wintering grounds in South America and along its migration routes, are believed to pose the most significant threats.

Canadian Occurrence:

Yukon, Northwest Territories, Nunavut, British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec

COSEWIC Status History:

Designated Special Concern in May 2012.

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* COSEWIC (Committee on the Status of Endangered Wildlife in Canada)

** The scientific name of the Buff-breasted Sandpiper (*Calidris subruficollis*) changed in 2013 (Chesser et al. 2013), after COSEWIC assessment in May 2012. Documents developed under the *Species at Risk Act* (SARA) must follow the species nomenclature used in Schedule 1 of SARA.

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2. Species Status Information

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An estimated 75% of the global Buff-breasted Sandpiper population breeds in Canada (Donaldson et al. 2000). In Canada, the species was assessed as Special Concern by COSEWIC in 2012 and listed as Special Concern under Schedule 1 of the *Species at Risk Act* (S.C. 2002, c. 29) in 2017. The Buff-breasted Sandpiper is not listed under any provincial species at risk legislation. The species has been identified as a priority

191 species in four of the twelve Bird Conservation Regions³. A recently updated
 192 assessment of shorebirds in Canada deemed Buff-breasted Sandpiper to be of High
 193 Concern in Canada based on the probable decline and threats to the species (Hope
 194 et al. 2019).

195
 196 **Table 1. Summary of national and provincial or state NatureServe ranks for the**
 197 **Buff-breasted Sandpiper where it occurs in North America (NatureServe, 2019)**

Global (G) Rank	National (N) Ranks	Sub-national (S) Ranks
G4	<u>Canada</u> N2N4B, N4N5M	Alberta (S3M), British Columbia (SUM), Labrador (SNA), Manitoba (S1S2M), Newfoundland Island (SNA), Northwest Territories (S2S4B), Nunavut (S3B, S3M), Ontario (SNA), Quebec (S3M), Saskatchewan (S4M), Yukon (S1B)
	<u>United States</u> N4B	Alabama (SNRM), Alaska (S2B), Arkansas (SNA), California (SNA), Colorado (SNA), Connecticut (SNA), Delaware (SNA), Florida (S2M), Georgia (SNRN), Illinois (SNA), Indiana (S3M), Iowa (S3N), Kansas (SNA), Kentucky (SNA), Louisiana (S3M), Maine (SNA), Maryland (SNA), Massachusetts (S1N), Michigan (SNRN), Minnesota (SNRM), Mississippi (SNA), Missouri (SNA), Nebraska (S2N), New Jersey (S4N), New York (SNRN), North Carolina (SNA), North Dakota (SNA), Ohio (SNA), Oklahoma (S3M), Pennsylvania (S2M), Rhode Island (S1N), South Carolina (SNA), South Dakota (SNA), Tennessee (S3N), Texas (S2S3), Virginia (SNA), Washington (SNA), Wisconsin (S3N), Wyoming (S4N)

198 National (N) and Subnational (S) NatureServe alphanumerical ranking: 1 – Critically Imperiled,
 199 2 – Imperiled, 3 – Vulnerable, 4 – Apparently Secure, 5 – Secure, NR – Unranked, NA – Not Applicable,
 200 U – Unrankable. Occurrence definitions: B – Breeding, M – Migrant. The N2N4B range indicates the
 201 range of uncertainty about the status of the species.

202
 203 The global NatureServe rank is G4 – Apparently Secure (reviewed in 2016;
 204 NatureServe 2019; see Table 1 for additional sub-rankings) and the IUCN Red List has
 205 categorized the species as Near Threatened since 2004 when its status was upgraded
 206 from Lower Risk (BirdLife International 2017). The species was listed in 1999 in
 207 Appendix I and II of the UN Convention on the Conservation of Migratory Species of
 208 Wild Animals, which prohibits hunting of the species in its wintering range⁴. The
 209 Buff-breasted Sandpiper is also protected under the *Migratory Birds Convention Act*,
 210 1994 which protects all individuals of the species as well as its nest and eggs on federal
 211 and non-federal lands.

³ Those Bird Conservation Regions are the Arctic Plains and Mountains, the Lower Great Lakes/St. Lawrence Plain, the Prairie Potholes, and the Taiga Shield and Hudson Plains.

⁴ This document refers to the wintering range as the species' range occupied during the northern hemisphere's winter months (December to March).

212 The Buff-breasted Sandpiper is a Species of High Concern in the United States.
213 (USSCP, 2016). In South America, the species is considered Vulnerable in Brazil,
214 Threatened in Paraguay (Ministerio de Ambiente y Desarrollo Sostenible, 2019), a
215 Priority Species for Conservation in Uruguay, Threatened in Argentina, and Highly
216 Threatened in Colombia (Johnston-González et al. 2010).

217

218 **3. Species Information**

219

220 **3.1. Species Description**

221

222 The Buff-breasted Sandpiper is a medium-sized, buff-coloured (light brownish yellow),
223 arctic-breeding shorebird. Males weigh about 70 g and females weigh about 55 g
224 (McCarty et al. 2017). They are marked with dark brown spots or streaks along the
225 crown and sides of the breast, and narrow, teardrop shaped, dark-brown streaks edged
226 in buff along the feather shafts on their back, scapulars⁵, upper tail, and wing coverts⁶
227 (COSEWIC 2012). Male, female, and juvenile plumage is similar, but the dark spots on
228 the undersides of the outer primaries are larger in males than in females who have
229 larger spots than juveniles (McCarty et al. 2017). The species has yellow legs and a
230 black bill.

231

232 Buff-breasted Sandpipers are the only North American shorebird with an exploded lek⁷
233 mating system (Lanctot et al. 1998). In an exploded lek, males are further away from
234 one another than they would be in a classic lek. Because of density-dependent effects⁸
235 associated with its unusual lek-mating system, further reductions in the species'
236 abundance could accelerate population collapse if males and females cannot locate
237 each other in their expansive breeding grounds. However, at present, there is no
238 indication that genetic diversity declined as a result of historic reductions in population
239 size (Lounsberry et al. 2013, 2014).

240

241 **3.2. Species Population and Distribution**

242

243 *Distribution*

244 The Buff-breasted Sandpiper breeds in low densities in the tundra along the coastline of
245 Alaska and Canada from Point Barrow, Alaska through the Northwest Territories and to
246 the Boothia Peninsula, Nunavut and as far north as Melville, Bathurst, and Devon
247 Islands, Nunavut (Figure 1; COSEWIC 2012; McCarty et al. 2017). There are also small
248 populations (280-650 individuals) breeding in Russia on Wrangel Island and the

⁵ Scapulars are the feathers at the top of the wing when the bird is at rest.

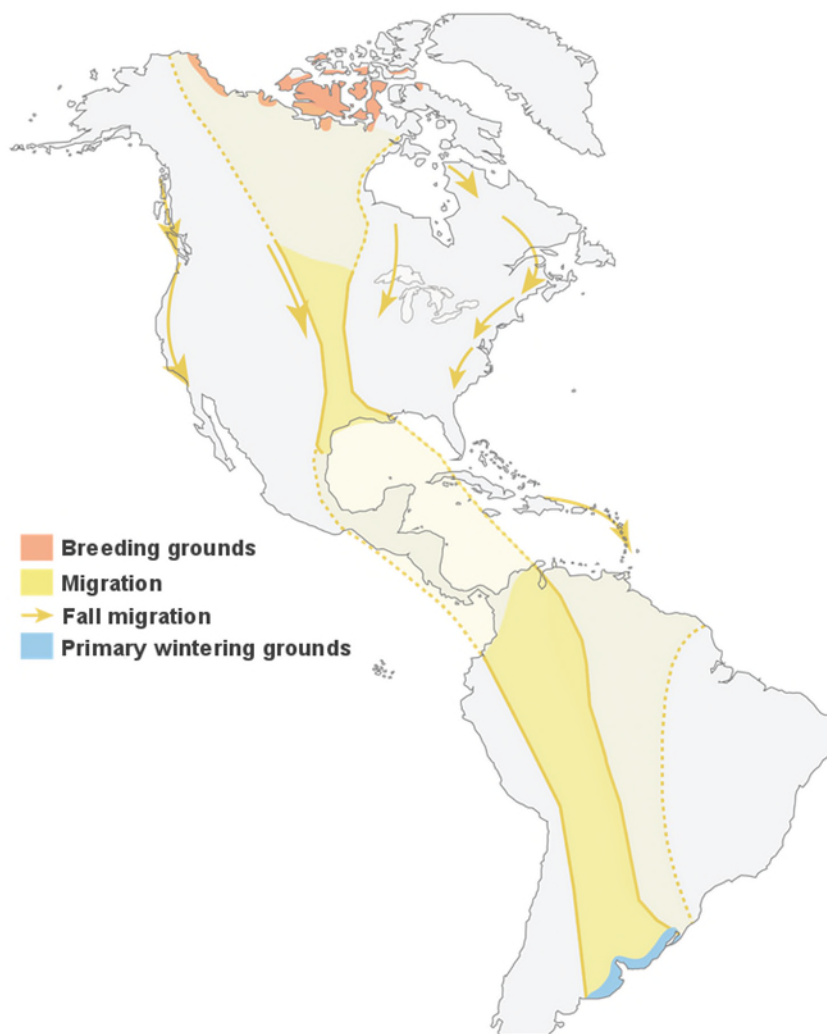
⁶ Wing coverts are the feathers that cover the wing's flight feathers.

⁷ A lek is an aggregation of male animals gathered to engage in competitive displays, lekking, to entice visiting females, which are surveying prospective partners to mate.

⁸ Density-dependent effects occur when a change in the size of a group influences, either positively or negatively, the conditions of habitat available for individual. For example, a lower number of Buff-breasted Sandpipers (lower density) might result in a decreased ability of individuals to find a mate in a given area, especially if the mating area is widespread.

249 Chukotski Peninsula (Lappo et al. 2012). The Buff-breasted Sandpiper breeds in low
250 densities; their local distribution is patchy and variable both between and within years—
251 one Alaskan study found only 10% of leks to be present in all three consecutive years of
252 the study (Lanctot and Weatherhead 1997). There is little to no breeding site fidelity
253 (less than 10% of adults return; Pruett-Jones 1988; Lanctot and Weatherhead 1997)
254 and males may display at multiple leks across the entire breeding range (Lanctot et al.
255 2016).

256 The Buff-breasted Sandpiper migrates south mainly following the Midcontinental flyway,
257 through the prairies and plains, where they make multiday stops in locations such as
258 southern Saskatchewan, in the Kansas Flint Hills, southcentral Texas and the Gulf of
259 Mexico coast in the United States (Lanctot et al. 2016; Lyons et al. 2019; Tibbitts et al.
260 2019). Some juveniles frequent the Atlantic coast during southbound migration, with
261 vagrant birds also migrating on the Pacific and Atlantic coasts (McCarty et al. 2017; see
262 Figure 1). Then, they follow the Midcontinental Amazonia/Pantanal flyway, stopping in
263 Bolivia and Paraguay (Lanctot et al. 2016; Tibbitts et al. 2019) before arriving on their
264 wintering grounds on the coast of central Argentina, southeast Uruguay, and southeast
265 Brazil (Lanctot et al. 2002; McCarty et al. 2017). The wintering grounds overlap with the
266 Southern Cone Grasslands, also known as the pampas. On their northbound migration,
267 birds stop in the Llanos plains of Colombia and Venezuela before crossing the Gulf of
268 Mexico. This region therefore represents an important stopover site on migration. Fall
269 and spring migrants take similar routes, but in the fall, juveniles migrating south may
270 follow the Atlantic and Pacific coasts leading to a more dispersed route in the fall than
271 spring (COSEWIC 2012). In contrast to the breeding grounds, birds show fairly high
272 wintering site fidelity (55% to 64% return rate), with males being somewhat more likely
273 to emigrate than females (Almeida 2009).



274
 275 **Figure 1. Distribution of the Buff-breasted Sandpiper in the Americas. Shaded yellow areas are**
 276 **migration corridors where the species is found at low densities; the species funnels through**
 277 **areas represented in dark yellow (from Cornell Lab - Birds of North America's Website, McCarty et**
 278 **al. 2017).**
 279

280 *Population Size and Trends*

281 Based on surveys done on stopover sites in the United States, the Buff-breasted
 282 Sandpiper population is estimated to include 56,000 individuals (range of 35,000 to
 283 78,000; Lanctot et al. 2010); earlier estimates were between 15,000 and 30,000
 284 (Morrison et al. 2006), but likely were underestimates (Lanctot et al. 2010). The current
 285 estimate of 56,000 individuals is based on counts in the Rainwater Basin, Nebraska, an
 286 important stopover location⁹ during northbound migration (Jorgensen et al. 2008). The
 287 uncertainty of the current population estimate depends on turnover rates estimated at
 288 stopover sites. Stopover duration at the Rainwater Basin is now known to be 48 hours

⁹ Lanctot et al. (2010) defined key conservation sites as areas where at least 0.2% of the population (about 100 birds) occur regularly through time.

289 or less (McCarty et al. 2015), suggesting actual population size may be higher than
290 previously estimated (Farmer and Durbian 2006). In addition, recent tracking data
291 suggests that some birds bypass the Rainwater Basin, again potentially increasing
292 population size estimates (R.B. Lanctot pers. comm. 2020). It should be noted that
293 surveys of Buff-breasted Sandpipers on wintering grounds do not cumulatively support
294 a population estimate of more than 50,000 birds. This suggests either a smaller
295 population than estimated at the Rainwater Basin, or the existence of unknown
296 wintering sites with large concentrations of birds (A.J. Lesterhuis, pers. comm. 2020;
297 see Appendix B for a summary of population estimates).

298
299 Arctic Program for Regional and International Shorebird Monitoring (PRISM) surveys
300 conducted between 1997 and 2007 across parts of Arctic Alaska yielded a population
301 size estimate of 42,839 individuals for the areas surveyed at that time (95% range =
302 5,856–79,260; Bart and Smith, 2012). PRISM surveys conducted on the breeding
303 grounds in Arctic Canada between 2010 and 2017 yielded much higher densities than
304 expected based on conventional assumptions of the species' distribution and
305 abundance. The population estimates arising from these surveys are many times larger
306 than the currently proposed range-wide estimate of 56,000 (Lanctot et al. 2010). At the
307 time of developing this management plan, these results are being carefully evaluated to
308 ensure that they are accurate (P.A. Smith, pers. comm. 2020). PRISM estimates for the
309 Buff-breasted Sandpiper present unique challenges because the species breeds at
310 highly variable densities, due to its lek mating system, and they inhabit dry upland areas
311 that are surveyed less intensively than the wetlands area used by many species
312 (Lanctot et al. 2010; COSEWIC 2012). These new PRISM analyses will provide
313 important information on abundance, distribution and habitat use for Buff-breasted
314 Sandpipers. Surveys such as the North American Breeding Bird Survey (BBS) and
315 Audubon Christmas Bird Count (CBC) provide very limited insight on this species.

316
317 Estimating trends is difficult because the species occurs in unpredictable locations on
318 the breeding grounds, and appears to adjust when, where and how long it uses sites on
319 both the migration and wintering grounds depending on environmental conditions
320 (Lanctot et al. 2010). Historically, the Buff-breasted Sandpiper numbered in the
321 hundreds of thousands. By the end of the 19th century, extensive commercial hunting
322 during migration, and to a lesser extent on the wintering grounds, resulted in population
323 numbers approaching dangerously low levels (McCarty et al. 2017; Lanctot et al. 2002,
324 2010). When the *Migratory Birds Convention Act* in 1917 and *Migratory Bird Treaty Act*
325 in 1918 came into force, hunting pressure on the population declined, likely slowing the
326 dramatic population decline (Lanctot et al. 2002, 2010; COSEWIC 2012).

327 Following hunting regulations, it is unknown whether the Buff-breasted Sandpiper
328 population recovered or remained at low levels between the 1920s and the 1970s.
329 The population is thought to have continued to decline in the recent decades (Lanctot
330 et al. 2002, 2010). Observers on the migratory and wintering grounds alike have
331 anecdotally reported declining numbers since at least the 1980s (Lanctot et al. 2002,
332 2010; COSEWIC 2012). For example, on the wintering grounds, there were 1,000 to
333 2,000 individuals during the winters of 1973 and 1974, with roosts of 600 to
334 1,000 individuals at Estancia Medaland, Argentina (Myers 1980). When the survey was

335 repeated in 1996–2000, there were rarely more than 100 birds sighted and never more
336 than 94 individuals together (although there was a flock of ~300 sighted outside the
337 study area) (Isacch and Martínez 2003a, 2003b). Estancia Medaland was declared a
338 Western Hemisphere Shorebird Reserve Network (WHSRN) site of Regional
339 Importance in 2018, in part based on counts of 1,010 Buff-breasted Sandpipers
340 recorded at the site in 2017 (Martínez-Curci et al. 2018). The extent to which birds move
341 between sites within a year is unknown but their numbers often vary substantially
342 between years and even within the season, so short-term studies should be interpreted
343 with caution (Myers 1980; Pruett-Jones 1988; Lanctot and Weatherhead 1997; Lanctot
344 et al. 2002, 2016; but see Almeida 2009).

345 **3.3. Needs of the Buff-breasted Sandpiper**

346 *Breeding*

347 The Buff-breasted Sandpiper is an upland species, preferring to breed on the drier,
348 elevated ridges of the tundra, rather than the wet, polygon lowlands as is common for
349 many other shorebirds. In the spring, males begin foraging and displaying on the first
350 snow-free areas, usually along bluffs and ridges bordering rivers (Pruett-Jones 1988;
351 Lanctot and Weatherhead 1997). As the snow melts, males display on leks in moist
352 graminoid meadow with many clumps of grasses (20 cm tall, 25-50 cm diameter;
353 Lanctot et al. 2010; COSEWIC 2012; McCarty et al. 2017). Display areas typically are
354 non-patterned ground, with few of the geometric patterns created by permafrost that are
355 common in many arctic areas. Buff-breasted Sandpipers have an exploded lek mating
356 system, with groups of 2-20 (average 2.6) males displaying together in a lek (Lanctot
357 and Weatherhead 1997). Males typically display at one lek for only a short time,
358 apparently moving between leks based on the number of available females (Lanctot and
359 Weatherhead 1997). This causes lek location to be unstable within and across years.
360 Solitary males may also display near the nest while females are fertile; this may be a
361 more reliable tactic later in the season when there are fewer available females (Prevett
362 and Barr 1976; Pruett-Jones 1988; but see Lanctot and Weatherhead 1997). Males
363 leave breeding grounds following the initiation of nesting by females (Sutton 1967;
364 Pitelka et al. 1974; McCarty et al. 2017).

365 Females nest away from lek sites (270-830 m; Pruett-Jones 1988), in well-drained
366 grassy tundra with sedge grass clumps or moss-willows or moist sedge–graminoid
367 meadows (Sutton 1967; Prevett and Barr 1976; Lanctot et al. 2010; McCarty et al.
368 2017). During incubation breaks, females forage in areas with little vegetation, often
369 along streams. They may also use habitats with a distinct net-like pattern across the
370 ground caused by permafrost freeze/thaw cycle. After their eggs hatch, females forage
371 with their brood in wetter areas, often along streams in emergent vegetation (Lanctot et
372 al. 2010). Unlike many other species, the Buff-breasted Sandpiper remains in the
373 uplands throughout brood rearing (McCarty et al. 2017).

374 *Migration*

375 Historically, during the North American portion of migration, Buff-breasted Sandpipers
376 would have congregated in the short-grass prairies, where fire and grazing bison kept

377 vegetation short (Jorgensen et al. 2007). These prairies are now largely taken over by
378 agriculture. Currently, migrating Buff-breasted Sandpipers congregate in surrogate
379 short-grass areas, like newly planted crops, pastures, plowed fields, sod farms, golf
380 courses, cemeteries, airports, freshly cut hayfields, lawns, and fallow or short-growth
381 agricultural fields (Lanctot et al. 2010; COSEWIC 2012; McCarty et al. 2017). The
382 species is attracted to “relatively moist” fields and, especially in drier year, to recently
383 watered fields (Lanctot et al. 2010 citing D. Newstead). In the Rainwater Basin,
384 Nebraska, an important stopover site, migrating birds congregate in corn or soybean
385 fields, with a strong preference for fields where soybean had been harvested on the
386 previous year (Jorgensen et al. 2007). Buff-breasted Sandpipers tend to use cornfields
387 where stalks are cut at the base and less than 10 cm in height (Jorgensen et al. 2007).
388 The birds spend about 50% of their time at migratory stopover sites foraging (McCarty
389 et al. 2009) and prefer the foraging site to be near (but not in) a wetland (Jorgensen et
390 al. 2007), which they use for bathing and drinking (McCarty et al. 2009). On the Gulf
391 Coast, staging Buff-breasted Sandpipers rely heavily on commercial sod and other
392 forms of agriculture to a lesser extent (Stone et al. 2019). In South America, migrating
393 Buff-breasted Sandpipers primarily use short-grass areas along rivers and wetlands.
394 They are also found in harvested or newly planted agricultural fields (particularly sugar
395 cane and rice), sand bars, or other short-grass habitats (Lanctot et al. 2002, 2010).

396 *Non-breeding*

397 Buff-breasted Sandpipers winter in the Pampas biome and show high fidelity to previous
398 wintering sites (Isacch and Martínez 2003b). As during migration, they prefer grasslands
399 where vegetation is 2 to 5 cm tall (Lanctot et al. 2002, 2004). Over winter, the birds rely
400 primarily on intensively grazed pastureland or areas with flooding events, high salinity,
401 and naturally short vegetation (Isacch and Martínez 2003b). Alternatively, the species
402 relies on soybean or rice agricultural fields (Lanctot et al. 2002, 2004). Habitat tracking
403 of wintering birds in the Samborombón Bay shows they rely on a combination of
404 Pampas grassland (day) and salt-tolerant coastal (night) areas in Argentina (Castresana
405 et al. 2019). In the Estancia Medaland, Buff-breasted Sandpipers move to freshwater
406 swamps at night (J.P. Isacch, pers. comm. 2019)

407 *Diet*

408 Buff-breasted Sandpipers feed on insects, with some seeds and plant material. They
409 also eat aquatic zooplankton, particularly during the fall after brood-rearing (McCarty
410 et al. 2017). Their exact diet is poorly documented and likely varies between sites.
411 However, on the wintering grounds, birds preferentially eat adult and larval beetles,
412 ants, flies, spiders and earthworms (Isacch et al. 2005). Although most other arctic
413 shorebirds eat worms, insect larvae, and marine zooplankton during brood rearing in the
414 wet lowlands, the Buff-breasted Sandpiper remains in the uplands throughout brood
415 rearing and therefore does not feed heavily on these aquatic invertebrates (McCarty
416 et al. 2017).

417 **4. Threats**

418
419 **4.1. Threat Assessment**

420
421 The Buff-breasted Sandpiper threat assessment is based on the IUCN-CMP (World Conservation Union–Conservation
422 Measures Partnership) unified threats classification system (Salafsky et al. 2008). This threat assessment was conducted
423 in June 2019. Threats are defined as the proximate activities or processes that have caused, are causing, or may cause in
424 the future the destruction, degradation, and/or impairment of the entity being assessed (population, species, community,
425 or ecosystem) in the area of interest (global, national, or subnational). Limiting factors are not considered during this
426 assessment process. Historical threats, indirect or cumulative effects of the threats, or any other relevant information that
427 would help understand the nature of the threats are presented in the Description of Threats section.

428
429 **Table 2.** Threat calculator assessment.

Threat #	Threat Description	Impact ^a	Scope ^b	Severity ^c	Timing ^d
1	Residential and commercial development	Negligible	Pervasive (71-100%)	Negligible (<1%)	High (Continuing)
1.1	Housing and urban areas	Negligible	Pervasive (71-100%)	Negligible (<1%)	High (Continuing)
1.3	Tourism and recreation areas	Unknown	Small (1-10%)	Unknown	High (Continuing)
2	Agriculture and aquaculture	Unknown	Pervasive (71-100%)	Unknown	High (Continuing)
2.1	Annual and perennial non-timber crops	Unknown	Pervasive (71-100%)	Unknown	High (Continuing)
2.2	Wood and pulp plantations	Not Calculated (outside assessment timeframe)	Negligible (<1%)	Negligible (<1%)	Low (Possibly in the long term, >10 yrs)
2.3	Livestock farming and ranching	Not a Threat	Large (31-70%)	Neutral or Potential Benefit	High (Continuing)
3	Energy production and mining	Medium-Low	Large - Restricted (11-70%)	Moderate (11-30%)	High (Continuing)
3.1	Oil and gas drilling	Low	Small (1-10%)	Slight (1-10%)	High (Continuing)
3.2	Mining and quarrying	Low	Small (1-10%)	Slight (1-10%)	High (Continuing)
3.3	Renewable energy	Medium - Low	Large - Restricted (11-70%)	Moderate (11-30%)	High (Continuing)
4	Transportation and service corridors	Negligible	Large - Restricted (11-70%)	Negligible (<1%)	High (Continuing)
4.2	Utility and service lines	Negligible	Large - Restricted (11-70%)	Negligible (<1%)	High (Continuing)

Threat #	Threat Description	Impact ^a	Scope ^b	Severity ^c	Timing ^d
5	Biological resource use	Negligible	Negligible (<1%)	Extreme (71-100%)	Moderate (Possibly in the short term, < 10 yrs)
5.1	Hunting and collecting terrestrial animals	Negligible	Negligible (<1%)	Extreme (71-100%)	High (Continuing)
7	Natural system modifications	Low	Pervasive-Large (31-100%)	Slight (1-10%)	High (Continuing)
7.1	Fire and fire suppression	Low	Pervasive - Large (31-100%)	Slight (1-10%)	High (Continuing)
7.2	Dams and water management/use	Negligible	Pervasive (71-100%)	Negligible (<1%)	High (Continuing)
7.3	Other ecosystem modifications	Unknown	Pervasive (71-100%)	Unknown	High (Continuing)
8	Invasive and problematic species, pathogens and genes	Negligible	Large (31-70%)	Negligible (<1%)	High (Continuing)
8.1	Invasive non-native/alien plants and animals	Negligible	Large (31-70%)	Negligible (<1%)	High (Continuing)
8.2	Problematic native plants and animals	Not a Threat	Restricted (11-30%)	Neutral or Potential Benefit	High (Continuing)
9	Pollution	Unknown	Pervasive (71-100%)	Unknown	High (Continuing)
9.3	Agricultural and forestry effluents	Unknown	Pervasive (71-100%)	Unknown	High (Continuing)
11	Climate change	Low	Pervasive (71-100%)	Slight (1-10%)	High (Continuing)
11.1	Ecosystem encroachment	Not Calculated (outside assessment timeframe)	Large (31-70%)	Unknown	Low (Possibly in the long term, >10 yrs)
11.4	Changes in precipitation and hydrological regimes	Unknown	Pervasive (71-100%)	Unknown	Moderate (Possibly in the short term, <10 yrs)
11.5	Severe / Extreme Weather Events	Low	Pervasive (71-100%)	Slight (1-10%)	High (Continuing)

430 ^a **Impact** – The degree to which a species is observed, inferred, or suspected to be directly or indirectly threatened in the area of interest. The
 431 impact of each threat is based on Severity and Scope rating and considers only present and future threats. Threat impact reflects a reduction of a
 432 species population or decline/degradation of the area of an ecosystem. The median rate of population reduction or area decline for each
 433 combination of scope and severity corresponds to the following classes of threat impact: Very High (75% declines), High (40%), Medium (15%),
 434 and Low (3%). Unknown: used when impact cannot be determined (e.g., if values for either scope or severity are unknown); Not Calculated:
 435 impact not calculated as threat is outside the assessment timeframe (e.g., timing is insignificant/negligible or low as threat is only considered to be
 436 in the past); Negligible: when scope or severity is negligible; Not a Threat: when severity is scored as neutral or potential benefit.

437 ^b **Scope** – Proportion of the species that can reasonably be expected to be affected by the threat within 10 years. Usually measured as a
 438 proportion of the species' population in the area of interest. (Pervasive = 71–100%; Large = 31–70%; Restricted = 11–30%; Small = 1–10%;
 439 Negligible < 1%).

440 ^c **Severity** – Within the scope, the level of damage to the species from the threat that can reasonably be expected to be affected by the threat
441 within a 10-year or three-generation timeframe. Usually measured as the degree of reduction of the species' population. (Extreme = 71–100%;
442 Serious = 31–70%; Moderate = 11–30%; Slight = 1–10%; Negligible < 1%; Neutral or Potential Benefit ≥ 0%).

443 ^d **Timing** – High = continuing; Moderate = only in the future (could happen in the short term [< 10 years or 3 generations]) or now suspended
444 (could come back in the short term); Low = only in the future (could happen in the long term) or now suspended (could come back in the long
445 term); Insignificant/Negligible = only in the past and unlikely to return, or no direct effect but limiting.

4.2. Description of Threats

The exact causes of the decline of Buff-breasted Sandpipers are unknown. Multiple factors likely reduce the suitability or availability of stopover and wintering sites, including fire suppression, resource extraction, conversion of short-grass prairies to agricultural land, and pesticide contamination. Habitat loss as a result of these factors likely are the most immediate threat to the species. Habitat loss from wind farm encroachment and direct mortality from collisions with wind turbines at important stopover and wintering sites are significant threats to the Buff-breasted Sandpiper. A large proportion of the population is exposed to threats occurring on the Midcontinental flyway as the species uses this narrow migration corridor in spring and fall. Most of the threats to the species, and their underlying factors, are ongoing. The species faces few threats on its breeding grounds, but an expansion of industrial activities in the Arctic could cumulatively result in impacts on the species. In the coming years, climate change will likely play a larger role in the decline of the species. Threats likely to affect the species within the next ten years are described below from highest to lowest impact and certainty (Table 4).

IUCN-CMP Threat 3.3 Renewable energy (Medium to Low Impact)

The development of wind farms is thought to have a medium to low impact on Buff-breasted Sandpipers, though there is uncertainty in both the scope and severity of this threat. Wind farms may kill birds if they enter the rotor sweep zone or cause birds to avoid historic staging areas (Lanctot et al. 2010). Pre-construction surveys in Indiana found that more than 20% of staging American Golden-Plovers (*Pluvialis dominica*), who often migrate with Buff-breasted Sandpipers, flew in the proposed rotor sweep zone (West Inc., unpublished report, described in Lanctot et al. 2010). Wind energy production has grown substantially in Canada and the United States with more growth projected (Statistics Canada 2017; U.S. Energy Information Administration 2019). Most wind farms in the United States are located along the Midcontinental flyway, where birds migrate both in the fall and in spring. This biannual use of the migration corridor increases the risk of negative interaction with wind farms. In Canada, wind energy installations are mostly found outside of the Buff-breasted Sandpiper's breeding and migration ranges (Canadian Wind Energy Association 2019). There are at least 10 wind farms in development in southern Alberta (Dowdell and Patel 2020), but they also seem to be outside of the main migration corridor (McCarty et al. 2015, 2017). However, northern regions and the Prairies show high wind energy potential (Canadian Geographic Enterprises 2009). Extensive windfarm development is projected in the grassland and coastal areas of Brazil, Uruguay and Argentina. As of 2018, the Global Wind Energy Council ranks Brazil as having the 8th largest wind power capacity in the world and the largest in South America, while Uruguay has the 3rd largest capacity in South America. In Brazil, ongoing windfarm development overlaps with important wintering areas for Buff-breasted Sandpipers, where flocks of 200 to 300 birds have been reported (J.B. Almeida, pers. comm. 2019).

488 *IUCN-CMP Threat 7.1 Fire and fire suppression (Low Impact)*

489 Buff-breasted Sandpipers seem to prefer grassland that has been recently burned
490 (Penner et al. 2015). The species may have benefitted from indigenous people's
491 practices of burning the grasslands in the Midwestern United States and on the
492 wintering grounds (R.B. Lanctot pers. comm. 2019a). Current fire suppression allows
493 woody vegetation to encroach into grasslands, reducing habitat availability (Brockway
494 et al. 2002), particularly as this species prefers areas without nearby trees or other
495 obstructions (Jorgensen et al. 2007). In the Kansas' Flint Hills, new management
496 techniques are starting to use fire for prairie conservation. Fire suppression was
497 deemed to have a low impact on Buff-breasted Sandpipers.

498 *IUCN-CMP Threat 11.5 Severe weather events (Low Impact)*

499 Because of climate change, severe storms are increasing, and this increase is linked to
500 declines in songbirds, particularly those that migrate over the Atlantic, as they cannot
501 seek shelter (Butler 2000). Buff-breasted Sandpipers' migration across the Gulf of
502 Mexico may become increasingly perilous. Similarly, juvenile mortality may increase
503 with storm number and severity. Unlike adults, juveniles often migrate along the Atlantic
504 Coast (Lanctot et al. 2010) and are therefore more likely to encounter storms or
505 hurricanes. On the breeding grounds, extreme weather may cause nest failure, but
506 losses to nests and chicks have not yet been studied in detail (J. Rausch, pers. comm.
507 2019). Overall, the impact of severe weather events is likely low.

508 *IUCN-CMP Threat 3.1 Oil and gas drilling (Low Impact)*

509 Buff-breasted Sandpipers have been documented breeding in the National Petroleum
510 Reserve, Kuparuk and Prudhoe Bay oil fields and the Arctic National Wildlife Refuge in
511 Alaska, where oil and gas drilling is either already occurring or proposed (Lanctot et al.
512 2010). The infrastructure associated with arctic oil and gas projects (e.g. roads,
513 runways, buildings) is usually built in the drier upland areas where Buff-breasted
514 Sandpiper males display. Building in these areas may lead to habitat loss and
515 disturbance during the breeding season, possibly causing females to abandon nests if
516 they are repeatedly flushed, or to increased predator numbers due to the presence of
517 artificial food sources.

518 Since 2007, oil drilling, particularly horizontal drilling and hydraulic fracturing (fracking)
519 has increased across the prairies in both Canada and the United States (National
520 Energy Board 2013). Horizontal drilling may reduce the amount of land affected by oil
521 and gas development. Many grassland species avoid these sites and their surroundings
522 to varying degrees (Thompson et al. 2015). On the wintering grounds, Colombian
523 grasslands are seeing an increase in habitat loss due to drilling (C. Ruiz-Guerra, pers.
524 comm. 2019). Given the limited extent of oil and gas development, their impact is likely
525 low.

526 *IUCN-CMP Threat 3.2 Mining and quarrying (Low Impact)*

527 As with oil and gas drilling, infrastructure associated with arctic mines (e.g. roads,
528 runways, buildings) is usually built on the drier upland areas where Buff-breasted

529 Sandpipers display and occasionally nest. There has been increased mining in Brazil on
530 the wintering grounds (COSEWIC 2012), but biologists negotiated the movement of an
531 8,000-hectare mine project south of Lagoa do Peixe away from Buff-breasted Sandpiper
532 habitats (Lanctot et al. 2010). Similar to oil and gas development, the limited footprint of
533 mining and quarrying resulted in this threat's low impact score.

534 *IUCN-CMP Threat 7.3 Other ecosystem modifications (Unknown Impact)*

535 Buff-breasted Sandpipers may be exposed to a wide array of pesticides because they
536 rely on agricultural habitat when migrating and during the winter (Strum et al. 2008,
537 2010). Although attractive to the Buff-breasted Sandpiper because of their physical
538 characteristics, surrogate short-grass habitat with intensive pesticides use could
539 represent ecological traps for the species from direct or indirect contamination (Lanctot
540 et al. 2010). Direct effects of pesticides are discussed under "Description of Threats:
541 9.3 Agricultural and forestry effluents". Insect abundance is also likely lower on cropland
542 that has been treated with insecticides, reducing food availability for insectivorous birds,
543 including this species (Hart et al. 2006; Bellavance et al. 2018). Poor insect abundance
544 in these areas may reduce survival because Buff-breasted Sandpipers rely heavily on
545 those insects to provide energy for migration. The impact on the population is unknown.

546 *IUCN-CMP Threat 9.3 Agricultural and forestry effluents (Unknown Impact)*

547 The Buff-breasted Sandpiper may be exposed to pesticides during migration and the
548 wintering period because they rely mainly on human-altered habitat (such as cropland,
549 sod fields and golf courses) sprayed with pesticides. Carbamate insecticides like
550 Furadan F4 have been linked to Buff-breasted Sandpiper mortality during migration
551 (Flickinger et al. 1986; Lanctot et al. 2010). Buff-breasted Sandpipers wintering in rice
552 fields and cattle pastures in Argentina and Uruguay have shown evidence of being
553 exposed to contaminants that altered the birds' nervous system (Strum et al. 2010).
554 Effects of the increasing use of neonicotinoid, the most widely used insecticide known to
555 be highly detrimental for seed eating birds (Goulson 2013, Gibbons et al. 2015), remain
556 undocumented for the Buff-breasted Sandpiper (McCarthy et al. 2017). Since 2016,
557 Brazil has approved the usage of more than 1200 pesticides, many of which are banned
558 elsewhere, which creates a concern of further negative effects on the species. Because
559 of the species' habitat use, a large proportion of the Buff-breasted Sandpiper population
560 might be exposed to pesticides and contaminants; however, population effects have not
561 been quantified. The overall impact of agricultural contaminants on the Buff-breasted
562 Sandpiper population is unknown, but likely is significant and in need of study.

563 *IUCN-CMP Threat 2.1 Annual and perennial non-timber crops (Unknown Impact)*

564 Most of the native, short-grass prairie historically used as stopover habitat has been
565 converted to agricultural fields, resulting in a profound loss of natural stopover habitat.
566 Short-grass prairies managed under cattle grazing provide suitable habitat for
567 Buff-breasted Sandpipers, but those areas are increasingly converted to agricultural
568 cropland. Conversion to agricultural cropland across Canada, the United States and
569 Mexico is ongoing, driven by the need to feed growing human populations, demands for
570 biofuel, and increasing crop irrigation in traditionally dry areas as electricity becomes

571 available ([Meeting of the Canada/Mexico/United States Trilateral Committee for Wildlife](#)
572 [and Ecosystem Conservation and Management 2019; Agenda item 24](#)). Similar
573 agricultural expansions are happening in South America in both migratory and wintering
574 habitat. Farmers are converting traditional rangeland into cropland in fertile areas
575 (Lanctot et al. 2010). Important migratory stopovers during northern migration in the
576 savannahs of Los Llanos, Colombia (Lanctot et al. 2016) have rapidly been converted
577 for palm oil and rice cultivation since 2000 (Romero-Ruiz et al. 2011). Illegal drainage
578 canals to irrigate rice and drain areas for cultivation threaten Brazilian wintering habitat
579 around coastal lagoons (Lanctot et al. 2010).

580 Because there is little unaltered short-grass habitat, Buff-breasted Sandpipers have
581 adopted some types of croplands as alternative habitat during migration and over the
582 winter. It is unclear whether agricultural areas are high-quality substitutes—there may
583 simply be no natural habitat available. Some types of fields are preferable to others
584 (e.g., soy is preferable to corn; Jorgensen et al. 2007). In Saskatchewan and Manitoba,
585 two important staging areas during northern migration (Tibbitts et al. 2019), pasture land
586 has decreased between 2011 and 2016 by 5% and 7%, respectively (Statistics Canada
587 2020). The increased agricultural production discussed above may provide habitat,
588 depending on which crops are planted. Some agricultural practices, increasingly used
589 for other conservation purposes, may be at odds with Buff-breasted Sandpiper
590 conservation (e.g., no-till agriculture conserves soil and water but may reduce insect
591 abundance in fields; Lanctot et al. 2010). No-till agriculture and monocultures, such as
592 sod fields, require increased chemical application, discussed under *7.3 Other*
593 *ecosystem modifications*. Since the conversion of native areas to cropland both
594 destroys traditional habitat and creates an alternative—albeit likely inferior—habitat, the
595 overall impacts of non-timber crops are unknown.

596 *IUCN-CMP Threat 11.4 Changes in precipitation and hydrological regimes (Unknown*
597 *Impact)*

598 Conditions on the breeding ground may get drier as precipitation regimes shift,
599 permafrost thaws, and drainage increases (Hinzman et al. 2005), which may change the
600 insect prey available to Buff-breasted Sandpipers. Along the migratory route, more
601 frequent severe droughts are predicted in the Great Plains, which will reduce wetland
602 habitat (Johnson et al. 2005). These areas are currently used by Buff-breasted
603 Sandpipers for resting and maintenance (McCarty et al. 2009). However, the large,
604 shallow lakes in the Parkland regions of Alberta (such as Beaverhill Lake and North
605 Cooking Lake) have been at extremely low water levels since the late 1990s (G. Court,
606 pers. comm. 2020). Those historical staging areas for Buff-breasted Sandpipers are
607 now used less frequently by the species (G. Court, pers. comm. 2020). Increasing
608 precipitation in the wintering range may contribute to flooding and displacement (Nuñez
609 et al. 2008). Important sites for the species, such as Asuncion Bay and Estancia
610 Medaland, are regularly flooded, which temporarily reduces the amount of available
611 habitat locally, yet overall effects on the wintering population are unknown
612 (A. Lesterhuis, pers. comm. 2019). It is ultimately unknown how changing precipitation
613 regimes will impact Buff-breasted Sandpiper populations.

614 *IUCN-CMP Threat 1.3 Tourism and recreational areas (Unknown Impact)*

615 Because this species prefers short grass habitat, birds use airports, golf courses, and
616 other large landscaped areas during their migration as short-term resting sites (Lanctot
617 et al. 2010; COSEWIC 2012; McCarty et al. 2017). These sites may represent poor
618 habitat—golf courses use large amounts of pesticides, and airport managers harass
619 birds to prevent bird strikes on planes (R.B. Lanctot pers. comm. 2019a). Those
620 surrogate habitats may be attractive to the species, but could result in poor foraging
621 conditions compared to natural habitat. The impact of tourism and recreation is
622 unknown.

623 *IUCN-CMP Threat 7.2 Dams & water management/use (Negligible Impact)*

624 Ground water pumping and surface drainage can result in drier fields, reducing the
625 suitability of short-grass habitat for Buff-breasted Sandpipers. Surface and ground water
626 management is a common practice in agricultural fields to optimize crop production.
627 Those practices likely influence the suitability of a large portion of the Buff-breasted
628 Sandpiper's non-breeding range, given that the species relies almost exclusively on
629 crops as stopover and wintering sites. The impact of dams and water management has
630 been considered as negligible for the species. This impact score could be revised
631 following further investigation on the permanent effects of drainage on the species'
632 habitat.

633 *IUCN-CMP Threat 1.1 Housing and urban areas (Negligible Impact)*

634 While the North American prairies that the Buff-breasted Sandpiper historically relied on
635 during migration have overwhelmingly been converted for agricultural use (Gauthier and
636 Wiken 2003), housing and urban areas expansion has likely been negligible. Evidence
637 from Nebraska suggests that while migrating the species prefers areas without
638 obstructions, such as buildings, trees, and other structures associated with human
639 settlements (Jorgensen et al. 2007). On the wintering grounds, the species is no longer
640 found surrounding Buenos Aires, Argentina after heavy urban development and habitat
641 destruction (Lanctot et al. 2002). The impact of this threat has been deemed negligible.

642 *IUCN-CMP Threat 8.1 Invasive non-native/alien plants and animals (Negligible Impact)*

643 Non-native plant species may spread into the remaining native grassland. This is
644 particularly true given that the Prairie Farm Rehabilitation Administration's Community
645 Pasture Program ended in 2012 and federally managed grassland was returned to the
646 provinces by 2018, decreasing resources for pasture management in Canada. Fire
647 suppression may also contribute to the spread of non-native plants that are not as
648 fire-resistant as their native competitors (Brockway et al. 2002). Finally, grasslands on
649 the wintering grounds are often modified by planting non-native grasses that can
650 increase forage levels for livestock (R.B. Lanctot pers. comm. 2019b). It is unclear
651 whether this modification will affect the use of the areas by Buff-breasted Sandpipers.
652 On wintering grounds, feral pigs alter vegetation where the Buff-breasted Sandpiper
653 occurs, but effects on the species have not been assessed. Despite the potential

654 negative effects, non-native species invasion poses a negligible threat to the Buff-
655 breasted Sandpiper.

656 *IUCN-CMP Threat 4.2 Utility and service lines (Negligible Impact)*

657 Although there have been instances where Buff-breasted Sandpipers collide with
658 powerlines, generally the species seems to coexist with powerlines without population-
659 level impacts, so the impact has been deemed negligible (Lanctot et al. 2010).

660 *IUCN-CMP Threat 5.1 Hunting and collection of terrestrial animals (Negligible Impact)*

661 Though historically commercial hunting was prevalent in North America, Buff-breasted
662 Sandpipers have been protected under the *Migratory Birds Convention Act* in Canada
663 and the *Migratory Bird Treaty Act* in the United States since 1917 and 1918,
664 respectively. The species is listed in Appendix I and II of the UN Convention on the
665 Conservation of Migratory Species of Wild Animals, which prohibits hunting of the
666 species in its wintering range. Presently, there is little risk of hunting throughout their
667 range. Small amounts of legal and illegal shorebird harvesting do occur in parts of Latin
668 America (the Guianas, the Caribbean, along the northern coast of South America, and
669 potentially other areas) but these areas are not along the main migratory route (Wege et
670 al. 2014). Currently, it is estimated that no more than 1371 +/- 282 Buff-breasted
671 Sandpipers could be sustainably harvested annually (Watts et al. 2015). This level of
672 hunting is unlikely to be occurring and hunting was deemed a negligible threat to the
673 population.

674 *IUCN-CMP Threat 11.1 Ecosystem encroachment (Outside of Assessment Timeframe)*

675 Buff-breasted Sandpipers are expected to lose about 50% of their potential suitable
676 breeding habitat by 2070 because of climate change (Wauchope et al. 2017). Warming
677 is allowing shrub growth to expand northward across the tundra (Sturm et al. 2001).
678 Melting permafrost may affect the shallow tundra wetlands, preferred for foraging.
679 Coastal erosion has accelerated as the permafrost melts and there are more ice-free
680 days with heavy wave action, even flooding some freshwater areas with saltwater
681 (Jones et al. 2009). Rising sea levels may also flood breeding sites and salinize
682 freshwater wetlands used for foraging (Lanctot et al. 2010). Buff-breasted Sandpipers
683 have low breeding site fidelity and ample breeding habitat, providing them some
684 flexibility in adjusting where they breed (Lanctot et al. 2016). Thus, the species may be
685 able to cope with changes in the near term but may struggle if habitat becomes more
686 limiting.

687 Additionally, in response to earlier spring thaws in the Arctic, the arthropods that
688 shorebirds feed on are emerging earlier. Some other shorebirds are responding to these
689 changes by breeding earlier. However, many species are no longer able to synchronize
690 the hatching of their eggs with peak insect emergence (i.e., phenological mismatch is
691 occurring; McKinnon et al. 2012; Tulp and Schekkerman 2008). It is unknown whether
692 Buff-breasted Sandpipers are able to adjust to these changes.

693 Climate change is projected to shift the location of suitable migratory stopover habitat
694 along the Midcontinental flyway (Wauchope et al. 2017).

695 Most Buff-breasted Sandpiper wintering habitat is coastal and could be flooded as a
696 result of the projected rise in sea levels. The species may be forced to move inland to
697 hillier, drier habitats or agricultural areas, which long-term suitability have not been
698 assessed. While the impact of ecosystem encroachment was not calculated because
699 these impacts are outside the timeframe of the threat assessment, rising sea levels on
700 the wintering ground may pose the largest threat to the species.

701 *IUCN-CMP Threat 2.2 Wood and pulp plantations (Outside of Assessment Timeframe)*

702 In Brazil, and to a lesser extent Argentina, tree plantations may affect Buff-breasted
703 Sandpipers wintering habitat. Ten percent of the grasslands in Rio Grande do Sul,
704 Brazil have been converted to pine, eucalyptus, and acacias plantations (Gautreau and
705 Vélez 2011), though much of this grassland is not coastal. These plantations are
706 avoided by Buff-breasted Sandpipers (Dias et al. 2013). Pine plantations are particularly
707 concerning because their seeds may disperse into adjacent grassland habitat, altering
708 even greater areas than the plantations themselves, and ecological restoration is
709 challenging (Simberloff et al. 2010; Lanctot et al. 2010). In fact, invasions of non-native
710 pines into native habitat have already occurred around the world, resulting in varying
711 degrees of habitat loss (Simberloff et al. 2010). This threat's impact is negligible to the
712 species. This impact score could be revised following further investigation on the
713 species' range overlap with tree plantation areas.

714 *IUCN-CMP Threat 8.2 Problematic native plants and animals (Not a Threat)*

715 Expanding Snow Goose (*Anser caerulescens*) populations cause habitat degradation in
716 agricultural fields in Saskatchewan and to a lesser extent Manitoba and Alberta where
717 geese grub for food on migratory staging grounds (Mowbray et al. 2000). Since Snow
718 Geese stage in Saskatchewan earlier than the Buff-breasted Sandpiper in the spring
719 and later in the fall, Snow Geese are not expected to impact Buff-breasted Sandpipers
720 on migration (Mowbray et al. 2000; McCarty et al. 2017). Grubbing may even be
721 beneficial if it exposes soil and invertebrates for Buff-breasted Sandpiper foraging
722 (C. Artuso, pers. comm. 2019). In two studies performed on the breeding grounds, the
723 presence of goose colonies were shown to increase predation risk to nesting
724 shorebirds; however, Buff-breasted Sandpipers were not specifically included in these
725 studies (Lamarre et al. 2017; Flemming et al. 2019).

726 Nest predators such as the Arctic Fox (*Vulpes lagopus*) and the Red Fox (*V. vulpes*),
727 whose range's has expanded northward over the last decades (Stickney et al. 2014,
728 Elmhagen et al. 2017), are expected to have a higher impact on nest survival through
729 changes in distribution, increased densities, and adapted behavior (Kubelka et al.
730 2018). Oil and gas development is thought to increase the number of avian and
731 mammalian predators due to the presence of artificial food sources and additional
732 denning and nesting sites. However, according to two studies, there is no evidence that
733 the infrastructure reduces nest survival of shorebirds as a group, although both studies
734 included only a small number of Buff-breasted Sandpiper nests (10 and 3, respectively;
735 Liebezeit et al. 2009; Bentzen et al. 2017). In general, predation risk has increased
736 over the last 70 years in the Northern Hemisphere, especially in the Arctic (Kubelka

737 et al. 2018). Problematic native plants and animals are deemed not a threat to this
738 species.

739 *IUCN-CMP Threat 2.3 Livestock farming and ranching (Not a Threat)*

740 Buff-breasted Sandpipers extensively use tame pastures during the winter and, to a
741 lesser extent, during migration (Lanctot et al. 2004; Jorgensen et al. 2007; Isacch and
742 Cardoni 2011; Aldabe et al. 2019). Tame pastures might provide similar amount of food
743 as in natural grasslands if grazing conditions are similar, and therefore adequate
744 wintering and stopover habitat. Pastures with suboptimal grazing conditions for the
745 species might still be used, as those may simply be the dominant habitat in the area.
746 Though this species prefers to forage in overgrazed areas, grazing to that intensity
747 year-round might be detrimental to the soil (Lanctot et al. 2004; Aldabe et al. 2019) and
748 can degrade the quality of the forage and increase erosion (Bement 1969, Cingolani et
749 al. 2005). Instead, Buff-breasted Sandpipers may benefit from seasonal rotations in
750 grazing intensity that maintain vegetation height from 2 to 5 cm while birds are present
751 (Isacch and Cardoni 2011; Aldabe et al. 2019). In Canada, the Prairie Farm
752 Rehabilitation Administration's Community Pasture Program ended in 2012, and
753 federally managed grassland was returned to the provinces by 2018. This may lead to
754 overgrazing, soil erosion, and damage in some areas where Buff-breasted Sandpipers
755 stopover depending on how the areas are managed going forward. On the balance,
756 livestock farming and ranching are not a threat to Buff-breasted Sandpipers.

757

758 **5. Management Objective**

759 The management objective for the Buff-breasted Sandpiper is to maintain the
760 population size of the species over a period of 10 years ranging from 2025 to 2035
761 using new stopover sites estimates provided by 2025.

762 Accounts of historical population sizes are limited and the trend of the population is
763 unknown. The species is difficult to survey given its sparse distribution on breeding
764 grounds and the difficulty to detect individuals in the field. Surveys at key stopover
765 areas currently provide the most reliable estimates of population size and will contribute
766 in measuring progress towards the management objective. A tracking study revealed
767 that the Flint Hills, located in Oklahoma and Kansas, and the Texas Gulf Coast are the
768 two main stopover areas for the Buff-breasted Sandpiper in the U. S., the latter likely
769 being the most important (Lanctot et al. 2016). From 2016 to 2019, the United States
770 Fish and Wildlife Service (USFWS), the United States Geological Survey (USGS), and
771 the University of Nebraska Omaha, working with citizen scientists, conducted spring
772 ground surveys for the Buff-breasted Sandpiper on the Texas Gulf Coast. Those
773 surveys will yield a more reliable population estimate¹⁰ for the species, which should be
774 available by 2026, and will provide a baseline for the long-term management objective.

¹⁰ The current estimates did not take turnover rates into account, which are known to be relatively high (see *Population Size and Trends* in section 3.2). This could lead to an underestimation of the population count. New estimates are expected to be more reliable as specific effort was put in assessing turnover rates at the Texas stopover sites through radio-tracking of individuals.

775 Progress towards meeting the management objective will be evaluated as new
776 population estimates become available.

777 The Buff-breasted Sandpiper was designated as Special Concern because of ongoing
778 threats related to habitat loss and degradation on the non-breeding grounds (COSEWIC
779 2012). Since hunting of the species was banned in North America in the early 1900s, its
780 population has grown, but numbers remain much lower than they were before hunting
781 began. The Buff-breasted Sandpiper population appears to be limited by the availability
782 of habitat on migration and non-breeding areas. Hence, the long-term management
783 objective will be achieved by ensuring a no net loss of suitable sites at the landscape
784 level on migration and wintering grounds. Considering the extent of non-breeding
785 habitat found outside Canada, achieving this goal will only be possible through strong
786 collaboration with Canada's international partners.

787 The United States Conservation Plan for the Buff-breasted Sandpiper sets the goal to
788 increase the population by more than 90% to at least 100,000 individuals (Lanctot et al.
789 2010). This goal aims to build resiliency in the population of the species to offset future
790 threats (Lanctot et al. 2010). In contrast, this management plan's objective seeks to
791 address the risk of the species to become endangered or threatened, which led
792 COSEWIC to assign a Special Concern status to the Buff-breasted Sandpiper.

793

794 **6. Broad Strategies and Conservation Measures**

795 **6.1. Actions Already Completed or Currently Underway**

796 In Canada, there has been little conservation work specifically targeting the
797 Buff-breasted Sandpiper. The following list is not exhaustive, but is meant to illustrate
798 the main areas where work has been completed or is already underway, to give context
799 to the broad strategies outlined in section 6.3. Actions completed or underway include
800 the following:

- 801 • Broad-scale initiatives which benefit the conservation and management of the
802 species:
 - 803 • The Buff-breasted Sandpiper is one of the focal species for the Americas Flyway
804 Action Plan of the Arctic Migratory Birds Initiative (AMBI). This designation
805 focuses efforts at understanding the factors limiting this species and ways to
806 improve its conservation throughout the flyway (CAFF 2019).
 - 807 • The USFWS is leading work, with contribution from the Canadian Wildlife Service
808 (CWS), to update the full life-cycle conservation plan for the Buff-breasted
809 Sandpiper.
 - 810 • Many organizations and programs provide financial incentives to farmers and
811 ranchers for conserving or restoring grassland and wetland habitats along the
812 migratory route. Examples include the United States and Canada Joint Ventures,
813 MultiSAR in Alberta, South of the Divide Conservation Action Program, the
814 United States Department of Agriculture's Conservation Reserve Program, and
815 the Sustainable Grazing Network in Mexico.

- 816 • Research identifying key breeding, stopover, and wintering locations using
817 satellite and GPS tracking technology is ongoing. See section 3. Species
818 Information.
819
- 820 • Conservation and management of the species in Canada:
- 821 • Buff-breasted Sandpiper breeding habitat is conserved in the national parks,
822 migratory bird sanctuaries, national wildlife areas of the Canadian Arctic, as well
823 as through the Inuvialuit community conservation plans.
- 824 • The Ahiak Migratory Bird Sanctuary Management Plan (2018) outlines a plan for
825 the co-management of Buff-breasted Sandpipers and other species by
826 Environment and Climate Change Canada (ECCC) and local Inuit in the
827 sanctuary (ECCC 2018).
- 828 • The Arctic PRISM, a joint effort between ECCC, the USGS, and the USFWS, has
829 been surveying the Arctic for shorebirds from 2002 to 2018 to determine
830 population sizes and trends, and clarify distribution and habitat usage of all
831 species, including the Buff-breasted Sandpiper. At the time of developing this
832 management plan, new estimates of population size and breeding distribution for
833 the species are being carefully evaluated to ensure accuracy.
- 834 • Land from the former Prairie Farm Rehabilitation Administration's Community
835 Pasture Program had been returned by 2018 to provinces for management and
836 is in large part still being managed for conservation by different groups in a way
837 that benefits the Buff-breasted Sandpiper.
838
- 839 • Conservation and management of the species outside Canada:
- 840 • Some of the identified key stopover sites have been designated as sites of
841 importance by the WHSRN, including Rainwater Basin in Nebraska (2009) and
842 the Flint Hills in Kansas and Oklahoma (2016) as sites of hemispheric
843 importance, as well as Asuncion Bay in Paraguay (2008) and Barba Azul Nature
844 Reserve in Bolivia (2015) as sites of regional importance.
- 845 • Following habitat destruction from construction in Asuncion Bay (Paraguay) in
846 2010, the CWS and the United States' *Neotropical Migratory Birds Conservation*
847 *Act* (NMBCA) have supported the local government in restoring habitat for
848 Buff-breasted Sandpiper and other impacted shorebirds.
- 849 • In 2018, a grant from NMBCA was awarded to fund the purchase of an additional
850 681 hectares of grassland and the management of 15,000 hectares of
851 Buff-breasted Sandpiper habitat at the Barba Azul Nature Reserve, Bolivia
852 (U.S. Fish and Wildlife Program 2018). Starting October 2019, the reserve will be
853 experimenting with beneficial management practices for cattle ranching to create
854 and maintain Buff-breasted Sandpiper staging habitat. Long-term monitoring of
855 the species will also be conducted at the site (Asociación Armonía 2019).
- 856 • The Southern Cone Grassland Alliance, supported in part by CWS, has helped
857 guide the development of beneficial management practices for sustainable
858 land-use in Argentina, Paraguay, Uruguay, and Brazil. Through this project,
859 ranching practices were improved on 116,479 hectares of grasslands and other
860 beneficial management practices implemented on 25,371 hectares (Rosenberg
861 et al. 2016).

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- Four sites of importance for the Buff-breasted Sandpiper on the wintering grounds have been designated under WHSRN, namely Lagoa do Peixe in Brazil (1990) and Bahía Samborombón in Argentina (2011) as sites of international importance, and Laguna de Rocha in Uruguay (2010) and Estancia Medaland in Argentina (2018) as sites of regional importance. These sites include both publicly and privately-owned land.
 - Biologists in several countries within the Southern Cone Grassland Alliance have conducted surveys for Buff-breasted Sandpipers with the goal of providing a winter-based population estimate and trend for the species.

871

872 6.2. Broad Strategies

873

874 The broad strategies for the Buff-breasted Sandpiper have been developed to address

875 the threats this species is facing across its range, primarily focusing on mitigating the

876 most pressing threats and gathering the information needed to address the remaining

877 threats. While renewable energy development received the highest impact score in the

878 threat assessment and this impact score could rapidly increase, wintering and stopover

879 habitat loss from a combination of factors (see section 4.2) remain the most immediate

880 threat to the Buff-breasted Sandpiper. Strategies fall under the following broad

881 categories¹¹:

- 882
- 883
- 884
- 885
- 886
- Livelihood, Economic & Moral Incentives
 - Conservation Designation & Planning
 - Institutional Development
 - Research and Monitoring

887 6.3. Conservation Measures

888

889 **Table 3. Conservation Measures and Implementation Schedule**

Conservation Measure	Priority ^e	Threats or Concerns Addressed	Timeline
Broad Strategy: Livelihood, Economic & Moral Incentives			
Market-based Incentives <ul style="list-style-type: none"> • Provide resources to landowners through stewardship programs to consider Buff-breasted Sandpiper habitat needs (such as short-grass, adequate soil moisture, and vital dry Arctic uplands in danger of flooding as sea levels rise) when managing their lands. 	High	IUCN Threats 2.1, 2.3, 7.1, and 7.2	Ongoing

¹¹ The broad strategy categories follow the International Union for Conservation of Nature – Conservation Measures Partnership (IUCN-CMP) Conservation Actions Classification v 2.0 (<http://cmp-openstandards.org/tools/threats-and-actions-taxonomies/>),

Conservation Measure	Priority^e	Threats or Concerns Addressed	Timeline
Better Products & Management Practices <ul style="list-style-type: none"> Encourage the wind energy sector to develop, implement, and promote beneficial management practices to mitigate threats to the Buff-breasted Sandpiper and its habitats where the species is known to occur. 	High	IUCN Threat 3.3	2021–2031
Better Products & Management Practices <ul style="list-style-type: none"> Assist landowners to implement and promote beneficial management by providing or helping to develop written and digital resources to strengthen stewardship programs, which directly contribute to creating and maintaining Buff-breasted Sandpiper habitat and an appreciation of its value. 	Moderate	IUCN Threats 2.1, 2.3, 7.1, and 7.2	2026–2036
Broad Strategy: Conservation Designation & Planning			
Protected Area Designation &/or Acquisition <ul style="list-style-type: none"> Conserve habitat at key sites. 	Moderate	IUCN Threats 2.1, 2.3, 3.1, 3.2 and 3.3	Ongoing
Broad Strategy: Institutional Development			
Alliance & Partnership Development <ul style="list-style-type: none"> Develop new international partnerships for conservation and maintain existing ones. 	High	All	Ongoing
Broad Strategy: Research and Monitoring			
Basic Research & Status Monitoring <ul style="list-style-type: none"> Centralize data from past surveys and complete the analysis of tracking studies that identify sites with high densities of Buff-breasted Sandpipers. 	High	Knowledge gap	2021–2026
Basic Research & Status Monitoring <ul style="list-style-type: none"> Monitor the species at known and potential key sites during southbound and northbound migration; Establish a list of key sites where at least 0.2% of the population (about 100 birds) occur regularly through time. 	High	Knowledge gap	2021–2026
Basic Research & Status Monitoring <ul style="list-style-type: none"> Develop a more reliable and accurate population estimate within the next 5 years 	High	Knowledge gap	2021–2026

Conservation Measure	Priority^e	Threats or Concerns Addressed	Timeline
Basic Research & Status Monitoring <ul style="list-style-type: none"> Determine fine-scale landscape features that predict habitat usage both on breeding and non-breeding grounds 	High	IUCN Threats 3.1, 3.2, 11.1, and 11.4	2021–2026
Basic Research & Status Monitoring <ul style="list-style-type: none"> Identify the natural processes that created and maintained suitable habitats to develop land-use practices beneficial for the species 	High	IUCN Threats 2.1, 2.3, 7.1, and 7.2	2021–2026
Basic Research & Status Monitoring <ul style="list-style-type: none"> Continue to monitor the species and its habitat on the breeding ground as part of the Arctic PRISM survey. 	High	Knowledge gap	2021–2031
Basic Research & Status Monitoring <ul style="list-style-type: none"> Determine level of exposure of the species to pesticides and effects of those contaminants on survival, fitness and food availability. 	Medium	IUCN Threats 7.3 and 9.3	2021–2026
Basic Research & Status Monitoring <ul style="list-style-type: none"> Evaluate current and past population monitoring methods and identify the most appropriate methods to assess progress towards the management objective. 	Medium	Knowledge gap	2021–2026
Basic Research & Status Monitoring <ul style="list-style-type: none"> Determine the fall migration route, survival rates and potential threats to juveniles of the Buff-breasted Sandpiper population. 	Low	Knowledge gap	2026–2031
Basic Research & Status Monitoring <ul style="list-style-type: none"> Assess the severity of the effects of climate change on demographics and distribution 	Low	Threats 11.1, 11.4, and 11.5	2026–2031

890 ^e “Priority” reflects the degree to which the measure contributes directly to the conservation of the species
 891 or is an essential precursor to a measure that contributes to the conservation of the species. High priority
 892 measures are considered those most likely to have an immediate and/or direct influence on attaining the
 893 management objective for the species. Medium priority measures may have a less immediate or less
 894 direct influence on reaching the management objective but are still important for the management of the
 895 population. Low priority conservation measures will likely have an indirect or gradual influence on
 896 reaching the management objective but are considered important contributions to the knowledge base
 897 and/or public involvement and acceptance of the species.
 898

899 **6.4. Narrative to Support Conservation Measures and**
900 **Implementation Schedule**

901
902 *Institutional Development*

903 Considering the extent of non-breeding habitat found outside Canada, implementing
904 broad strategies that benefit the Buff-breasted Sandpiper will only be possible through
905 strong collaboration with Canada's international partners. In addition, collaboration with
906 the wind energy sector is required to mitigate threats to the species and its habitat at
907 key sites.

908 As such, Canada and international partners created the Midcontinental Shorebird
909 Conservation Initiative (MSCI), which aims to deliver full life-cycle conservation for the
910 Buff-breasted Sandpiper and other species. The Buff-breasted Sandpiper is recognized
911 as high conservation concern in many countries because it occupies several locations
912 relevant to shorebird conservation that are prioritized as part of the MSCI.

913 *Livelihood, Economic & Moral Incentives, and Conservation Designation & Planning*

914 Wintering and stopover habitat used by the Buff-breasted Sandpiper is predominantly
915 privately owned and used as agricultural cropland or pastureland, so the involvement of
916 private landowners is critical. Stewardship programs can support and incentivize
917 landowners to manage their land for short-grass habitat and shorebird conservation.
918 Where appropriate and after consideration of a range of ecological targets, this may
919 involve using livestock or fire to maintain short-grass habitat, as well as appropriate soil
920 moisture in sod fields. Support could also be given to sod farm owners, where housing
921 development exerts pressure on agricultural lands. Further research is need to
922 determine if this type of habitat provides adequate conditions to support the recovery of
923 Buff-breasted Sandpiper. Conservation managers and landowners of key migratory and
924 wintering sites should be educated about Buff-breasted Sandpiper's unusual habitat
925 requirements (shortgrass rather than the taller coastal wetland grasses preferred by
926 most shorebirds and waterbirds) so that these requirements are not overlooked when
927 implementing management practices for shorebirds more broadly.

928 Appropriate buffers and mitigation measures for renewable energy developments must
929 be put in place in locations where there is high density of Buff-breasted Sandpiper.
930 *Standards for monitoring nonbreeding shorebirds in the Western Hemisphere* (PRISM
931 2018) provide a comprehensive protocol for *ad hoc* assessments of habitat use by
932 shorebirds.

933 *Research and Monitoring*

934 Buff-breasted Sandpipers should be monitored to determine habitat usage, population
935 size and trends. By 2025, this monitoring effort should inform a more reliable and
936 accurate baseline population size towards the management objective. Surveys on
937 staging or wintering grounds may be more effective in determining population sizes and
938 trends than arctic surveys because the species does not congregate in large numbers
939 or show site fidelity on the breeding grounds. This is particularly important as population

940 trends have not been quantified. At the same time, arctic breeding ground surveys and
941 GPS-tracking can provide important information about micro-scale habitat use, which is
942 needed to identify areas sensitive to industrial development and to climate change.
943 Arctic PRISM may provide some of this information as upland habitats are included in
944 the surveys (COSEWIC 2012). Surveys along the migratory route and in the wintering
945 grounds can provide similar information about habitat use during these stages.

946 Monitoring of habitat use and research on suitable habitat characteristics are key steps
947 in shaping conservation actions for the species. By 2025, key wintering and migratory
948 stopovers sites that cumulatively support 80% of the current population estimate of
949 56,000 individuals should be identified. Canada will collaborate with its international
950 partners to work towards a no net loss of suitable habitat at those sites. Tracking
951 Buff-breasted Sandpipers using technology such as isotopes, genetics, radio-telemetry,
952 geolocators, and satellite telemetry provides a wealth of information, including the
953 location of sites with high densities of the species. Once identified, high-density
954 locations can be conserved and managed cooperatively with landowners. Much of the
955 species monitoring work is already in progress, but the analysis of the data is ongoing
956 (R.B. Lanctot pers. comm. 2019b). Additionally, to most effectively use this technology,
957 the potential effects of geolocators and telemetry units on movement and survival must
958 be assessed (identified as High priority by the ECCC Shorebird Technical Committee in
959 2016).

960 Various threats to the Buff-breasted Sandpiper require further investigation to
961 understand their impact. The species' reliance on agricultural areas during the
962 non-breeding period puts individuals at risk of pesticide contamination. While there has
963 been some research into the effects of pesticides, multiple unknowns remain, such as
964 the extent of exposure to various chemicals; the direct effects of those chemicals on the
965 species, and; the indirect effects on the invertebrates eaten by the species.

966 Climate change may become one of the greatest threats facing this species but the
967 severity of its current and projected effects on the Buff-breasted Sandpiper requires
968 more research. As average temperatures increase in the Arctic, the northern limit of
969 shrub vegetation is advancing into the Buff-breasted Sandpiper's breeding habitat. On
970 the wintering grounds, habitat is expected to be lost from coastal erosion and rising sea
971 levels. It is unclear whether the species is adjusting its breeding schedule to match
972 earlier insect emergence in the Arctic. Along migration, habitat and weather patterns are
973 expected to shift and it is unknown whether the species will adapt to these changes.
974 The population-level effect of these threats is unknown. Some changes, like more
975 frequent and severe storms, may have strong impacts on individual survival, but more
976 study is needed to determine whether birds are able to survive such situations. During
977 fall migration, juveniles following the Atlantic coast might be disproportionately vulnerable
978 to increased frequency and severity of storms compared to adults who migrate inland.
979 Overall, more research into the effects of climate change on Buff-breasted Sandpiper
980 demographics and distribution is needed.

981

982 **7. Measuring Progress**

983

984 The performance indicators presented below provide a way to measure progress
985 towards achieving the management objective and monitoring the implementation of the
986 management plan.

987

- 988 - By 2026, a more accurate population estimate from stopover sites is available.
989 - By 2026, key wintering and migratory stopovers sites that cumulatively support
990 80% of the current population estimate are identified. Key sites are defined as
991 areas where at least 0.2% of the population (about 100 birds) occur regularly
992 through time.
993 - By 2036, the Buff-breasted Sandpiper population is maintained at the 2026 level
994 detected from stopover surveys.

995

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997

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- 1309

1310 **Appendix A: Effects on the Environment and Other Species**

1311
1312 A strategic environmental assessment (SEA) is conducted on all SARA recovery
1313 planning documents, in accordance with the [Cabinet Directive on the Environmental](#)
1314 [Assessment of Policy, Plan and Program Proposals](#)¹². The purpose of a SEA is to
1315 incorporate environmental considerations into the development of public policies, plans,
1316 and program proposals to support environmentally sound decision-making and to
1317 evaluate whether the outcomes of a recovery planning document could affect any
1318 component of the environment or any of the [Federal Sustainable Development](#)
1319 [Strategy](#)'s¹³ (FSDS) goals and targets.

1320
1321 Conservation planning is intended to benefit species at risk and biodiversity in general.
1322 However, it is recognized that implementation of management plans may also
1323 inadvertently lead to environmental effects beyond the intended benefits. The planning
1324 process based on national guidelines directly incorporates consideration of all
1325 environmental effects, with a particular focus on possible impacts upon non-target
1326 species or habitats. The results of the SEA are incorporated directly into the
1327 management plan itself but are also summarized below in this statement.

1328
1329 The Buff-breasted Sandpiper is an arctic shorebird, breeding in the coastal uplands and
1330 relying on short-grass habitat on migratory stopover sites and wintering grounds.
1331 Conservation measures aiming to preserve short-grass habitats and manage
1332 pasturelands for Buff-breasted Sandpipers are expected to provide habitat for other
1333 shorebirds migrating and wintering with them, including but not limited to the
1334 Semipalmated Plover (*Charadrius semipalmatus*), Baird's Sandpiper (*Calidris bairdii*),
1335 American Golden-Plover (*Pluvialis dominica*), Pectoral Sandpiper (*Calidris melanotos*),
1336 and Upland Sandpiper (*Bartramia longicauda*). On the breeding ground, other species
1337 also nest in the upland coastal habitat including Black-bellied Plover (*Pluvialis*
1338 *squatarola*) and American Golden-Plover so conservation measures on the breeding
1339 ground (e.g., managing development, climate action) may be of broad benefit.

¹² www.canada.ca/en/impact-assessment-agency/programs/strategic-environmental-assessment/cabinet-directive-environmental-assessment-policy-plan-program-proposals.html

¹³ www.fds-sfdd.ca/en#/en/goals/

1340 **Appendix B: Summary of Buff-breasted Sandpiper Population Estimates**

1341

Life Cycle Stage	Location	Year	Estimation (thousands)	Scope	Particularities	Reference
Spring migration	Rainwater Basin	2004–2005	56 (35–78, 95%CI)	Global	- Stopover duration (2 days) not considered; possible high underestimation - Assumes that all individuals stop there but they don't; possible underestimation	Jorgensen et al. 2008; Lanctot et al. 2010; McCarty et al. 2015.
Spring Migration	Flint Hills ecoregion	2014	20.7 (11.7–35.4, 95%CI)	Surveyed area	- Surveys performed from a moving vehicle - Stopover duration not considered; possible high underestimation	Lyons et al. 2016.
Spring Migration	Flint Hills ecoregion	2015	12.7 (5–28.9, 95%CI)	Surveyed area	- Difference with 2014 could be that fewer birds stopped in the study area or could be due to timing of surveys	Lyons et al. 2016.
Spring migration	Coastal Texas	2016–2019	Not yet available	Global	- Stopover duration obtained through tagging data and considered for estimation	J.E. Lyons, pers.comm, 2020; Lanctot et al. 2016.
Breeding grounds	Canadian Arctic	2010–2017	550 (293–719, 85%CI) (358–654, 95%CI)	Canada	- Currently being reviewed to evaluate accuracy - Effects of deviation from random site selection unknown; possible positive bias - Small sample size in marginal habitats; possible unstable estimates - Many of the PRISM estimates are much higher than estimates based on summed winter counts, because for widely dispersed species, there are always birds wintering in low numbers in areas that aren't surveyed	P.A. Smith, pers. comm. 2020; CWS, unpublished data.
Breeding grounds	Arctic Alaska	1997–2007	42.5 (5.8–79, 95%CI)	Surveyed area	- Estimation based on only 60 observations; high uncertainty	Andres et al. 2012; McCarty et al. 2020; Bart and Smith 2020.

Life Cycle Stage	Location	Year	Estimation (thousands)	Scope	Particularities	Reference
Wintering grounds	Argentina, Uruguay, Brazil	1999 & 2001	None provided but could be 100–200	Global	- Not provided for statistical reasons associated with the use of unsupervised satellite image classification	R.B. Lanctot, pers. comm. 2020; Lanctot et al. 2004.
Wintering grounds	South America	-	Less than 50	Global	- Most likely missing important wintering sites or birds too dispersed	A.J. Lesterhuis, pers. comm. 2019.

1342