Conservation Plan for Wilson's Phalarope (*Phalaropus tricolor*)

Version 1.1

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Arne J. Lesterhuis[1] and Rob P. Clay[2]

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WESTERN HEMISPHERE
SHOREBIRD RESERVE NETWORK

NOTE about Version 1.1:

The only difference between Version 1.1 (February 2010) and Version 1.0 (November 2009) is the addition of a Spanish executive summary.

Conservation Plan Author:

[1] BirdLife International, Gaetano Martino 215 esq. Teniente Ross, Asunción, Paraguay; arne_j_lesterhuis@yahoo.co.uk.

[2] Birdlife International, Gaetano Martino 215 esq. Teniente Ross, Asunción, Paraguay; rob.clay@birdlife.org.

Conservation Plan Editor:

Meredith Gutowski, WHSRN Executive Office, Manomet Center for Conservation Sciences, P.O. Box 1770, Manomet, Massachusetts 02345, USA; mgutowski@manomet.org

For further information:

Manomet Center for Conservation Sciences: www.manomet.org

Western Hemisphere Shorebird Reserve Network: www.whsrn.org

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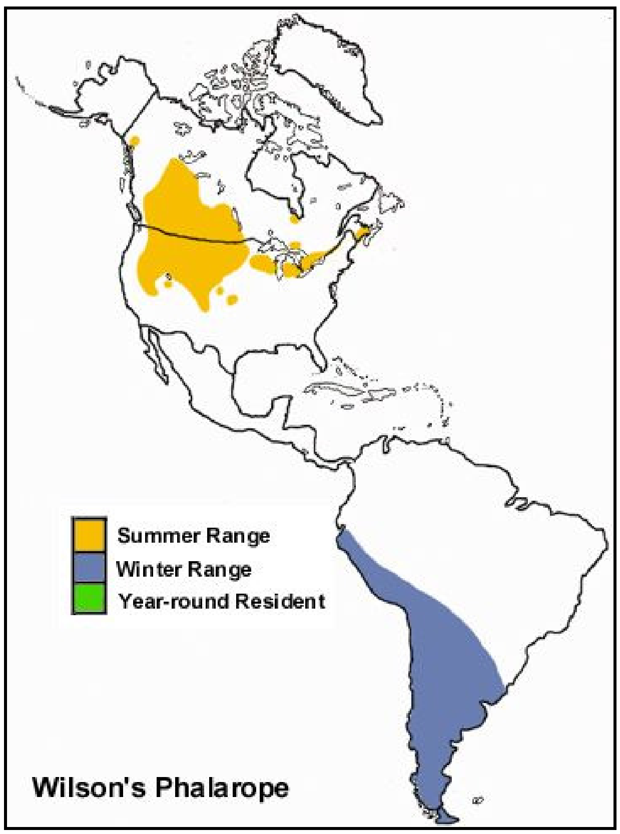
EXECUTIVE SUMMARY

Wilson's Phalarope (*Phalaropus tricolor*) is a medium-size shorebird best known for congregating in huge, post-breeding flocks at a few sites in North America and for its reversed sexual dimorphism, with females being more colorful than the males. Unlike the two other phalarope species [Red Phalarope (*P. lobatus*) and Red-necked Phalarope (*P. fulicarius*)], Wilson's Phalarope is a temperate breeder (as opposed to having a holarctic breeding distribution) and does not winter at sea. The species is confined to the Americas where it breeds in central Canada and the United States and winters primarily on saline lakes in the Andes of South America and the Southern Cone lowlands.



Map 1: Breeding and nonbreeding range of *Phalaropus tricolor* (from Skagen *et al.* 1999)

Despite being a relatively numerous species with a population estimated at 1.5 million individuals, Wilson's Phalarope warrants conservation planning because the species is believed to have undergone a significant decline in the past, as a result of habitat conversion, from which it has not recovered. Nevertheless, this apparent decline is a controversial issue to some extent, as a wide consensus does not appear to exist regarding the significant decline in the species's population.

Currently, it is unclear whether the species's population is increasing, declining, or stable. While its breeding range has considerably expanded in recent decades, the species no longer breeds at a number of former sites, and the population has not shown a marked increase in size despite the expansion in range.

Factors which are believed to threaten the species and/or pose barriers to its recovery include:

1. **Habitat loss on breeding grounds**: The conversion of most of the North American prairie grasslands and associated wetlands to agriculture has destroyed a significant area of appropriate breeding habitat for this species. This is believed to have been a major factor in its apparent decline during the 20th century and will continue to be if no conservation measures are taken.

2. **Habitat loss and/or degradation during migration**: Wilson's Phalarope is particularly susceptible to habitat loss and degradation at the few sites which hold significant molt congregations prior to the main migratory movement to the wintering grounds (*e.g.*, up to 50% of the population is believed to congregate at Great Salt Lake, Utah). Extraction of water for agricultural use and the degradation of water quality are particular concerns.

3. **Habitat degradation on the nonbreeding (wintering) grounds**: The majority of the population is believed to "winter" in the saline lakes of the altiplano in Argentina, Bolivia, and Peru where mining activities are affecting the quality and extent of the saline lagoons. Large concentrations also are known to winter in saline lakes on the Argentinean Pampas and the Central Chaco (Argentina and Paraguay), where ever-expanding agriculture and increasing severity of drought are significant threats.

4. **Exposure to Agrochemicals**: Wilson's Phalarope is found in close proximity to agricultural areas, especially during the breeding season, where the widespread use of agrochemicals may be causing currently unrecognized mortality or other problems.

5. **Climate change**: The species could be particularly vulnerable to the effects of climate change on its breeding habitat. Parts of the prairies are predicted to become drier, and

drought has already been documented among the main reasons for breeding areas being abandoned. On the other hand, other parts are predicted to become wetter; however, it is uncertain whether these will provide suitable nesting habitat for the species. The future availability of water in saline lakes and Southern Cone lowlands in the nonbreeding areas is also a cause for concern. For example, it has been shown that drought at Mar Chiquita, a large saline lagoon in Argentina, negatively affects the number of Wilson's Phalaropes.

6. **Introduction of exotic species**: Field observations have shown that breeding and nonbreeding lagoons may be abandoned when introduced exotic fish species cause trophic changes in the lagoons.

Generally speaking, the impact and extent of each of the above listed threats on the species are poorly understood. Other potential threats, such as hunting, are little known but are not believed to be of high concern to the species. There is a clear need for research on Wilson's Phalarope to better understands its population dynamics and the degree to which it is threatened.

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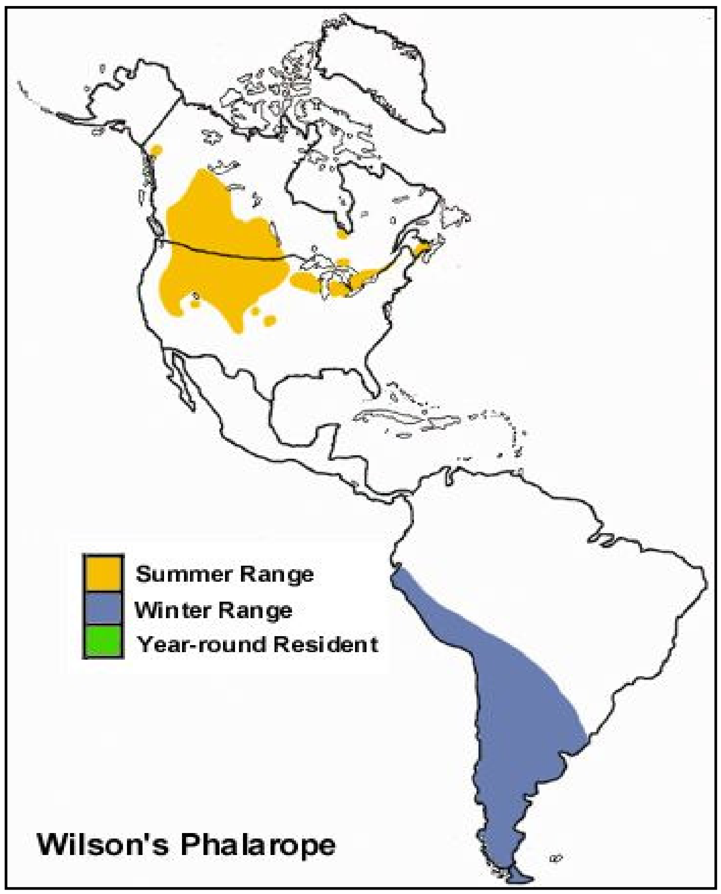
RESUMEN EJECUTIVO

Phalaropus tricolor es un ave playera de tamaño medio mejor conocido por congregando en grandes banderas después la época de reproducción en algunos sitios de Norteamérica, y por su dimorfismo sexual invertido donde las hembras son más coloridas que los machos. Contrario a otras dos especies del mismo género (*P. lobatus* y *P. fulicarius*), el *Phalaropus tricolor* se reproduce en las climas templadas (opuesto a una distribución en toda la ártica) y no pasa el invierno en el mar. La distribución de la especie se limita a las Américas, donde se reproduce en el centro de Canadá y los Estados Unidos y pasa los inviernos principalmente en lagos salinos en los Andes de Suramérica y en las tierras bajas del Cono Sur.

A pesar de ser una especie relativamente numerosa, con una población estimada en 1,5 millones de individuos, *P. tricolor* merece la planeación de conservación porque se cree que la población ha sufrido un descenso significativo en el pasado, como resultado de la conversión del hábitat, de cual no se ha recuperado. Sin embargo, esta aparente disminución es un tema de controversia en cierta medida porque un amplio consenso no parece existir en cuanto a la disminución significativa de la población de esta especie.

En la actualidad, no está claro si la población de la especie está aumentando, disminuyendo, o se encuentra estable. Su área de reproducción se ha extendido considerablemente en los últimos decenios, pero al mismo tiempo la especie ya no se reproduce a muchos de los sitios que usaba en años pasados, y la población no ha demostrado un aumento marcado en el tamaño a pesar de la expansión en su rango.



Mapa 1. Rango de reproducción y no reproducción de *Phalaropus tricolor* (de Skagen *et al.* 1999)

Los factores que se creen amenazar la especie y/o crear obstáculos para su recuperación incluyen:

1. **La pérdida de hábitat en los sitios de reproducción:** La transformación de la mayoría de los pastizales y humedales asociados en Norteamérica a la agricultura ha destruida un área significativa del hábitat apropiado para la reproducción de esta especie. Se cree que esta pérdida de hábitat ha sido un factor importante en su disminución evidente durante el siglo XX y seguirá si no se toman medidas de conservación.
2. **La pérdida y/o degradación del hábitat durante la migración:** *Phalaropus tricolor* es particularmente susceptible a la pérdida y degradación de hábitat a los pocos sitios que albergan congregaciones significativas antes de los movimientos migratorios a los sitios invernados (por ejemplo, se cree que hasta el 50% de la población se congrega en el Gran Lago Salado, Utah). La extracción de agua para uso agrícola y la degradación de la calidad del agua son causas de preocupación en particular.
3. **La degradación del hábitat en los sitios donde no se reproducen (sitios invernados):** Se cree que la mayoría de la población pasa el "invierno" en los lagos salinos del altiplano en Argentina, Bolivia, y Perú, donde actividades mineras están afectando a la calidad y el alcance de las lagunas salinas. También se sabe que grandes concentraciones pasan el invierno en los lagos salinos en las Pampas de Argentina y el Chaco Central (Argentina y Paraguay), donde hay amenazas significativas como la agricultura que continua expandir y el aumento en la severidad de sequía.
4. **Exposición a productos agroquímicos:** Se encuentra *Phalaropus tricolor* cerca a zonas agrícolas, especialmente durante la temporada de reproducción, donde el uso generalizado de agroquímicos podría ser una causa de mortalidad no reconocida actualmente u otros problemas.
5. **El cambio climático global:** La especie podría ser particularmente vulnerable a los efectos del cambio climático global en los hábitats de reproducción. Se predice que partes de las praderas se vuelvan más secas, y estas sequías ya han sido documentadas entre las principales razones para el abandono de algunas zonas de reproducción. Por otro lado, se predice que otras partes serán más húmedas; sin embargo, no está claro si éstas proporcionarán el hábitat de anidamiento adecuado para la especie. La futura disponibilidad de agua en lagos salinos y las tierras bajas del Cono Sur en las zonas de no reproducción también es una causa de preocupación. Por ejemplo, se ha demostrado que la sequía en Mar Chiquita, una laguna salina de gran tamaño en la Argentina, afecta negativamente el número de los *P. tricolor*.

6. **Introducción de especies exóticas:** Las observaciones de campo han demostrado que las lagunas donde las aves se reproducen además las lagunas invernadas podrían ser abandonadas por *P. tricolor* cuando especies exóticas de peces introducidos causen cambios tróficos en las lagunas.

En términos generales, el impacto y el alcance de cada de las amenazas identificadas en cuanto a *P. tricolor* son poca conocidas. Se falta suficiente información sobre otras amenazas potenciales, tales como la caza, pero no se cree que esas están de gran preocupación para la especie. Hay una clara necesidad de investigar el *P. tricolor* para comprender mejor las dinámicas de su población y el grado en que se está amenazada.

PURPOSE

Wilson's Phalarope (*Phalaropus tricolor*) is a medium-size shorebird confined to the Americas, where it breeds in central Canada and the United States and winters primarily on saline lakes in the Andes of South America and the Southern Cone lowlands (Argentinean Pampas and Patagonian Steppe). Unlike the two other species of phalaropes, Wilson's Phalarope is entirely terrestrial, mainly using interior saline and freshwater wetlands throughout its range. The purpose of this conservation plan is to define the conservation status of Wilson's Phalarope throughout its range, describe current threats, identify research and management needs, and outline recommended conservation actions on the basis of current knowledge of the species.

Although it is unclear to what extend the species has suffered a population decline in the past, the intent of this conservation plan is to help guide management and research activities, identify gaps in knowledge, and develop short-term conservation strategies that will benefit this species in the long-term and prevent declines in the future.

STATUS AND NATURAL HISTORY

Wilson's Phalarope (*Phalaropus tricolor*) has been relatively well studied on its breeding and migration staging grounds in North America. In particular, aspects of the species's breeding biology like courtship nest site selection, nest densities, and nest success has gained noticeable attention (e.g. Höhn 1967; Howe 1975a and b; Murrey 1983; Colwell 1986, 1987, 1992; Colwell and Oring 1988a, b, c, d, e; Delehanty and Oring 1993). Diet and foraging strategies and habitat use have also been the focus of several studies (Siegfried and Batt 1972, Skagen and Oman 1996, Laubhan and Gammonley 2000, May *et al.* 2002, Andrei *et al.* 2009). Other studies have attempted to unravel the origin and relationship of phalaropes (e.g. Dittman and Zink 1991, Ericson *et al.* 2003). Being a species that is commonly found in saline habitats throughout its annual lifecycle, a number of authors have focused their studies on the species's adaptations to those habitats (i.e. Mahony and Jehl 1985, Jehl 1988). During the non-breeding season the species has extensively been studied by Jehl at staging sites in North America (i.e., Jehl 1981, 1987, 1988, 1997, 1999). On the other hand, very little information is available regarding the species on its wintering grounds; among the few exceptions are studies on feeding and behavior

(Burger and Howe 1975) and on interactions with Chilean Flamingos (*Phoenicopterus chilensis*) (Hurlbert *et al.* 1984).

Unlike most shorebirds, Wilson's Phalaropes are highly aquatic, foraging principally while swimming. They mainly feed on small invertebrates like dipterans and crustaceans, particularly brine flies and brine shrimp, but also occasionally on seeds of aquatic plants (Colwell and Jehl 1994, O'Brien *et al.* 2006). During foraging, Wilson's Phalaropes conspicuously spin around in order to create a vortex that draws invertebrates to the surface (Jehl 1988). They often forage among flocks of other species such as American Avocet (*Recurvirostra americana*), Northern Shoveler (*Anas clypeata*), Blue-winged Teal (*Anas discors*), and Chilean Flamingos (*Phoenicopterus chilensis*) in order to feed on invertebrates that those species stir up (Williams 1953, Siegfried and Batt 1972, Hurlbert *et al.* 1984, O'Brien *et al.* 2006). Wilson's Phalaropes also can be frequently observed feeding actively on land, rapidly chasing and pecking prey from the ground, often disturbing other shorebirds (O'Brien *et al.* 2006).

Courtship, which begins during northbound migration, is mostly characterized by female-female aggression (Höhn 1967, Kagarise 1979, Colwell and Oring 1988). After pairs are formed, females initiate nest site selection, which may be in vegetation on the edge of a lagoon or in upland areas, but always within 100 meters of wetlands (Höhn 1967, Colwell and Jehl 1994). Nests are usually situated in taller and more mixed vegetation that is generally denser than that used by other prairie-breeding shorebirds (Colwell and Oring 1990). After clutch completion (usually four eggs), females leave the task of incubating and taking care of young entirely to the males (Colwell and Jehl 1994). As for the other phalaropes, polyandry has been documented for Wilson's Phalarope (Colwell 1986).

MORPHOLOGY

With a length of 22–24 centimeters (9.25 inches), Wilson's Phalarope is the largest of the three phalarope species (Hayman *et al*. 1986). It is separable from the two other phalaropes [Red Phalarope (*P. lobatus*) and Red-necked Phalarope (*P. fulicarius*)] by its longer and thinner bill, proportionately longer neck and legs, lack of a white wing-stripe in flight (Figure 1) and a completely white rump (Blake 1977, Paulson 2005). During the nonbreeding season its black legs turn yellow, a characteristic feature not shared with the other phalaropes (Message and Taylor 2005). Phalaropes are highly aquatic shorebirds with lobed toes that enable them to swim.

Wilson's Phalarope is, however, the most terrestrial of the three species and has less developed lobes (Hayman *et al*. 1986). Unlike most shorebird species (but as with other phalarope species), *P. tricolor* shows highly noticeable reversed sexual dimorphism, with females being larger and more brightly colored (in the breeding season) than males. Average measurements (in grams and millimeters) of birds from the breeding grounds (Johnsgard 1981, Prater *et al*. 1997) are:

	Mass	**Wingspan**	**Bill Length**	**Tarsus**
Male	50.1 g (n=100)	125 mm (range 119–129; n=32)	31 mm (range 29–33; n=28)	32 mm (range 29–34; n=32)
Female	68 g (n= 53)	136 mm (range 130–142; n=31)	34 mm (range 31–36; n=29)	33 mm (range 31–35; n=31)

Plumage

During the breeding season the female has a pale bluish-grey crown, nape, and hindneck, and a conspicuous black band covering the sides of the face and neck (Figure 2). This band is chestnut red on the sides of the mantle, becoming an orange-pink wash on its breast and strongest on the sides of the neck. The remainder of the underparts is entirely white. The mantle and upper scapulars are mostly pale grayish, except for chestnut red bands on the edges of the mantle and one across the scapulars. The male's breeding plumage resembles that of the female but is duller; the chestnut red bands are replaced by a more dull orange-brown wash and the upperparts (crown, nape, mantle, and scapulars) are blackish-brown instead of pale grey (Figure 2).

Figure 1. Female in flight showing lack of white wing-stripe./ ©Steven Mlodinow

Figure 2. Female (left) and male (right) in breeding plumage./ ©Steven Mlodinow

The nonbreeding plumage (Figure 3) is similar in both sexes, with entirely pale grayish upperparts except for the white upper tail coverts. A clear white supercilium contrasts with the gray crown and hindneck and the grey stripe behind the eye that extends down to the neck (a feature not shared by the other species of phalarope).

Figure 3. Nonbreeding plumage of Wilson's Phalarope./ © P. Smith, www.FaunaParaguay.com

Juvenal plumage is dark brownish on the upperparts with broad buff fringes on the feathers, giving a scaly appearance (Figure 4). The breast sides are washed with buff, while the rest of the underparts are white, and the legs yellowish. First-winter birds retain the buff fringes to the inner median coverts until spring (Prater *et al*. 1997).

Figure 4. Juvenile with some remaining downy feathers./ ©Steven Mlodinow

Molt

Wilson's Phalarope is one of the few shorebird species that is known to have a molt migration, flying from breeding grounds to staging areas where they undergo an almost complete molt in as little as 32–40 days (Jehl 1987, 1988). Although males arrive later than females at the staging areas, they start molting the head and body feathers on the breeding grounds while caring for the chicks (Jehl 1988, Colwell and Jehl 1994). However, the majority of the male's plumage is also replaced on the staging grounds (Jehl 1988). In both sexes, flight-feather molt begins approximately one week after the body molt and is suspended around mid-July or August for migration to the nonbreeding (wintering) grounds, where molt is completed on arrival (Burger and Howe 1975, Jehl 1987, 1988). Molt in juveniles is far less intensive and is mostly completed on the wintering grounds (Burger and Howe 1975, Jehl 1988).

TAXONOMY

The three phalarope species—Red Phalarope (*P. lobatus*), Red-necked Phalarope (*P. fulicarius*), and Wilson's Phalarope (*P. tricolor*)—were once placed in their own family, *Phalaropodidae*, but genetic studies have since shown them to be nestled within *Scolopacidae* (e.g. Ericson *et al*. 2003). Wilson's Phalarope is a monotypic species, either recognized within the genus *Phalaropus* or placed in its own genus, *Steganopus*. In this document we follow the American Ornithologists' Union (1998) and Remsen *et al*. 2009 in using *Phalaropus*, although other authors (e.g. van Gils and Wiersma 1996) prefer *Steganopus* in recognition of the genetic distance between Wilson's Phalarope and the other two phalarope species. In the historical literature, Wilson's Phalarope has been referred to as *Phalaropus wilsoni(i)*, *P. stenodactylus*, *P. frenatus* (Hellmayr and Conover, 1948) or even confusingly as *P. lobatus* (Smith 1889).

The degree of relatedness between the three phalarope species has yet to be fully resolved. Nonetheless, mtDNA data analyzed by Dittmann and Zink (1991) suggest that the Red Phalarope (*P. lobatus*) and Red-necked Phalarope (*P. fulicarius*) are sister species and that Wilson's Phalarope is more distantly related. In fact, the species has been considered to be the more primitive of the three (Jehl 1968). Dittmann and Zink (op. cit.) also considered it more likely that the three phalaropes are monophyletic, as opposed to Wilson's Phalarope being a case of convergence.

Although “Wilson’s Phalarope” is the species’s only common name in English, it is known by a variety of common names in other languages throughout its range in Central and South America, including: Faláropo de Wilson (Mexico and Central America), Falaropo Piquilargo (Mexico), Falaropo Tricolor (Ecuador, Paraguay, Colombia), Pollito de Mar Tricolor (Chile), Falaropo Común, Chorlito Palmado Grande, Chorlo nadador (Argentina), Zarapico de Wilson (Cuba), Chorlillo Piquilargo (Mexico, Belize, Guatemala and El Salvador), Falaropo Pico Largo (Honduras), and Pisa N´Agua (Brazil).

POPULATION ESTIMATE AND TREND

Population Estimates

Morrison *et al*. (2006) provide an estimate for the global population of *Phalaropus tricolor* of 1,500,000 individuals, a figure unchanged from Morrison *et al.* (2001) due to an absence of new data. In both cases they considered the estimate to be of low accuracy, but “likely to be in the right order of magnitude.” The figure is based on post-breeding migration counts in North America, including totals of 827,100 birds recorded in the Interior Flyway (Skagen *et al.* 1999) and 82,500 in the Pacific Flyway (Harrington and Perry 1995), with a few birds also recorded in the Eastern Flyway (826 cited in Morrison *et al*. 2001). The Canadian population has been estimated at 680,000 birds (Morrison *et al*. 2001), based on the percentage of the species’s breeding range that lies in Canada (45.3%) and a global population of 1,500,000.

Several global population estimates have been published in the literature. Hurlbert *et al.* (1984) cited 1,000,000–3,000,000 birds (an estimate provided by J. Jehl), while Rose and Scott (1997), gave 100,000–1,000,000 individuals (which was a number based on Morrison *et al.* 1994). Most recent authors, however, have used 1,500,000 birds (e.g. van Gils and Wiersma 1996, Morrison *et al.* 2006). Jehl (1988) was the first author to provide an estimate of 1,500,000. He derived this number based on a total count of 741,000 individuals (primarily adults) reported from all major known staging sites in North America in July 1986. This was based on the assumptions of no movement between staging sites and that the number of juveniles during the post-breeding migration is similar to the number of adults. Unfortunately, count data from the nonbreeding grounds are too few and insufficiently systematic to be of use in calculating global population estimates.

Population Trend

The population of Wilson's Phalarope is commonly believed to have undergone a significant decline during the 20th Century. Both the Canadian and U.S. Shorebird Conservation Plans (Donaldson *et al*. 2000, Brown *et al*. 2001, USFWS 2004) consider Wilson's Phalarope to show an "apparent population decline" (a population trend score of "4") and this was reiterated by Morrison *et al*. (2006) and Wetlands International (2006). Observations at staging sites in western North America noted major declines at some lakes during the 1990s compared to counts in the 1980s. Data from the breeding grounds from 1967 to the 1990s, including Breeding Bird Surveys (BBS), also indicated a general decline, but did not indicate any sudden changes. In Saskatchewan, Beyersbergen and Duncan (2007) reported much lower counts of Wilson's Phalarope at the Chaplin Lake staging area than what was recorded by Jehl (1988). During surveys conducted in the fall of 1994, they observed two peaks during the migration period of which the highest did not surpass 7,000 birds. However, Jehl (1999) considered that "the validity and severity of the decline is hard to test because correspondence between population sizes predicted from BBS trends and observations from staging areas is poor," and Colwell and Jehl (1994) concluded that evidence for an overall population decrease is at best inconclusive.

A more recent analysis of MMS (Maritimes Shorebird Survey) and ISS (International Shorebird Survey) data by Bart *et al*. (2007) of survey trends for North American shorebirds gave annual trends for Wilson's Phalarope of 1.0086 for the North Atlantic region and 1.0000 for the Midwest region for the period 1974–1998, suggesting a stable population with a slight tendency to increase. However, the breeding and migration ranges of Wilson's Phalarope only marginally overlap with the geographic regions of the Bart *et al*. study, and the documented trends presumably represent just a small proportion of the species's population.

Wilson's Phalarope was included in the U.S. list of Birds of Conservation Concern 2002 (USFWS 2002) due to the widely reported declines. However, the species has not been included in the more recent Birds of Conservation Concern 2008 (USFWS 2009) as now it is considered that there is "no information on population change, or insufficient information to assess past declines" (a population trend score of "3") (B. Andres in litt. 2009).

Insufficient data are available from the wintering grounds and migration areas outside of the North American staging sites for an analysis of trends. However, it is perhaps of note that while large congregations of up to 100,000 individuals of *P. tricolor* were reported in high

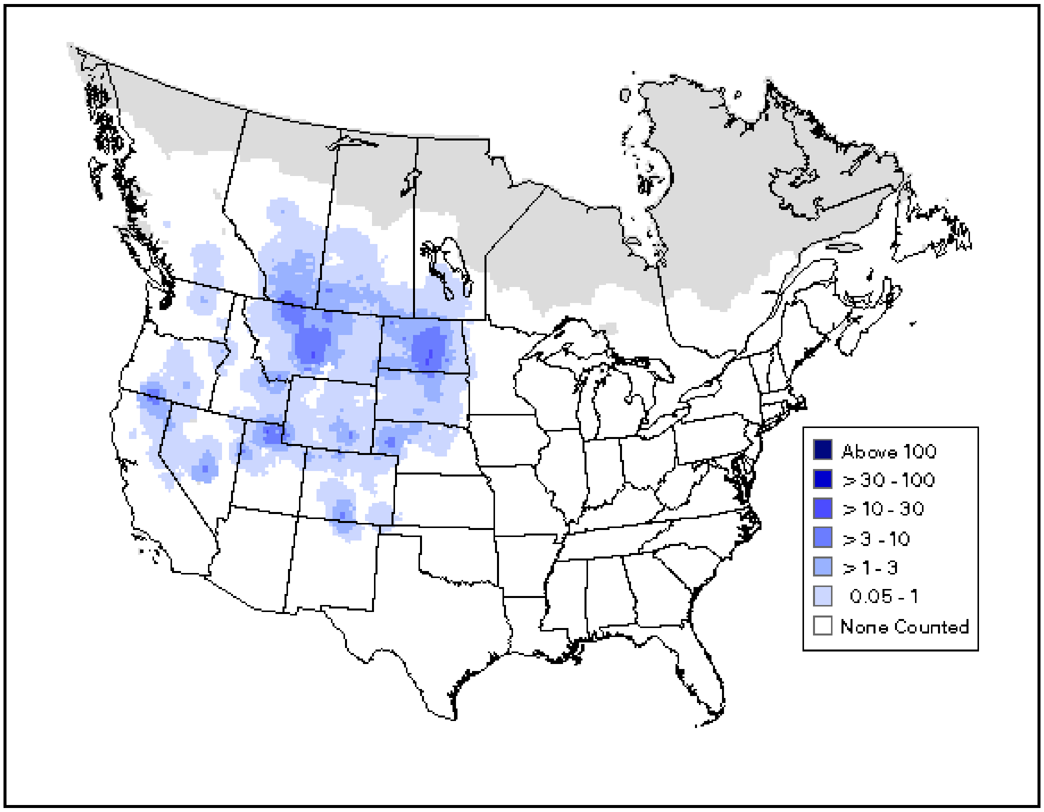
Andean lakes in southern Bolivia and an estimated 500,000 at Laguna Mar Chiquita (large saline lagoon on the Argentinean Pampa) in the 1970s (Hurlbert *et al.* 1984, Nores 1989), similar large concentrations in recent decades do not appear to have been recorded. This potentially indicates a population decline, however, this is a speculation. It can also be as a result of limited monitoring efforts to those areas, which is especially believed to be the case for the high Andean lakes area.

DISTRIBUTION & ABUNDANCE

Unlike the other two phalarope species that have a holarctic breeding distribution and a pelagic winter distribution, Wilson's Phalarope is confined to the Americas; it breeds in the central United States and Canada and has a winter range centered on saline lakes in the Andes of South America and the Southern Cone lowlands (Map 1).

Breeding Range

A contraction of the breeding range (and presumably numbers) during the early 20th Century was likely linked to the loss of prairie wetlands. Currently, the species's breeding range covers much of western and interior North America. In Canada, it breeds in southern Yukon, British Columbia, northern Alberta, Saskatchewan, and Manitoba. It also breeds locally in southern Ontario and Quebec (Gauthier and Aubry 1996). In the United States, Wilson's Phalarope breeds in south to south-central California, east-central Arizona, west-central New Mexico, northern Texas, eastern South Dakota, northern Illinois, northern Indiana, northern Ohio, Nevada, Utah, Colorado, Nebraska, and Minnesota (Johnsgard 1981, DeGraaf and Rappole 1995). The first records for Alaska were made in 1962 (Kessel and Gibson 1994). Over the last decade, this species has started to breed locally in western Oregon and Washington, and was documented as breeding in Alaska as recently as June 2001 when a nest was found at Canvasback Lake (Erwin *et al.* 2004). Locally it also breeds in New Mexico. There is a scattering of records to the southern Great Lakes and, rarely, to the continent's Atlantic Coast (Paulson 2005). Core breeding-range states include Montana, North Dakota, South Dakota, Utah, California, and Oregon (Map 2).



Map 2. Breeding range map showing core breeding sites in Montana, North Dakota, and South Dakota (Sauer *et al.* 2008).

Nonbreeding Range

The nonbreeding (wintering) area of *Phalaropus tricolor* is commonly believed to be centered on the Andes of northern Argentina and Chile, Bolivia, and southern Peru (Jehl, 1981, Hurlbert 1984), but also the lowlands of the southern cone have shown to be of considerable importance in terms of numbers. Its entire wintering range covers a wider area, extending from northern Peru diagonally to Uruguay and south to Tierra del Fuego (Hayman *et al*. 1986, van Gils and Wiersma 1996). Occasionally, birds can be found wintering as far north as northern Mexico and in the U.S. states of California (southern), Arizona, New Mexico, Texas, Louisiana, and Mississippi (Sauer *et al.* 2008, Howell and Webb 1995). Rarely, nonbreeding birds have been observed in Hispaniola and Barbados (Raffaele *et al*. 2003).

In Ecuador, *P. tricolor* uses the artificial saltlakes of Ecuasal in the Península of Sta. Elena, located along the southern coast, as a stopover site during migration. Numbers counted during fall migration are in the range of 15,000 to 32,500 individuals and annually reach approximately 1 to 3% of the global population (Agreda *et al.* 2009).

Large congregations of *P. tricolor* have been reported from southern Bolivia (Potosí Department), with counts of at least 100,000 from Laguna Loromayo, Laguna Hedionda, Laguna Kalina, and Laguna Pastos Grandes (Hurlbert *et al.* 1984). These researchers estimated a total of 500,000 – 1,000,000 birds to be present in their study area in the southern Bolivian altiplano during the 1970s, and considered this area to be the core wintering region for the species. On migration, birds are commonly observed in Paraguay and are most abundant in the Paraguayan Chaco, where a flock of up 25,000 birds have been observed (del Castillo and Clay 2004)

The species is a regular visitor to the altiplano of Chile (Jaramillo *et al*. 2003), though the numbers reported to date are considerably lower than in neighboring areas of Argentina and Bolivia. The highest counts in Chile are flocks of up to 5,000 birds observed in the 1990s at Salar de Surire in the 15th region (N. Amado Pool *in litt*. 2009). However, there is also a record of up to 50,000 birds in the 1990s mentioned in an unpublished report (Bech and Brendstrup-Hansen 1992). At Laguna de los Cisnes, in the 12th region (Magellanes), up to 1,000 birds have been reported (A. Jamarillo *in litt*. 2009).

Large congregations are found in Argentina at Laguna de Pozuelos (Jujuy Province) and further south on the Argentinean Pampas at Laguna Mar Chiquita (Córdoba Province), both with counts estimated at 500,000 individuals (Di Giacomo *et al.* 2007, Nores 1989). It is unclear whether these are regular numbers. Also, a potential bias in estimation must be taken into account given the challenge of accurately estimating numbers of birds within flocks this large. More recently, the population of *P. tricolor* at Laguna Mar Chiquita is estimated at 250,000 birds (Osinaga Acosta *et al.* 2006). Reported numbers are lower in the rest of Argentina, with observations of flocks of >50 birds along the Atlantic coast of Buenos Aires Province (Myers and Myers1979) 1,700 in Santa Fe Province (Burger and Howe 1975), and up to 7,000 at sites in La Pampa Province (F. Bruno *in litt*.). Vuilleumier (1995) considered the species a rare visitor to southern Patagonia with observations generally not surpassing 50 birds. However, birds appear not to be rare at all in Patagonia, as small flocks (i.e., approximately 100 birds) can be observed at virtually every small pond throughout the whole area south to northern Tierra del Fuego (Jaramillo *in litt.* 2009, Fjeldsa *in litt.* 2009), which can add up to quite a large number of wintering birds.

Although birds are generally observed in lower numbers but spread over a wide area, the absolute total of birds wintering in the central Argentinean lowlands and Patagonia likely reach a similar figure as that from the Andean region. In other words, the species's winter distribution can be separated into two distinct winter regions: the first in the Andean region and the second in the Argentinean lowlands and Patagonia, or southern cone lowlands.

In northern and eastern South America, *P. tricolor* is a relatively uncommon visitor. In Colombia it has been noted as a rare fall transient and winter visitor (Hilty and Brown 1986), while it is considered as very rare in Venezuela, and the Guianas (Hilty 2003). In Brazil, the species occurs in low numbers in Río Grande do Sul between November and January (Belton 1994, Mauricio and Diaz 1996). Elsewhere in the country it is very rare: the second record for Sao Paulo state was in October 2003 (Silva e Silva and Olmos 2007) and the first documented record for Paraná state was only recently described by Scherer-Neto *et al.* (2008). In Mato Grosso state, birds have been observed in August (Sick 1993).

Extralimital records

Phalaropus tricolor is a casual or accidental visitor to many areas outside of its normal range. The species occurs annually in Britain and Ireland, with an average of 3.8 birds recorded each year during 1950–2005 (BBRC 2007). The number of birds recorded per year gradually increased during the 1950s (average of 0.5 birds/year) to the 1980s (7.8 birds/year) but then declined during the 1990s (3.9 birds/year) and 2000s (1.3 birds/year). While a marked increase in observers is likely to explain the increase in birds detected during the 1950s to 1970s, it is tempting to believe that the declines in the 1990s–2000s reflect genuine changes in the number of *P. tricolor* occurring in Britain and Ireland as well as changes in the overall population size and/or changes in migration routes or behavior.

Although not recorded as frequently as in Europe, *P. tricolor* has also been recorded in Africa, New Zealand, and Australia (Hayman *et al*. 1986, Lane and Davies 1987, Heather and Robertson 1996). Records in Africa are to be expected, as there is increasing evidence of north-south migration suggested by an increase in winter and spring records (Schiemann 1980) and regular occurrence at some locations in successive years (Hayman *et al*. 1986).

MIGRATION

Wilson's Phalarope is a long-distance migrant with birds undertaking annual movements from breeding grounds in central North America to nonbreeding (wintering) grounds in southern South America. A bird found [dead] on Alexander Island (71º S) is the southernmost record of a shorebird species (Van Gils and Wiersma 1996). Notably, Wilson's Phalarope is one of only two shorebird species known to undergo a molt migration (Jehl 1988). Large numbers of adults stage at hypersaline lakes in western North America where abundant food enables a rapid molt and pre-migratory fattening (Colwell and Jehl 1986). When the species prepares for the nonstop flight to South America, some of the late-staging adults amass loads of up to 54% of total body mass; for most shorebirds, fat loads of 45% of body mass is the maximum. This gain results in a brief period of being too heavy to fly—a phenomenon unknown for other species of shorebirds (Jehl 1997).

Of the three mayor flyways identified for the Western Hemisphere (e.g. Boere and Stroud 2006), the species frequents the Mississippi Americas Flyway, crossing the interior of North America. Brown *et al.* (2001) divided these three major flyways into five distinctive flyways in North America (Pacific-Asiatic, Intermountain West, Central, Mississippi, and Atlantic), of which this species mainly uses the Intermountain West (up to 90% of adults) and the Central Flyway.

Southbound Migration

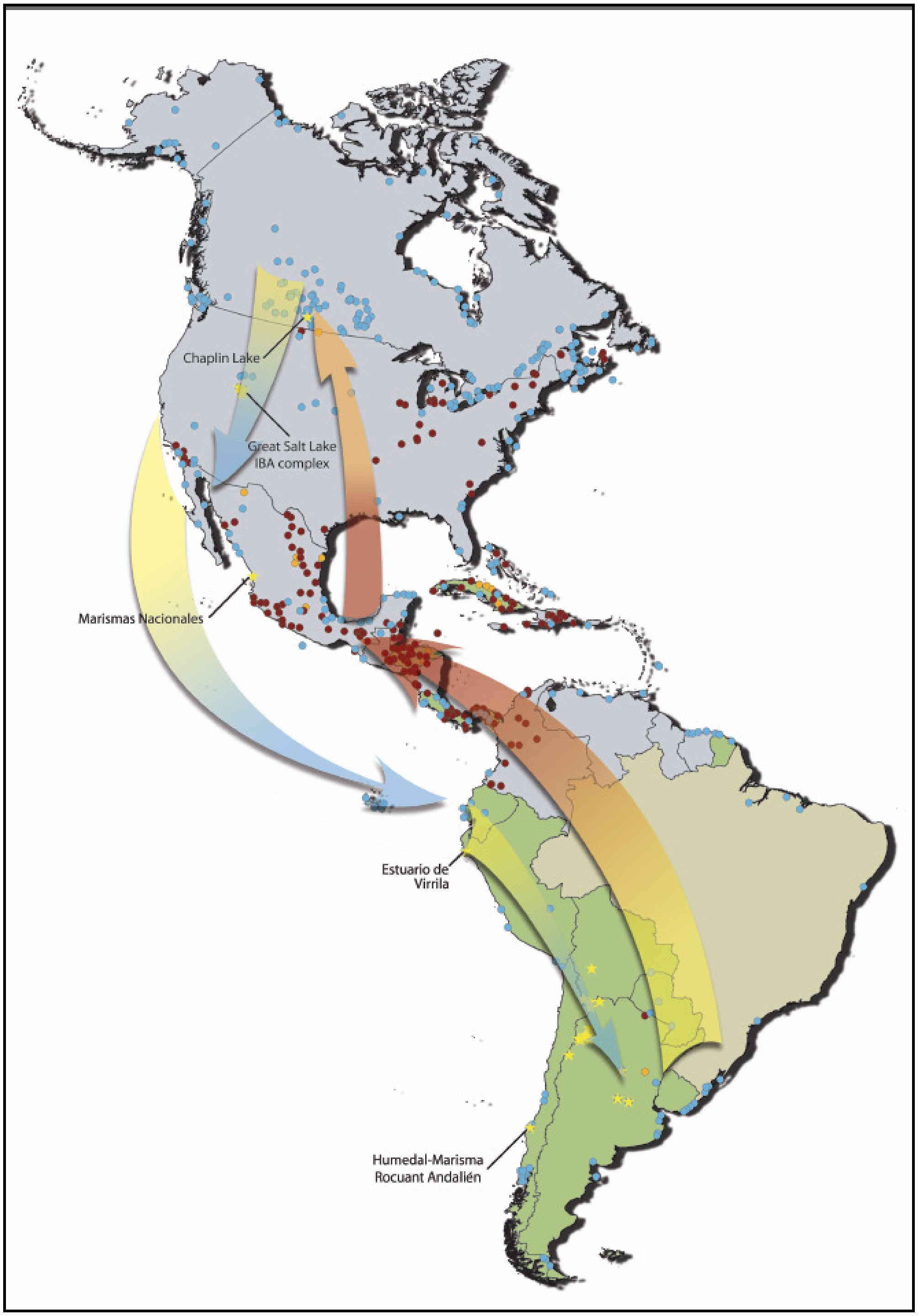
The southbound migration of Wilson's Phalarope starts with females departing their breeding grounds and arriving at staging areas in western North America by mid-June. Males generally arrive two or more weeks later (Jehl 1988) due to the species's reversed sex roles where males remain longer to care for the eggs and young instead of the females. After molting and building up fat levels, birds then undertake a rapid and direct non-stop flight, following a Great Circle route[1] from the staging areas crossing the Pacific Ocean between coastal California to coastal western South America (Map 3). The notion that birds follow a Great Circle route on southbound migration is based on the absence of fall records for Central America and northern South America (Jehl 1988). Departure from the staging areas is from late July to August, and

[1] A route which is the shortest distance between two destinations on the surface of the Earth.

nearly all migrants have left by mid-September (Jehl 1988). The first migrants arrive on the west coast of Ecuador and Peru by early August. In Ecuador, the species is a common transient. Agreda *et al.* 2009 observed numbers peaking between August and September at the Ecuasal Lagoons. Despite being relatively numerous in Ecuador on migration, the numbers of migrants appear to fluctuate considerably, with flocks of just a few hundred birds recorded in some years (Ridgely and Greenfield 2001).

From the west coast of South America, passing though Ecuador and Peru, birds move south through the Andes, with a few moving as far south as Tierra del Fuego. *P. tricolor* is a common migrant through Paraguay, where a flock of up to 25,000 has been observed at Chaco Lodge, a saline lagoon in the Paraguayan Chaco (Lesterhuis and Clay 2001). Most birds arrive on the wintering grounds by late September to early November. The vast majority of the population was believed to winter at the high Andean lakes area (Hurlbert *et al.* 1984), but as mentioned previously, large numbers, albeit widespread, also winter on freshwater and saline lagoons and other wetlands of central and southern South America, reaching equally high numbers.

Small flocks have been observed along the Central Amazonian/Pantanal Flyway (Antas 1983), but it seems more likely that birds use the Western Amazonian Flyway, as described by Antas, which crosses the Andes highlands and merges with the Pantanal Flyway; from there, birds continue further south through Paraguay to wintering sites in the Argentinean lowlands and Patagonia.

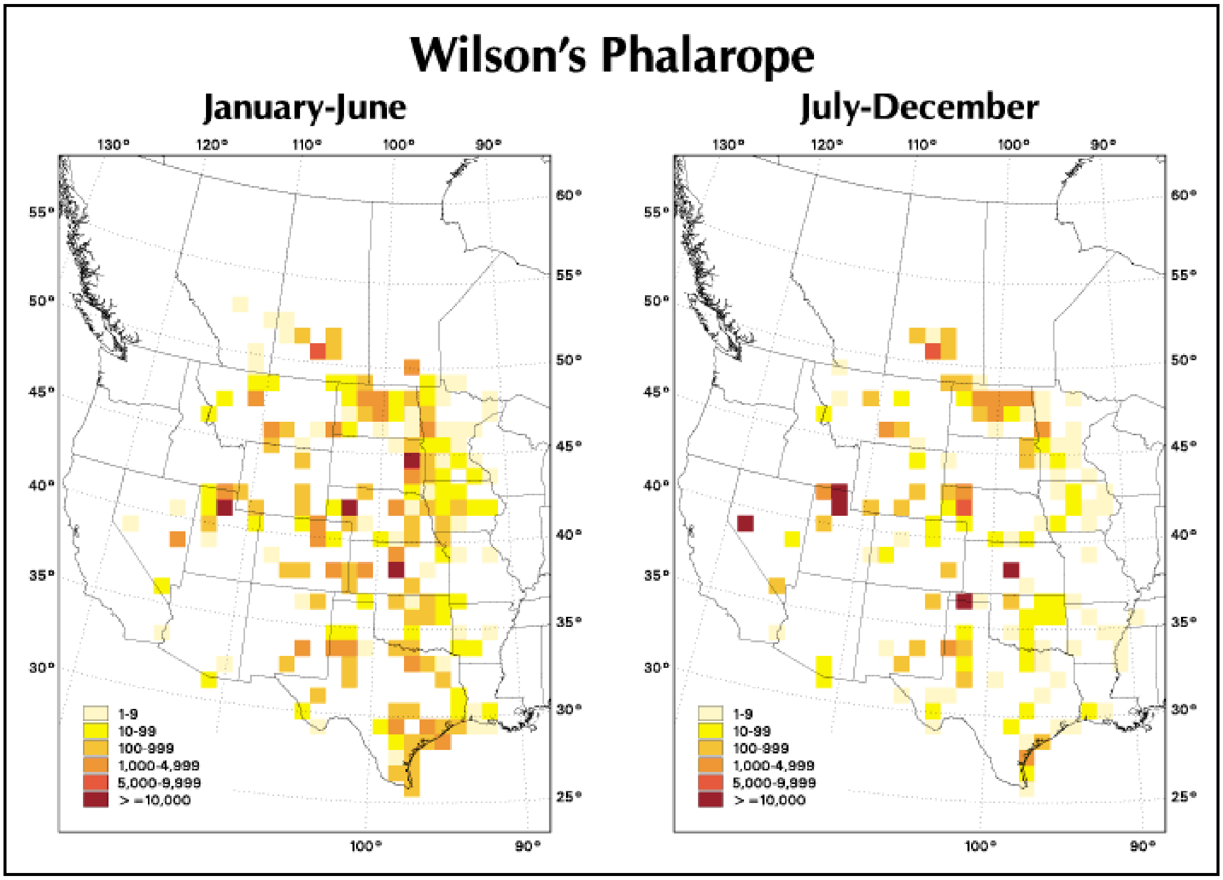


Map 3. Suggested northbound and southbound migration routes of Wilson's Phalarope based on available information (from Devenish *et al.* 2009)

Northbound Migration

The return migration of *P. tricolor* starts in March with the first birds arriving back on the breeding grounds in late April to early May. Little is known of the return migration, but available data suggest that birds use interior flyways through South America, continuing over land through Central America and Mexico and/or crossing the Gulf of Mexico (Map 3). Large congregations of northbound birds have been recorded from a number of wetlands in Mexico, with flocks of up to 66,000 birds observed at Lago Texcoco (WHSRN 2008) and 60,000 at Bahía Santa María (Vega 2006). Monitoring carried out in Ecuador at the Ecuasal Lagoons between 2000 and 2005 (and in 2008) showed returning birds' numbers peaking in February–April, although in much lower numbers than are observed in the area during southbound migration (Agreda *et al.* 2009). It should be noted that February might be a bit too early for return migration and would rather indicate birds that wintered in the area.

After arrival in North America, most migrants appear to pass through the Intermountain West region and the south-central plains (Map 4). In the western Great Basin, it has been estimated that up to 90% of the entire population passes through the Cheyenne Bottoms in Kansas in years with optimal conditions (Colwell and Jehl 1994). First-year birds return to the breeding grounds, but it is unclear what proportion actually breeds (O'Brien *et al.* 2006).



Map 4. Geographical abundance of Wilson's Phalaropes during southbound and northbound migration (from Skagen *et al.* 1999)

MAJOR HABITATS

Breeding Range

With the replacement of much of the native prairies of Canada and the United States by agriculture, the primary breeding habitat of Wilson's Phalarope is shallow water bodies in disturbed mixed grass prairies and agricultural areas (DeGraaf and Rappole 1995). Here, the species nests semi-colonially at shallow ponds and lakes, ranging from fresh to strong saline, and preferably close to wet-meadow vegetation. However, it is also found nesting in swales along streams, shallow sloughs fringed with short grasses, and hay meadows or pastures, sometimes up to 100 meters away from water (Johnsgard 1981, Colwell and Jehl 1994, DeGraaf and Rappole 1995). Additional breeding habitats include taiga interspersed with moist, grassy muskeg, and aspen-grove parklands (DeGraaf and Rappole 1995). Of 438 pairs found by Johnsgard (1981) in North Dakota, 50% were found nesting on semi-permanent ponds ranging from fresh to sub-saline; 40% were found on seasonal ponds and lakes; and the remaining 10% in alkali ponds or lakes and other types of wetlands like fen ponds. Despite being known as a semi-colonial breeder, nest densities vary greatly and probably depend to some extent on habitat availability and quality, with higher densities on highly suitable habitat.

Migration

During migration, Wilson's Phalarope uses a variety of wetland habitats, from coastal wetlands and lagoons to freshwater wetlands and hypersaline lakes. Large flocks of adults prepare for southbound migration at open, shallow-water habitats, especially at large saline lakes. Huge flocks gather at saline lakes in western Canada, such as Old Wives Lake and Chaplin Lake (Saskatchewan), and in the western United States at Great Salt Lake (Utah), Abert Lake (Oregon), and Mono Lake (California) (Colwell and Jehl 1994). Smaller numbers can be found in flooded meadows and alkaline ponds, and some gather at coastal estuarine marshes and sewage ponds in California. Spring migrants use shallow wetlands and coastal marshes in the south-central United States (Colwell and Jehl 1994).

During migration in Central and South America, *P. tricolor* can be found in inland marshes, flooded fields, salt works, and sewage-ponds (Colwell and Jehl 1994, Hayman *et al*. 1986). In western Amazon, Brazil, small numbers have been observed using oxbow lakes and mudflats along the Manu River (Bolster and Robinson 1990). The species also has been recorded at coastal mudflats and beaches, and occasionally uses sheltered tidal pools, lagoons, and estuaries (Van Gils and Wiersma 1996). In Ecuador, three birds were observed feeding on floating vegetation at Micacocha Lake (Freile 2004).

Nonbreeding Range

The main nonbreeding (wintering) habitats used by *P. tricolor* are mudflats and shallow, open-water habitats of saline lakes of the high Andes in southern Peru, western Bolivia, northern Chile, and northwest Argentina. Further south in the Southern Cone lowlands (i.e. Chaco and Pampas) in Argentina, Bolivia, Chile, and Paraguay, the species occurs in lowland saline lagoons, along river shores and bays (i.e. along the Paraguay River), freshwater lagoons, pools, water reservoirs used for cattle ranging, and flooded grasslands and marshy areas. Numerous small flocks can further be observed throughout the Patagonian steppe, using the abundant small freshwater ponds and pools up to Tierra del Fuego. Occasionally birds can be recorded in rice fields in Argentina and Brazil (Blanco *et al*. 2006).

CONSERVATION STATUS

Although Wilson's Phalarope is believed to have suffered significant declines in the past, it is currently not considered of global conservation concern. The IUCN Red List considers the species to be of "Least Concern" at the global level, given its "large range, with an estimated global Extent of Occurrence of 3,800,000 km^2" and "a large global population estimated to be 1,500,000 individuals (Wetlands International 2002);" and while "global population trends have not been quantified, the species is not believed to approach the thresholds for the population decline criterion of the IUCN Red List" (BirdLife International 2008). Similarly, NatureServe (2007) considers the species to be "Secure" (category G5). The species is not specifically listed by the Convention on Migratory Species (though it is included, along with all migratory *Scolopacidae*, in Appendix II), nor is it listed by the Convention on International Trade in Endangered Species (CITES).

At the national level, Wilson's Phalarope has been considered a "Species of High Concern" in the U.S. and Canadian Shorebird Conservation Plans (Donaldson *et al*. 2000, Brown *et al*. 2001, USFWS 2004). It was also considered to be a species of "National Concern" in the 2002 version of Birds of Conservation Concern (USFWS 2002), but was dropped from the 2008 version (USFWS 2009), as the overall population is currently considered to be stable (B. Andres in litt. 2009). The species is not included in the ABC/Audubon Watchlist (Butcher *et al*. 2007). The species is also not included in the Committee on the Status of Endangered Wildlife in Canada list (COSEWIC).

Throughout its nonbreeding range, *P. tricolor* is not considered of conservation concern on national or regional lists; in most cases, such lists do not even exist yet.

POPULATION GOALS

The U.S. Shorebird Conservation Plan (Brown *et al*. 2001) established a population goal of restoring the *P. tricolor* global population to its estimated size in the 1970s of 2,800,000 birds. This figure was derived from a calculation based on BBS data in the United States that suggested a population decline of 2.09% per year between 1970 and 2000 (B. Andres *in litt.* 2009, Brown *et al*. 2001). Given the uncertainty regarding the validity of using BBS data for declines in this species (see section above), it seems appropriate to set a minimum goal of no net loss of the current population.

CONSERVATION SITES

This section of the plan identifies the key sites of conservation importance for *Phalaropus tricolor*. These are all sites that are identified as holding 1% or more of the biogeographic population of the species, the standard criterion used by Ramsar, Important Bird Areas (IBAs), WHSRN, and others. There are no significantly large discrete breeding populations of *P. tricolor* and there are also no subspecies, therefore 1% of the total population estimate is taken also to be 1% of the global population, currently estimated at 1,500,000 birds. Thus any site holding 15,000 or more *P. tricolor* qualifies as a site of global conservation importance for the species (Table 1); sites known to hold less than 1% of the global population but more than 0.33% (5,000 birds) are considered to be of regional (or local) importance for the species (Table 2).

A total of 37 key sites of global importance were identified based on high counts meeting or surpassing 1% of the global population. The country with the most sites is the United States (15 sites), followed by Bolivia (7 sites). The Great Salt Lake (USA) is one of the most important of the key sites, where nearly 50% of the entire population stages after the breeding season. Of all 37 sites, 16 are designated WHSRN sites, 9 are IBAs, and 7 are Ramsar sites (some of these sites carry multiple designations, see Table 1). To date, 14 sites are not designated by any initiative; however, based on the counts presented here, would qualify as either a WHSRN site, IBA, or Ramsar site.

Of the 30 sites of regional (or local) importance identified in Table 2, the majority are located in the United States (16 sites), followed by Bolivia and Argentina (6 each). A number of the sites of regional importance contain counts of 10,000+ birds, approaching the 1% threshold level.

Abbreviations used in the tables below are as follows: Site Name: NWR – National Wildlife Refuge. Source: NWC – Neotropical Waterbird Census (provided by Wetlands International 2008), ISS – International Shorebird Survey, WBDB – World Bird Database; Designation: WHSRN – Western Hemisphere Shorebird Reserve Network site, IBA – Important Bird Area, Ramsar – Ramsar Wetland of International Importance.

Table 1. Key sites of global importance (≥ 1% global population, or 15,000 birds)

Site name	State/Prov.	Country	High Count	Seasonal use	Designation	Source
E. Coteau Lake	Saskatchewan	Canada	30,000	Staging		Jehl 1988
Reed Lake	Saskatchewan	Canada	25,000	Staging	WHSRN	Jehl 1988
Chaplin Lake	Saskatchewan	Canada	35,000	Staging	WHSRN	Jelh 1988
Great Salt Lake	Utah	USA	400,000–600,000	Staging	WHSRN	Jehl 1999
Layton	Utah	USA	175,000	Staging	-	ISS
Ogden Bay	Utah	USA	335,051	Staging	IBA	WBDB
Benton Lake NWR	Montana	USA	20,000	Staging	WHSRN	Jehl 1988
Big Lake	Montana	USA	40,000	Staging	-	Jehl 1988
Bowdoin NWR/ Medicine Lake NWR	Montana	USA	28,000 – 33,000	Staging	WHSRN (Bowdoin NWR)	Jehl 1988
Mono Lake	California	USA	93,000	Staging	WHSRN	Winkler 1977
Moss Landing	California	USA	350,000	Staging	-	ISS
San Francisco Bay	California	USA	40,000	Staging	WHSRN	Jehl 1988
Lake Abert	Oregon	USA	67,000 (150,000?)	Staging	-	Jehl 1999
Harney Basin	Oregon	USA	17,668	Staging	-	Shuford, W. D. *et al.* 2002
Cheyenne Bottoms	Kansas	USA	146,000	Staging	WHSRN/ Ramsar	Skagen *et al.* 1999
Lahontan Valley	Nevada	USA	67,000	Staging	WHSRN	Neeland Henry 1996
Crescent Lake	Texas	USA	18,000		-	ISS
Stillwater NWR	Nevada	USA	67,000	Staging	WHSRN (Lahontan Valley)	Jehl 1988
Lago de Texcoco	Mexico	Mexico	40,000–66,000	Passage	WHSRN	WHSRN 2008
Bahía de Santa María	Sinaloa	Mexico	60,000	Passage	WHSRN	X. Vega 2006
Sistema Lagunar Ceuta	Sinaloa	Mexico	15,000	Passage	WHSRN/ Ramsar	Ramsar
Laguna Pastos Grandes	Potosî	Bolivia	100,000	Winter	-	Blanco and Canevari 1998

Site name	State/Prov.	Country	High Count	Seasonal use	Designation	Source
Laguna Loromayo	Potosî	Bolivia	±100,000	Winter	-	Fjeldså and Krabbe 1990
Lago Hedionda	Potosî	Bolivia	±100,000	Winter	-	Fjeldså and Krabbe 1990
Laguna Kalina	Potosî	Bolivia	±100,000	Winter	-	Hurlbert *et al.* 1984
Laguna Colorado	Potosî	Bolivia	±100,000	Winter	-	Fjeldså and Krabbe 1990
Laguna Kollpa Khota	Oruro	Bolivia	±100,000	Winter	-	Krabbe and Fjeldsa *in litt.*
Laguna Chulluncani	Potosî	Bolivia	±25,000	WInter	-	Hurlbert *et al.* 1984
Reserva Nacional Salinas y Aguada Blanca	Arequipa, Moquegua	Peru	20,000	Winter	Ramsar/ IBA	Ramsar
Lago Junin	Junin	Peru	"Tens of thousands"	Winter	IBA	Scott and Carbonell 1986
Ciénaga de La Segua	Manabí	Ecuador	15,000	Stopover	IBA/ Ramsar	Birdlife 2005
Humedales de Pacoa	Santa Elena	Ecuador	25,000	Stopover	IBA/WHSRN	Cisneros-Heredia, D. 2006
Lagunas de Ecuasal-Salinas	Santa Elena	Ecuador	16,000	Stopover	IBA/ WHSRN	Agreda *et al.* 2009
Laguna Mar Chiquita	Cordoba	Argentina	500,000	Winter	Ramsar/ IBA/WHSRN	Nores 1989
Laguna de Pozuelos	Jujuy	Argentina	500,000	Winter	Ramsar/ IBA	Di Giacomo *et al.* 2007
Lagunas Saladas – Riacho Yacaré	Presidente Hayes	Paraguay	20,000	Passage	Ramsar/ IBA	Lesterhuis and Clay 2001
Salar de Surire	15th Region	Chile	50,000	Winter	-	Bech, J. and M. Brendstrup-Hansen. 1992.

Table 2. Key sites of regional (or local) importance (≥0.33% but ≤1% of global population, or between 5,000 and 15,000 birds).

Site name	State/Prov.	Country	High Count	Seasonal use	Designation	Source
At 14 Lake Sites	Saskatchewan	Canada	8,230	Staging		ISS
J. Clark Salyer NWR	North Dakota	USA	6,000	Staging	WHSRN	WHSRN
Long Lake NWR	North Dakota	USA	6,555	Staging	WHSRN	Gregg Knutsen and Keri Lang (USFWS)
Miller Lake	North Dakota	USA	7,560	Staging	-	Jehl 1988
Horsehead Lake	North Dakota	USA	13,500	Staging	-	Jehl 1988
Between Cactus Lake and Etter, Moore County	Texas	USA	10,000	Staging	-	Skagen *et al.* 1999

Site name	State/Prov.	Country	High Count	Seasonal use	Designation	Source
Summer Lake	Oregon	USA	10,000	Staging	-	Littlefield, C.D. 1990
Klamath	Oregon	USA	5,500	Staging	-	ISS
Tulare L. Basin	California	USA	12,000	Staging	-	ISS
San Diego Bay	California	USA	5,000–10,000	Staging	WHSRN (South San Diego Bay)	Jehl 1988
Lake SO of Wesby	California	USA	8,000	Staging	-	Jehl 1988
Dumbarton Bridge	California	USA	10,000	Staging	-	ISS
Crescent Lake NWR	Nebraska	USA	8,055	Staging	-	Skagen *et al.* 1999
Lubbock	Texas	USA	10,000	Staging	-	ISS
Midland	Texas	USA	10,000	Staging	-	ISS
Ruby Lake NWR	Nevada	USA	5,000	Staging	-	ISS
Pathfinder Ref.	Wyoming	USA	10,000	Staging	-	ISS
Laguna Verde	Potosî	Bolivia	3,000–5,000	Winter	-	Hurlbert *et al* 1984
Laguna Saquewa	Oruro	Bolivia	11,034	Winter	-	NWC
Lago Uru Uru	Oruro	Bolivia	6,866	Winter	-	NWC
Laguna Alalay	Cochabamba	Bolivia	10,000	Winter	-	Blanco and Canevari 1998
Laguna Saquewa	Oruro	Bolivia	11,034	Winter	-	NWC
Lake Poopó	Oruro	Bolivia	9,134	Winter	Ramsar/ IBA	Birdlife International 2005
Reserva Natural Guatrache	La Pampa	Argentina	5,000	Winter	-	F. Bruno/ D. Acevedo/ R. Olivera
Bajo Giuliani	La Pampa	Argentina	7,000	Winter	-	F. Bruno
Reserva Natural Chadilauquen	La Pampa	Argentina	7,000	Winter	-	F. Bruno/ D. Acevedo/ R. Olivera
Banados del Rio Dulce	Cordoba	Argentina	10,000	Winter	-	Scott and Carbonell 1986
Estancia El Fogón	Cordoba	Argentina	6,750	Winter	-	NWC
Monte de las Barrancas	Cordoba	Argentina	6,000	Winter	-	NWC
Lago Titicaca	Puna	Peru	12,906	Winter	-	Velarde Falconi 1998

CONSERVATION THREATS

Wilson's Phalarope is not believed to be currently undergoing a population-wide decline in numbers, but given that the total current population is believed to be significantly below that of the 1970s, it may be more appropriate to think in terms of "barriers to recovery" rather than threats leading to declines. The most significant barrier to recovery seems likely to be the loss and degradation of breeding habitat, potentially exacerbated by the effects of agrochemicals used throughout the range of the species. Notwithstanding, at a local scale some populations are undoubtedly under threat currently from a variety of factors, plus face potential threats such as habitat changes due to climate change and unregulated mining in areas surrounding the favored high Andean wetland wintering areas of concern.

In this section, the standard lexicon of Salafsky *et al.* (2008) was applied to assess conservation threats and actions for Wilson's Phalarope. This unified classification taxonomy organizes threats and actions in a hierarchy, and the highest priority actions appear in the plan's Conservation Timeline. All conservation threats identified in the unified classification system were considered, but only those that currently apply to Wilson's Phalarope are presented here. The threats are presented in the order used by this classification system, not priority order.

RESIDENTIAL & COMMERCIAL DEVELOPMENT

The drainage of wetlands and the conversion of associated grasslands to residential and commercial developments have resulted in the loss and degradation of habitat (e.g., through changes in hydrological and chemical regimes of wetlands) for Wilson's Phalarope throughout its breeding and migration range. However, such geographically focused developments are of less concern when compared to the massive habitat loss resulting from agricultural expansion. In a few cases, commercial developments can favor the species, through the development of saline lagoons for salt extraction (e.g., the lagoons at Salinas, Ecuador). Also, the Glauber's salt solution mining operation at Chaplin Lake, Canada, maintains water levels at optimal depth for shorebirds (G. Beyersbergen *in litt.* 2009), a definite benefit for Wilson's Phalarope and various other shorebird species that make use of the area.

AGRICULTURE

The massive loss of prairie wetlands in North America has presumably had a significant impact on the past and current population of the species. Once a vast expanse of grasslands with numerous wetlands, the prairies are now an agrarian system dominated by croplands. Wetland drainage to enhance agricultural production has been the primary factor resulting in the loss of wetlands in this region (Tiner 1984, Millar 1989, Dahl 1990, Dahl and Johnson 1991).

One of the most severely affected parts of the prairies is the Prairie Pothole Region (covering the U.S. states of Iowa, western Minnesota, North Dakota, South Dakota, and north-eastern Montana, and the Canadian Provinces of Alberta, Saskatchewan, and Manitoba). More than half of the historic Prairie Pothole wetlands have been lost (Dahl and Johnson 1991), and in the eastern parts of the region (i.e. Minnesota) fewer than 10% of the original wetlands and less than 1% of the native prairie grasslands still exist. Nearly 70% of the original Prairie Pothole grasslands now support crop production. Conversion of grassland to cropland peaked in the 1920s, coinciding with a notable contraction in the availability of breeding habitat of Wilson's Phalarope (Dahl and Johnson 1991). In other words, grassland conversion resulted in loss of suitable habitat for Wilson's Phalarope. Although by the1960s it was generally believed that all areas appropriate for agriculture had been converted, technological advancements and economic pressures continue to drive the conversion of more marginal areas.

Jehl (1999) considered the loss of breeding habitat to be one of the possible reasons for the apparent decline in the species's population. He compared an estimate of nesting habitat (abundance of ponds, data from Caithamer and Dubovsky 1996) in the year before each staging count with counts from staging sites. Jehl found a strong correlation between changes in the number of ponds and adults ($P = 0.012$, Figure 5) at Mono Lake, Califonia, but not elsewhere. He further postulated that if breeding habitat influences Wilson's Phalarope numbers, it should be possible to anticipate trends and make predictions. An 18% increase in pond numbers between 1995 and 1996 was reflected in an increase in the number of adults staging in 1997, both at Mono Lake and overall (Jehl 1999).

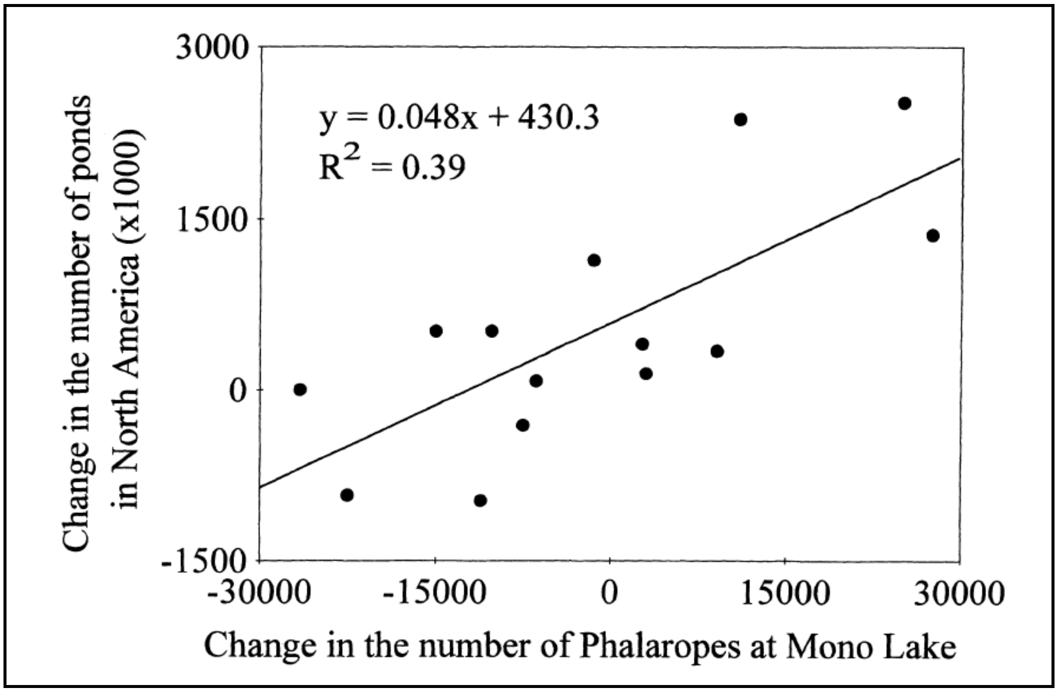


Figure 5. Changes in the number of Wilson's Phalaropes at Mono Lake, California, in relation to changes in the number of ponds in the main breeding area in the previous year (from Jehl 1999).

Agriculture would appear to be less of a concern, in terms of habitat loss, on the species's main wintering grounds – the saline, high-altitude lakes of the central Andeans. However, other parts of the species's migration and wintering range have been extensively modified by agriculture, consequently with significant loss of wetlands. The Pampas grasslands of Argentina, for example, have been extensively altered by agriculture (Bucher and Nores 1988, Soriano 1992), with a more than 60% decrease in the extent of grasslands in the Argentine Pampas over the period 1880–2000 (Viglizzo and Frank 2006). There has been a particularly rapid loss in recent decades through agricultural intensification, and a shift from cattle ranching to crops in the most fertile grassland areas (Viglizzo *et al*. 2005). The loss of wetlands in the Great Plains used by northbound migrants may also be a factor (Jehl 1999).

NATURAL SYSTEM MODIFICATIONS

Wilson's Phalarope is particularly susceptible to habitat loss and degradation at the few sites which hold significant molt congregations prior to the main migratory movement to the wintering grounds. Extraction of water for agricultural use is a particular concern at many of these sites, and could greatly exacerbate natural fluctuations in water levels. The major challenge is to ensure sufficient water inflow to these saline lakes—the ecology of which has been and continues to be changed in many cases through water diversion or reclamation projects (Jehl 1994). Studies show that decreased inflow leads to reduced size and increased salinity levels, which result in a decreased mass of invertebrates and changes in the species composition, negatively affecting the ability of Wilson's Phalaropes to replenish their fat reserves (Andrei *et al*. 2009). Increasingly, the altiplano lakes favored as wintering sites are also threatened by water extraction, primarily for mining, which also leads to contamination from mine effluents and run-off. On the breeding grounds, in addition to the changes in natural systems resulting from conversion to croplands, major non-agricultural impacts include the alteration of hydrological and chemical regimes in wetlands due to road construction (Swanson *et al*. 1988).

PROBLEMATIC SPECIES

Nest predation is a potentially important limiting factor for Wilson's Phalarope. During a 6-year study in Saskatchewan, Canada, nest success varied from 17% to 56% of clutches hatching ≥1 egg (Colwell and Oring 1988). Most clutch loss (on average 59% of failed clutches) was due to predation, with the next highest losses (average 17%) resulting from abandonment, which often follows partial clutch loss to predators (Colwell and Oring 1988). During this period, unknown predators killed 1% (n = 275) of incubating males. Colwell (1992) showed that predation rates are highest during years of greatest human activity around nests. In studies in North Dakota and Alberta, 96% (n=23) and 85% (n=7) of clutches, respectively, failed to hatch at least one chick (Höhn 1967, Kagarise 1979).

Observed predators of eggs and young include garter snake (*Thamnophis* spp.), various gulls (*Larus* spp.), American Crow (*Corvus brachyrhynchos*), Red-winged Blackbird (*Agelaius phoeniceus*), Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*), striped skunk (*Mephitis mephitis*), Franklin's ground squirrel (*Spermophilus franklini*), Richardson's ground squirrel (*S. richardsoni*), and northern raccoon (*Procyon lotor*) (Kagarise 1979, Colwell and Oring 1988).

Another potential threat that needs further investigation is the introduction of exotic species. Observations from the field have shown that breeding and nonbreeding lagoons may be abandoned when introduced exotic fish species (i.e. Rainbow Trout) cause dramatic trophic changes in the lagoons (Fjeldså *in litt.* 2009).

POLLUTION

The remaining prairie wetlands are impacted by a number of agricultural practices that result in elevated sedimentation rates (Martin and Hartman 1986, Gleason and Euliss 1996), drift of agricultural chemicals into wetlands (Grue *et al*. 1989), large inputs of nutrients (Neely and Baker 1989), unnatural variance in water-level fluctuation (Euliss and Mushet 1996), and altered vegetative communities (Kantrud and Newton 1996).

It would seem likely that there are both direct (through exposure to agrochemicals) and indirect (through changes in wetland ecology) impacts to Wilson's Phalarope. Exposure to agrochemicals may cause immediate death or reduce longer-term survival and/or reproductive rates. Birds are perhaps most susceptible to agrochemicals on their breeding grounds, during the migration through North America, and in lowland wintering areas, especially the Pampas. While the risk of exposure to agrochemicals in the favored wintering grounds in the altiplano is currently low, the Puna and Páramo grasslands are increasingly being cultivated for potatoes (and this is likely to continue, at ever increasing altitudes due to the effects of climate change), leading to greater run-off of sediments and agrochemicals into the high Andean lakes. Mining activities in the altiplano, on the other hand, do form a more serious threat due to contamination from mine effluents and run-off.

CLIMATE CHANGE & SEVERE WEATHER

The Intergovernmental Panel on Climate Change predicts that global temperatures will rise between 1.4 and 5.8°C by 2100, a temperature increase that is likely without precedent in the last 10,000 years (IPCC 2001). Of particular concern for Wilson's Phalarope is the increased likelihood of drought throughout a large part of the current breeding grounds, and the impact of droughts and increased temperatures on the key pre-migration staging sites. The major declines noted at some staging lakes during the 1980s were probably associated with droughts in their breeding areas (Jehl 1999). Colwell (1986, 1992) postulated that nest failure may be higher during drought years (as high nesting densities at the few remaining wetlands may attract predators).

Staging sites such as the Great Salt Lake, Utah, may be some of the most vulnerable wetlands in North America to changing climate. Increasing temperatures would result in an increase of evaporation and, without increases in rainfall to offset this, a reduction in lake size.

Consequently, salinity levels would increase, leading to a decreased mass of invertebrates and changes in species composition, negatively affecting the ability of the phalaropes to replenish fat reserves (Andrei *et al*. 2009).

Recent estimates of increased sea levels (resulting from thermal expansion of ocean water and melting of landfast ice) suggest that they may rise 1 meter, and potentially even 2 meters by 2010 (Rahmstorf 2007, Pfeffer *et al*. 2008). Such sea-level rises will eliminate many coastal areas used by the species, of particular concern being the coastal lagoons in western South America where the species arrives after its transoceanic flight. Migrating Wilson's Phalaropes are presumably dependent on favorable winds and weather patterns to complete their long transoceanic flights. Warming ocean temperatures could change wind and weather patterns, thus disrupting migration (Gill *et al*. 2005). An increase in the number and severity of storms, both during migration and while at staging sites, could also have negative consequences for the species (Piersma and Lindstöm 2004).

The remaining prairie (and Pampas) grasslands are already threatened by the expansion of non-native weedy species such as European cheatgrass (*Bromus tectorum*); to date, it is unknown whether this species provides suitable breeding habitat for Wilson's Phalarope. Climate change could intensify such threats, because opportunistic exotic species are well-suited to take advantage of the ecosystem disturbances caused by warming temperatures.

CONSERVATION STRATEGIES AND ACTIONS

In this section, we present the priority conservation strategies and actions for the species on a hemispheric scale. Progress toward completion of these actions is dependent on suitable funding and workload prioritization, but the steps described here should be incorporated into priority conservation planning.

NATIONAL STATUS ASSESSMENTS & LEGISLATION

With the exception of the U.S. and Canadian Shorebird Conservation Plans, and the U.S. Birds of Conservation Concern 2002, *Phalaropus tricolor* appears not to have been considered in virtually any other national or regional conservation assessments to date. One exception is the

U.S. Fish and Wildlife Service's Mountain-Prairie Region (Region 6), which considered adding the species to Bird Conservation Region 9 as a nonbreeding bird (S.D. Fellows *in litt.* 2009).

Conducting such assessments of the status of the species throughout its entire range should be a priority, as well as then including it in corresponding national/regional threatened species legislation, where warranted. Status assessments are specifically lacking throughout its nonbreeding range and should be encouraged, on either national or regional levels.

CONSERVATION OF KEY SITES

Many sites in the nonbreeding range where large congregations have been recorded currently lack protection. Site-specific information is listed in the Conservation Sites section of this plan and Tables 1 and 2. Acquiring legal protection for as many of these sites as possible should be a medium- to long-term goal. In the short term, their recognition as WHSRN and Ramsar sites, where appropriate and feasible, can be an important step in achieving legal protection. However, assessments of the current status of existing WHSRN and Ramsar sites is also necessary, as many of those sites still lack adequate management plans.

Creating new national protected areas can be a slow and time-consuming process, and it may be more effective to seek protection at the sub-national (e.g., state or provincial) or local (e.g., municipal) level, or through private reserve schemes. Decentralized processes in many countries in Latin America favor the creation of such reserves. An international designation that may be appropriate for some areas would be the World Heritage site (under the World Heritage Convention).

Many other sites, while officially protected on a national or international level, lack effective management regimes. The following sections give examples of the type of management activities that are known or believed to be needed for conserving Wilson's Phalarope and its habitat. Conservation action at key sites should start with a detailed assessment of threats to the site, and an understanding of the pressures behind them, as well as the stakeholders involved. This is best achieved through a participatory stakeholder analysis (for each site), during which all relevant stakeholders are identified and the threats and their drivers systematically assessed. Additional analyses that can help guide conservation action include: an institutional analysis of local partners to identify key capacity needs; a problem analysis leading to the production of a detailed project plan and logical framework (of project goals, objectives, activities, results, and expected outcomes); a ‘participatory livelihoods analysis’ to find out more about the situation of local people and how their livelihoods relate to the coastal environment; and a baseline conservation assessment of the site, for which the WHSRN Site Assessment Tool can be used.

CONSERVATION OF IMPORTANT HABITATS

A suite of habitat-level strategies and actions are key to the long-term survival of Wilson’s Phalarope and the fulfillment of the population goal. Among these are the following priorities:

- Ensuring the adequate **protection of suitable areas of habitat** throughout the breeding and nonbreeding range of the species. Whenever possible, delimitation of such areas should take into consideration the likely changes arising from global climate change (such as the displacement of appropriate breeding habitat). Planning for new protected areas or modifications to existing ones should include corridors of potential habitat into which appropriate breeding habitat can expand if conditions change. A highly positive fact is that recent changes in the breeding range of the species suggest that it is sufficiently able to discover new breeding habitats (Skagen and Knopf 1993, Colwell and Jehl 1994). A regional approach to protected areas planning, which takes into consideration the potential of the species to colonize new areas of appropriate habitat, will be important over the medium- to long-term.
- Lobbying for appropriate **measures to minimize the impacts of climate change**, including mandatory emissions reductions and the adoption of appropriate adaptation and mitigation strategies.
- Lobbying for responsible **agricultural practices that combine economic viability with environmental sustainability and social equality**. Active engagement with producers and agro-industry groups through roundtables, such as the Roundtable for Responsible Soy and the Roundtable on Sustainable Biofuels, is key. Such interaction can provide important opportunities to not only influence the criteria used to define responsible production, but also the decisions about which areas will have agricultural expansion/intensification and which areas will be set aside for more traditional land uses.

- Encouraging integrated **water management schemes** to ensure water quality and availability at important breeding, staging, and wintering areas, and maintaining natural water levels during periods of peak use.
- Supporting the development of **agricultural certification schemes** for livestock (e.g., beef raised on natural grasslands with intact natural wetlands) and crop products (e.g., organic rice) which are beneficial to the conservation of Wilson's Phalarope and other wetland and grassland species.

IMPLEMENTATION OF BENEFICIAL MANAGEMENT PRACTICES

There are at least three significant challenges facing the management of key breeding areas, and staging and wintering sites:

- Ensuring the quality of wetland habitats on the breeding grounds.
- Maximizing recruitment into the population by minimizing breeding failure (as a result of nest predation and abandonment due to disturbance).
- Securing sufficient water inflow to the saline lakes and wetlands which comprise the key molt-staging sites and the preferred wintering habitat.

EDUCATION

Education and outreach are required at many different levels. These range from informing individual farmers about the consequences of their decisions regarding grassland and wetland management, to mining companies operating on the nonbreeding grounds, to high-level executives making decisions within governments and agro-businesses. National and local programs should be developed to raise awareness about the importance of conserving Wilson's Phalarope populations and habitats. Target groups would include farmers and other relevant landowners or managers, students, local and national governments, and the general public. This species's large staging and wintering congregations are notable spectacles that provide excellent opportunities for outreach and education activities.

TRAINING

The successful implementation of many of the priority conservation strategies and actions outlined in this section will require appropriately trained conservation practitioners and policy makers. Among priority areas for training are threats assessment, site conservation planning, integration of site- and species-specific conservation actions within development agendas, habitat management and creation, public outreach and education, and fundraising.

RESEARCH AND MONITORING NEEDS

Wilson's Phalarope has been relatively well studied on its breeding grounds and at several staging sites in North America. However, very little is known about the species during its migration outside of North America and on the South American nonbreeding (wintering) grounds.

DISTRIBUTION AND HABITAT USE

While the overall distribution and habitat preferences of Wilson's Phalarope are reasonably well known, there still remain some significant gaps in knowledge. Work is needed in various areas including the following:

- Better understanding of the use of saline lakes in the altiplano of Argentina, Bolivia, Chile, and Peru.
- Quantification of the importance of wintering areas and habitats away from the altiplano saline lakes (i.e. the Southern Cone lowlands).
- Identification of the habitats used and flyways followed during the northbound migration. To date only large concentration have been found in central México, however, numbers do not reach those observed on wintering grounds and at U.S. staging areas.

KEY SITES

While many sites of global or regional importance for the conservation of Wilson's Phalarope have been identified, there are undoubtedly more that await discovery. Field research should focus on:

- A systematic survey of lakes in the altiplano of northern Argentina and Chile, Bolivia and southern Peru, and the Southern Cone lowlands (i.e. Chaco, Pampas, and the Patagonian Steppe) in Argentina, Bolivia, Chile, and Paraguay.
- A systematic survey of coastal areas in western Ecuador and Peru to better understand key sites and habitats used by arriving migrants. Possibly only a small portion of the birds re-fuel on coastal lagoons whereas the majority continues nonstop to the Andean region and/or further.
- Surveys of potential key sites in northern South America, Central America, and Mexico during the northbound migration.
- Determining if *P. tricolor* shows site fidelity to wintering sites and stopover areas in South America.

POPULATION STATUS AND TRENDS

There is a clear need for research to better understand the population dynamics of Wilson's Phalarope, and especially to determine population-wide trends. Among clear priorities are:

- An annual census of Wilson's Phalarope at molt staging sites in North America.
- A periodic (5-yearly) simultaneous census on the wintering grounds (saline lakes of the Altiplano and Southern Cone lowlands).
- Further testing of the relationship detected by Jehl (1999) between availability of breeding habitat and number of birds at staging sites in the subsequent year. This should include a refinement to take into consideration the actual extent of habitat availability (and not just an indication based on the number of ponds).

THREATS

The relative impacts of the different threats/limiting factors faced by Wilson's Phalarope are poorly understood. Important areas for research include:

- Quantify the exposure to and the likely impacts of agrochemicals, heavy metals, and other contaminants.
- Extent to which agricultural land uses alter the ecology of wetland breeding and migration habitats, and the impacts on the species.
- Methods for reducing/eliminating nest predation.
- Quantify threats to altiplano saline lake wintering sites (i.e. impact of mining activities).
- Investigate the impact of the introduction of exotic species. Field observations have shown that breeding and nonbreeding lagoons may be abandoned when introduced exotic fish species cause trophic changes in the lagoons. Also, it is unclear how Wilson's Phalarope responds to the expansion of European cheatgrass (*Bromus tectorum*) on breeding and wintering grounds.
- Develop and refine models to explore the likely effects of climate change on breeding and nonbreeding habitats.

MONITORING

A coordinated monitoring program is required to obtain a better understanding of Wilson's Phalarope population size and trend, and to assess the effectiveness of the actions outlined in this conservation plan. A coordinated program is especially needed throughout its nonbreeding range, where monitoring efforts currently are fragmented and carried out piecemeal by partners who often lack dedicated funding to ensure ongoing efforts.

CONSERVATION TIMELINE

By 2010

- Establish a *Phalaropus tricolor* Working Group including participants from throughout the range of the species.
- Translate the Wilson's Phalarope Conservation Plan into Spanish and Portuguese.
- Designate all known sites of global importance for *P. tricolor* as Important Bird Areas.

By 2011

- Designate at least three sites of global importance (those holding 1% or more of the global population) for *P. tricolor* as WHSRN sites.
- Assess the importance of all globally important *P. tricolor* sites for other species, to facilitate multi-species conservation planning and actions.
- Assess and document the protected status (regional, national, international, voluntary) for all sites of global importance for *P. tricolor*.
- Working with Joint Ventures in the species's breeding range and principal migration routes, ensure that Wilson's Phalarope habitat needs are being addressed within the JV's boundaries.
- Working with the relevant Scientific Councilors and national focal points for the Convention of Migratory Species, incorporate the conservation and research needs of *P. tricolor* into the regional action plans for the conservation of migratory grassland birds (Argentina, Paraguay, Uruguay).
- Working with the relevant Scientific Councilors and national focal points for the Convention of Migratory Species, incorporate the conservation and research needs of *P. tricolor* within the implementation of the High Andean Flamingos Memorandum of Understanding (Bolivia, Chile, Peru).
- Coordinating with the contact group for the Ramsar Convention's High Andean Wetland Conservation Strategy, ensure that research and conservation needs for *P. tricolor* and

other shorebird species are taken into consideration in the development of actions to fulfill the strategy.

- Provide support to the High Andean Flamingo Conservation Group to enable it to conduct counts of *P. tricolor* during the international flamingo census in 2010.
- Clearly establish highest-priority sites for conservation action through a participatory process combining the importance for *P. tricolor* (and other species) with urgency (level of threat). Identify site-based priority actions therein.

By 2012

- Within protected areas of global or regional importance for *P. tricolor,* identify all conservation actions required to maintain or increase the species's populations.
- Complete the training for conservation practitioners in threats assessment, site conservation planning, and public outreach at highest priority sites.
- Quantitatively assess the potential impact of climate change on *P. tricolor* throughout its range, focusing on key sites and habitats.
- Consolidate, coordinate, and expand efforts to assess the impacts of agrochemicals, heavy metals, and other contaminants on *P. tricolor* (and other grassland shorebird species).
- Establish a long-term, coordinated monitoring scheme for *P. tricolor* at its molt staging sites in western and central North America, and likewise at primary wintering sites in the altiplano of Argentina, Bolivia, Chile, and Peru.
- Conduct surveys to assess *P. tricolor*'s use of wetland habitats during northbound migration in the northern Andes and Central America.

By 2013

- Develop proposals to include threatened national populations of *P. tricolor* in relevant legislation in all countries and/or states within its range.
- Designate at least five more sites of global importance for *P. tricolor* as WHSRN sites.

- Complete site conservation plans for the highest-priority sites for conservation action for *P. tricolor.*
- Through an extensive color-marking program, initiate a study of site fidelity on wintering grounds.

By 2016–2019

- Conservation actions are underway at all sites of global and regional importance for *P. tricolor*.
- All sites of global importance have been designated as WHSRN sites and have received at least some level of formal protection as local, sub-national, or national protected areas, private reserves, and/or through international conventions (Ramsar, World Heritage).
- Surveys to census *P. tricolor* global population, including an annual census of molt staging sites and a periodic (5-yearly) winter survey, are underway and leading to more accurate population estimates.
- Monitoring protocols at breeding, migration, and wintering sites are underway and providing a clearer picture of population trends.

EVALUATION

Evaluating the progress, success, and needs of the conservation strategies and actions outlined in this plan will not be an easy task, as it will involve the assessment of many actions across very different geographic regions. This is confounded by only limited existing communication between researchers and conservation practitioners throughout the hemisphere, and further complicated by language differences. A first step in the implementation of this plan is to create a *Phalaropus tricolor* Working Group including researchers, conservationists, and educators from throughout the range of the species, with the goal of overcoming these challenges and fostering and coordinating research, conservation action, and monitoring.

Once created, the working group should be tasked with monitoring the implementation of the plan's conservation strategies and actions (and revising them as required). A key tool for monitoring the effectiveness of conservation action, built around the "Pressure-State-Response" (threat, condition, conservation action) framework adopted by the Convention on Biological Diversity, is the WHSRN Site Assessment Tool. This tool, which can be used for any site of importance for shorebirds (i.e., not only recognized WHSRN sites), permits changes in threats, shorebird populations, and conservation responses to be tracked over time and correlated, both at individual sites and across the network. Implementation of the tool will require that appropriately trained conservation practitioners, local conservation groups, birdwatchers, and professional ornithologists are contributing information to a central coordinator/coordinating group (i.e., the working group). Alignment of the tool with the Open Standards for the Practice of Conservation (Conservation Measures Partnership 2007) will enable the results of site assessments to be readily integrated with, and feed directly into, any conservation planning which utilizes Miradi (adaptive management software for conservation projects, based upon the Open Standards).

While the Site Assessment Tool provides a means for both detailed and general monitoring that is useful to conservation decision makers, measurement of more general indicators of success will be important for communicating progress to a wider audience. Among potential metrics are:

- Number of members in the *Phalaropus tricolor* Working Group, and their geographic distribution.
- Number of national/sub-national/regional threatened species (Red List) assessments undertaken that consider *P. tricolor* populations.
- The amount of local and national legislation passed that favors/improves conditions for the conservation of *P. tricolor*.
- Number of hectares of *P. tricolor* habitat newly incorporated within public or private protected areas systems and/or under international designations (Ramsar site, World Heritage site).
- Number of new WHSRN sites designated entirely or partly for *P. tricolor.*
- Number of sites of international importance (regional or global) for *P. tricolor* with site conservation plans that target the species.

- Number of surveys undertaken to search for additional sites of importance and to assess the species's use of different habitat types.
- Number of local conservation groups participating in *P. tricolor* conservation efforts (including population monitoring).
- Number of education and outreach programs which have incorporated information regarding the conservation of *P. tricolor*.
- Number of sites of international importance (regional or global) for *P. tricolor* being recognized as a result of new information becoming available.
- Clarification of *P. tricolor* population size and trends.
- Clear understanding of migratory movements, both on northbound and southbound migration, and identification of key stopover sites.
- Clear (quantified) understanding of the threats posed by contaminants and different types of habitat loss (i.e. caused by agricultural expansion and or climate change).

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