CONSERVATION PLAN FOR THE LESSER YELLOWLEGS

(*TRINGA FLAVIPES*)

Version 1.0

August 2012

Robert P. Clay[1], Arne J. Lesterhuis[1], and Silvia Centrón[2]

WHSRN
WESTERN HEMISPHERE
SHOREBIRD RESERVE NETWORK

Conservation Plan Authors:

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

[2] Guyra Paraguay, Gaetano Martino 215 esq. Teniente Ross, Asunción, Paraguay. silvia@guyra.org.py

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

Financial Contributors:

Manomet Center for Conservation Sciences / Shorebird Recovery Project

U.S. Forest Service – International Programs

Acknowledgements:

We are very thankful to everyone who contributed to the development of this plan. Key count data and other critical information for identifying important sites, threats, and research/management needs were provided by Brad Andres, Adam Brown, Luis Gonzalez Bruzual, Oswaldo Cortes, Garry Donaldson, Ben Haase, Brian Harrington, Pierre-Yves Henry, John Kvarnbäck, Anthony Levesque, Otte Ottema, Fabrice Schmitt, Paul Smith, and Dario Unterkofler. Participants in the shorebird hunting symposium held during the IV Western Hemisphere Shorebird Group meeting provided additional information on the threat posed by hunting. Special thanks are due to the people who reviewed earlier drafts of the plan, including Daniel Blanco, Anthony Levesque, Nyls de Pracontal, Jan-Hein Ribot, Arie L. Spaans, Susan Skagen, and Lee Tibits. We further thank Wetlands International for use of data from the Neotropical Waterbird Census; Manomet Center for Conservation Sciences for providing data from the International Shorebird Survey database; and Birdlife International for allowing the use

of its Lesser Yellowlegs data in the World Bird Database. A special thank you is extended to Bill Smoker, James Lowen, Kevin Karlson, and Peter Massas for permission to use their photos in the plan. We extend our apologies to anyone accidentally omitted from the above list – please let us know! Generous individual donors to the Manomet Center for Conservation Sciences' Shorebird Recovery Project and support from the U.S. Forest Service – International Programs made the development of this plan and its publication possible. Finally, we would especially like to thank the editor, Meredith Gutowski, for her patience and help during the development of this plan.

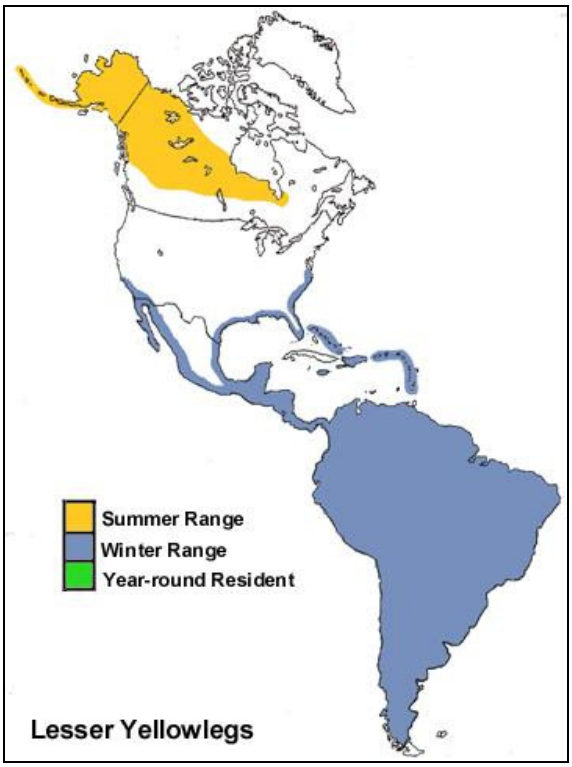
Recommended Citation:

Clay, R.P., A.J. Lesterhuis, and S. Centrón. 2012. Conservation Plan for the Lesser Yellowlegs (*Tringa flavipes*). Version 1.0. Manomet Center for Conservation Sciences, Manomet, Massachusetts.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Lesser Yellowlegs (*Tringa flavipes*) is a medium shorebird that is easily recognized by its long yellow legs. The species is sometimes confused with the similar Greater Yellowlegs (*Tringa melanoleuca*), but is comparatively smaller and has a shorter and finer bill. The Lesser Yellowlegs is restricted to the Americas where it breeds in the boreal forest belt of Alaska and Canada and migrates to its nonbreeding grounds covering most of the South American continent (Map 1).



Map 1: Breeding (yellow) and nonbreeding (blue) range of *Tringa flavipes* (from Skagen *et al.* 1999)

The species has a global population size estimated at 400,000 individuals, but it is believed that numbers were much higher in the past. Hunting in the late nineteenth and early twentieth century is especially considered to have caused significant population declines of the species. In recent years, several lines of evidence have suggested that the global population of *Tringa flavipes* is declining and has therefore been added to the U.S. Fish and Wildlife Service's Birds of Conservation Concern 2008 as a species of "National Concern."

Main factors identified which are believed to threaten the species and/or pose barriers to its recovery include the loss of habitat, exposure to agrochemicals, unregulated hunting, and climate change. Principle causes of loss of habitat are logging, agricultural expansion and intensification, and the conversion of land to other uses such as residential development and mining. Agrochemicals are being used throughout the species' migration corridors and nonbreeding grounds with potentially negative effects on the birds. The species is no longer subjected to the intense hunting pressure that it suffered in historical times; however, unregulated hunting remains a concern during the southbound migration, especially in the Caribbean and the Guianas. As a boreal forest-breeding species, *Tringa flavipes* is also highly susceptible to climate change as higher temperatures could, for example, cause drought on its breeding sites.

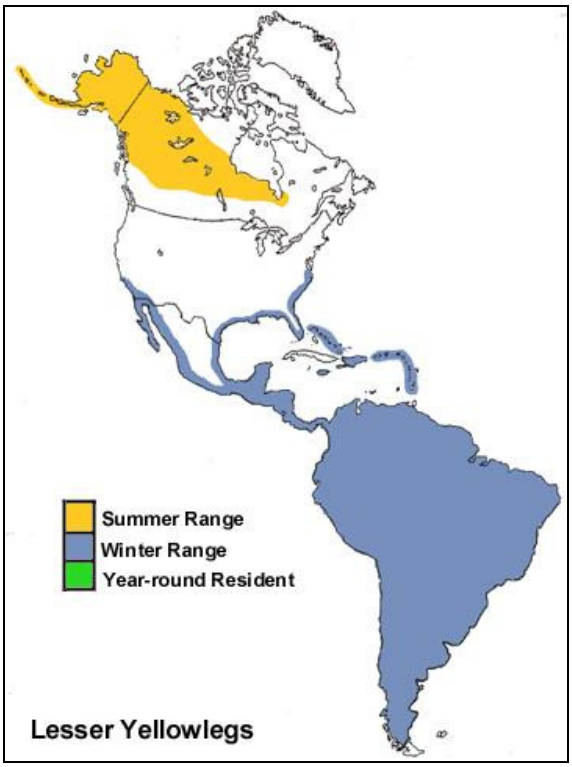
Key to the long-term survival of *Tringa flavipes* is a set of habitat-level strategies and actions, including ensuring adequate protection of large tracts of the species' breeding habitat; adopting responsible agricultural practices that combine economic viability with environmental sustainability and social equality; and supporting the development of agricultural certification schemes such as for rice, which are beneficial to the conservation of *T. flavipes*.

The effective management and conservation of a network of key sites for the species will also be important for its long-term survival. A total of 26 sites of global importance (holding 1% or more of the species' global population) are identified in this plan, the majority of which are migration stopover sites and nonbreeding (wintering) sites. A further 25 sites are identified as being of regional importance (holding 0.25% or more of the species' global population). Reducing the use of agrochemicals and/or encouraging their appropriate application are important actions to take throughout the nonbreeding range, where most key sites have been identified. Also, the regulation or (where appropriate) elimination of hunting are main actions required at these sites, especially in the Caribbean.

A first key step in implementing the activities identified in this plan is the creation of a Lesser Yellowlegs Working Group that includes participants from throughout the species' range. It also is important to undertake a revised assessment of the global conservation status of the *Tringa flavipes* for the IUCN Red List.

RESUMEN EJECUTIVO

El *Tringa flavipes* ("Lesser Yellowlegs" por su nombre en inglés) es de tamaño mediano, muy fácil de reconocerla por sus largas patas amarillas. Muchas veces se la confunde por su similitud con *Tringa melanoleuca* ("Greater Yellowlegs," en inglés), pero es notablemente más pequeña y tiene un pico más corto y fino. El *T. flavipes* cuenta con una distribución restringida en las Américas, nidifica en el cordón forestal de Alaska y Canadá, y luego migra cubriendo gran parte de Sudamérica (mapa 1).



Mapa 1: Áreas de nidificación (amarillo) y no reproductiva (azul) de *Tringa flavipes* (de Skagen *et al.* 1999)

La estimación poblacional de la especie a nivel global está estimada en 400.000 individuos, pero se cree que en el pasado éste número fue mucho más elevado. Se considera que la cacería a finales del siglo diecinueve y comienzos del siglo veinte fue el principal causante de la declinación poblacional de la especie. Se incluyo la especie en la lista de Aves de Interés para la Conservación 2008como especie de interés a nivel "Preocupación Nacional," por el Servicio

de Pesca y Vida Silvestre de los EE.UU., dado que en los últimos años varias líneas de evidencia sugirieron que la población global de *Tringa flavipes* ha disminuido.

Los factores identificados considerados como principales amenazas para la especie y/o obstáculos a su recuperación incluyen la pérdida de hábitat, la exposición a los agroquímicos, la caza no regulada, y el cambio climático. Las causas principales de la pérdida de hábitat son: deforestación, expansión e intensificación de la agricultura, y la conversión del uso de la tierra como por ejemplo el desarrollo urbano y minería. Los productos agroquímicos se utilizan a lo largo de los corredores de migración de la especie y en los terrenos no reproductivos con efectos potencialmente negativos sobre las aves. La especie ya no se encuentra sometida a la intensa presión de caza que sufrió en tiempos históricos, sin embargo la caza no regulada sigue siendo una preocupación durante la migración al Sur, especialmente en el Caribe y Guayanas. Como especie que nidifica en bosques boreales, *Tringa flavipes* es muy susceptible al cambio climático a causa de temperaturas elevadas debido al calentamiento global, dando un ejemplo, podría causar la sequía en sus sitios de reproducción.

La clave para la supervivencia a largo plazo de *Tringa flavipes* es un conjunto de estrategias a nivel de hábitat y acciones que deberán garantizar la adecuada protección de grandes extensiones de hábitat de reproducción de la especie, la adopción de prácticas agrícolas responsables que combinan la viabilidad económica con la sostenibilidad ambiental y la igualdad social, y apoyar el desarrollo de esquemas de certificación para la agricultura, por ejemplo, los cultivos de arroz son beneficiosos para la conservación de la *Tringa flavipes.*

La gestión eficaz y la conservación de una red de sitios claves para la especie también será importante para la supervivencia de la misma a largo plazo. Un total de 26 sitios de importancia global (que contienen el 1% o más de la población global) fueron identificados en este plan, de los cuales la mayoría de los sitios son de parada migratoria y no reproductiva (de invierno). También se identificaron otros 25 sitios de importancia regional (que contienen el 0,25% o más de la población global). Reducir el uso de agroquímicos y/o fomentar su aplicación apropiada son medidas importantes que deben tomarse en todo el rango de distribución no reproductivo en los sitios identificados como más importantes. También la regulación (o en su caso) la prohibición de la caza, son las principales acciones que se requieren en estos sitios, especialmente en el Caribe.

Un primer paso fundamental en la ejecución de las actividades señaladas en este plan es la creación de un grupo de trabajo para *Tringa flavipes* que incluye a participantes de todo el rango de distribución de la especie. También es importante llevar a cabo una nueva evaluación de la situación mundial de conservación de las especies para la Lista Roja de la UICN.

PURPOSE

Of all the shorebird species occurring in the United States, only three are federally listed as endangered or threatened. However, the U.S. Shorebird Conservation Plan (Brown *et al.* 2001, U.S. Shorebird Conservation Plan 2004) identified more than 20 shorebird species in peril; all require conservation attention if their population declines are to be reversed. In a response to the lack of a comprehensive and organized treatment of conservation threats and actions for these species, the Western Hemisphere Shorebird Reserve Network (WHSRN) identified the development of species-specific conservation plans as a means to provide guidance to conservation practitioners. The purpose of this plan is to synthesize information known to date about the status and needs of the Lesser Yellowlegs (*Tringa flavipes*), and to identify the most appropriate conservation actions necessary to address the species' conservation status.

Tringa flavipes is a long-distant migrant in the Western Hemisphere that breeds in the boreal forest belt of Alaska and Canada and migrates to nonbreeding ("wintering") grounds that cover most of the South American continent. Despite being widely distributed and one of the most commonly known shorebird species, it is one of the 20 species listed in the U.S. Shorebird Conservation Plan. *Tringa flavipes* is threatened by a number of factors, including loss of habitat, exposure to agrochemicals, unregulated hunting, and climate change. To what extent these threats (individually or collectively) are influencing *Tringa flavipes* is unclear. Thus, there is a clear need for better understanding the population dynamics of the species and the degree to which apparent threats are influencing its current status.

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.

STATUS AND NATURAL HISTORY

The shorebird species Lesser Yellowlegs (*Tringa flavipes*) has been relatively well studied during migration through North America and, to a lesser extent, on its breeding grounds. However, little is known about the species when migrating outside of North America or on nonbreeding (wintering) grounds in Central and South America and the Caribbean.

MORPHOLOGY

Tringa flavipes is one of 16 species of "shanks" or "tringine" sandpipers in the family Scolopacidae (subfamily Tringinae, tribe Tringini). These are small to medium shorebirds, often with long, brightly-colored legs, and a bill that is longer than the head. *Tringa flavipes* is a slim, attenuated, medium-sized *Tringa* that stands elegantly on long, orange-yellow legs and has a straight, slim bill. In flight it shows dark upperwings and a squarish white patch on the rump (Fig. 1).

Figure 1. Adult Lesser Yellowlegs (*Tringa flavipes*) in flight / © Bill Smoker

In all plumages, *Tringa flavipes* has brownish-grey upperparts with contrasting underparts and some streaking on the head, neck, and breast. Breeding *T. flavipes* has variable black markings on the upperparts and fine barring on the breast and flanks, which contrasts with the clean white belly (Fig. 2). The nonbreeding plumage is more uniform, with alternating dark

and pale marginal spots to the upperpart feathers (Fig. 3). The sexes are similar in plumage, though females on average are slightly longer-winged. Juvenile *T. flavipes* can be recognized by their uniformly fresh, brownish upperparts with sharply defined white spots on the feathers. (Fig. 4).

Figure 2. Adult Lesser Yellowlegs in breeding plumage / © Bill Smoker

Figure 3. Adult Lesser Yellowlegs molting into nonbreeding plumage / © James Lowen

Figure 4. Juvenile Lesser Yellowlegs / © Kevin Karlson

In all plumages, the Lesser Yellowlegs is very similar to the Greater Yellowlegs (*Tringa melanoleuca*), but is noticeably smaller (25–30%); has an all-dark, shorter, and finer bill that lacks the slight up-tilt of the often bicolored bill of *T. melanoleuca*; has a slimmer chest and neck; and lacks brown notching on the flight feathers (Fig. 5). The Eurasian Wood Sandpiper (*T.* glareola) is also similar to *T. flavipes*, especially to juveniles, but has relatively shorter legs, bill, neck, and wings. *T. glareola* also has browner plumages, with a longer and more marked supercilium. *Tringa flavipes* and *T. melanoleuca* differ from other large *Tringa* in their square, white rump-patches, and in their long wings which, when folded, project noticeably beyond the tail.

Figure 5. Lesser Yellowlegs (left, *Tringa flavipes*) and Greater Yellowlegs (right, *T. melanoleuca*) in breeding plumage / © Peter Massas/Flickr

Juvenile *Tringa flavipes* are distinguishable as such in the field until October, but can be identified throughout their first year by the presence of retained juvenal coverts, inner primaries, and secondaries. The molt out of juvenal plumage occurs primarily on the wintering grounds, and includes the head and body feathers, outer primaries, and inner rectrices. Head-and-body molt occurs between early September and January; primary and rectrix molt takes place between early November and mid-April. In March and April, first-year birds undergo a partial head-and-body molt, the extent of which is variable, but may include the inner secondaries (observed in birds in Suriname; A.L. Spaans *in litt.* 2012). Between late January and April, adults undergo a head-and-body molt to breeding plumage, the extent of which is variable, leading to a great deal of variation in breeding plumage. The complete molt to nonbreeding plumage usually begins in July on the breeding grounds, with the molt of a few head and body feathers; it is then suspended during the southbound migration, to be completed mainly on the wintering grounds (during July to January).

TAXONOMY

The family Scolopacidae is traditionally split into five or more subfamilies and additional tribes (*e.g.*, AOU 1998). In a recent analysis of shorebird phylogeny, Livezey (2010) recognized four subfamilies (Arenariinae, Calidrinae, Tringinae, Scolopacinae), treating the phalaropes as a separate family. Remsen *et al*. (2012) have, for the moment, withheld recognition of subfamilies within the Scolopacidae pending genetic data that confirm the groupings as real and deep splits. Nonetheless, recognition of the "shanks" or "tringine" sandpipers as a natural grouping is widely recognized. Although the number of valid species in the group has consistently remained unchanged, recognized genera have varied from one (Vaurie 1965) to six (Peters 1934).

Tringa flavipes and *T. melanoleuca* have both formerly been placed in a separate genus, *Neoglottis* (*e.g.* Ridgway 1919) or *Totanus* (*e.g.* Laubmann 1939). However, more recent phylogenetic studies using morphological characters (*e.g.* Vaurie 1965, Jehl 1968, Strauch 1978, Mickevich and Parenti 1980, Chu 1995), or a combination of morphology and molecular analyses (*e.g.* Pereira & Baker 2005) have shown them to be best placed within *Tringa*. Despite the close plumage similarities between *T. flavipes* and *T. melanoleuca*, molecular studies suggest that the closest relative of Lesser Yellowlegs is the Willet, *Tringa* (*Catoptrophorus*) *semipalmata* (Pereira & Baker 2005); this was recently confirmed through further, multiple gene-based phylogenetic analyses (Gibson 2010, Gibson & Baker 2012).

No subspecies have been described for *T. flavipes*, though there is very slight variation in average size geographically—with eastern North American birds being smallest, and those from central North America being the largest (Tibbitts & Moskoff 1999, Prater *et al.* 1997).

POPULATION ESTIMATE & TREND

Population Estimates

Morrison *et al*. (2006) give a population estimate for *Tringa flavipes* of 400,000 birds, with a range of 300,000–500,000; the same estimate was used in Waterbird Population Estimates 4 (Wetlands International 2006). These figures represent a slightly lower population than the previously used estimate of 500,000 birds (Morrison *et al*. 2001), and a lower upper range than the 300,000–800,000 given in Waterbird Population Estimates 3 (Wetlands International 2002).

The **400,000-bird estimate** is derived from a re-assessment of wintering data (T.L. Tibbitts pers. comm. to R. Morrison, cited in Morrison *et al*. 2006). The minimum value for the range (300,000) is derived from the total number of birds for the sites listed in five countries in South America by Scott & Carbonell (1986) of 296,700 birds (Morrison *et al*. 2001). The maximum value for the range is derived from a two-year survey of the Prairie Pothole Region in 2002–2003 by Skagen *et al*. (2008), which produced an average of 128,101±34,693 (SE) birds in the study area during northward migration and 283,578±63,956 (SE) birds during southward migration. Assuming a residency period of seven days for each season, these estimates imply that 558,200 and 567,200 birds passed through the area in spring and fall, respectively (Skagen *et al*. 2008). Morrison *et al*. (2006) adopted a conservative approach with these figures, assuming that the true number lies 1 SE below the mean, such that the total passing through the area in spring and fall would be 407,000 and 439,200, respectively.

Population Trend

In recent years, several lines of evidence have suggested that the global population of *Tringa flavipes* is declining. Data from the Breeding Bird Survey (BBS) suggest that the species has undergone a large and statistically significant decrease in North America over the last 40 years (-94.9% decline over 40 years, equating to a -52.6% decline per decade; Butcher and Niven 2007, Sauer *et al.* 2011). However, these surveys cover considerably less than 50% of the species' breeding range in North America (perhaps just 10–15%) and patterns from the southern boundary of the species' range (plus a few patches further north) could easily differ from that for the overall population (G. Donaldson in litt. 2012). Further north on the breeding grounds, two studies have reported substantial declines in the number of shorebirds breeding at Churchill, Manitoba (Canada), including Lesser Yellowlegs (Gratto-Trevor 1994, Lin and Jehl 1998).

In their analysis of two surveys of fall migrating shorebirds in central and eastern North America, Bart *et al*. (2007) found a decline in *Tringa flavipes* numbers in both the North Atlantic and Midwest regions, though the declines were not significant. Annual trends were of 0.9636 and 0.992 respectively. Ross *et al.* (2012) used data from a volunteer-based survey at stopover sites throughout Ontario, Canada, to assess population trends of shorebirds over the period 1974–2009. Numbers of Yellowlegs, 83% of which were *T. flavipes,* declined throughout the period, with a statistically significant ($P < 0.01$) annual decline rate of -6.9 (percentage change).

Furthermore the rate of decline appeared to be increasing; it was larger and statistically significant during 1989–2009 (-11.2, P < 0.00) than during 1974–1989 (-4.9, P = 0.62).

Following reported declines in the wintering population of *T. flavipes* in Suriname since the 1970s, Ottema & Ramcharan (2009) carried out a survey at one site in 2008–2009 repeating the methods of a previous survey at the same location. The results showed that numbers of *T. flavipes* had decreased by c.80% compared to those recorded in 2002–2003. The results of an aerial survey in December 2008, plus additional ground-based observations and four surveys at another location, suggested that the detected decline might be representative of the entire coast of Suriname. If true, then such a decline would be particularly worrying; Morrison & Ross (1989) found that of the total population of *T. flavipes* and *T. melanoleuca* detected through aerial surveys of the South American coast, 70% were located in Suriname. Ottema and Ramcharan (2009) used this to suggest that the global population of *T. flavipes* may have declined by c.75% from 2002–2003 to 2008–2009, and that the species may face extinction within 20–30 years. However, as the geographic scope of the 2008–2009 fieldwork was rather limited, it was not possible to eliminate the possibility that the wintering population of *T. flavipes* may have shifted its geographical preference, either along the coast of north-eastern South America or more widely. Nonetheless, Morrison *et al.* 2011, reporting on surveys along the coast of the Guianas (*i.e.*, Guyana, Suriname, and French Guiana) for Semipalmated Sandpiper (*Calidris pusilla*) noted that, "Decreases were also seen across many other shorebird species…especially Lesser Yellowlegs (*Tringa flavipes*) and Greater Yellowlegs (*T. melanoleuca*)," suggesting that birds have not simply redistributed along the coast of the Guianas.

Other reported declines of the local wintering population of *Tringa flavipes* are from the Lesser Antillean island of St. Martin. Wetland surveys conducted each winter since 2000–2001 have detected a decline from a high of 348 birds in January 2001, to less than 5 birds in each of the last five winters (A. Brown *in litt.* 2011). Declines have also been noted in the Bogotá wetlands in Colombia, though this is quite possibly linked to the decrease in the extent of wetland habitats (O. Cortes *in litt.* 2012). In coastal southwest Ecuador, B. Haase (*in litt.* 2011) has documented a significant downward trend in the population of the *T. flavipes* wintering in the Salinas lagoons since he began regular monitoring there in 1991 (Fig. 6).

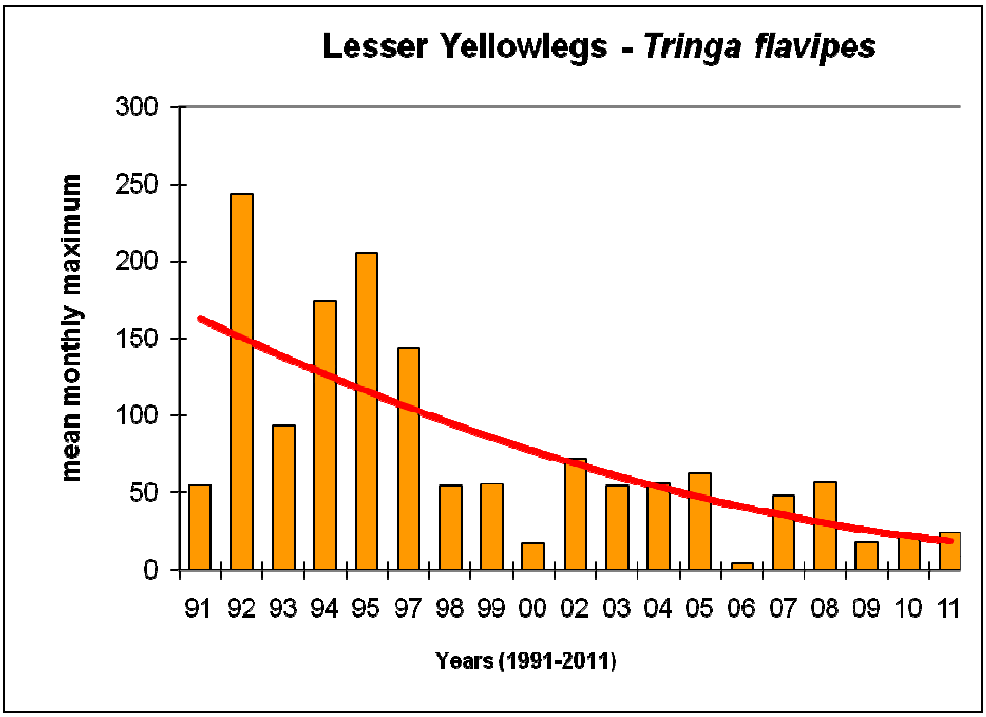


Figure 6. Decline in the population of *Tringa flavipes* wintering at the Salinas lagoons, southwest Ecuador, during 1991–2010. / *Figure kindly provided by B. Haase.*

Nores (2011) reported on fluctuations at Mar Chiquita in Córdoba and Santiago del Estero Provinces, Argentina, during 1973 to 2010. Large numbers of Nearctic breeding shorebirds, including a peak count of 15,000 *Tringa flavipes*, were recorded at the Segundo River estuary in the mid 1970s. Conditions then changed in the lake and the estuary was flooded. The highest count of *T. flavipes* recorded during 1990–1999 was 1,535 birds. Since the mid 2000s, water levels have dropped and the Segundo River estuary has reformed. However, large concentrations of shorebirds have not reappeared; just 32 *T. flavipes* were recorded in a census during November 2010.

Historical Changes

Market-driven hunting in the late nineteenth and early twentieth century is considered to have caused significant population declines of the species (Forbush 1912, Stone 1937, Kumlien and Hollister 1951). *Tringa flavipes* was a popular game species at that time and large numbers were harvested regularly at many migration stopover and wintering sites, including Long Island,

New York (Nichols and Harper 1916); Cape May, New Jersey (Stone 1937); Puerto Rico (S. Danforth in Bent 1927); Bermuda (S. Reid in Bent 1927); Barbados (Hutt 1991); and Argentina, Uruguay, Paraguay, and Chile (Wetmore 1927). There are reports of 20–106 birds being killed with single shots (Forbush 1912, Bent 1927).

DISTRIBUTION & ABUNDANCE

Breeding Range

Tringa flavipes breeds in the boreal forest belt from western Alaska, USA (162°W), east to the James Bay region in Quebec, Canada (73°W), with a northern breeding limit of 69°N and a southern one of 51°N. In Alaska, the species breeds throughout the area bordered by the Anaktuvuk Pass in the north, the Kobuk River in the northwest, the Sheenjek Valley in the northeast, the Situk River flats in the southeast, Lake Clark National Park in the southwest, and Innoko National Wildlife Refuge in the west (Tibbitts & Moskoff 1999 and references therein). In Canada, the species breeds in a belt with a northern limit in northern Yukon, northwest and east-central Northwest Territories, south Nunavut, north Manitoba, north Ontario and north-central Quebec; and with a southern limit from northwest and east-central British Columbia, south-central Alberta, south-central Saskatchewan, central Manitoba, and north Ontario (Tibbitts & Moskoff 1999 and references therein) (see Map 1).

Where their ranges overlap, *Tringa flavipes* breeds further north than *T. melanoleuca*, and doesn't occur in the eastern portion of the latter's breeding range (*e.g.* Newfoundland, Labrador, and eastern Nova Scotia, Canada).

Nonbreeding Range

Tringa flavipes winters primarily in coastal areas from central California (38°N) and southern New Jersey, USA (39°N), south through much of the Caribbean, Central America, and South America (where it also occurs commonly in inland wetlands) as far south as 55°S. Small numbers winter further north along both coasts of the United States. The majority of the U.S. wintering population occurs in the Gulf states, and particularly Texas, Louisiana, and Florida (see Map 1). Within the United States, *T. flavipes* does not winter as far north or as commonly at inland localities as *T. melanoleuca*.

In Mexico, *Tringa flavipes* is found wintering on both coasts, but is most numerous on the Pacific coast, typically in wetlands and lagoons just behind the outer coast. During aerial surveys in 1992–1994, Morrison & Ross (2008) found the highest concentration of *Tringa* spp. in Oaxaca (in the Laguna Mar Muerto). On the Caribbean coast, they found that the wetlands of western and northern Yucatán Peninsula held the highest numbers.

Aerial surveys of almost the entire coastline of South America conducted during 1982–1986 showed both species of yellowlegs to be widely distributed, though with the major wintering area centered on the Guianas (Morrison & Ross 1989). Over 91,000 yellowlegs were observed during the surveys, with 90.7% on the northern coast of South America, 6.7% on the Atlantic coast, and 2.6% on the Pacific coast. Between them, the Guianas held 78,000 yellowlegs, or 85.9% of the total for South America, with 72.8% (of the South American total) in Suriname (Morrison & Ross 1989, also Spaans 1978). Other areas of the South American coast that Morrison & Ross (1989) found to hold large numbers of yellowlegs included:

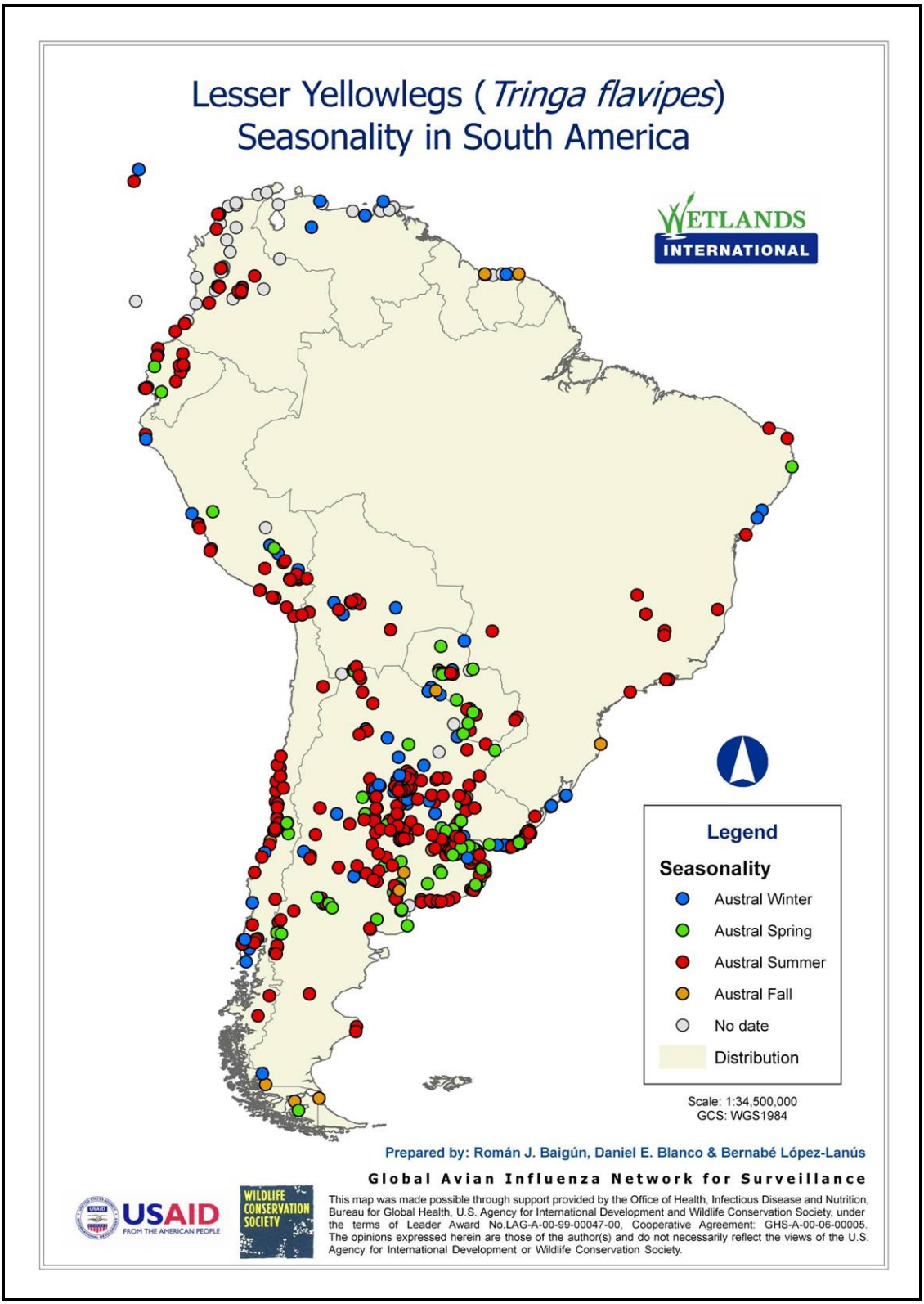
- Northern coast: lagoon systems in western and central Venezuela; the Caroni Swamp in Trinidad.
- Atlantic coast: wetlands and lagoons in the States of Rio de Janeiro and Rio Grande do Sul, respectively, in Brazil; wetlands and lagoon systems in eastern Uruguay and in Buenos Aires Province, Argentina.
- Pacific coast: lagoons and wetlands along the coast of Peru.

Some areas of the northeastern coast of Brazil were not surveyed by Morrison & Ross (1989), essentially from the State of Rio Grande do Norte to the northern coast of Bahia. Subsequently, ground surveys have identified several important areas for shorebirds along this coast, but *Tringa flavipes* appears to only occur in low numbers of just a few individuals per site, such as in the States of Paraibi (Cardoso & Zeppelini 2011) and Sergipe (Barbeiri 2007).

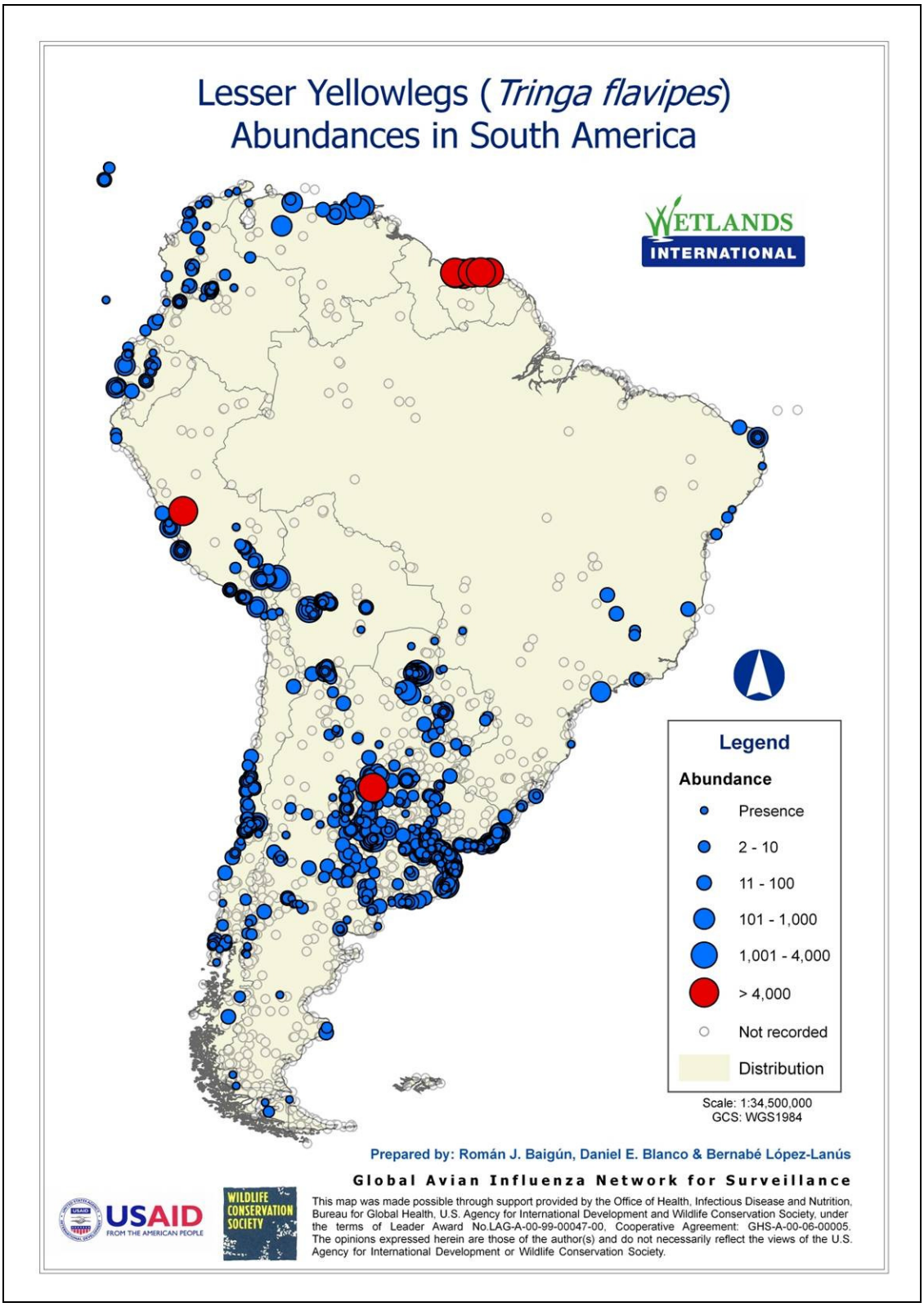
Morrison & Ross (1989) recorded few yellowlegs along the Chilean coast—a total of just 210 birds, with the highest counts on the island of Chiloé (164). However, in recent years it has become apparent that wetlands associated with river mouths in central Chile hold important numbers. For instance, the Rocuant-Andalién wetland in the Bio-Bio region regularly holds 2,000–3,000 birds (L. Espinosa per P. Ortiz pers. comm. 2009, BirdLife International 2012a, RPC pers. obs.).

Tringa flavipes is also a common "winterer" in wetlands of the interior of South America, with peak abundance in lowland savanna and grassland zones (Fjeldså & Krabbe 1990, Blanco *et al.* 2008) (Maps 2 and 3). Aerial surveys of the Brazilian Pantanal in October 1996 revealed the two *Tringa* spp. (*T. flavipes* and *T. melanoleuca*) to be the most common and widespread North American-breeding shorebird, with the highest numbers recorded in the south-central Pantanal (Morrison *et al.* 2008). In the central Amazon, *T. flavipes* is an uncommon southbound migrant and a rare winterer (Stotz *et al.* 1992). The species is reasonably common in wetlands throughout the *puna* of Peru, Bolivia, northern Argentina, and Chile, but is more sporadic in occurrence in Andean wetlands of Ecuador and Colombia (Fjeldså & Krabbe 1990, Laredo 1996, Ridgely & Greenfield 2000), where it occurs around páramo lakes up to at least 4,000 meters above sea level (RPC pers. obs.)

Small numbers of individuals (presumably mainly first-year birds) oversummer throughout the species' winter range (Blanco *et al.* 2008, Tibbitts & Moskoff 1999; RPC, AJL & SCV unpub. data). Jong & Spaans (1978) reported "only a few thousand" oversummering on the coast of Suriname in the 1970s. Scherer & Petry (2012) recorded *Tringa flavipes* along a 120-km strip of beach in the State of Rio Grande do Sul, Brazil, throughout the year; they considered that birds observed from May to July were likely to be small flocks of juveniles that winter on the beaches and lakes in the interior of the State, then concentrate on the coast during the austral winter (Maps 2 and 3).



Map 2: Seasonality of Lesser Yellowlegs in South America (Source: Blanco *et al.* 2008)



Map 3: Abundance of *Tringa flavipes* by site in South America (data from Neotropical Waterbird Census and other sources) (Source: Blanco *et al.* 2008)

Extralimital Records

Within the Americas, *Tringa flavipes* occurs as an occasional visitor to areas to the north and west of its breeding range, such as the Bering Sea islands and the northern coasts of Alaska, Northwest Territories, and Nunavut (Gabrielson and Lincoln 1959, Stephen and Herter 1989), and also as a vagrant to the Falkland Islands (Malvinas) (Woods and Woods 2006). In the Galapagos Islands it occurs as an uncommon migrant (Wiedenfeld 2006).

Outside of the Americas, *Tringa flavipes* is a regular vagrant to Greenland, Iceland, the Azores, and the British Isles. In Great Britain there were 19 records by 1949, and then 292 records between 1950 and 2010. Over that time period, the average number of individuals recorded per year has increased from just over 2 birds in the 1950s and 1960s, to nearly 5 birds in the 1970s and 1980s, and to over 8 birds during 2000–2010. If only the last 30 years of data are considered (to allow for much lower numbers of observers in the 1950s and 1960s), the trend is still an increasing one (Figure 7).

The species is less regular as a vagrant in other parts of Europe and is a rare vagrant to several African countries (perhaps referring to birds that arrived as vagrants in Europe and then continue to migrate north-south within the Eurasian-African flyway). The species also has been recorded as a vagrant in several Asian and Pacific countries and territories, including Australia, New Zealand, and the Hawaiian Islands, where the species is a regular vagrant in small numbers most years (Pyle 2002).

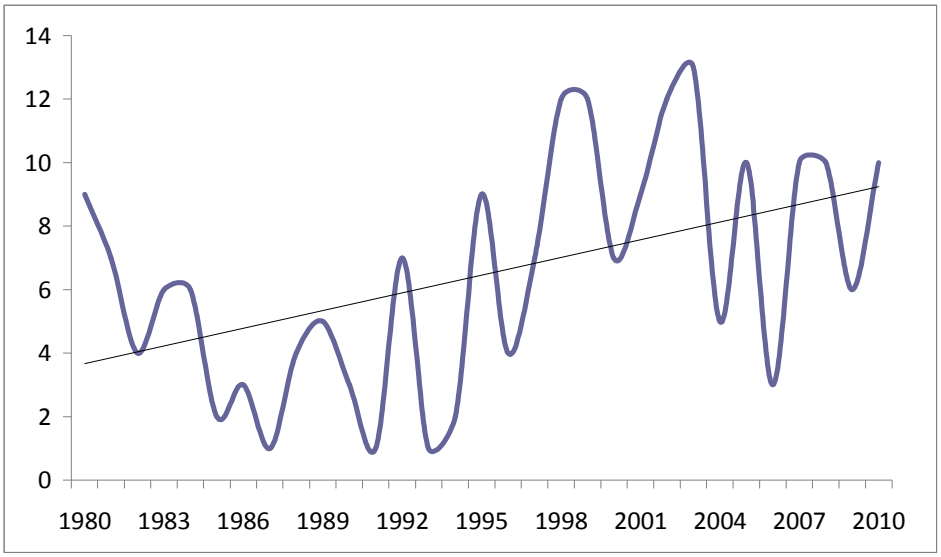


Figure 7. Records of *Tringa flavipes* in the United Kingdom, 1980–2010 (BBRC 2011). Vertical axis shows number of individuals.

MIGRATION

Southbound Migration

Southbound (fall) migration of *Tringa flavipes* takes place between mid-June and November. The majority of adult females depart the breeding grounds by early July, while most adult males depart by mid-July. Failed breeders may begin to head south by mid-June. Southbound juveniles depart the breeding grounds between late July and mid-August, and occur in both coastal and interior sites. The first southbound migrants appear in the northern United States (outside of Alaska) by late June; peak numbers occur during mid-July and early August. About a week later, there is a peak along the Gulf coast. The southbound migration of adults is more widespread than the northbound (spring) migration; during fall migration, birds commonly occur on the Atlantic Coast but rarely do during spring migration. The species is more numerous on the Pacific Coast during fall migration, though the two main migration routes are through the midcontinent and along the Atlantic Coast.

The species is a common transient in the Caribbean, with adults arriving in early July and peaking during August-September; juveniles first appear after the second week of August. Migrants reach Mexico and Central America in July, with peak passage occurring from late August onwards (Howell & Webb 1995, Ridgely & Gwynne 1989, Stiles & Skutch 1989).

Migrants reach Suriname by July (Spaans 1978) and start arriving in Paraguay by early August, with a peak during mid- to late September (RPC, AJL & SCV unpub. data); arrival in Argentina is by mid-August (Myers & Myers 1979).

The migration routes taken by birds from specific breeding populations is unknown, but general movement patterns can be inferred from count data and timing. Southbound migrants use two main migratory routes: through the midcontinent and along the Atlantic Coast. Many breeders from the eastern part of the range appear to stage in the Atlantic provinces of Canada and in the New England region of the United States (Bent 1927, McNeil & Cadieux 1972). Birds are particularly abundant along the shores of the St. Lawrence River, on Magdalen Island, and in the upper reaches of the Bay of Fundy (Hicklin 1987, Gauthier & Aubry 1996). From these staging areas, birds are believed to migrate by a series of hops along the Atlantic Coast, though some birds may make long, transoceanic flights to the Caribbean and northeast South America (McNeil & Cadieux 1972).

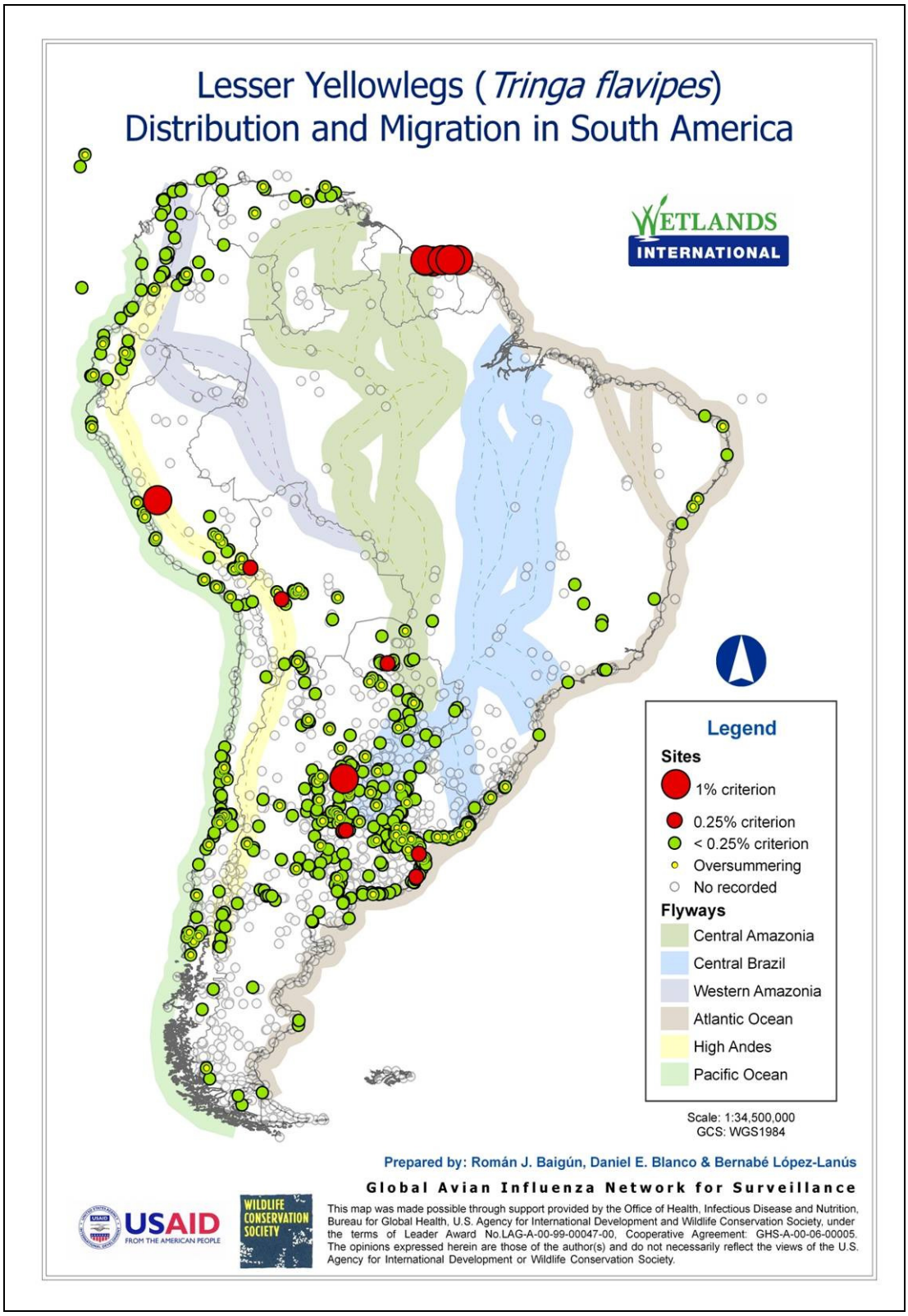
In western North America, *T. flavipes* is an uncommon to locally abundant southbound migrant throughout most of Alaska and British Columbia, Canada (Gabrielson & Lincoln 1959, Campbell *et al*. 1990), and a common migrant in the Pacific Northwest (Paulson 1993). Some Alaskan migrants may travel along the coast to British Columbia, as suggested by concentrations of hundreds of birds seen on Middleton Isle in the Gulf of Alaska in late July (S. Hatch cited in Tibbitts & Moskoff 1989). The species is more common in southern than in northern California, USA (Garrett and Dunn 1981).

In Suriname, the first and early-arriving migrants appear to continue eastward along the coast, whereas later-arriving migrants appear to winter locally (Spaans 1978). Birds moving eastward may then continue round the coast or "cut the corner," flying over the mainland between Sao Luis Island and the mouth of the Parnaiba River (Antas 1983). In this semi-arid corner of Brazil, *Tringa flavipes* regularly use the dams made for human and agricultural use. Two additional flyways are used by southbound *T. flavipes*: the Central Brazil flyway and the Central Amazonia/Pantanal flyway (Antas 1983) (Map 4).

Northbound Migration

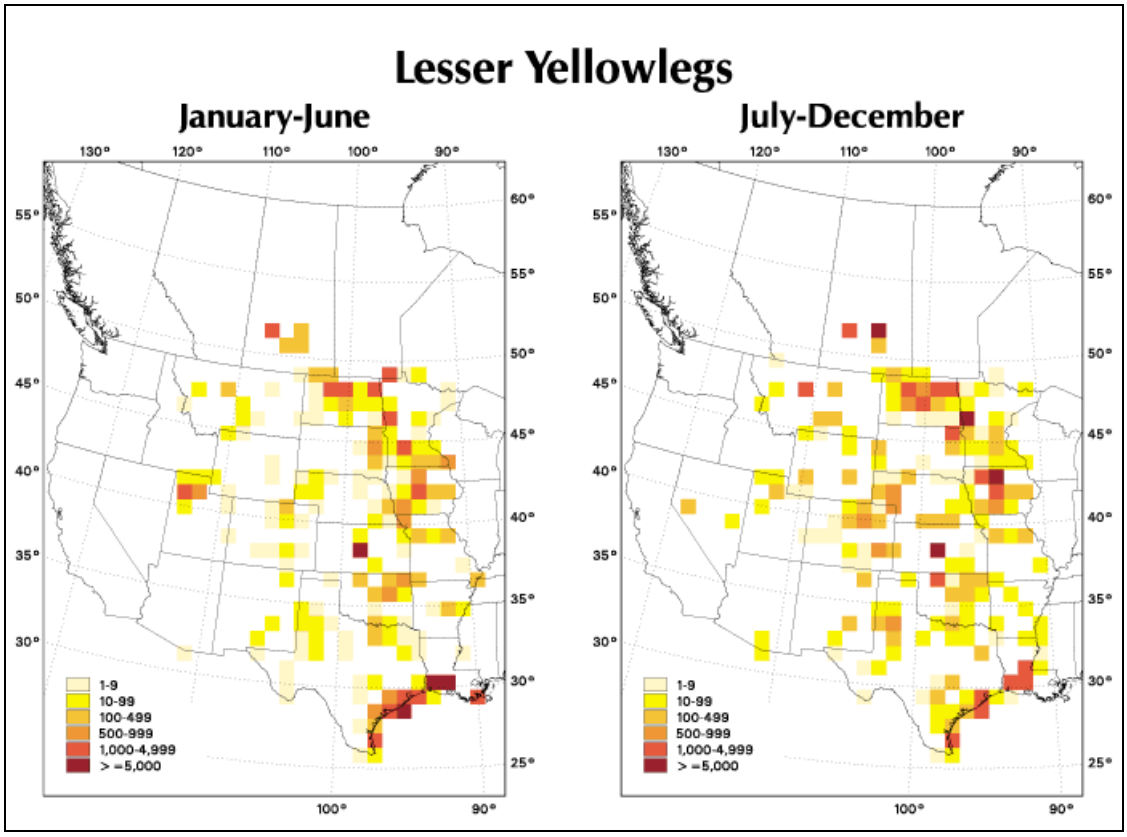
Northbound (spring) migration occurs between late February and late May. Adults begin to depart their wintering areas in late February and early March. Northbound migration of first-year birds averages later than that of adults. Some first-years remain on their wintering grounds while others migrate partway or all the way north to the breeding grounds.

In South America, northbound migrants probably use the same flyways as on southbound (fall) migration, but may make greater use of the Atlantic Coast and also the Western Amazonia Flyway, entering the upper valleys of the Amazonian rivers in Bolivia, Peru, and Colombia. Alternatively, they may cross central South America to the northern coastline in a non-stop flight (Antas 1983) (Map 4).



Map 4. Shorebird flyways in the interior of South America and sites of global and regional importance as identified using Neotropical Waterbird Census data and other sources (Source: Blanco *et al.* 2008).

In North America, northbound migrants are most common in the Southeast and interior, and scarcer in the Northeast and along the Pacific Coast. The primary migration route is thus midcontinental (mostly west of the Mississippi River, USA). Peak numbers reach the Gulf coast by mid-April and northern United States by early May. Arrival on the breeding grounds takes place between late April and early June (Map 5).



Map 5: Northbound (left) and southbound (right) migration of *Tringa flavipes* through midcontinental North America. (From Skagen *et al*. 1999).

MAJOR HABITATS

Breeding Range

The following text has been adapted primarily from Tibbits and Moskoff (1999), which represents the best summary of the species' breeding habitat.

Over 90% of the breeding range of *Tringa flavipes* lies in the Boreal Forest of Alaska and Canada, where the species favors open forest and forest-tundra transition habitats. Typical nesting areas contain a mix of shallow wetlands, trees or shrubs, and open areas. Preferred nesting habitat is open to semi-open forest (coniferous or deciduous), mixed with marshes, bogs, sedge meadows, and ponds; burnt areas littered with fallen trees and adjacent to muskegs; bogs or fens dotted with small wooded islands; grass meadows with patches of tall second-growth shrubs; and damp tussock-heath tundra adjacent to bogs (Street 1923, Rowan 1929, Irving 1960, Kessel & Schaller 1960, Campbell *et al*. 1990, Tibbitts & Moskoff 1999). *T. flavipes* also nests in man-made habitats such as rights-of-way for seismic and gas lines, and road and mine clearings (Peck and James 1983, Campbell *et al*. 1990). Where the species is sympatric with *T. melanoleuca*, *T. flavipes* often nests in drier, more vegetated habitats.

Typical foraging areas are along the shores of freshwater lakes and sloughs (Rowan 1929, Bannerman 1961) or, in the case of coastal breeders, in small brackish pools in salt marshes (Tibbits & Moskoff 1999). Breeders move between nesting and foraging areas daily. Broods are reared in fresh or brackish wetlands where shallow ponds are surrounded by tall vegetation.

Nonbreeding Range

During the nonbreeding season, *Tringa flavipes* inhabits a wide range of wetland habitats from sea level to at least 4,000 meters above. Preferred habitats include salt, brackish, and freshwater marshes; wet meadows, mud flats, estuaries, mangrove swamps, river banks; shorelines of lakes and reservoirs; and sewage lagoons, prairie sloughs, and salt pans. Along the coast of the Guianas, *T. flavipes* concentrates in shallow lagoons and brackish marshes that lie behind the outer coast (Spaans 1978, Morrison & Ross 1989). Birds use the adjacent tidal flats during the dry season (August–December), and make greater use of the lagoons and marshes during the wet season (December–March) (Spaans 1978). Along the coast of Buenos Aires Province, Blanco *et al.* (2006) found that *T. flavipes* was most abundant in habitats associated with the Estuarine landscapes (saltmarshes) and not recorded along sandy beaches and shores with cliffs, for example. At sites in the interior of Brazil, Paraguay, and Peru, birds are common along the shores of lakes and rivers during the drier months (September–November), but become scarce when rainfall increases during wetter months (December–March) (Antas 1983, Bolster & Robinson 1990; RPC, AJL & SCV unpub. data).

Flooded agricultural fields (especially rice fields) have become an important habitat for the species (Spaans 1978, McKay 1980, Remsen *et al*. 1991, Blanco *et al*. 2006). In Suriname, highest densities (7.8 birds/ha) were found in recently flooded rice fields being harrowed, plowed, or leveled. Densities were also relatively high in recently flooded fields with no agricultural activities (4.6 birds/ha) and in flooded fields a few days after such activities (2.6 birds/ha) (Hicklin and Spaans 1993). Inundated agricultural fields in southeast Florida, USA, supported high densities (62.2 birds/ha) of fall migrants for brief periods when appropriate habitat was available (Sykes and Hunter 1978). Blanco *et al*. (submitted) found *T. flavipes* to be common in rice fields of Argentina, Brazil, and Uruguay, with the species most frequent in Uruguay. Densities varied between 0.15 birds/ha (CI 90%: 0.07–0.23) in Brazil and 0.70 birds/ha (CI 90%: 0.24–1.16) in Argentina. Densities of *T. flavipes*, as with other shorebirds, tended to be highest in flooded paddies with rice plants less than 20 cm high; however, unlike many other shorebirds, high densities were also recorded where the plants were over 20 cm.

CONSERVATION STATUS

At a global level, *Tringa flavipes* is considered as "Least Concern" on the IUCN Red List (BirdLife International 2012). The large range of the species and the large population size do not approach the thresholds for threatened status under any of the IUCN criteria. Despite the fact that the population trend appears to be negative, the decline is not believed to be sufficiently rapid to approach the thresholds for threatened status under the Population Trend criterion. However, the uncertainties surrounding existing population data for *T. flavipes* seriously hinder attempts to estimate the global population trend. The species would be eligible for uplisting to Near Threatened status under the Population Decline criterion if it was shown that it had undergone a decline approaching 30% over 17 years (estimate of three generations), or up to Vulnerable if greater than 30%.

NatureServe (2007) considers *T. flavipes* to be "Secure" (category G5). The species is not specifically listed by the Convention on Migratory Species (CMS), although it is included, along with all migratory Charadriidae, in Appendix II to the convention. It is not listed by the Convention on International Trade in Endangered Species (CITES).

Tringa flavipes was first considered to be of "Low Concern" in the Canadian and U.S. Shorebird Conservation Plans (Donaldson *et al*. 2000, Brown *et al*. 2001), and was then uplisted to "Moderate Concern" in the 2004 update (USFWS 2004). The decline suggested by the Breeding Bird Survey (BBS) data prompted the U.S. Fish and Wildlife Service to add *T. flavipes* to its Birds of Conservation Concern 2008 report as a species of "National Concern" (USFWS 2008, B. Andres in litt. 2009).

POPULATION GOAL(S)

Brown *et al*. (2000) considered the population-change status of *Tringa flavipes* to be unknown, but noted that declines were not suspected. As such, their population goal for the species was to maintain the population at the 2000 level, estimated to be 500,000 birds. Brown *et al*. (2001), however, proposed a population target of 2,400,000 individuals, based on the calculated 1980 population level. Presumably this difference was due to new information about declines in the *T. flavipes* population.

As adequate information is lacking about population size and trends of *T. flavipes*, it is very difficult to set quantitative population goals for the species. Nonetheless, it is prudent to set a minimum goal of no net loss in the current *T. flavipes* population, and ideally to increase the current population size to offset expected future decreases from habitat loss and other threats.

CONSERVATION SITES

This section of the plan identifies the key sites of conservation importance for *Tringa flavipes*. Key sites support 1% or more of the biogeographic population of the species. As no subspecies have been described for *T. flavipes* (nor are there significantly large, discrete breeding populations), 1% of the biogeographic population is taken to be 1% of the global population estimated at 400,000 birds. Thus, any site holding 4,000 or more *T. flavipes* qualifies as a site of global conservation importance for the species, according to Birdlife International's Important Bird Area (IBA) criteria, and as a Site of Regional Importance in the Western Hemisphere Shorebird Reserve Network (WHSRN) (Table 1). Sites known to hold less than 1% of the global population but more than 0.25% (1,000 birds) are considered to be of regional importance for the

species (Table 2); it is anticipated that such sites may prove to be key once turnover is taken into account.

NOTE: Abbreviations used in **Tables 1 and 2** (below) are as follows: *Site Name*: **NWR** – National Wildlife Refuge. *Designation:* **IBA** – Important Bird Area, **WHSRN** – Western Hemisphere Shorebird Reserve Network site. *Source:* **NWC data** – Neotropical Waterbird Census (provided by Wetlands International 2009), **WBDB** – World Bird Database.

Table 1: Sites of **global** importance for Lesser Yellowlegs (*Tringa flavipes*) supporting 1% or more of the species' global population (*i.e.*, 4,000 birds or more).

Site Name	State/ Province	Country	High Count	Seasonal Use	Designation	Source
Reserva de Uso Múltiple Bañados del Río Dulce y Laguna Mar Chiquita	Cordoba	Argentina	15,000	Winter	IBA, WHSRN	WBDB
Bahía de Samborombón y Punta Rasa	Buenos Aires	Argentina	2,500–9,999	Winter	IBA, WHSRN	WBDB
San Javier	Santa Fé	Argentina	>5000	Winter	IBA	Blanco e*t al. in press*
St Lucy Shooting Swamps		Barbados	13,200	Winter	IBA	WBDB
St Philip Shooting Swamps		Barbados	13,200	Winter	IBA	WBDB
Sounding Lake		Canada	11,480		IBA	WBDB
Humedal Sur de Sancti Spiritus		Cuba	5,000	Winter	IBA	WBDB
Delta del Cauto		Cuba	5,000	Winter	IBA	WBDB
Amana		French Guiana	2,500–9,999	Winter	IBA	WBDB
Littoral		French Guiana	25,000	Winter	IBA	WBDB
Plaine Kaw & Pointe Béhague		French Guiana	2,500–9,999	Winter	IBA	WBDB
Suroeste		Puerto Rico (to USA)	4,262	Passage	IBA, WHSRN	WBDB
West Coast Mudflats		Trinidad and Tobago	10,000	Passage	IBA	WBDB
North, Middle and East Caicos Ramsar Site		Turks and Caicos Islands (to UK)	5,000	Winter	IBA	WBDB
Grand Turk Salinas and Shores		Turks and Caicos Islands (to UK)	6,000	Winter	IBA	WBDB
Cheyenne Bottoms WMA	Kansas	USA	52,140	Staging	WHSRN	Skagen *et al.* 1999
San Bernard NWR	Texas	USA	6,238	Staging		Skagen *et al.* 1999
Brazoria NWR	Texas	USA	4,955	Staging	WHSRN	Skagen *et al.* 1999

Site Name	State/ Province	Country	High Count	Seasonal Use	Designation	Source
Between Duson and Crowley	Louisiana	USA	4,490	Staging		Skagen *et al.* 1999
Quill Lakes	Saskatchewan	Canada	13,600	Staging	WHSRN	Skagen *et al.* 1999
North Dakota State University, Fargo	North Dakota	USA	7,000	Staging		Skagen *et al.* 1999
Union Slough NWR	Iowa	USA	6,000	Staging		Skagen *et al.* 1999
Bigi Pan	Nickerie and Coronie Districts	Suriname	50,000	Winter	IBA, WHSRN	de Jong & Spaans 1984
Coppename Monding NR	Saramacca District	Suriname	50,000	Winter	IBA, WHSRN	de Jong & Spaans 1984
Wia Wia	Commewijne District	Suriname	9,000	Winter	WHSRN	Ribot 2012
North Commewijne	Commewijne District	Suriname	100,000	Winter	IBA	de Jong & Spaans 1984

Table 2: Sites of **regional** importance for Lesser Yellowlegs (*Tringa flavipes*) supporting more than 0.25% but less than 1% of the species' global population (*i.e.* 1,000–3,999 birds).

Site Name	State/ Province	Country	High Count	Seasonal Use	Designation	Source
Between Jennings and Welsh	Louisiana	USA	3,348	Staging		Skagen *et al.* 1999
Anahuac NWR	Texas	USA	2,500	Staging	WHSRN	Skagen *et al.* 1999
Grand Terre, Jefferson Parish	Louisiana	USA	2,027	Staging		Skagen *et al.* 1999
Cameron Parish	Louisiana	USA	2,000	Staging		Skagen *et al.* 1999
Riverdale, Great Salt Lake	Utah	USA	2,000	Staging	WHSRN	Skagen *et al.* 1999
Between Lake Arthur and Holmwood	Louisiana	USA	1,355	Staging		Skagen *et al.* 1999
Roseau County	Minnesota	USA	1,330	Staging		Skagen *et al.* 1999
Acadia Parish	Louisiana	USA	1,230	Staging		Skagen *et al.* 1999
Laguna Atascosa NWR	Texas	USA	1,218	Staging	WHSRN	Skagen *et al.* 1999
Catahoula Lake	Louisiana	USA	3,095	Staging		Skagen *et al.* 1999
Wells County	North Dakota	USA	2,500	Staging		Skagen *et al.* 1999
Luck Lake	Saskatchewan	Canada	1,850	Staging		Skagen *et al.* 1999
Grand Forks Lagoons Area	North Dakota	USA	1,800	Staging		Skagen *et al.* 1999

Site Name	State/ Province	Country	High Count	Seasonal Use	Designation	Source
Orwell WMA	Minnesota	USA	1,600	Staging		Skagen *et al.* 1999
Grand Forks County	North Dakota	USA	1,600	Staging	WHSRN	Skagen *et al.* 1999
Salt Plains NWR	Oklahoma	USA	1,501	Staging	WHSRN	Skagen *et al.* 1999
Sewage Lagoons, Minot	North Dakota	USA	1,351	Staging		Skagen *et al.* 1999
Fields near West bend, Kossuth County	Iowa	USA	1,200	Staging		Skagen *et al.* 1999
Bahía de Jobos		Puerto Rico (to USA)	1,059	Passage	IBA	WBDB
Humedal-Marisma Rocuant Andalién		Chile	3,000	Winter	IBA	WBDB
Laguna Los Patos (Rufino)	Santa Fe	Argentina	1,080	Winter		NWC
Canal Del Arroyo Saladillo	Cordoba	Argentina	1,401	Winter		NWC
Laguna del Plata (Laguna de Mar Chiquita)	Cordoba	Argentina	1,326	Winter	IBA, WHSRN	NWC
Laguna Miramar (Rufino)	Santa Fe	Argentina	3,136	Winter		NWC
Weg naar Zee (Noord Saramacca)	Paramaribo District	Suriname	3,900	Winter	IBA	Ribot 2012

CONSERVATION THREATS

Tringa flavipes is threatened by a number of factors, such as loss of habitat, exposure to agrochemicals, unregulated hunting, and climate change. Loss of habitat is variously caused by logging, energy-sector related developments, agricultural expansion and intensification, and conversion of land to other uses such as residential development and mining. Agrochemicals are being used throughout the species' migration corridors and nonbreeding grounds with potentially negative effects on the birds. Although the species is no longer subjected to the intense hunting pressure that it suffered in historical times, unregulated hunting remains a concern during the southbound (fall) migration, especially in the Caribbean and the Guianas. As a boreal-forest-breeding species, *T. flavipes* is also highly susceptible to climate change.

Threats to *T. flavipes* are addressed in more detail in the following sections, presented not in priority order but per the order they appear in the IUCN-Conservation Measures Partnership classification hierarchy (Conservation Measures Partnership, 2007).

RESIDENTIAL & COMMERCIAL DEVELOPMENT

The conversion of wetlands to residential and commercial uses has resulted in the loss of habitat for *Tringa flavipes* along its migration routes and winter range. Although often of less concern than the massive loss of habitat resulting from agricultural expansion, urban expansion can be a serious concern at key migration stopover and wintering sites. For instance, of the 50,000 hectares of wetlands estimated to exist at the beginning of the 20th Century around Bogota, Colombia, just 800 hectares remain today (O. Cortes in litt. 2012).

AGRICULTURE

Conversion of wetland habitats to agriculture has resulted in a significant loss of habitat for *Tringa flavipes* throughout its nonbreeding (winter) range and along its migratory pathways. However, in some areas (*e.g.* in southern South America) the conversion of grasslands to rice fields may actually benefit the species.

ENERGY PRODUCTION & MINING

Resource Extraction

The development and extraction of oil and gas resources, especially within the breeding range, may have negative impacts on the species. Of particular concern is tar sands oil development in Alberta Province, Canada. This activity creates open-pit mines, which leads to habitat loss and fragmentation, toxic waste holding ponds which entrap and kill birds, water extraction resulting in desiccation of wetlands, and more indirect impacts through water and air pollution (Wells *et al.* 2008). An indirect impact of resource extraction may also be increased predator populations. Availability of garbage around development sites and associated human communities attracts and favors predators, whose presence can lead to significant losses of nests and chicks.

TRANSPORTATION & SERVICE CORRIDORS

Of particular concern are some of the massive water development projects currently being initiated or planned as part of the Initiative for the Integration of Regional Infrastructure in

South America (IIRSA in Spanish, *Iniciativa para la Integración de la Infraestructura Regional Sudamericana,* http://www.iirsa.org). For example, development of the Paraguay-Paraná hidrovia (fluvial navigation system) could lead to the loss of wetlands bordering the river, which *Tringa flavipes* uses extensively during migration and as primary wintering habitat. Similarly, the development of hidrovias within the Amazon basin could lead to the loss of wetland habitats used during *T. flavipes* migration and by some wintering birds. Another form of development with unknown consequences involves the potentially lethal effects of wind turbines erected along migration routes.

BIOLOGICAL RESOURCE USE

Hunting

Tringa flavipes presumably suffered a major decline during the 19th and early 20th centuries from excessive sport and market hunting, primarily in North America but also to a lesser degree on its nonbreeding grounds in South America. Shorebird hunting declined throughout North America after passage of the Migratory Bird Treaty Act in 1918. This treaty was amended in 1997 to allow for spring subsistence harvest, however, the regulations for implementing the harvest were not in effect until 2003 (See: http://alaska.fws.gov/ambcc/History.htm).

Harvest and egg-gathering is permitted for *T. flavipes* and 17 other species of shorebirds in Alaska generally between 1 April and 31 August, with a 30-day closure at the height of the nesting season. No daily bag limits are set, but in the case of *T. flavipes*, there are no reports of significant numbers of birds being taken. In Canada, subsistence harvest of shorebirds is thought to be minor, with some birds likely taken in the spring. In both countries, shorebirds also are taken as target practice for children and young adults learning to use their firearms.

Hunting of shorebirds remains a significant issue in the Caribbean. Hutt (1991) first documented the systematic hunting of shorebirds on Barbados, which occurs in carefully designed "shooting swamps" owned and managed by private hunting clubs. These artificial swamps vary in size, the larger ones holding up to 2 hectares of open water contained in a series of embanked enclosures known as "trays". Shorebird hunting continues to this day on Barbados at levels similar to those documented by Hutt (Burke 2008), and may pose a significant threat to *T. flavipes*. Estimates of the total number of shorebirds harvested per season (and the totals per

species) are not yet available from the clubs. Burke (2008) estimates the number of birds killed each shooting season (July–October) by the 10 active shooting swamps ranges between 15,000 and 30,000 birds. Totals vary significantly across years and swamps; wet years generally produce larger harvests. However, it is clear that *T. flavipes* comprises between 40 and 60% of the total harvest (Reed & Burke 2011). The solution, however, is not as simple as restricting or banning the clubs, as they would then stop maintaining appropriate habitat for shorebirds and thus greatly reduce the availability of habitat on the island. The Canadian Wildlife Service is working with Birdlife International's Caribbean Program and the Barbados Wild-Fowlers Association (BFWA) to gather current information on the harvest and to develop a model of sustainable shorebird harvest. To date, members of 50% of the shooting swamps have agreed to furnish their harvest data (Reed & Burke 2011). Birdlife International has raised funds to establish and manage the Woodbourne Shorebird Refuge. Some shooting swamps are maintaining water levels year-round to benefit migrant and resident birds, and the BFWA has helped fund maintenance of non-shooting reserves.

As with Barbados, shorebird hunting has a long tradition in Guadeloupe and Martinique; in fact, the hunting pressure in the French Caribbean may be greater than on Barbados. About 14–15 species are harvested on these two islands by approximately 1,400 hunters on Martinique and 2,800 hunters on Guadeloupe (though not all hunters target shorebirds, many also hunt forest species). The season runs from July to January and no daily bag limits are set. In contrast to the situation in Barbados, wetlands are not managed for shorebird hunting in Guadeloupe, and only to a limited extent in Martinique. *Tringa flavipes* is the most hunted shorebird species on both islands, with several thousand harvested each year, although exact numbers are not available (A. Levesque *in litt*. 2012).

Elsewhere in the Caribbean, hunting has been identified as a potential threat to shorebirds in Puerto Rico and Trinidad and Tobago (Andres 2011). On the latter islands, there are about 750 hunters and a season of November to February with no bag limits. More specific information is needed to determine the magnitude of the shorebird harvest on these islands.

In South America, hunting also poses a significant threat to *T. flavipes* in the Guianas, especially given the significance of the Guianese coastline as a wintering area for the species. Three main methods are used for hunting: shooting with a gun, trapping with a cast-net, and intercepting with a "choking wire." Cast-nets are used during very dark nights in combination

with a strong light. Choking wires are long, metal wires secured at one end to an uprooted mangrove stump or trunk on the mudflat; the other end is hand-held at a distance. When a flock of shorebirds flies by, the wire is snapped vertically, causing a sinuous whipping along its length. Birds colliding with the rapidly moving wire are killed or seriously wounded. This method originated in Guyana, and has now also spread into Suriname. While the hunting of most shorebird species is illegal in Guyana and Suriname, it remains legal in French Guiana (Delelis & De Pracontal 2006).

In Suriname, where the hunting of shorebirds has been illegal since 2002, there is little enforcement and it is estimated that several tens of thousands of shorebirds are trapped and shot each year. A survey conducted by the government and A.L. Spaans in 2006 indicated that virtually all shorebird species occurring in Suriname were illegally hunted and trapped in some quantity, with *T. flavipes* and Semipalmated Sandpiper (*Calidris pusilla*) being the dominant species (Ottema & Spaans 2008). The survey also documented an illegal food trade of shorebirds, including selling to local markets.

Very limited information is available regarding the hunting of shorebirds elsewhere in Central and South America. However, as a medium-sized, relatively common and approachable species, *T. flavipes* is likely targeted both for sport and target practice, and as a food source. Such is the case in Asunción Bay, Paraguay, where local children hunt the species with sling-shots (RPC, AJL & SCV unpub. data).

Logging

Over 90% of the breeding range of *Tringa flavipes* lies within the Boreal Forest of Alaska and Canada. To date, only 12% of this forest is protected. Over 30% has already been designated for logging, energy, and other development. Millions of hectares of the boreal forest are clear-cut each year, affecting in great extent the breeding habitat of the species. On a local scale, this may benefit the species, as they often use disturbed areas; however, the impact of widespread logging on the hydrology of the boreal region is potentially a much greater concern.

POLLUTION

Contaminants

Application of agrochemicals is common in wetland habitats along *Tringa flavipes'* migratory routes and throughout its nonbreeding range, therefore it seems likely that pesticides and herbicides pose a threat to the species. *T. flavipes* may be especially susceptible to agrochemicals applied in rice fields, where molluscides, insecticides, and herbicides are regularly applied (Blanco *et al*. 2006). Exposure to agrochemicals may cause immediate death or reduce longer-term survival and/or reproductive rates. The birds are perhaps most vulnerable to agrochemicals on their wintering grounds and during the northbound (spring) migration through central North America. Tissues of southbound (fall) migrants collected during 1979–1985 in Peru (n = 10 birds), Ecuador (n = 3), and Costa Rica (n = 8) contained elevated levels (>1.00 parts per million [ppm] wet weight) of the organochlorine DDE, a metabolite of DDT; whereas, samples from Suriname (n = 9 birds) contained low levels (0.01 ppm) (Fyfe *et al*. 1990). Twelve birds were found dead from aldrin-dieldrin poisoning in rice fields on the Texas Gulf coast (USA) during a 5-year study (1967–1971) of the effects of rice seed treated with the organochlorine aldrin (Flickinger and King 1972). Tissues from several birds collected at Corpus Christi, Texas (USA), in the winter of 1976–1977 contained relatively high levels of selenium, a heavy metal known for its deleterious effects on waterbirds, and relatively low levels of other heavy metals and organochlorines (White *et al*. 1980). One of the first studies on exposure of migratory shorebirds to cholinesterase-inhabiting pesticides in the Western Hemisphere showed that migratory shorebirds, including *T. flavipes*, are exposed to such pesticides at specific sites in the winter range but not at migration stopover sites (Strum *et al*. 2010).

As an obligate wetland species, *T. flavipes* is also susceptible to both coastal and inland oil spills. Several oiled birds, some unable to fly, were observed at an inland site in British Columbia, Canada, between 1976 and 1989 (C. Siddle cited in Tibbitts & Moskoff 1999). The exploitation of tar sands in Alberta Province, Canada, poses multiple threats to boreal-forest dependent species such as *T. flavipes*, including through contamination (Wells *et al*. 2008). Annual bird mortality from landing and drowning in the oily water in current tar sands tailings ponds could range from more than 8,000 birds (of all waterbird species) to well over 100,000. The likely doubling of tailings ponds, given the proposed tar sands mining expansions, would increase projected annual bird deaths to between 17,000 and 300,000 individuals. Additionally,

direct contamination of natural aquatic systems from leakage of tailings ponds and experimental reclamation ponds in the tar sands is well documented, and includes polycyclic aromatic hydrocarbons (PAHs) and naphthenic acids. The impacts of PAHs on birds are becoming better known and include developmental abnormalities and mortality in embryos, reduced egg production, increased clutch or brood abandonment, reduced growth, and increased organ weight.

CLIMATE CHANGE & SEVERE WEATHER

The Intergovernmental Panel on Climate Change (IPCC) predicts that global temperature will rise between 1.4 and 5.8°C by 2100, a temperature increase that is likely without precedence in the last 10,000 years (IPCC 2001). Of particular concern for *Tringa. flavipes* and other boreal-breeding shorebirds is the uncertain effect of global warming and climate change on breeding habitat and breeding success. The boreal forest is already being impacted by global climate change: temperatures within the forest are rising, seasons are shifting, and fires as well as forest depredation by insects are increasing. Vast, boreal-forest wetlands that serve as breeding grounds could dry up from the high temperatures and drought associated with global warming. Similarly, the palustrine wetlands needed by birds for refueling during migration could also dry up, compromising their ability to arrive in the breeding ground in good condition (S. Skagen *in litt.* 2012). Furthermore, with insects emerging earlier, long-distance migratory birds may arrive too late to find food.

As a result of thermal expansion of ocean water and increased melting of landfast ice, the IPCC considers that sea level is likely to rise between 0.09 and 0.88 meters by 2100 (IPCC 2001). More recent estimates suggest that sea-level rises will be even higher, likely to reach 1 meter, and potentially even 2 meters (Rahmstorf 2007, Pfeffer *et al*. 2008). Such sea-level rises will eliminate many coastal areas currently used by *T. flavipes*, though may also create new habitat as coastal grasslands and other habitats become flooded.

Migrating *T. flavipes* are presumably dependent on favorable winds and weather patterns to complete their long, oceanic 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 & Lindstöm 2004), exacerbated by the prevalence of

hunting at the first land-falls in the Lesser Antilles (Barbados, Guadeloupe, and Martinique) and the Guianas.

CONSERVATION STRATEGIES AND ACTIONS

In this section, we present the priority conservation strategies and actions for the species on a hemispheric scale in light of the aforementioned threats. Steps described here should be incorporated into priority conservation planning, although progress toward completing these is dependent on suitable funding and on workloads being similarly aligned. The following conservation actions are presented not in priority order but rather as they appear in the IUCN-Conservation Measures Partnership classification hierarchy (Conservation Measures Partnership, 2007).

NATIONAL STATUS ASSESSMENTS & LEGISLATION

Tringa flavipes was considered to be a species of "National Concern" in the 2008 Birds of Conservation Concern (USFWS 2008). However, it appears that no other countries in the Western Hemisphere have recognized the species as being of concern at a national level. Conducting national or, where appropriate, regional assessments of the status of the species should be a priority, as well as then including it in corresponding national/regional threatened species legislation, where warranted.

CONSERVATION OF KEY SITES

Many key breeding and nonbreeding locations 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, where appropriate and feasible as Western Hemisphere Shorebird Reserve Network (WHSRN) and Ramsar sites can be an important step toward achieving legal protection. 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 protected areas) or local (municipal protected areas) level, or through private reserve opportunities. Decentralization 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 a World Heritage site (under the World Heritage Convention).

Many other sites, while officially protected, lack effective management regimes. The following sections give examples of the type of management activities that are needed for conserving shorebirds and their habitats. Conservation action at key sites should start with a detailed assessment of the threats, an understanding of the pressures behind them, and the stakeholders involved. This is best achieved through a participatory 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 a baseline conservation assessment of the site using the WHSRN Site Assessment Tool; an institutional analysis of any local partners to identify key capacity needs; a problem analysis leading to production of a detailed project plan and logical framework with project goals, objectives, activities, results, and expected outcomes; and a 'participatory livelihoods analysis' to find out more about the situation of local people and how their livelihoods relate to the coastal environment.

CONSERVATION OF IMPORTANT HABITATS

Key to the long-term survival of *Tringa flavipes* and fulfillment of the minimum population goal of no net loss will be a suite of habitat-level strategies and actions. Among these are the following priorities:

- Ensuring the adequate **protection of large tracts of breeding habitat** for *T. flavipes* and many other boreal forest-breeding species. Whenever possible, delimitation of such areas should take into consideration the likely changes arising from global climate change (such as the northward 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.
- 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, for example through roundtables, 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. Working with rice producers to develop responsible practices should be a particularly high priority.
- Supporting the development of **agricultural certification schemes** for rice (and other crops) that are beneficial to the conservation of *T. flavipes* and other wetland species. Best practices should focus on limiting the use of agrochemicals and ensuring appropriate water levels for birds to forage.

Protecting large expanses of migration stopover and wintering habitat will be difficult. An important first step may be the formal recognition of certain landscape-level areas as being of particular importance for the species. This can be achieved through the WHSRN "Landscape of Hemispheric Importance" designation, for which a landscape area must hold 30% or more of the biogeographic population (*e.g.*, at least 132,000 *T. flavipes*).

IMPLEMENTATION OF BENEFICIAL MANAGEMENT PRACTICES

Site and Habitat Management

Reducing the use of agrochemicals, and/or encouraging their appropriate application, (*i.e.*, only at recommended levels and using specified techniques) are important actions that need to be taken throughout the nonbreeding range of *Tringa flavipes.*. Achieving this will require working with national and local authorities, and especially with government agricultural institutes that provide training to producers. However, because of the immense geographic areas over which the species moves annually, substantial reduction in hazards from contaminants presents an enormous challenge. At least some reduction might be possible in the short term within specific industries (*e.g.* the rice industry).

Key sites for *T. flavipes* throughout its range should be managed in such a way that at least a part of the site provides suitable habitat for the species to forage in at all times. This is especially needed at staging and stopover sites, which are of vital importance for the species to complete its annual migration cycle.

Hunting

The complex issue of shorebird shooting on Barbados should continue to be addressed. The artificially maintained shooting swamps provide important habitat for non-target waterbirds throughout the year, and for those migratory shorebirds which escape the guns. Elimination of shooting would in turn eliminate the swamps, as they exist and are maintained solely as places in which to hunt. The answer lies in the regulation of shooting, including the setting of species-specific bag limits based on accurate data for the numbers of each species being shot and a better understanding of the total numbers occurring. The creation of the Woodbourne Shorebird Refuge has been an important first step in establishing a safe haven for migrating shorebirds, and is a model which should be replicated elsewhere on the island. Formal regulation across the island should enable the most vulnerable species, such as *T. flavipes,* to have a reprieve. A positive outcome in Barbados could be especially important in helping to develop appropriate ways to address shorebird hunting throughout the Caribbean basin, in the Guianas, and elsewhere (albeit hunting elsewhere is largely subsistence). Priorities actions include:

- Developing a reliable subsistence harvest survey in Alaska and Canada that provides more reliable information on the harvest of shorebirds.
- Accurately determining the magnitude of the shorebird harvest in the French Caribbean and in the Guianas.
- Assessing the threat posed by hunting elsewhere in the Caribbean, South America, and Central America.
- Identifying ways to increase enforcement of existing regulations and to restructure current regulations.

EDUCATION

Education and outreach are required at many different levels, ranging from explaining to hunters in the Caribbean and the Guianas the global impact of their hunting activities; to individual farmers regarding the consequences of their decisions about agrochemical applications; to high-level decision makers in governments on what laws currently protect the birds in their countries/regions; and to high-level decision makers in agro-businesses. National and local programs should be developed to raise awareness about the importance of conserving *Tringa flavipes* populations and habitats. Target groups would include farmers and other relevant landowners or managers, agricultural consumers, school children, and the general public.

In Suriname, the Nature Conservation Department (NCD) of the Suriname Forest Service, with financial support from Dutch organizations, has already initiated an awareness campaign for effective protection of legally protected species (ibises, egrets, shorebirds, etc.) along the coast. This campaign already produced several posters and stickers, and started an education program at primary schools. The NCD is now producing 20 educational billboards to post at sites where the poaching of shorebirds is most frequent (A.L. Spaans *in litt.* 2012).

TRAINING

The successful implementation of many of the priority conservation strategies and actions outlined in this section for *Tringa flavipes* will require appropriately trained conservation practitioners and policy makers. Priority areas for training include threat assessment, site conservation planning, integration of site- and species-specific conservation actions within development agendas, strategies for law enforcement, habitat management and creation, public outreach and education, finding of alternative sources of income for subsistence hunters, and fundraising. In areas where the species is hunted for food, local people should be trained in alternative sources of income.

RESEARCH AND MONITORING NEEDS

Tringa flavipes has been relatively well studied during migration through North America, and to a lesser extent on its breeding grounds. However, little is known about the species when migrating outside of North America or on its nonbreeding (wintering) grounds in Central and

South America and the Caribbean. A priority need is to determine the conservation status of the species and, in particular, its population trend. Long-term breeding studies of individually marked birds are needed to gain insight into relationships between behavior, habitat use, and breeding success. Such studies would also provide estimates of survival and productivity, information that could be used to identify factors influencing population dynamics. More information is needed on the effects of landscape changes (*e.g.*, agriculture, reclamation, urbanization) on survival and distribution of *T. flavipes* in all seasons. As wetland habitats across the Western Hemisphere continue to be altered, studies to measure habitat requirements during migration and winter will become increasingly important, especially in the face of global climate change.

DISTRIBUTION & HABITAT USE

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

- Gaining more information about *T. flavipes* use of upland areas in South America, especially in the southern Andes during northbound migration.
- Quantifying the current importance of the coast of the Guianas (Suriname in particular).
- Quantifying the importance of coastal wetlands of Chile as wintering habitat.
- Gaining a better understanding of the use of rice fields, especially during migration in South and Central America.
- Researching migratory connectivity (*i.e.*, links between breeding populations and wintering grounds) by various means such as morphometric differences, stable isotopes, and geolocators.

KEY SITES

While a number of key sites of global or regional importance for the conservation of *Tringa flavipes* have been identified, there are undoubtedly more that await discovery. Field research should focus on:

- Identifying the main stopover sites used, if any, during migration in South America.

- Determining if *T. flavipes* migrates directly to the wintering grounds or uses stopover sites en route.
- Identifying additional key sites on the wintering grounds and during migration in North America.
- Determining if *T. flavipes* shows site fidelity to wintering sites and stopover areas.
- Assessing the extent of movements during the nonbreeding season.

POPULATION STATUS & TRENDS

The population estimate of 400,000 *Tringa flavipes* cited herein (Morrison *et al.* 2006) seems reasonably accurate. A clear picture of population declines is also emerging, though further research is needed to determine whether apparent declines are real, or reflect (at least partially) changes in distribution, or some other factor. Related to this is the need for research to better understand the population dynamics of the species. Standardized programs to monitor population size should be established and/or continued at representative breeding, migration, and wintering areas. Information on many aspects of the breeding ecology of *T. flavipes* is lacking. Priorities include:

- Conducting a more extensive census, breeding-range wide, to determine trends.
- Consolidating efforts to monitor the species during both the southbound and northbound migrations.
- Consolidating efforts to monitor the species on the nonbreeding (wintering) grounds, including the compilation and analysis of existing data.

THREATS

The relative impacts of the different threats faced by *Tringa flavipes* are poorly understood. Important areas for research include:

- Estimating the numbers of birds being killed by hunters throughout the range, but especially in the Caribbean and the Guianas.
- Quantifying the exposure to and the likely impacts of agrochemicals (some studies have been done to date, *e.g.* Strum *et al.* 2010).

- Developing and refining models to explore the likely effects of climate change on breeding and nonbreeding habitats.

MONITORING

A coordinated monitoring program is required to assess the effectiveness of the actions outlined in this conservation plan. Currently, monitoring efforts are fragmented and carried out piecemeal by partners who often lack dedicated funding to ensure ongoing efforts. However, some existing monitoring initiatives that gather data with the help of a large network of volunteers, like the International Shorebird Survey (ISS) and the Neotropical Waterbird Census (NWC), could be an effective tool to increase monitoring efforts for the species. The effectiveness of management efforts cannot be measured without dedicated funding, nor can the population trend of the *Tringa flavipes* be accurately determined.

CONSERVATION TIMELINE

By 2012

- Establish a *Tringa flavipes* Working Group to include participants from throughout the range of the species.
- Designate all known sites of global importance for *T. flavipes* as Important Bird Areas.
- Undertake a revised assessment of the global conservation status of the species for the IUCN Red List.

By 2013

- Compile and analyze all existing but unpublished data for *T. flavipes* on its wintering grounds, to identify additional key sites, and further quantify the populations occurring at known sites.
- Assess the importance of all globally important *T. flavipes* sites for other species to facilitate multi-species conservation planning and actions.

- Initiate systematic monitoring of numbers (by species) migrating through the French *départements* and territories in the Caribbean and quantify the impacts of hunting.
- Conduct geolocator studies to determine the species' migration route and be able to link key sites throughout its range.
- Establish two no-shooting swamps in Barbados as refuges for *T. flavipes* and other shorebird species.
- Assess and document the protected status (regional, national, international, voluntary) for all sites of global importance for *T. flavipes*.
- Clearly establish highest-priority sites for conservation action through a participatory process combining the importance for *T. flavipes* (and other species) with urgency (level of threat). Identify priority actions therein.
- Initiate dialogues with Joint Ventures along the species' principal migration routes to ensure that *T. flavipes* conservation and research needs are taken into consideration in their plans and actions.
- Designate at least three sites of global importance for *T. flavipes* as new WHSRN sites.
- Establish a long-term, coordinated monitoring scheme for *T. flavipes* within primary wintering areas (especially the Suriname coastline).
- Conduct surveys to assess *T. flavipes'* use of Chilean coastal wetlands as wintering areas.
- Work with Scientific Councilors and national focal points for the Convention of Migratory Species (CMS) to add the species to CMS Appendix I.

By 2014

- Formally designate at least two areas as WHSRN Landscapes of Hemispheric Importance for the species.
- Identify all conservation actions required to maintain or increase *T. flavipes* populations within protected areas of global or regional importance for the species.
- Provide training in threat assessment, site conservation planning, and public outreach for conservation practitioners at highest-priority sites.

- Quantitatively assess the potential impact of climate change on *T. flavipes* throughout its range, focusing on key sites and habitats.

By 2015

- Develop proposals to include threatened national or subnational populations of *T. flavipes* in relevant legislation in all countries and/or states within its range.
- Designate at least five more sites of global importance for *T. flavipes* as new WHSRN sites.
- Complete site conservation plans for the highest-priority sites for conservation action for *T. flavipes*.
- Conduct stable isotopes and morphometrics studies to further determine links between breeding and nonbreeding populations and sites.
- Through an extensive color-banding program, initiate a study of site fidelity on wintering grounds.

By 2015–2018

- Conservation actions underway at all sites of global and regional importance for *T. flavipes.*
- All sites of global importance have been designated as WHSRN sites and have received at least some level of formal protection as local, subnational, or national protected areas, private reserves, and/or via international conventions (Ramsar, World Heritage).
- Surveys to census *T. flavipes'* global population, including greater coverage of the breeding range, are underway and lead to more accurate population estimate.
- Monitoring protocols at breeding, migration, and wintering sites are underway and providing a clearer picture of population trends.

EVALUATION

Evaluating the progress, success, and future needs of the conservation strategies and actions outlined in this plan for *Tringa flavipes* is challenging, involving the assessment of many actions across very different geographic regions. The situation is confounded by the limited communication between researchers and conservation practitioners throughout the hemisphere, and further complicated by language differences (Dutch, English, French, Portuguese, Spanish, and numerous indigenous languages) throughout the species' range. A first step in the implementation of this plan is to create a *Tringa flavipes* Working Group including researchers, conservationists, and educators from throughout the range of the species; a goal for the group would be to overcome these challenges and foster and coordinate research, conservation action, and monitoring for *T. flavipes*.

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 networks of sites. Implementation of the tool will require a network of appropriately trained conservation practitioners, local conservation groups, birdwatchers, and professional ornithologists all 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 WHSRN Site Assessment Tool provides a means for both detailed and general monitoring useful to conservation decision makers and managers, measurement of more general indicators of success will be important for communicating progress to a wider audience. Potential metrics include:

- Number of members of *T. flavipes* Working Group, and their geographic distribution.

- Number of national/subnational/regional threatened species (Red List) assessments undertaken that consider corresponding *T. flavipes* populations.
- The amount of local and national legislation passed that favors/improves conditions for the conservation of *T. flavipes*.
- Number of hectares of *T. flavipes* 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 *T. flavipes*.
- Number of sites of international importance (regional or global) for *T. flavipes* with site conservation plans that target the species.
- Number of surveys undertaken to search for additional sites of importance and to assess the use of different habitat types by *T. flavipes*.
- Number of local conservation groups participating in *T. flavipes* conservation efforts (including population monitoring).
- Number of education and outreach programs that have information regarding the conservation of *T. flavipes* incorporated into them.
- Number of newly recognized sites of international importance (regional or global) for *T. flavipes* as a result of new information becoming available.
- Clarification of *T. flavipes* population size and trends.
- Clear understanding of migratory movements, both on northbound and southbound migration, and identification of key stopover sites.
- Quantified understanding of the threats posed by hunting, agrochemicals, agricultural expansion, and climate change.

LITERATURE CITED

American Ornithologists' Union. 1998. Check-list of North American birds. 7th ed. Am. Ornithol. Union, Washington, D.C.

Andres, B. 2011. Shorebird hunting in the Caribbean. Symposia Report from Western Hemisphere Shorebird Group, Fourth Meeting. Wader Study Group Bull. 118(3): 198–199.

Andres, B.A., P.A. Smith, C.L. Gratto-Trevor, R.I.G. Morrison. In prep. Population estimates of North American shorebirds, 2012.

Antas, P. de T.Z. 1983. Migration of nearctic shorebirds (Charadriidae and Scolopacidae) in Brasil - flyways and their different seasonal use. Wader Study Group Bulletin 39: 52–56.

Bannerman, D.A. 1961. The birds of the British Isles. Vol. 9. Oliver & Boyd, Edinburgh, Scotland.

Barbieri, E. 2007. Seasonal abundance of shorebirds at Aracaju, Sergipe, Brazil. Wader Study Group Bull. 113: 40–46.

Bart, J., S. Brown, B. Harrington, and R.I.G. Morrison. 2007. Survey trends of North American shorebirds: population declines or shifting distributions? J. Avian Biol. 38: 73–82.

Bent, A.C. 1927. Life histories of North American shore birds, Pt. 1. U.S. Natl. Mus. Bull. no. 142.

BirdLife International. 2012a. Important Bird Areas factsheet: Humedal-Marisma Rocuant Andalién. Downloaded from http://www.birdlife.org

BirdLife International. 2012b. Lesser Yellowlegs factsheet. Downloaded from http://www.birdlife.org

Blanco, D.E, B. López-Lanús, R.A. Dias, A. Azpiroz, and F. Rilla. 2006. Use of rice fields by migratory shorebirds in southern South America: implications for conservation and management. Wetlands International. Buenos Aires, Argentina.

Blanco, D.E., P. Yorio, P.F. Petracci, and G. Pugnali. 2006. Distribution and abundance of non-breeding shorebirds along the coasts of the Buenos Aires Province, Argentina. Waterbirds 29(3): 381–390.

Blanco D.E., R. Baigún, and B. López-Lanús. 2008. Lesser Yellowlegs in South America factsheet. Wetlands International for the Global Avian Influenza Network for Surveillance / WCS / USAID.

Blanco, D.E., A.P. Goijman, R. Antunes Dias, and M.E. Zaccagnini. Density, habitat use and conservation of shorebirds in rice fields in southeastern South America. Submitted to Condor (in review).

Bolster, D.C. and S.K. Robinson. 1990. Habitat use and relative abundance of migrant shorebirds in a western Amazonian site. Condor 92:239–242.

British Birds Rarities Committee (BBRC). 2011. Statistics – Waders http://www.bbrc.org.uk/waders.htm

Brown, S., C. Hickey, B. Gill, L. Gorman, C. Gratto-Trevor, S. Haig, B. Harrington, C. Hunter, G. Morrison, G. Page, P. Sanzenbacher, S. Skagen, and N. Warnock. 2000. National shorebird conservation assessment: Shorebird conservation status, conservation units, population estimates, population targets, and species prioritization. Manomet Center for Conservation Sciences, Manomet, MA, USA.

Brown, S., C. Hickey, B. Harrington, R. and Gill. (eds.). 2001. The United States Shorebird Conservation Plan. 2nd edition. Manomet Center for Conservation Sciences, Manomet, Massachusetts.

Burke, W. 2008. Barbados Pp. 82–89 in: D.C. Wege and V. Anadón-Irizarry (Eds) Important Bird Areas in the Caribbean: key sites for conservation. BirdLife International: Cambridge, UK.

Butcher, G.S. and D.K. Niven. 2007. Combining data from the Christmas Bird Count and the Breeding Bird Survey to determine the continental status and trends of North America birds. National Audubon Society, New York, NY, USA. http://www.audubon.org/bird/stateofthebirds/CBID/report.php.

Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser, and M.C.E. McNall. 1990. The birds of British Columbia, Vol.1. Loons through woodpeckers. R. Br. Columbia Mus. Victoria.

Cardoso, T.A.L. and D. Zeppelini. 2011. Migratory Shorebirds during Boreal Summer and SouthwardMigration on the Coast of Paraíba, Brazil. Waterbirds 34(3):369–375.

Chu, P.C. 1995. Phylogenetic reanalysis of Strauch's osteological data set for the Charadriiformes. Condor 97:174–196.

Conservation Measures Partnership 2007. Open standards for the practice of conservation. Version 2. http://www.conservationmeasures.org/CMP/

Delilis, N. and N. de Pracontal. 2006. Statut de conservation, sites d'importance et politiques de conservation en Guyane française. Report to BirdLife International on behalf of Waterbird Conservation Council.

Donaldson, G., C. Hyslop, G. Morrison, L. Dickson, and I. Davidson. 2000. Canadian shorebird conservation plan. Canadian Wildlife Service: Hull, Quebec.

Flickinger, E.L. and K.A. King. 1972. Some effects of aldrin-treated rice on Gulf Coast wildlife. J. Wildl. Manage. 36:706–727.

Forbush, E.H. 1912. A history of the game birds, wild-fowl and shore birds of Massachusetts and adjacent states. Wright & Potter Printing Co. Boston.

Fyfe, R.W., U. Banasch, V. Benavides, N. Hilgert de Benavides, A. Luscombe, and J. Sanchez. 1990. Organochlorine residues in potential prey of Peregrine Falcons, *Falco peregrinus*, in Latin America. Can. Field-Nat. 104:285–292.

Gabrielson, I.N. and F.C. Lincoln, 1959. The birds of Alaska. Stackpole Co. Harrisburg, PA.

Garrett, K. and J. Dunn. 1981. Birds of southern California: status and distribution. Los Angeles Audubon Soc. Los Angeles, CA.

Gauthier, J. and Y. Aubry, 1996. The breeding birds of Québec: Atlas of the breeding birds of southern Québec. Association Québécoise des groupes d'ornithologues, Prov. Québec Soc. Prot. Birds, Can. Wildl. Serv. Montréal, Québec.

Gibson, R. 2010. Phylogenetic relationships among the Scolopaci (Aves: Charadriiformes): Implications for the study of behavioural evolution. MSc Thesis, Department of Ecology & Evolutionary Biology, University of Toronto.

Gibson, R. and A.J. Baker, 2012. Multiple gene sequences resolve phylogenetic relationships in the shorebird suborder Scolopaci (Aves: Charadriiformes). Molecular Phylogenetics and Evolution 64(1):66–72.

Gill, R.E., T. Piersma, G. Hufford, R. Servanckx, and A. Riegen. 2005. Cross theultimate ecological barrier: Evidence for an 11,000-km-long non-stop flight from Alaska to New Zealand and eastern Australia by Bar-tailed Godwits. Condor 107: 1–20.

Gratto-Trevor, C.L. 1994. Monitoring shorebird populations in the arctic. Bird Trends 3: 10–12. Canadian Wildlife Service, Environment Canada, Ottawa.

Hicklin, P.W. 1987. The migration of shorebirds in the Bay of Fundy. Wilson Bull. 99:540–570.

Hicklin, P.W. and A.L. Spaans. 1992. The birds of the SML rice fields in Suriname: species composition, numbers and toxichemical threats. Canadian Wildlife Service. Technical Report Series 174. Ottawa, Canada.

Howell, S.N.G. and S. Webb. 1995. A guide to the birds of Mexico and northern Central America. Oxford Univ. Press, New York.

Hutt, M.B. 1991. Shooting of migrating shorebirds in Barbados. Pages 77–91 in T. Salathé. Ed. Conserving migratory birds. ICBP Tech. Publ. 12.

IPCC. 2001. Summary for Policymakers. Intergovernmental Panel on Climate Change. http://www.ipcc.ch/pub/spm22-01.pdf.

Irving, L. 1960. Birds of Anaktuvuk Pass, Kobuk, and Old Crow: A study in Arctic adaptation. U.S. Natl. Mus. Bull. 217.

Jehl, J.R., Jr. 1968. Relationships in the Charadrii (shorebirds): a taxonomic study based on color patterns of the downy young. Memoirs of the San Diego Society of Natural History 3:1–54.

Jong, B.H.J. de, and A.L. Spaans. 1978. Waterfowl and wetlands in Suriname: Contribution to the IWRB/ICBP Neotropical Wetlands Project. RIN Contributions to Research on Management of Natural Resources No 1984-1/ Suriname Forest Service Report No 1984-1. Research Institute for Nature Management, Arnhem, The Netherlands.

Jong B.H.J. de, and A.L. Spaans (in cooperation with M. Held) 1984. Waterfowl and wetlands in Suriname: Contribution to the IWRB/ICBP Neotropical Wetlands Project. RIN Contributions to Research and Management of Natural Resouces No 1984-1 / Suriname Forest Service Report No 1984-01. Research Institute for Nature Management, Arnhem, The Netherlands. 277 p.

Kessel, B. and G.B Schaller.1960. Birds of the Upper Sheenjek Valley. Biol. Pap. Univ. Alsk. no. 4.

Kumlien, L. and N. Hollister. 1951. The birds of Wisconsin. Wisconsin Soc. Ornithol. Inc., Madison.

Laubmann, A. 1939. Wissenschaftliche Ergebnisse der Deutschen Gran Chaco-Expedition. Die Vögel von Paraguay. Vol. 1. Strecker und Schröder, Stuttgart. 228 pp.

Lin, W. and J.R. Jehl, Jr. 1998. Population status of shorebirds nesting in the Churchill, Manitoba, area in 1997. Hubbs-Sea World research institute, Tech. Rep. 98–284. Hubbs-Sea World Res. Inst., San Diego, California.

Livezey, B.C. 2010. Phylogenetics of modern shorebirds (Charadriiformes) based on phenotypic evidence: analysis and discussion. Zoological Journal of the Linnean Society.160(3): 567–618.

Mckay, W.D. 1980. The influence of agriculture on avian communities near Villavicencio, Colombia. Wilson Bull. 92:381–389.

McNeil, R. and F. Cadieux, 1972. Fat content and flight-range capabilities of some adult spring and fall migrant North American shorebirds in relation to migration routes on the Atlantic coast. Nat. Can. 99:589–605.

Mickevich, M.F., and L.R. Parenti. 1980. The phylogeny of the Charadriiformes (Aves): a new estimate using the method of character compatibility analysis by J. G. Strauch. Systematic Zoology 29:108–113.

Morrison, R.I.G. and R.K. Ross. 1989. Atlas of nearctic shorebirds on the coast of South America. Vol. 2. Can. Wildl. Serv. Spec. Publ., Ottawa.Morrison *et al.* 2005.

Morrison, R.I.G, B.J. McCaffery, R.E.Gill, S.K, Skagen, S.L. Jones, G.W. Page, C.L. Gratto-Trevor, and B.A. Andres. 2006. Population estimates of North American shorebirds, 2006. Wader Study Group Bull. 111: 67–85.

Morrison, R.I.G., I.L. Serrano, P.T.Z. Antas, and R.K. Ross. 2008. Migratory birds in the Pantanal: distribution of neartic shorebirds and water species in the Pantanal. WWF-Brazil.

Morrison, R.I.G., D.S. Mizrahi, R.K. Ross, O.H. Ottema, N. de Pracontal, and A. Narine. 2012. Dramatic Declines of Semipalmated Sandpipers on their Major Wintering Areas in the Guianas, Northern SouthAmerica. Waterbirds 35(1):120–134.

Myers, J.P. and L.P. Myers. 1979. Shorebirds of coastal Buenos Aires Province, Argentina. Ibis 121: 186–200.

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer.

Nichols, J.T. and F. Harper. 1916. Field notes on some long island shore birds. Auk 33:237–255.

Nores, M. 2011. Long-Term Waterbird Fluctuations in Mar Chiquita Lake, Central Argentina.Waterbirds 34(3):381–388.

Ottema, O.H. and A.L. Spaans. 2008. Challenges and advances in shorebird conservation in the Guianas, with a focus on Suriname. Ornitolog. Neotrop. 19:339–346.

Ottema, O.H. and S. Ramcharan. 2009. Declining numbers of Lesser Yellowlegs *Tringa flavipes* in Suriname. Wader Study Group Bull. 116: 87–88.

Paulson, D.R. 1993. Shorebirds of the Pacific Northwest. Univ. of Washington Press, Seattle.

Peck, G.K. and R.D. James. 1983. Breeding birds of Ontario: nidology and distribution, Vol. 1 Non-passerines. R. Ont. Mus. Life Sci. Misc. Publ. Toronto.

Pereira, S.L. and A.J. Baker. 2005. Multiple Gene Evidence for Parallel Evolution and Retention of Ancestral Morphological States in the Shanks (Charadriiformes: Scolopacidae). Condor 107(3): 514–526.

Peters, J.L. 1934. Check-list of birds of the world. Vol 11. Pp. xviii 1–401 Harvard University Press.

Pfeffer, W.T., J.T. Harper, and S.O. O'Neel. 2008. Kinematic Constraints on Glacier Contributions to 21st-Century Sea-Level Rise. Science, 321:1340–1343.

Piersma, T. and A. Lindstrom. 2004. Migrating shorebirds as integrative sentinels of global environmental change. Ibis 146: 61–69 Supplement 1.

Prater, A. J., J.H. Marchant, and J. Vuorinen. 1997. Guide to the Identification & Ageing of Holarctic Waders, British Trust for Ornithology. Norfolk, UK.

Pyle, R.L. 2002. Checklist of the Birds of Hawaii. Elepaio 62 (6): 137–148.

Rahmstorf, S. 2007. A Semi-Empirical Approach to Projecting Future Sea-Level Rise. Science, 315: 368–370.

Reed, E.T. and W. Burke. 2011. Assessment of Shorebird Harvest in Barbados and Development of a Harvest Strategy. Presentation at IV Western Hemisphere Shorebird Group, Vancouver, August 2011.

Remsen, J.V., Jr., M.M. Swan, S.W. Cardiff, and K.V. Rosenberg. 1991. The importance of the rice-growing region of south-central Louisiana to winter populations of raptors, waders, and other birds. J. La. Ornithol. 1:35–47.

Remsen, J.V., Jr., C.D. Cadena, A. Jaramillo, M. Nores, J.F. Pacheco, J. Pérez-Emán, M.B. Robbins, F.G. Stiles, D.F. Stotz, and K.J. Zimmer. Version [24 April 2012]. A classification of the bird species of South America. American Ornithologists' Union.http://www.museum.lsu.edu/~Remsen/SACCBaseline.html

Ribot, J.H.J.M. (2012). Digital distribution maps of birds in Suriname [database] Retrieved from:http://webserv.nhl.nl/~ribot/php4/verspreiding.php4 on June 1st 2012.

Ridgely, R.S. and J.A. Gwynne, Jr. 1989. A guide to the birds of Panama with Costa Rica, Nicaragua, and Honduras. 2nd ed. Princeton Univ. Press, Princeton, NJ.

Ridgway, R. 1919. The birds of North and Middle America: a descriptive catalogue of the higher groups, genera, species and subspecies of birds known to occur in North America. Vol. 8. U.S. Natl. Mus. Bull. no. 50, Washington, D.C.

Ross, R.K., P.A. Smith, B. Campbell, C.A. Friis, and R.I.G. Morrison. 2012. Population Trends of Shorebirds in Southern Ontario, 1974–2009. Waterbirds 35(1):15–24.

Rowan, W. 1929. Notes on Alberta waders included on the British list, Part VII. Br. Birds 23:2–17.

Sauer, J.R., J.E. Hines, J.E. Fallon, K.L. Pardieck, D.J. Ziolkowski, Jr., and W.A. Link. 2011. The North American Breeding Bird Survey, results and analysis 1966 – 2010, version 12.07.2011. U.S. Geological Survey, Patuxent Wildlife Research Center, Laurel, MD, USA.

Scherer, A.L. and M.V. Petry. 2012. Seasonal Variation in Shorebird Abundance in the State of Rio Grande Do Sul, Southern Brazil. Wilson Journal of Ornithology 124(1):40–50.

Scott, D.A. and M. Carbonell. 1986. A directory of Neotropical wetlands. IUCN, Cambridge, UK and IWRB, Slimbridge, UK.

Skagen, S.K., P.B. Sharpe, R.G. Waltermire, and M.B. Dillon. 1999. Biogeographical profiles of shorebird migration in midcontinental North America. Biological Sciences report USGS/BRD/BSR—2000–2003. U.S. Government Printing Office, Denver, CO.

Skagen, S.K., D.A. Granfors, and C.P. Melcher. 2008. On determining the significance of ephemeral continental wetlands to North American migratory shorebirds. Auk 125: 20–29.

Spaans, A.L. 1978. Status and numerical fluctuations of some North American waders along the Suriname coast. Wilson Bull. 90:60–83.

Stephen, R.J. and D.R. Herter. 1989. The birds of the Beaufort Sea. BP Exploration Inc. Anchorage, AK.

Stiles, F.G. and A.F. Skutch. 1989. A guide to the birds of Costa Rica. Cornell Univ. Press, Ithaca, NY.

Stone, W. 1937. Bird studies at old Cape May: an ornithology of coastal New Jersey. Delaware Valley Ornithol. Club, Philadelphia, PA.

Strauch, J.G., Jr. 1978. The phylogeny of the Charadriiformes (Aves): a new estimate using the method of character compatibility analysis. Transactions of the Zoological Society of London 34:263–345.

Street, J.F. 1923. On the nesting grounds of the Solitary Sandpiper and the Lesser Yellowlegs. Auk. 60:577–583.

Strum, K.M., M.J. Hooper, K.A. Johnson, R.B. Lanctot, M.E. Zaccagnini, and B.K. Sandercock. 2010. Exposure of migratory shorebirds to cholinesterase-inhibiting contaminants in the Western Hemisphere. The Condor 112(1):15–28.

Sykes, P.W. and G.S. Hunter. 1978. Bird use of flooded agricultural fields during summer and early fall and some recommendations for management. Fla. Field Nat. 6:36–43.

Tibbitts, T. L. and W. Moskoff. 1999. Lesser Yellowlegs (Tringa flavipes), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online:http://bna.birds.cornell.edu/bna/species/427

Vaurie, C. 1965. The birds of the palearctic fauna: a systematic reference, non-passeriformes. H. F. and G. Witherby, London.

USFWS 2004. U.S. Shorebird Conservation Plan. High Priority Shorebirds ─ 2004. Unpublished Report, U. S. Fish and Wildlife Service, 4401 N. Fairfax Dr., MBSP 4107, Arlington, VA, 22203 U.S.A.

Wells, J., S. Casey-Lefkowitz, G. Chavarria, and S. Dyer. 2008. Danger in the Nursery: Impact on Birds of Tar Sands Oil Development in Canada's Boreal Forest. NDRC Report.

Wetlands International. 2002. Waterbird Population Estimates – third Edition. Wetlands International, Wageningen, The Netherlands.

Wetlands International. 2006. Waterbird Population Estimates – fourth edition. Wetlands International, Wageningen, The Netherlands.

Wetlands International. 2009. *Tringa flavipes*. Base de datos del Censo Neotropical de Aves Acuáticas. Wetlands International, Buenos Aires, Argentina.

Wetmore, A. 1927. Our migrant shorebirds in southern South America. U.S. Dept. Agric. Tech. Bull. 26.

White, D.H., K.A. King, and R.M. Prouty. 1980. Significance of organochlorine and heavy metal residues in wintering shorebirds at Corpus Christi, Texas, 1976–1977. Pestic. Monit. J. 14:58–63.

Wiedenfeld, D. 2006 Aves: The Galapagos Islands, Ecuador. Check List 2006: 2(2) 1–27.

Woods, R.W. and A. Woods. 2006. Birds and mammals of the Falkland Islands. Old Basing, UK: WILDGuides.