

# IMPORTANT SITES FOR SHOREBIRDS AND WATERBIRDS IN THE CARIBBEAN: REPORT ON THE FIRST FIVE YEARS (2010-2014) OF THE CARIBBEAN WATERBIRD CENSUS (CWC)



CWC point count at Great Pedro Pond, Jamaica -  
wintering home of many waterbirds

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## BACKGROUND

Caribbean wetlands provide essential stopover and wintering habitat for more than 126 aquatic and terrestrial Neotropical migratory bird species. Thirty-six (29%) of these are included in Canadian Wildlife Service (CWS) and US Fish and Wildlife Service (USFWS) lists of Birds of Conservation Concern<sup>1</sup>, including wetland species such as Brown Pelican, Reddish Egret, Solitary Sandpiper, Lesser Yellowlegs, Whimbrel, Red Knot, Short-billed Dowitcher and Least Tern, and terrestrial species such as the White-crowned Pigeon, Yellow-billed Cuckoo, Prairie Warbler and Prothonotary Warbler. They also provide breeding habitat for many resident species including several globally threatened birds such as the regionally endemic West Indian Whistling-Duck, which has been the flagship species for BirdsCaribbean's wetland conservation efforts (Sorenson 2008).



In spite of the importance of Caribbean wetlands for resident and migratory species and the critical ecosystem services they provide, many wetlands have been destroyed for development while those remaining are degraded from pollution and/or under increasing threat as more land is converted for tourism, agriculture, cattle raising, industry, and urban development or lost to sea level rise<sup>2</sup>. In addition to these threats, Caribbean wetland fauna and flora are affected by competition with invasive species and illegal hunting, as well as the regular passage of hurricanes and tropical storms that damage prey resources, and nesting, roosting and foraging sites. The unsustainable use of Caribbean natural resources, which has already threatened 56 resident species with extinction, and potential impacts of climate change also represent a challenge for the conservation of Neotropical birds on migration and on their wintering grounds.

The Caribbean Waterbird Plan (SCSCB 2004) identified major gaps in basic information about the status, distribution, habitat use, and migration patterns of wetland species. The plan also noted the lack of management or conservation programs for threatened species and Wetlands of International Importance, the general need to increase capacity to implement surveys and conservation programs, and the urgent need to promote environmental awareness of the importance of wetlands in countries of the region. In the absence of data it is impossible to assess the need for conservation measures or their effectiveness. Due to lack of skills, support and funding there are few datasets on the status or distribution of waterbirds in the

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<sup>1</sup> <http://www.fws.gov/birdhabitat/Grants/NMBCA/BirdList.shtm>

<sup>2</sup> "... the Caribbean region has the second highest mangrove area loss ... with approximately 24% of mangrove area lost over the past quarter-century." FAO (2007). *The World's Mangroves 1980-2005*, FAO Forestry Paper 153.

"Seventy-five percent of Puerto Rico's wetlands have been lost... By [the 1970's and 1980's], more than half of the nation's marshes, swamps and salt flats were gone." EPA .Building near wetlands - The basic facts.

<http://www.epa.gov/region2/water/wetlands/prdf.pdf> . This dramatic habitat loss has been mainly related to activities of a highly dense human population, estimated in 37.5 million, with an annual growth rate of approximately 2.5%.

insular Caribbean. Lack of experience limits capacity to prepare proposals for surveys and set up sustainable monitoring programs. Results of surveys are often not shared, published or applied to practical conservation problems.

The Caribbean is also under-represented in regional initiatives including the Ramsar Convention, Specially Protected Areas and Wildlife (SPAW) Protocol of the Cartagena Convention, Western Hemisphere Shorebird Reserve (WHSRN) and the Western Hemisphere Migratory Species Initiative (WHMSI). These issues have been further highlighted in the analysis of Important Bird Areas (IBAs) in the Caribbean (BirdLife International 2008). Even when important wetlands are designated as protected by law, there is no guarantee that the site will not be developed for alternative uses which destroy or seriously degrade the area, the latest example being the grave and imminent threat of development of a trans-shipment port and logistics hub in the Portland Bight Protected Area, Jamaica's largest protected area containing the country's largest remaining mangroves, fish sanctuaries, and threatened and irreplaceable biodiversity<sup>3</sup>.

BirdsCaribbean (formerly the Society for the Conservation and Study of Caribbean Birds) has a long-standing commitment to waterbird and wetland conservation and has been working to develop a coordinated region-wide program to address these gaps and promote greater interest in and conservation of wetlands and waterbirds at government, NGO and community levels. BirdsCaribbean is the largest nonprofit NGO dedicated to the protection of the region's bird species and their habitats through research, education, conservation action and capacity building. The organization has a network of over 1,200 conservationists, researchers, wildlife professionals, educators, and concerned citizens and volunteers among its membership, including representatives of most of the region's territories and states, and of all NGOs and government agencies working with avian conservation in the islands. The broad expertise of its members has provided BirdsCaribbean the opportunity to examine the major challenges for the protection of Caribbean bird species, particularly through the efforts of the Monitoring, Seabirds, Waterbirds, and West Indian Whistling-Duck and Wetlands Education working groups. As a result, reports prepared by these working groups have identified the need to develop the capacity in the region for monitoring the status of birds and their habitats (see <http://www.BirdsCaribbean.org>).

The **Caribbean Waterbird Census (CWC)**<sup>4</sup>, is a region-wide waterbird and wetland monitoring program that was successfully launched in 2010, and forms part of our larger regional bird monitoring program called Caribbean Birdwatch<sup>5</sup>. Through regional bird monitoring training workshops initiated in 2009, we have been working to strengthen conservation of migratory and resident waterbirds and wetlands through the development of a cadre of persons trained in the development, promotion and implementation of a

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<sup>3</sup> BirdsCaribbean prepared a fact sheet and talking points on the issue and organized a letter writing campaign to object to this development. For more information visit: [www.savegoatislands.org](http://www.savegoatislands.org).

<sup>4</sup> The CWC arose from discussions at the SCSCB's previous monitoring training workshop "**Long-term Bird Monitoring in the Caribbean – Why, What, Where and How?**" which took place in Nassau, Bahamas in February 2009. It is a part of a regional bird monitoring program called *Caribbean Birdwatch*. For more information: visit [Long-term Bird Monitoring in the Caribbean – Why, What, Where, and How?](#)

<sup>5</sup> The Caribbean region will join Wetland International's global program of wetland bird monitoring, with data from the Caribbean filling a major gap in the coverage of the International/Neotropical Waterbird Census. It can be used to promote site conservation, assess impacts of climate change and other threats, and design programs to protect, manage and restore wetlands.

region-wide waterbird and habitat monitoring program. The project was developed based on inter-agency consultations spanning several years with our many partners in participating countries at our workshops and regional meetings and international partners (for example the US Fish and Wildlife Service, US Forest Service, Cornell Lab of Ornithology, Royal Society for the Protection of Birds, Waterbird Conservation Council and Wetlands International).

## CWC GOAL AND OBJECTIVES

The overall goal of the CWC Program is to increase long-term support for waterbird and wetland conservation in the insular Caribbean by promoting monitoring as a means to improve science-based conservation planning and adaptive management of birds.

The **objectives of the CWC** are to:

- Promote inventories, surveys and censuses of waterbirds and their habitats in all Caribbean countries
- Determine the distribution, abundance and habitat use of waterbirds at sites throughout the region, especially during fall and spring migration and overwintering periods
- Encourage broad-based participation in waterbird counts including NGOs, governmental agencies, institutions, communities and volunteers
- Identify and ensure that as many internationally and nationally important wetland sites as possible are conserved and monitored
- Increase awareness of conservation issues related to wetlands and waterbirds and what can be done to address these issues.

## DESCRIPTION OF WORK

This report was prepared for Environment Canada and included the following tasks and deliverables:

- 1) Coordinate and deliver the Caribbean Waterbird Census (CWC) 2014 Regional Count
- 2) Production of trilingual training and promotional material for the CWC (monitoring manual for use by participants and promotional flyer to recruit additional surveyors).
- 3) Prepare a summary report on results of the CWC from 2010-2014 with emphasis on Canadian species of conservation concern, which are the same as the Focal Species List in the **Atlantic Flyway Shorebird Business Strategy**<sup>6</sup> (see Tables 1 and 2). Arctic-nesting shorebirds have shown serious declines. The 2012 Arctic Report Card produced by Conservation of Arctic Flora and Fauna (CAFF) stated that 56 per cent of North American populations of shorebirds are in decline. For Canada, *The State of Canada's Birds – 2012* reported that Arctic shorebird populations have declined by 60%. The reasons for the declines have not been completely elucidated for all species, however it is known that factors occurring away from the breeding grounds, including habitat loss and alteration and harvesting and hunting could be factors in the changes observed in some populations. Environment Canada (EC) and other shorebird conservation organizations and initiatives require

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<sup>6</sup> The [Atlantic Flyway Shorebird Business Strategy](#) is an unprecedented, multi-partner endeavor to implement conservation for shorebirds across an enormous geographic scale by creating a long-term platform for stability and recovery of focal species.

information pertaining to the numbers and locations of shorebirds when they are on migratory and overwintering grounds in order to be able to plan and deliver conservation programs throughout the life cycle of each species, as well as assist in-country partners with conservation actions at sites.

**Table 1: Summary of project outputs and indicators of success**

ACTIVITY HEADING	OUTPUTS	INDICATORS OF SUCCESS
Coordinate and deliver the 2014 Regional CWC count	CWC 2014 regional count completed	- Number of countries participating in the count, number of checklists submitted to eBird Caribbean, number of sites censused and species observed
Produce trilingual CWC Training and Promotional materials	- Caribbean Waterbird Census manual & protocols produced in 3 languages - CWC Promotional Flyer produced in 3 languages - Presentations and other supporting materials	- Manual and protocols produced (available for download: <a href="#">English</a> , <a href="#">Spanish</a> , French) - CWC Flyer available for distribution (see Appendix 6) - PowerPoint presentations developed for workshops and local training of CWC monitors (available for download from a Dropbox folder)
Prepare a summary report on the results of the CWC from 2010 to 2014 with emphasis on species of conservation concern	CWC 2010-2014 Summary Report	- Increased participation in the CWC as indicated by the number of countries, checklists and sites that were censused in 2014 - CWC data available from eBird Caribbean for analysis and mapping - Top sites, in the region and for each country, identified and mapped for 15 shorebird focal species - Follow-up actions initiated at important sites

**Table 2. Focal Species List (from Atlantic Flyway Shorebird Business Strategy by Winn et al. 2013)**

Species	USSCP Status <sup>1</sup>	Population Level	WHSRN <sup>2</sup> Species Plan	Rationale Notes
American Golden Plover	High Concern	Global	Yes	Representative of grassland migrant and wintering species, Caribbean basin hunting pressure
American Oystercatcher	High Concern	North American	Yes	Existing focal species with a business plan, temperate beach-nesting representative
Greater Yellowlegs	High Concern	Global	No	Boreal nester, hunted in Caribbean and South America
Lesser Yellowlegs	High Concern	Global	Yes	Boreal nesters, Birds of Conservation Concern List, hunted in Caribbean and South America
Marbled Godwit	High Concern	Global	Yes	Small Atlantic Flyway population,



				grassland/prairie nesting representative
Piping Plover	High Imperiled	Global	No	Threatened, High priority, temperate beach nesting representative, Piping Plover Recovery Plan
Purple Sandpiper	High Concern	North American	Yes	Small population, northeast wintering, unique rocky shoreline representative
Red Knot	High Imperiled	Global	Yes	Precipitous decline of Patagonian migrants, candidate for U.S., Endangered Species Act listing
Red-necked Phalarope	High Concern		Yes (Atlantic)	Unique life history, population representative of phalaropes, crash of staging population on Bay of Fundy
Ruddy Turnstone	High Concern	North American	No	Declines noted in South American and Delaware Bay surveys
Sanderling	High Concern	North American	Yes	Representative of dispersed migrants, broad wintering distribution
Semipalmated Sandpiper	High Concern (Eastern)	Global	Underway	Significant recent population declines along Delaware Bay, Bay of Fundy, and north coast of South America
Snowy Plover	High Imperiled	North American	Underway	High priority, temperate beach nesting representative
Whimbrel	High Concern	North American	Yes	Salt marsh obligate representative, measured decline, hunted in Caribbean
Wilson's Plover	High Concern	North American	Underway	High priority, temperate beach nesting representative

Focal species selected by the Atlantic Flyway Shorebird Working Group to represent shorebirds throughout the Atlantic Flyway.

<sup>1</sup>US Shorebird Conservation Plan

<sup>2</sup>Western Hemisphere Shorebird Reserve Network

## CWC 2014 REGIONAL COUNT

### METHODS

The fifth annual regional CWC count was held during January-February 2014. The region-wide count is organized during the middle of winter (when migratory birds are most stationary on the landscape) to get a "snapshot" of waterbird numbers and distribution (overwintering and resident species) across the Caribbean. The dates for the 2014 count were from Tuesday, January 14 to Monday, February 3rd. This included 3 weekends and World Wetlands Day on Feb. 2nd. Participants in our CWC network are also encouraged to count waterbirds at other times of year and as often as possible, particularly during fall and spring migration periods, in order to fill gaps in our knowledge about species migration patterns, numbers, and the sites they are using—all vitally important information for conservation and management.

Previously, we provided training to persons in the CWC methodology during two 5-day training



workshops held in Negril, Jamaica in February 2010 and Nassau, Bahamas in February 2011<sup>7</sup>. Additional persons were trained in shorter workshops held in the Everglades National Park, Florida in December 2010 (in conjunction with the WHMSI IV Conference in Miami) and in Grenada in August 2011<sup>8</sup>. The participants were prospective national and site coordinators for the CWC. They included wildlife professionals and protected area managers employed by governments and NGOs, also educators and citizen science volunteers, all of whom share a common interest in learning monitoring methodologies to contribute to conservation and management of migrant and resident waterbirds and their habitats.

The overall goal of the training workshops was to provide participants from across the Caribbean with equipment, materials, knowledge, and skills in waterbird identification and waterbird and wetland monitoring protocols, so that they could:

- Design and implement a long-term waterbird monitoring program in their own country (or improve/expand programs that are in place)
- Participate in the Caribbean Waterbird Census and identify important sites in their country
- Train and mentor others
- Form the basis of a regional monitoring network.

Workshop participants were provided with binoculars, field guides, bird identification cards, clipboards, Wildlife COUNT Program CDs, and field notebooks. In addition, some participants have had the opportunity to apply for a Small Grant (up to \$5,000) to obtain additional monitoring equipment (spotting scope and tripod, more binoculars and field guides, GPS, Rangefinders, etc.), hold training workshops in their local communities, carry out counts (e.g., funding for travel) and raise awareness through events organized for local communities. Depending on local objectives and capacity, participants carried out Level 1 (basic counts) or Level 2 (counts with measures of detection probability) at one or more wetlands in their country<sup>9</sup>. Depending on wetland size and accessibility, they could choose to do an Area Search<sup>10</sup> of their wetland or conduct one or more Point Counts<sup>11</sup> from different locations around and/or through their wetland.

## Coordination and delivery of the 2014 Caribbean Waterbird Census

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<sup>7</sup> Since writing of this report, another 5-day CWC training workshop was also held in Curacao; 24 persons from all 6 Dutch Caribbean islands participated in the training.

<sup>8</sup> A total of 81 persons from 18 countries were trained in these workshops. Workshop reports are available at: [Bird Monitoring Training in Caribbean Protected Areas; Increasing Capacity for Caribbean Wetlands Conservation: A Training Workshop for Monitoring, Education and Conservation](#)

<sup>9</sup> The CWC offers a flexible approach to monitoring that enables participants to choose the protocol and extent of participation in the program that is best suited to their objectives, available resources and capacity. The CWC is designed so that at the basic level anyone can implement the program and can contribute to monitoring

<sup>10</sup> Area searches are observations made while traveling and censusing within a defined area. Examples include walking along a boardwalk or shoreline and counting birds in the entire wetland. Recommended duration is 5-20 minutes though longer durations may be necessary for certain searches.

<sup>11</sup> Points counts are observations made from a specific location censusing a defined area. Recommended duration is 6, 9 or 12 minutes though longer durations (add increments of 3 minutes) may be necessary for certain counts.



In 2014 we made a special effort to reach out to all our partners and encourage them to participate in the regional count as well as recruit new people and organizations/institutions to join the CWC through the following activities:

- Announcement of the 2014 CWC on our BirdsCaribbean listserve (831 members) and Caribbean Waterbird Census Network listserve (162 members).
- Article about the CWC on [eBird Caribbean](#); including an announcement about the opportunity to win a pair of Zeiss binoculars by participating and entering CWC data into eBird Caribbean.
- Promotion of the count on social media: Facebook page ([CaribbeanBirdsSCSCB](#)) and Twitter (@BirdsCaribbean).
- Individual messages sent to partners that have been involved in the past encouraging them to carry out counts, recruit and train new people to help with the count, expand the number of wetlands they count, etc.
- Emails to potential new partners inviting them to get involved and carry out a count for the first time.
- Resources to learn how to participate in the count were provided, including links to our eBird Caribbean article on [how to carry out a basic count](#) (with basic protocols and data sheets), how to enter data in eBird Caribbean, Caribbean Waterbird Census Manual and training powerpoints.<sup>12</sup>
- Awarding of small grants to partners in 4 countries to enable them to participate in the 2014 CWC.
- Messages sent to CWC partners to remind them to enter their CWC data into eBird Caribbean for preparation of this report.

#### **Central American Waterbird Census**

In February 2014, J. Gerbracht helped facilitate the Central American Waterbird Census (CAWC) Workshop in El Salvador hosted by SalvaNATURA. The purpose of the workshop was to formalize a number of aspects of the CAWC, which was originally launched in 2011. It has been recognized that the Caribbean Waterbird Census has become a very successful monitoring program in the Caribbean and using it as a model would help to formalize and further the CAWC. L. Sorenson and J. Gerbracht provided powerpoint presentations for the workshop; which were translated to Spanish by A. Rodriguez. Jeff presented the organizational structure of the CWC, along with details and rationale for the CWC protocols, the importance of training participants in the CWC, entering and archiving the count data and using those data for conservation.

The workshop was attended by 15 persons with representatives from every Central American country. Topics that were emphasized included the importance of correct identification, bias, detectability and how to organize a count to reduce bias and increase detectability, levels of monitoring and the CWC standard protocols, how to enter data in eBird, and field practice of waterbird count protocols. The participants will be modeling the CAWC after the CWC, and have already put in place the higher organizational structure needed to ensure its success throughout Central America. They will be following the protocols designed for the CWC, and will be entering their data into the Central American eBird portal, facilitating broader visualization and analysis of the combined Caribbean and Central American data.

Counts were conducted at wetlands across the Caribbean during the regional count period in Jan-Feb by persons trained in our monitoring workshops as well as other interested stakeholders and volunteers. In addition, some partners have been able to carry out counts during other times of year (e.g., during fall and spring migration) over the past several years. Data were entered by partners into eBird Caribbean, a web-

<sup>12</sup> CWC resources are available for download at this Dropbox [link](https://www.dropbox.com/sh/9l6oyg0e2sczf4x/AAC0BajfBq6z32SFfwnr5G9Va?dl=0):  
<https://www.dropbox.com/sh/9l6oyg0e2sczf4x/AAC0BajfBq6z32SFfwnr5G9Va?dl=0>  
See also <http://www.birdscaribbean.org/our-work/caribbean-waterbird-census-program/>

based database in which users can submit, save and explore their bird observations<sup>13</sup>. We are also working on providing a data storage system to capture other data that partners are collecting on environmental and habitat covariates that likely affect bird distribution and abundance (e.g., water depth, salinity, disturbance, vegetation status, etc.).

Here we report results from CWC data entered during Jan-Feb (most surveys were conducted during the CWC 3 week regional period) and from year-round observations (2010-2014<sup>14</sup>). To begin to assess which countries and sites are most important, we examined the **five** highest counts in the region for the **15** focal shorebird species and **three** highest counts for each country for **seven** select species. We also show distribution and frequency data for **thirteen** focal shorebirds species, including American Golden Plover, American Oystercatcher, Greater Yellowlegs, Lesser Yellowlegs, Piping Plover, Red Knot, Red-necked Phalarope, Ruddy Turnstone, Sanderling, Semipalmated Sandpiper, Snowy Plover, Whimbrel and Wilson's Plover.

To determine high counts for wetlands, we downloaded eBird checklist data and considered only those data entered using a CWC protocol. Data were reviewed for all valid counts from 2010 to the present and the single highest count for a species within a given season and location was noted. Seasons for this result were 'Fall' (records collected between September and November), 'Winter' (collected between December and February) and 'Spring' (records between March and May). In some cases, where larger wetlands are composed of a series of point counts, we summed the count values across points for a given wetland if those counts were conducted within 3 days of each other to derive the highest count for that wetland. Examples of wetlands where these distinct points counts were summed are the Monte Cristi wetlands of the Dominican Republic and Great Pond on the US Virgin Islands. Sites were then ranked based on season and the highest count recorded to populate the table. These site/species rankings were calculated for the entire Caribbean region (Table 3) and for each country for a subset of the species (Tables 4-9).

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## RESULTS

### GEOGRAPHICAL COVERAGE AND MONITORING SUMMARY STATISTICS

The CWC count data shows that **21** countries have participated in the CWC Counts since their inception in 2010. **Figure 1**, showing Regional Count period data only (Jan-Feb) and **Figure 2**, showing year-round data, both indicate marked increases on the number of surveys conducted in the most recent Regional Count. Especially noteworthy are the increases in the Bahamas, Barbados, Dominican Republic, Guadeloupe, Puerto Rico, Trinidad and Tobago, Turks and Caicos and the US Virgin Islands. Other regions such as Antigua and Barbuda, Bonaire, Cuba and likely others, have conducted surveys during the most

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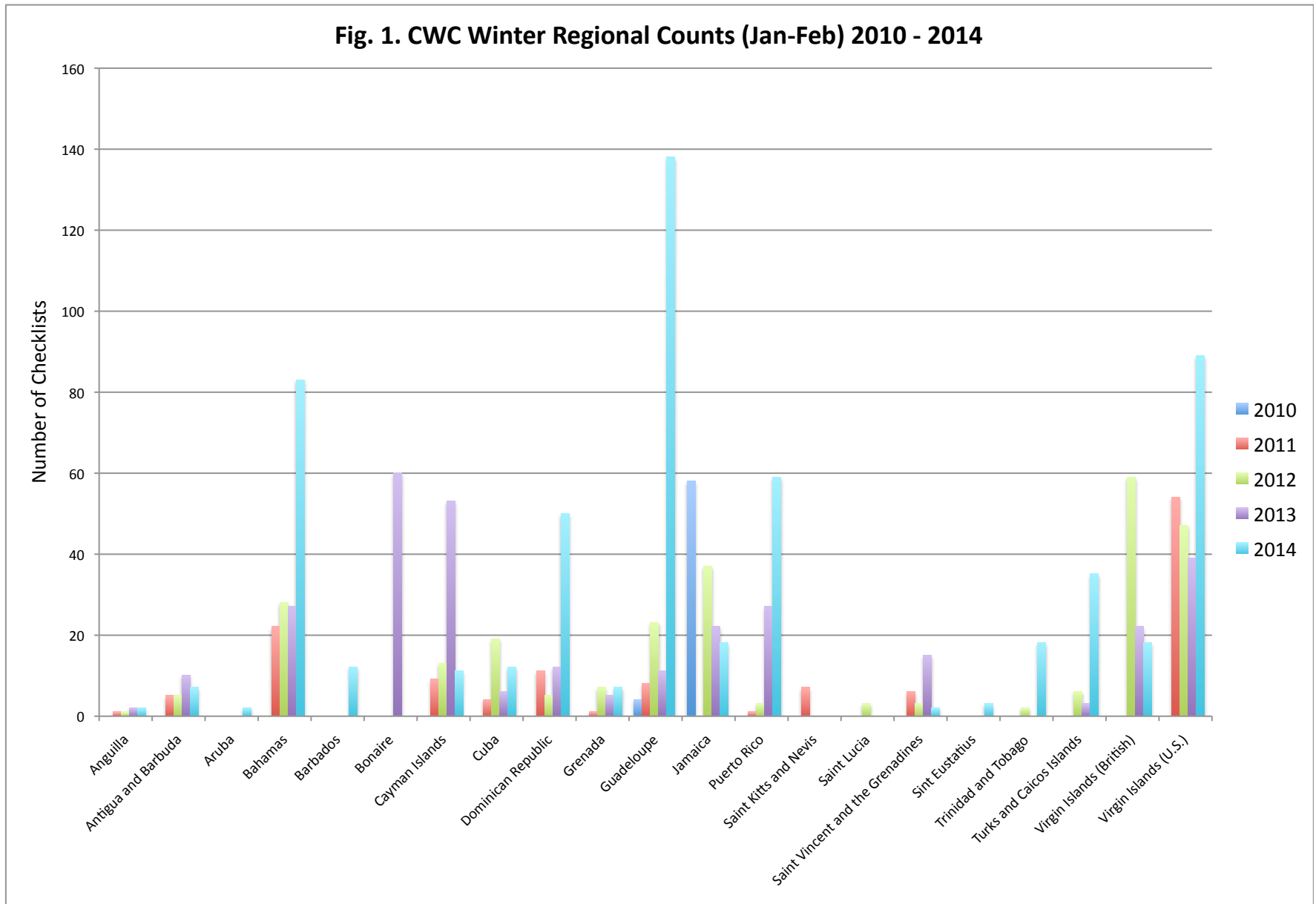
<sup>13</sup> eBird is an invaluable tool for birders, scientists, natural resource managers, and conservationists. The application allows users to keep track of all their bird observations and at the same time contribute to expanding our knowledge of bird distribution and abundance in each country in the Caribbean. Launched in 2002, eBird is in use all across the Western Hemisphere, connecting a vast international network of eBird users. The eBird Caribbean portal was developed in 2008.

<sup>14</sup> The first "official" CWC regional count was in Jan-Feb. 2011, however, some counts were made in 2010 during a pilot year when we were developing and testing our methodology.

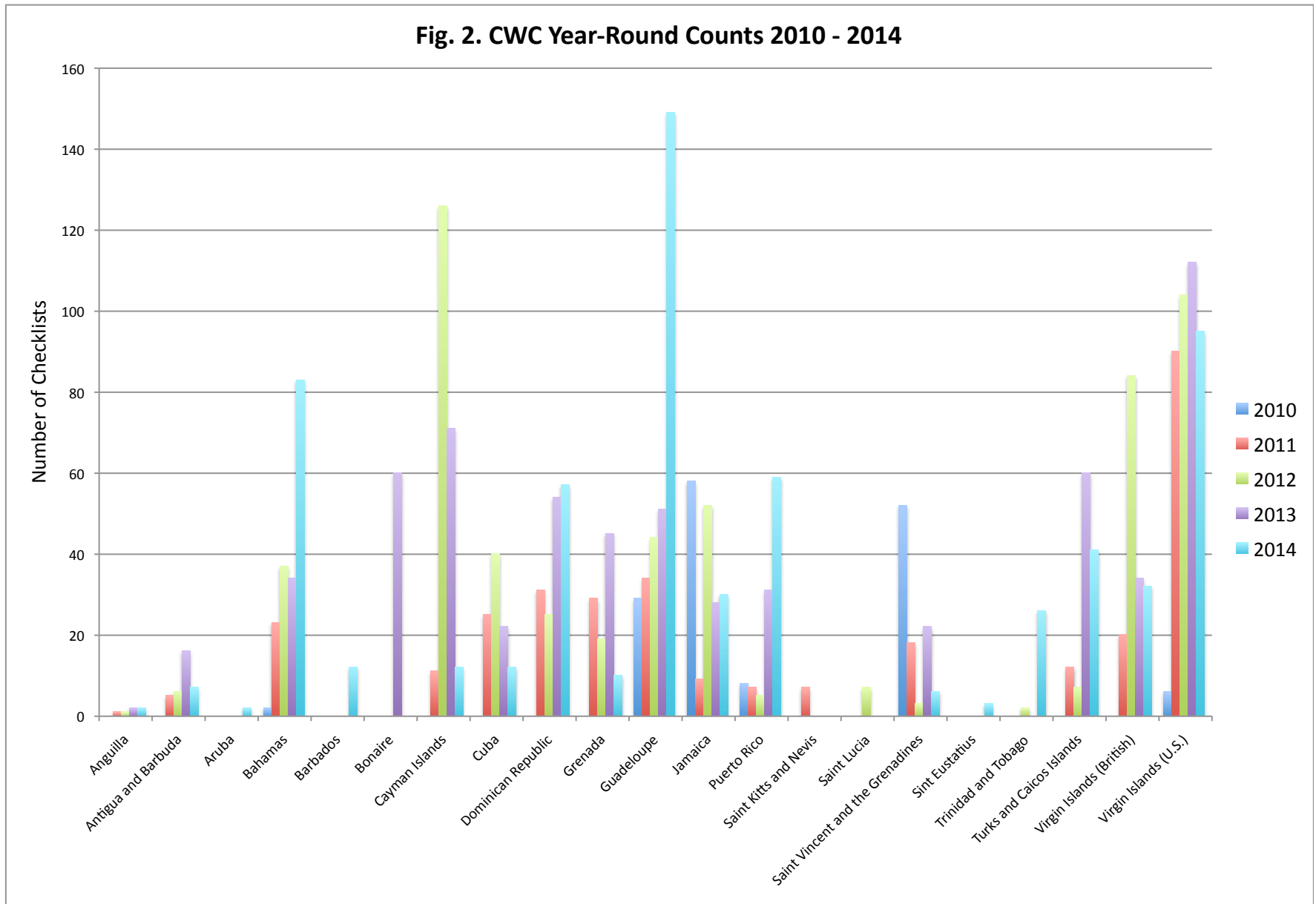
recent Regional Count period and previous years, but have not yet entered those data into the eBird Caribbean data repository, from which these data were retrieved.

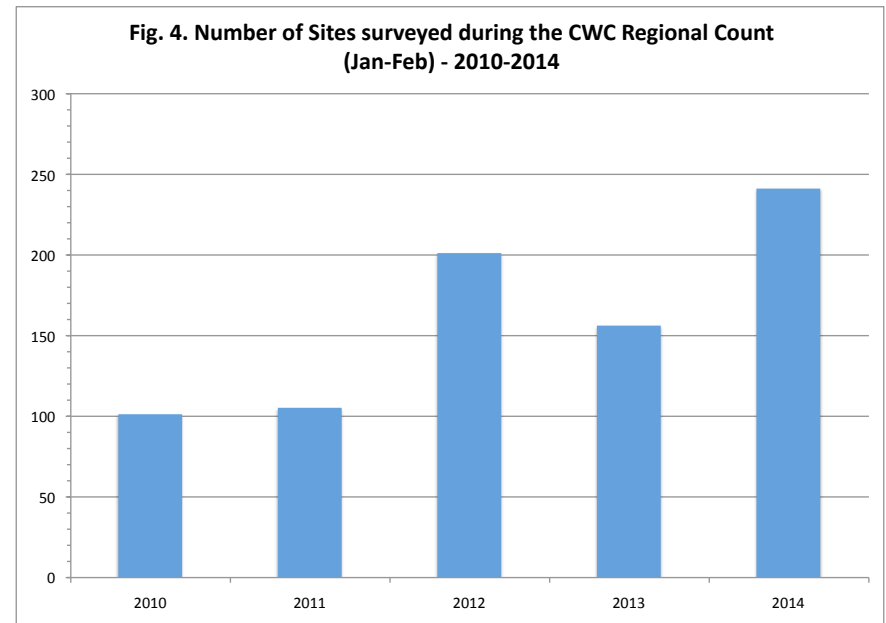
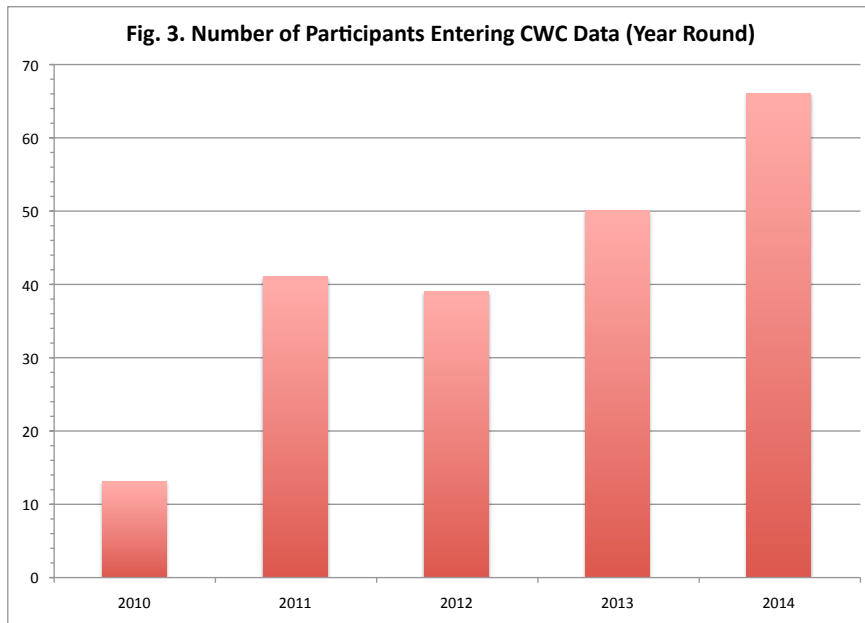
Note that only data from January and February are included for 2014 in Fig. 2, so the number of total checklists for the full year is likely to surpass the values in 2013. This information will be up-dated once all the data has been entered for the remaining months of 2014.

**Fig. 1. CWC Winter Regional Counts (Jan-Feb) 2010 - 2014**



**Fig. 2. CWC Year-Round Counts 2010 - 2014**



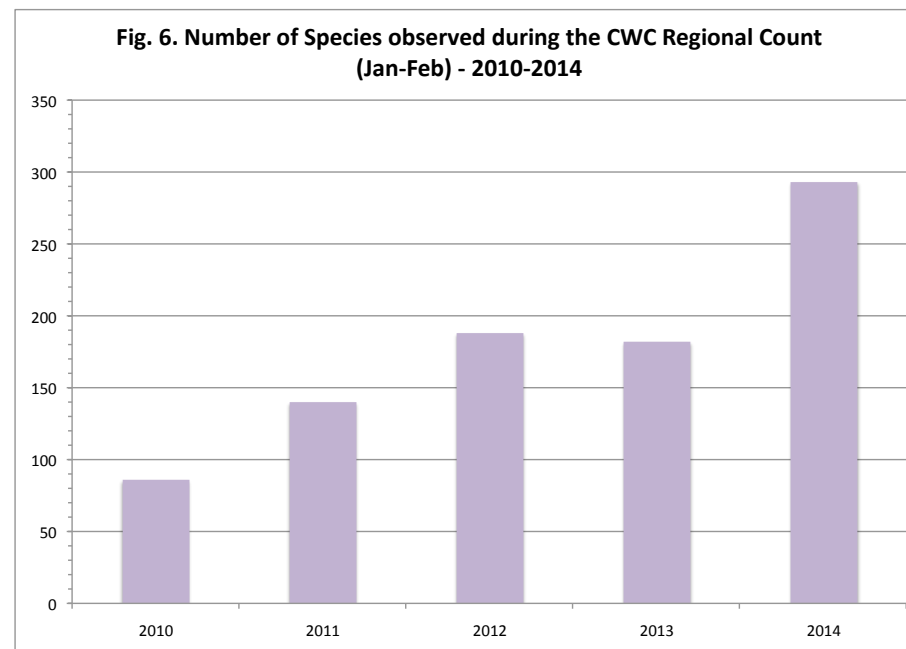
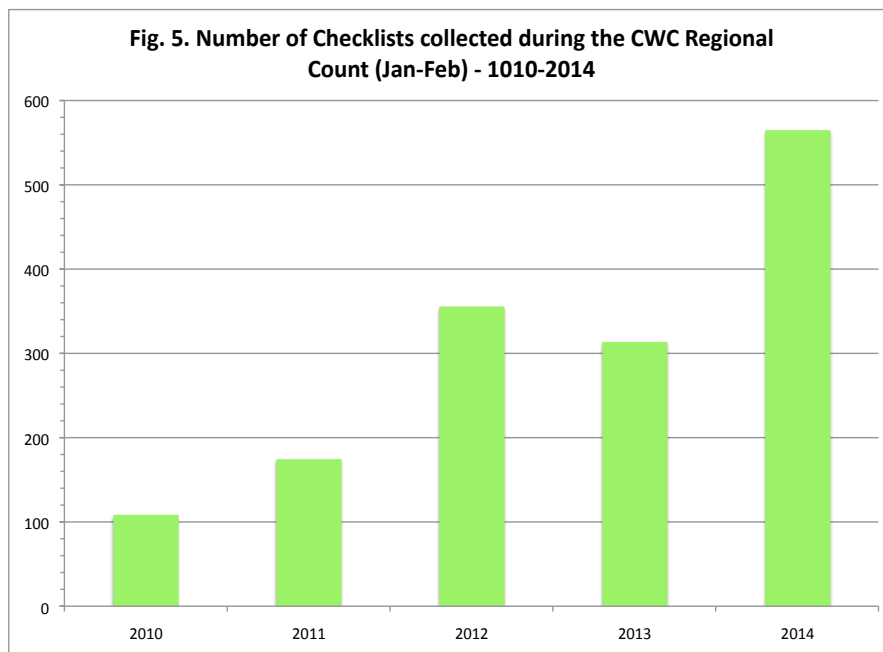


**Figure 3** shows participation rates in the CWC for each of the years where the CWC has been conducted, specifically showing the number of individuals entering CWC data throughout the entire year. This has increased from **13** persons in **2010** to **66** persons in **2014**. Because counts are typically conducted by 2 or more participants, the numbers of persons participating in the field are likely more than double the numbers shown here. Note that there has been a marked increase in participants for 2014, even though this includes data only for the first quarter of the year (Jan-March), i.e., data available at the time this report was prepared. We expect this number to be higher by end of the year.

The number of sites surveyed is important as a gauge for how the CWC is increasing its spatial coverage of the Caribbean region. **Figure 4** shows the number of sites where counts were conducted during the Regional Count period of January and February for each of the CWC count years; this has increased from **101** in **2010** to a high of **241** sites in **2014**.

A total of **1,332 CWC checklists** were entered into eBird Caribbean for the CWC Regional Count from 2010-2014, while a total of **2,319 CWC** checklists were entered year-round during the same time period.





**Figure 5** shows the number of checklists entered into ebird Caribbean for the CWC Regional Count Period; this has increased significantly from **109** checklists in **2010** to **565** for **2014**. By comparing Figures 4 and 5, we can see that while the total number of sites censused in 2014 increased slightly over the previous high in 2012 (241 and 201 respectively), the large increase in the number of counts conducted (565 and 356 respectively) shows that these sites are being more thoroughly and more frequently covered during the Regional Count period.

Another indicator of the depth of coverage for these sites is the large increase in the number of species counted during the Regional Count period (**Figure 6**): while previous years recorded around 170 species, this year's Regional Count recorded **293** species.

**Figures 7** and **8** show the locations of CWC sites throughout the Caribbean for the 2014 Regional Count (January-February data) and for CWC counts throughout the years 2010-2014, respectively. Although we encourage our partners to target important wetlands (e.g., Ramsar sites, Important Bird Areas (IBAs), parks and protected areas) for their counts, it is clear that there are large gaps in coverage and many wetlands have not yet been surveyed due to logistical problems, lack of capacity (trained counters and monitoring equipment) and funding.



**Figure 7.** Locations of CWC sites throughout the Caribbean for the 2014 Regional Count (data are included from Jan-February 2014).



**Figure 8.** Locations of CWC sites throughout the Caribbean from 2010-2014 (year-round data included). This map may be viewed [online](#) which will allow the user to zoom in on any country or site to see the location of the site. The name of the site can be viewed by holding the cursor over the red balloon.

## HIGH COUNTS OF FOCAL SHOREBIRD SPECIES

We reviewed the High Count data for each focal shorebird species and wetland, based on the fall, winter and spring seasons, to determine if there were specific wetlands harboring significant numbers of shorebird species. **Table 3** displays the 5 localities with the highest counts for each species throughout the Caribbean. **Tables 4-10 (Appendix 1)** shows the 3 localities that have the highest counts for each species in each country where that species was observed. While using raw high counts does not signify that these wetlands are the ‘most’ important sites in the Caribbean for the species of interest, it does show which sites hold significant numbers of a species and therefore warrant further monitoring and conservation efforts.

The following are a few examples gleaned from these tables. Of special significance are the counts of **Wilson’s Plover** at Sur de Los Palacios, Cuba throughout the three seasons: Fall (54 individuals), Winter (150 individuals) and Spring (119 individuals). Two of these three counts exceed the 1% threshold utilized by BirdLife in accessing IBA importance. The Monte Cristi site in the Dominican Republic is an important site for a number of shorebird species throughout the migration and winter season, though the counts in the Fall season are especially significant, with counts of **Greater Yellowlegs** (868 individuals), **Lesser Yellowlegs** (3,252 individuals) and **Semipalmated Sandpiper** (3,153 individuals) all being the highest overall counts for the species throughout the Caribbean. Counts on Petite-Terre in Guadeloupe show a different pattern with each of the three seasons having counts of more than 170 **Ruddy Turnstones**. For Ruddy Turnstones, at least, this site is equally important during all 3 seasons we reviewed.

**TABLE 3. FIVE HIGHEST COUNTS IN THE REGION FOR THE 15 SPECIES OF INTEREST FOR THREE SEASONS**

Species	Fall			Winter			Spring		
	Site	Country	High Count	Site	Country	High Count	Site	Country	High Count
<b>American Golden-Plover</b>	Sur de Los Palacios	Cuba	30	Tunzas de Zaza, Laguna del Cementerio	Cuba	5	Sur de Los Palacios	Cuba	6
	Pointe des Chateaux	Guadeloupe	5	Sur de Los Palacios	Cuba	4	Petite-Terre	Guadeloupe	1
	Petite-Terre	Guadeloupe	4	Pointe des Chateaux	Guadeloupe	2	Provo Golf Course Ponds	Turks and Caicos Islands	1
	Grand Harbour	Cayman Islands	1	Grand Harbour	Cayman Islands	1			
<b>American Oystercatcher</b>	Petite-Terre	Guadeloupe	8	Petite-Terre	Guadeloupe	10	Cape Wright Pond	Virgin Islands (British)	13
	Pointe des Chateaux	Guadeloupe	2	Big Thrift Harbor Cay - East End Point	Bahamas	5	Petite-Terre	Guadeloupe	10
	Monte Cristi	Dominican Republic	2	Costa Peñon Brusi	Puerto Rico	3	Conch Grounds	Turks and Caicos Islands	1
				Brush Cay	Bahamas	2			
				Deep Water Cay	Bahamas	2			
<b>Greater Yellowlegs</b>	Monte Cristi	Dominican Republic	868	Old Harbour Bay Pond	Jamaica	200	Sur de Los Palacios	Cuba	80

Species	Fall			Winter			Spring		
	Site	Country	High Count	Site	Country	High Count	Site	Country	High Count
<b>Greater Yellowlegs (Continued)</b>	Sur de Los Palacios	Cuba	107	Sur de Los Palacios	Cuba	142	Las Salinas, Ciénaga de Zapata	Cuba	35
	Petite-Terre	Guadeloupe	16	Monte Cristi	Dominican Republic	87	Monte Cristi	Dominican Republic	34
	Southgate Pond	Virgin Islands (U.S.)	14	Parottee Pond central	Jamaica	83	Petite-Terre	Guadeloupe	20
	Boca de Nigua Protected Area	Dominican Republic	8	Midland Acres	Cayman Islands	65	Southgate Pond	Virgin Islands (U.S.)	13
<b>Lesser Yellowlegs</b>	Monte Cristi	Dominican Republic	3,252	Old Harbour Bay Pond	Jamaica	600	Laguna Dulce or Cilito	Dominican Republic	350
	Sur de Los Palacios	Cuba	139	Sur de Los Palacios	Cuba	395	Monte Cristi	Dominican Republic	131
	Southgate Pond	Virgin Islands (U.S.)	91	Road Salt Pond	Anguilla	217	Las Salinas, Ciénaga de Zapata	Cuba	54
	Petite-Terre	Guadeloupe	60	Monte Cristi	Dominican Republic	217	Sur de Los Palacios	Cuba	53
<b>Piping Plover<sup>15</sup></b>	Great Pond	Virgin Islands (U.S.)	49	Las Salinas, Ciénaga de Zapata	Cuba	147	Petite-Terre	Guadeloupe	38
	Abaco Cays IBA-- Green Turtle Cay	Bahamas	2	Fortune Bay Beach	Bahamas	20	Sur de Los Palacios	Cuba	10
				Green Turtle Cay Sand Spit	Bahamas	15			
				Discovery Beach	Bahamas	13			
				Reef Golf Course Seashore	Bahamas	12			
				South Beach Tidal Flats IBA	Bahamas	9			

<sup>15</sup> Additional data for Piping Plovers has been gathered by the Bahamas National Trust and National Audubon Society.



Species	Fall			Winter			Spring		
	Site	Country	High Count	Site	Country	High Count	Site	Country	High Count
<b>Red Knot</b>	Abaco Cays IBA-- Green Turtle Cay	Bahamas	2	Green Turtle Cay Sand Spit	Bahamas	36	Petite-Terre	Guadeloupe	1
	Petite-Terre	Guadeloupe	1	Costa Peñon Brusi	Puerto Rico	5			
	Pointe des Chateaux	Guadeloupe	1	Pointe des Chateaux	Guadeloupe	2			
				Tunzas de Zaza, Laguna del Cementerio	Cuba	2			
<b>Red-necked Phalarope</b>				Grand Harbour West Dykes	Cayman Islands	1			
				Maroon Hill Pond, Inagua NP	Bahamas	4	Sur de Los Palacios	Cuba	6
<b>Ruddy Turnstone</b>	Petite-Terre	Guadeloupe	176	Petite-Terre	Guadeloupe	177	Petite-Terre	Guadeloupe	178
	Sur de Los Palacios	Cuba	69	Montagu Foreshore	Bahamas	127	Pointe des Chateaux	Guadeloupe	49
	Pointe des Chateaux	Guadeloupe	34	Playa del Chivo	Cuba	80	Southgate Pond	Virgin Islands (U.S.)	46
	Conch Grounds	Turks and Caicos Islands	33	Sur de Los Palacios	Bahamas	52	Conch Grounds	Turks and Caicos Islands	34
<b>Sanderling</b>	Monte Cristi	Dominican Republic	27	Abaco, Coopers Town	Bahamas	51	Milford Bay, Tobago	Trinidad and Tobago	24
	Sur de Los Palacios	Cuba	34	Costa Peñon Brusi	Puerto Rico	78	Sur de Los Palacios	Cuba	77
	Monte Cristi	Dominican Republic	20	Green Turtle Cay Sand Spit	Bahamas	51	Anse du Belley	Guadeloupe	30
	Pointe des Chateaux	Guadeloupe	9	Monte Cristi	Dominican Republic	40	Pointe des Chateaux	Guadeloupe	28

Species	Fall			Winter			Spring		
	Site	Country	High Count	Site	Country	High Count	Site	Country	High Count
<b>Sanderling (continued)</b>	Monumento Natural Bahía de las Calderas (Salinas de Bani)	Dominican Republic	5	Punta Hicacos - Plot 1	Cuba	37	Milford Bay, Tobago	Trinidad and Tobago	10
	Abaco Cays IBA-- Green Turtle Cay	Bahamas	4	Pointe des Chateaux	Guadeloupe	31	Parottee Pond	Jamaica	7
<b>Semipalmated Sandpiper</b>	Monte Cristi	Dominican Republic	3,153	Maroon Hill Pond, Inagua NP	Bahamas	800	Monte Cristi	Dominican Republic	645
	Great Pond	Virgin Islands (U.S.)	313	Monte Cristi	Dominican Republic	782	Laguna Dulce or Cilito	Dominican Republic	500
	Pointe des Chateaux	Guadeloupe	160	Darkwoods Saltpond	Antigua and Barbuda	180	Petite-Terre	Guadeloupe	155
	Krause Lagoon remnant	Virgin Islands (U.S.)	155	Long Salt Pond	Anguilla	134	Pointe des Chateaux	Guadeloupe	66
	Southgate Pond	Virgin Islands (U.S.)	143	Petite-Terre	Guadeloupe	118	Great Pond	Virgin Islands (U.S.)	55
<b>Snowy Plover</b>	Sur de Los Palacios	Cuba	17	Sur de Los Palacios	Cuba	33	Sur de Los Palacios	Cuba	17
	Monumento Natural Bahía de las Calderas (Salinas de Bani)	Dominican Republic	4	Salina Matijs	Bonaire	13	Monte Cristi	Dominican Republic	15
	Great Inagua IBA	Bahamas	2	Monte Cristi	Dominican Republic	4			
	South Caicos Salinas	Turks and Caicos Islands	2	Plage des Raisins Clairs	Guadeloupe	2			
	Pointe des Chateaux	Guadeloupe	1						

Species	Fall			Winter			Spring		
	Site	Country	High Count	Site	Country	High Count	Site	Country	High Count
<b>Whimbrel</b>	Great Pond	Virgin Islands (U.S.)	16	Belmont Salt Pond	Saint Vincent and the Grenadines	23	Woburn MPA - Observation Tower	Grenada	3
	Petit Carenage	Grenada	11	Great Pond	Virgin Islands (U.S.)	9	Mt. Hartman	Grenada	2
	Ashton Lagoon	Saint Vincent and the Grenadines	10	Mt. Hartman	Grenada	4	Petite-Terre	Guadeloupe	2
	Mount Fancy Salt Pond-A	Virgin Islands (U.S.)	8	Orange Valley	Trinidad and Tobago	4	Tobago Plantation / Hilton Hotel Ponds	Trinidad and Tobago	2
	Pointe des Chateaux	Guadeloupe	6	Waterloo/Brickfield/Orange Valley	Trinidad and Tobago	4	Great Pond	Virgin Islands (U.S.)	2
<b>Wilson's Plover</b>	Sur de Los Palacios	Cuba	54	<b>Sur de Los Palacios</b>	<b>Cuba</b>	<b>150</b>	<b>Sur de Los Palacios</b>	<b>Cuba</b>	<b>119</b>
	Great Pond	Virgin Islands (U.S.)	32	Old Harbour Bay Pond	Jamaica	73	Pointe des Chateaux	Guadeloupe	21
	Pointe des Chateaux	Guadeloupe	27	Parottee Pond	Jamaica	50	Monte Cristi/Charcos del pueblo	Dominican Republic	16
	Mount Fancy Salt Pond	Virgin Islands (U.S.)	15	Great Pond	Virgin Islands (U.S.)	36	Great Pond	Virgin Islands (U.S.)	15
	Petite-Terre	Guadeloupe	14	Pointe des Chateaux	Guadeloupe	27	Petite-Terre	Guadeloupe	12

## SPECIES DISTRIBUTION AND FREQUENCY MAPS

We mapped the distribution and abundance of **13** Atlantic Flyway shorebird focal species: American Golden Plover, American Oystercatcher, Greater Yellowlegs, Lesser Yellowlegs, Piping Plover, Red Knot, Red-necked Phalarope, Ruddy Turnstone, Sanderling, Semipalmated Sandpiper, Snowy Plover, Whimbrel and Wilson's Plover. **Two maps were created for each species:**

The **first** map shows sites where the species was observed during CWC counts (data from year-round, 2010-2014). Points are graduated in size based on the highest count of individuals at each site. The data collected in the CWC can be used for displays such as this as well as more rigorous analysis made possible by the detailed CWC protocols. The continued expansion of both spatial and temporal coverage will give us insights into the migration and wintering abundance and distribution of birds within the Caribbean.

The **second** "*frequency*" map shows the frequency of occurrence of a species for each sampled 20km x 20km grid cell in the Caribbean (checklists from year-round, all eBird Caribbean data, 2010-2014). Shading is based on frequency values calculated by dividing the number of complete checklists reporting the species by the total number of checklists for each cell. Cells shaded gray represent sampled cells where the species was not detected.

We show one set of maps for the **Lesser Yellowlegs** in the main report text; the remaining maps are included in **Appendix 2**. Links to each species' frequency maps online are also available below:

[American Golden-Plover](#)

[American Oystercatcher](#)

[Greater Yellowlegs](#)

[Lesser Yellowlegs](#)

[Piping Plover](#)

[Red Knot](#)

[Red-necked Phalarope](#)

[Ruddy Turnstone](#)



[Sanderling](#)

[Semipalmated Sandpiper](#)

[Snowy Plover](#)

[Whimbrel](#)

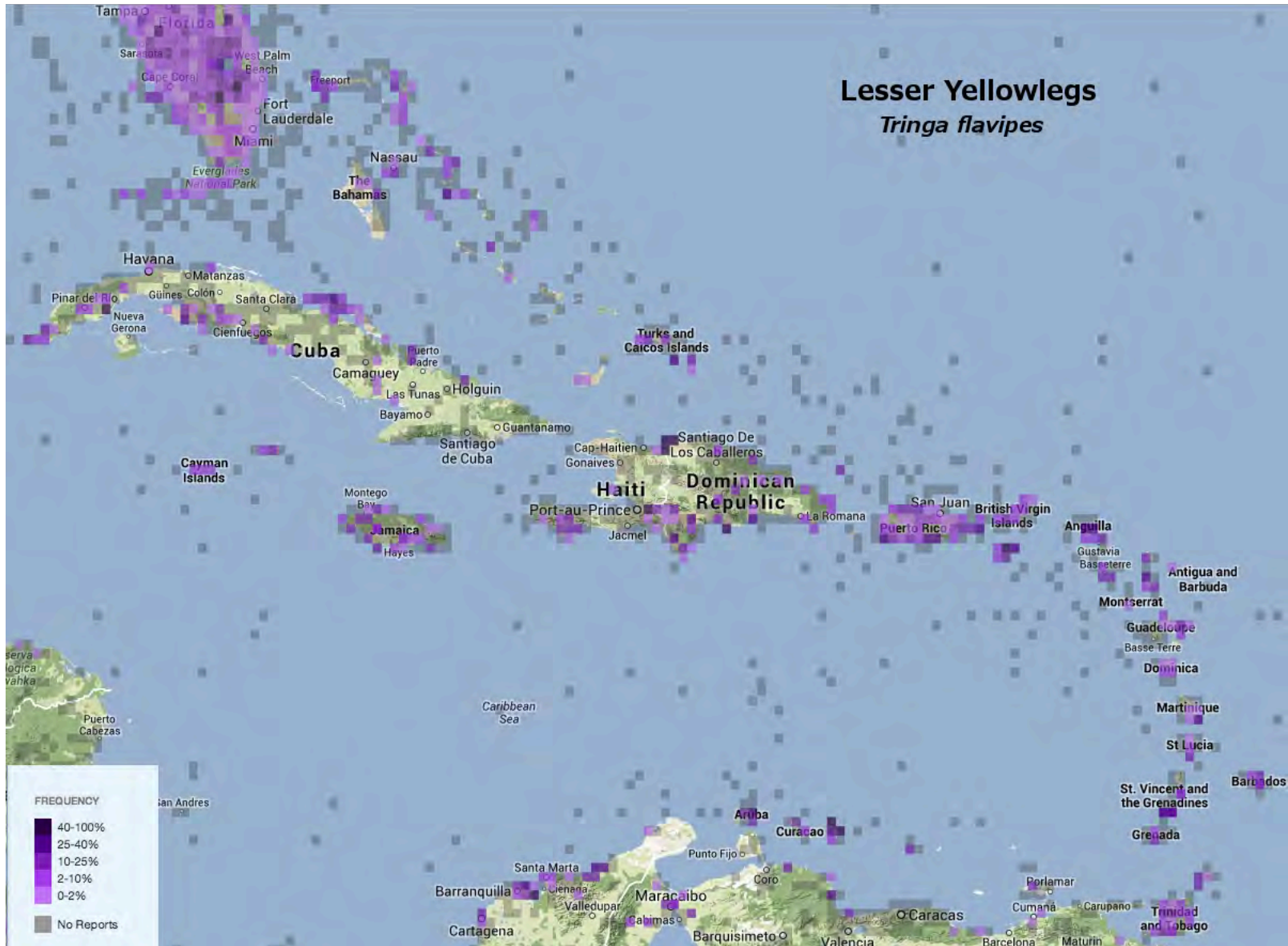
[Wilson's Plover](#)





**Figure 9.** Sites where Lesser Yellowlegs were observed during CWC counts (2010-2014, year-round data). The size of the markers is graduated based on the highest single count of Lesser Yellowlegs at each site.





**Figure 10.** This map shows the frequency of occurrence of Lesser Yellowlegs; i.e., the proportion of surveys where the species was observed using all eBird Caribbean data, year-round, 2010-2014.

## SPECIES DIVERSITY DATA AND MAPS: FOCAL SHOREBIRDS, WATERBIRDS AND ALL BIRDS

We also reviewed each count location within the Caribbean where a CWC count was conducted between 2010 and the present to determine which of these locations held the highest number of Atlantic Flyway shorebird focal species (**Appendix 3, Table 4**), and the highest numbers of ‘Waterbird’ species and All Bird species at each of the wetlands (**Appendix 3, Table 5**; ‘Waterbird’ species are listed in **Appendix 4, Table 6**). The sample size (number of checklists at each wetland) is also listed in **Table 5**. For these data, individual count locations were not combined to the site level and the counts within the table represent the high count for each species at each location.

**Table 4** shows that of the 13 Atlantic Flyway shorebird focal species recorded on CWC counts in the Caribbean, several count locations had 10 or more of these species: two locations in Guadeloupe (Pointe des Chateaux and Petite-Terre) and one in Cuba (Sur de Los Palacios). Seven sites, located in Guadeloupe, Grenada, DR, Bahamas, Cuba, and Grenada recorded 9, 8 or 7 focal shorebird species. Given the wide range of habitat requirements for the focal species, ranging from rocky shores and sand beach to mudflats, it is surprising that these sites recorded this high diversity. The data also show the importance of these sites for a variety of shorebird species.

When taking the number of surveys conducted at each location into account, Sur de Los Palacios has a very high species diversity for the relatively low number of counts conducted so far. These sites with high diversity are most likely to also have a diversity of habitats. Comparing the diversity with the number of counts conducted can begin to direct the CWC surveyors to locations which have relatively low numbers of counts conducted with a higher than average number of species reported. Certainly, as more counts are conducted at each location, more species will be recorded following normal species accumulation curves, and prioritizing locations with few counts and more diverse assemblages of species is important.

An additional method of reviewing the CWC sites was to look at species diversity for species beyond the Atlantic Flyway shorebird focal species. **Table 5** shows species diversity as reported by CWC counts between 2010 and 2014 based on wetland level data. Count locations were combined at the site or wetland level where possible to provide a different view on the importance of a wetland as a whole. Reported diversity numbers were calculated based on two different species groups beyond the focal species: ‘Waterbirds’ and All Species. A complete species list can be seen in **Appendix 4, Tables 6 and 7** and species included in the ‘Waterbirds’ group are designated in **Table 6**. We considered species such as Mangrove Cuckoo, Yellow Warbler and Red-winged Blackbird as ‘Waterbirds’ based on their close ties to wetlands. While arguments can certainly be made for including some species and excluding others from this ‘Waterbirds’ group, we used the designations provided in Table 6.

Maps of selected regions were created with each site being categorically color-coded based on the ‘Waterbird’ diversity of the site. A number of the sites, which contained the highest observed diversity of focal species, were also among the sites with the highest observed diversity of ‘Waterbirds’. Sur de Los Palacios in Cuba, (Western Cuba map, **Appendix 5, Figure 35**) and Monte Cristi in the Dominican Republic (Hispaniola

map, **Appendix 5, Figure 37**) are both especially high in both diversity of focal shorebirds and in ‘waterbirds’ overall. Other sites, which contained fewer focal species, proved to be very important for other groups of ‘waterbirds’, such sites may have habitat more appropriate for the broader ‘waterbird’ group than for the focal shorebirds species. Sites included in this group are Las Salinas, Ciénaga de Zapata in Cuba, Southgate Pond St. Croix, USVI (St. Croix map, **Figure 36**), and Provo Golf Course Ponds in Turks & Caicos. Lastly are a class of sites that have very high diversity of overall species compared to ‘waterbirds’. Sites such as Font Hill in Jamaica have a high diversity of non-waterbird species in addition to its ‘waterbird’ diversity.



**Figure 35.** This map shows observed diversity of ‘waterbirds’ in western Cuba based on CWC surveys conducted between 2010 and 2014.

# Saint Croix, USVI



**Figure 36.** This map shows observed diversity of ‘waterbirds’ in St. Croix, U.S. Virgin Islands based on CWC surveys conducted between 2010 and 2014.



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## DISCUSSION

Participation in the CWC has grown considerably over the last five years, as evidenced by the increase each year in the number of participating countries, contributors, checklists, and sites that were surveyed. Through mapping of CWC distribution and abundance data, in combination with data of high counts at CWC sites, we can show where each focal shorebird species occurs and is most abundant throughout the Caribbean during fall and spring migration and overwintering periods. In addition, regionally and nationally important sites for the 15 focal species can begin to be identified from the data (**Wilson's Plover** at Sur de Los Palacios, Cuba, Monte Cristi wetlands in the Dominican Republic). CWC data are also invaluable in providing information on diversity at sites, i.e., which sites harbour high diversity of focal shorebird species, all 'waterbirds,' and all species.

As the CWC database grows, it will be possible in the future to show more accurate visualizations of the most important overwintering sites as well as spring and fall migration routes and key stopover sites of different species. It will also be possible to create 'occurrence' or [STEM \(Spatio-Temporal Exploratory Model\) maps](#) for species in the Caribbean, as has been done for a number of species in the Lower 48 of the U.S. (Wood et al 2011).

## LIMITATIONS AND INTERPRETATION OF THE CWC DATA

The CWC counts that are included here represent the **minimum** number birds observed at a count location on a given day; they **cannot** be interpreted as representative of the actual population size using the site because of the following:

- For most sites the entire wetland was not counted, rather observers counted birds at one or a few locations in part of the wetland, thus many birds present at the site were not counted.
- These data include no analysis or estimate of detection probability. Detection is rarely perfect, thus the number of individuals counted is likely underestimated, the extent of undercounting depending on the species and conditions of the habitat at each site.
- The data do not address migration turnover, i.e., the fact that at some sites a number of individuals are stopping over for a few days during migration. One count on one or two days during a season does not represent the number of individuals in a population using the site over a period of time.

Only CWC data are included in the tables and maps; i.e., we did not use data from counts at wetlands where the observer did not choose one of the CWC protocol options in eBird Caribbean to enter their data. Thus, more data on shorebird/waterbird distribution and numbers at wetlands are available in eBird and could be examined for more information. However, we view the CWC data as higher quality on average because most participants have been trained in bird identification, CWC protocols and best practices in monitoring (e.g., being aware of bias and detectability, the importance of standardization, etc.).

To estimate total population size at a site, the density of birds could be counted (individuals per hectare) at the site and this number multiplied by the total area of suitable habitat available at the site. For many counts, however, this estimate would be biased, because the monitoring sites were not chosen

randomly – rather they were chosen because the count site was accessible (an issue at many wetlands) and also possibly well known as having good numbers and/or diversity of waterbirds. In a few cases, however, our CWC partners have designed monitoring studies where a sampling frame was established and multiple count stations set up along a survey route. Data may be available for more detailed analysis of population density, size and trends from these more intensive monitoring programs.

## **EVALUATION, LESSONS LEARNED, DIFFICULTIES, AND CHALLENGES**

- There are large gaps in coverage and some important wetlands are not yet included in the CWC due to lack of trained observers and funding.
- There is large variation in census effort: some countries/ islands have entered many checklists while others have entered very few or none at all.
- Not all CWC count data has been entered into eBird Caribbean. Access to the Internet to enter data remains challenging in Cuba<sup>16</sup>.
- Data quality control: eBird Caribbean contains filters to flag any sightings that are rare or questionable, however, these records need to be reviewed by a knowledgeable person. We need more persons in country to fulfill the role of eBird record reviewer. Although some species entered in eBird may be misidentified (and it will be difficult to determine if this is the case, especially with similar looking shorebirds), this will likely improve with time and observer experience.
- The CWC partnership that has been formed as a result of training workshops and discussions at BirDsCaribbean's regional meetings (e.g., Grenada 3013) has been critical to the success of the initiative. Participants have expressed appreciation for the training they have received in learning how to count waterbirds using standard methodology and all of the other CWC resources (e.g., manual, powerpoint presentations, equipment, small grants, etc.). They also like being a part of a larger effort, where their data contributes to regional/international as well as local knowledge of migratory and resident waterbirds. A Yahoo discussion group is used to share information on the CWC.
- We need to continue to develop key partnerships, especially at the national government levels. This is important to make the CWC self-sustaining over the long term in each country. Turks and Caicos Islands is an example of one country that has adopted the CWC monitoring program at the government level (Dept of Environment and Marine Affairs) and is supporting CWC surveys at many wetlands within the country. Several other countries are working towards institutionalizing CWC monitoring.
- There is a great deal of enthusiasm for the participation in the CWC. The program has attracted much local interest in some countries and synergy and cooperation has led to thriving CWC programs in several countries.

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<sup>16</sup> It is possible for CWC participants to enter their data into a formatted Excel file, which can then be sent to the project coordinators to enter, but this needs to be arranged and completed.

- The Small Grants program has been **critical** to the success of the CWC. It has allowed trained participants to immediately organize and implement their own monitoring programs, including purchasing equipment, conducting counts, and delivering local monitoring training workshops and a variety of awareness raising activities (e.g., celebration of World Wetlands Day, waterbird field trips, programs in schools and with youth, wetland clean-ups, etc.).
- We need to encourage and support the participants in the CWC network to write national reports (e.g. by providing a template), communicate results to the media and decision makers, and lobby government for the conservation and/or restoration of important wetlands that are under threat or inappropriately used. Ultimately, we hope the results from these surveys and well-designed monitoring programs will facilitate adaptive management of wetlands and conservation actions, such as the designation of more Wetlands of International Importance, WHSRN sites, IBAs, parks and protected areas.
- More information and publicity about the importance of wetlands for resident and migratory waterbirds, as well as low-impact activities at sites that benefit local communities and show the site's economic values could also help protect wetlands from being destroyed/ converted to other uses, an omnipresent threat for many important wetlands.

#### **NEXT STEPS AND NEEDS FOR THE FUTURE**

For sites that were identified as important for the 15 focal shorebird species, determine if the site is protected and if not, plan conservation initiatives that will work towards the goal of gaining protection for the site and developing sustainable use activities that benefit local communities. For all important sites, consider the following actions:

- Raise local awareness of the importance of the site through reports to decision makers and articles in the media highlighting the large numbers and diversity of wintering waterbirds, especially species of conservation concern, and the ecosystem service values of the wetland.
- Seek additional protection and designation of the site as appropriate (e.g., waterbird reserve, Ramsar site, Important Bird & Biodiversity Area, fish sanctuary, etc.)
- Carry out activities which increase/show the value of the site for local people, such as building an observation platform with an interpretive sign so that the site has value for education and bird and nature tourism (protected area status alone is not enough, i.e., it does not guarantee the site will not be destroyed/ converted for other uses)
- Seek involvement of the local community in the use, management, monitoring, and care of the site.

To continue to grow the CWC program, it is essential to continue to increase local engagement and build capacity to participate in the CWC through the following actions:

- Identify more partners/ colleagues within each country to participate in the program, especially in Spanish and French Caribbean countries.
- Identify in-country partners that are willing to serve as country coordinators; the role of country coordinators will be to liaise with all persons/organizations participating in the count to ensure that all important sites are covered, recruit more persons to carry out counts, and provide training and assistance as needed.

- Carry out more training workshops, covering (as in prior workshops) species identification, CWC count methodologies, and data entry in ebird Caribbean and spreadsheets for further analysis.
- Continued training and mentoring is necessary to ensure that data quality continues to improve; feedback to all participants in the network on CWC results is essential to show the value of the data and their efforts.
- Provide continued skills-building training workshops and support for our partners, for example, follow-up workshops on data analysis and statistics, writing reports and publishing results, community outreach and education, and communicating with decision makers.
- Continue the Small Grants Program to enable local partners to develop and carry out their CWC program and/or expand the number of wetlands surveyed.
- Carry out more intensive surveys at sites that have been identified as harboring large numbers of shorebirds (e.g., Monte Cristos in the DR, Cargill Salt Facility in southern Bonaire) using Level 2 or 3 count methodology (e.g., point counts with distance sampling) to enable estimates of population density and size.
- Continue to raise local awareness at all levels about the importance and value of Caribbean waterbirds and wetlands.
- Continue to seek long-term sustainability by integrating surveys into existing national and site programs, by seeking ways to make the CWC maximally cost effective, by seeking sponsorship to continue the programs, and by training participants to prepare funding proposals for future work.
- Develop wetlands for local education and bird and nature tourism (i.e., Watchable Wildlife Ponds, [Caribbean Birding Trail](#) sites) so that sites are recognized as being valuable for local people, livelihoods, and the economy. Boardwalks, viewing platforms and interpretive signage are needed to make key sites accessible and attractive for visitors. Our experience shows that providing this infrastructure in conjunction with awareness activities and guide training greatly increases local appreciation of wetlands—sites once regarded as ‘useless’ become resources for education and ecotourism.
- A full-time Regional Coordinator is needed to oversee the program, provide technical advice, liaise with all partners and recruit new ones, fundraise, provide continued training, manage and analyze CWC data, and prepare reports with recommendations for conservation and management actions.

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## CONCLUSIONS

The CWC monitoring program has grown significantly since its inception and the amount of data gathered thus far are beginning to yield interesting and important results. There is a great deal of interest and enthusiasm in the CWC program and our training workshops. Our results show that a regional effort is possible as well as essential to understanding the importance of Caribbean wetlands for both long and short-term distant migrant, wintering and resident waterbirds. The data can be used to identify key sites for species of concern, which can be targeted for conservation actions.



To grow the CWC program, it is essential to continue to build engagement through more training workshops, small grants, and nurturing of the CWC network and partnerships. Local participation is crucial to determine the number of waterbirds/shorebirds and key locations while establishing new within-country expertise to allow for continued surveillance. Conservation actions, such as raising awareness, providing legal protection, and developing sites for local education and bird tourism, can and should be taken now to help ensure that these critical wetlands, the last remaining in the region, are not lost forever to development.

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## ACKNOWLEDGEMENTS

We are very grateful to Environment Canada for the support to help us coordinate and deliver the CWC 2014 Regional Count as well as complete a formatted version of the CWC manual and final report. We are also grateful to a wide variety of donors and partners that have provided funding or in-kind support to the CWC program over the last five years, including the Organization of American States through the Western Hemisphere Migratory Species Initiative (WHMSI), US Forest Service International Programs, Royal Society for the Protection of Birds, Optics for the Tropics, Cornell Laboratory of Ornithology, National Fish and Wildlife Foundation, Rare Species Conservatory Foundation, Bahamas National Trust, US Fish and Wildlife Service (Division of International Conservation, Neotropical Migratory Bird Conservation Act Fund, and Division of Migratory Birds), Regional Activity Centre of the SPAW Protocol of the United Nations Environment Program, Waterbird Council of the Americas, Wetlands International, Birders Exchange, and others. Finally, we extend our heartfelt thanks to all of our partners in the CWC network that are out there counting waterbirds one or more times during the year – your dedication, enthusiasm and hard work is much appreciated.

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<http://www.plosbiology.org/article/info%3Adoi%2F10.1371%2Fjournal.pbio.1001220>



Participants gather for the morning's training presentations about monitoring, The Retreat, Bahamas National Trust Headquarters.



Birding at the South Beach tidal flats – Piping Plovers and other shorebirds abound.





Checking bird ID on the field trip to Harrold and Wilson Ponds National Park:  
Ken Kriese (USFWS), Atoya George (BVI) and Darren Henry (Tobago).



Predensa Moore (Bahamas) and Adams Toussaint (St. Lucia) go head to head  
in the *Name that Bird!* team competition on the last day.



Team Osprey looks on anxiously as one of their teammates compete in the *Name that Bird!* Team competition.



Field trip to Bonefish Ponds National Park – a wonderful mangrove wetland – home to many waterbirds and nursery for marine fisheries.





Practice point count at Spring Pond – freshwater wetland in Jamaica loaded with Common Moorhens, also American Coots, Lesser Yellowlegs, Least Grebes, Pied-billed Grebes, Masked Ducks (!), and more.



Great Pedro Pond: winter home to 762 Blue-winged Teal and many other waterbirds; Angela Ramsey (Tobago) & Anthony Levesque (Guadeloupe) count them all.