Arctic Shorebird Demographics Network/ La Red Ártica de Demográficos de Aves Playeras

Overview and Preliminary Report

Steering Committee:
Stephen Brown, Network Coordinator
Rick Lanctot, Science Coordinator
Brett K. Sandercock, Demographics Coordinator
River Gates, Field Coordinator

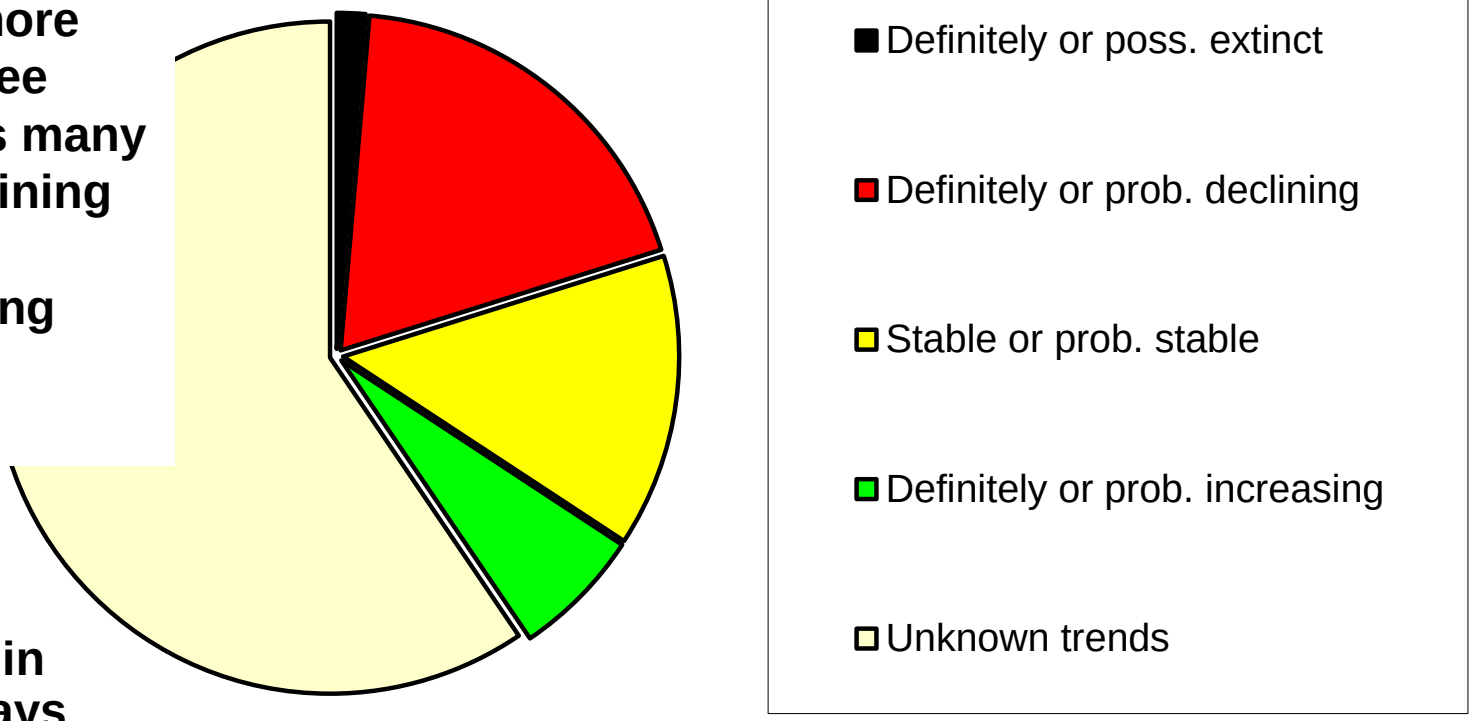
MANOMET
Center for Conservation Sciences

U.S. FISH & WILDLIFE SERVICE

K-STATE
Kansas State University

Global Shorebird Population Trends

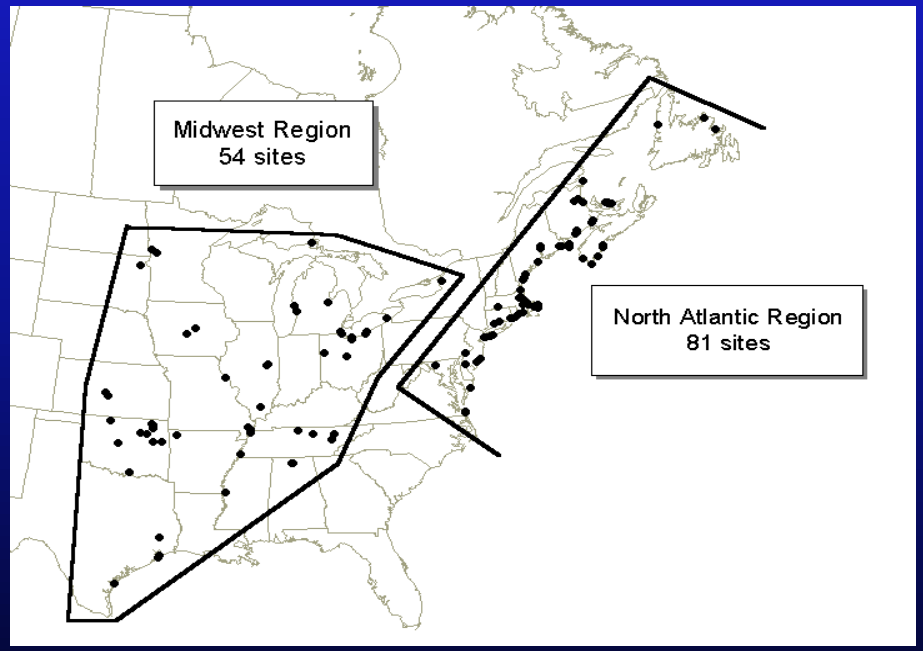
Of populations with known trend, more than three times as many are declining as are increasing



Similar broad pattern in all flyways

Conclusions from the 2003 International Wader Study Group Conference, Cádiz, Spain

North American Shorebirds Are Declining/ Aves Playeras del Norte América Están Declinando



International and Maritimes Shorebird Survey Data

North Atlantic: 22 of 30 species declining

Midwest: 11 of 29 species declining

Bart et al. 2007

Why Are Shorebirds Declining?/ ¿Por Qué la Declinación de Las Aves Playeras?

Shorebird Research Group of the Americas hypotheses:

- Habitat loss or change
- Human disturbance
- Increasing predator populations
- Climate change
- Toxic chemicals and pollutants
- Interactions of these
- Declines are only apparent

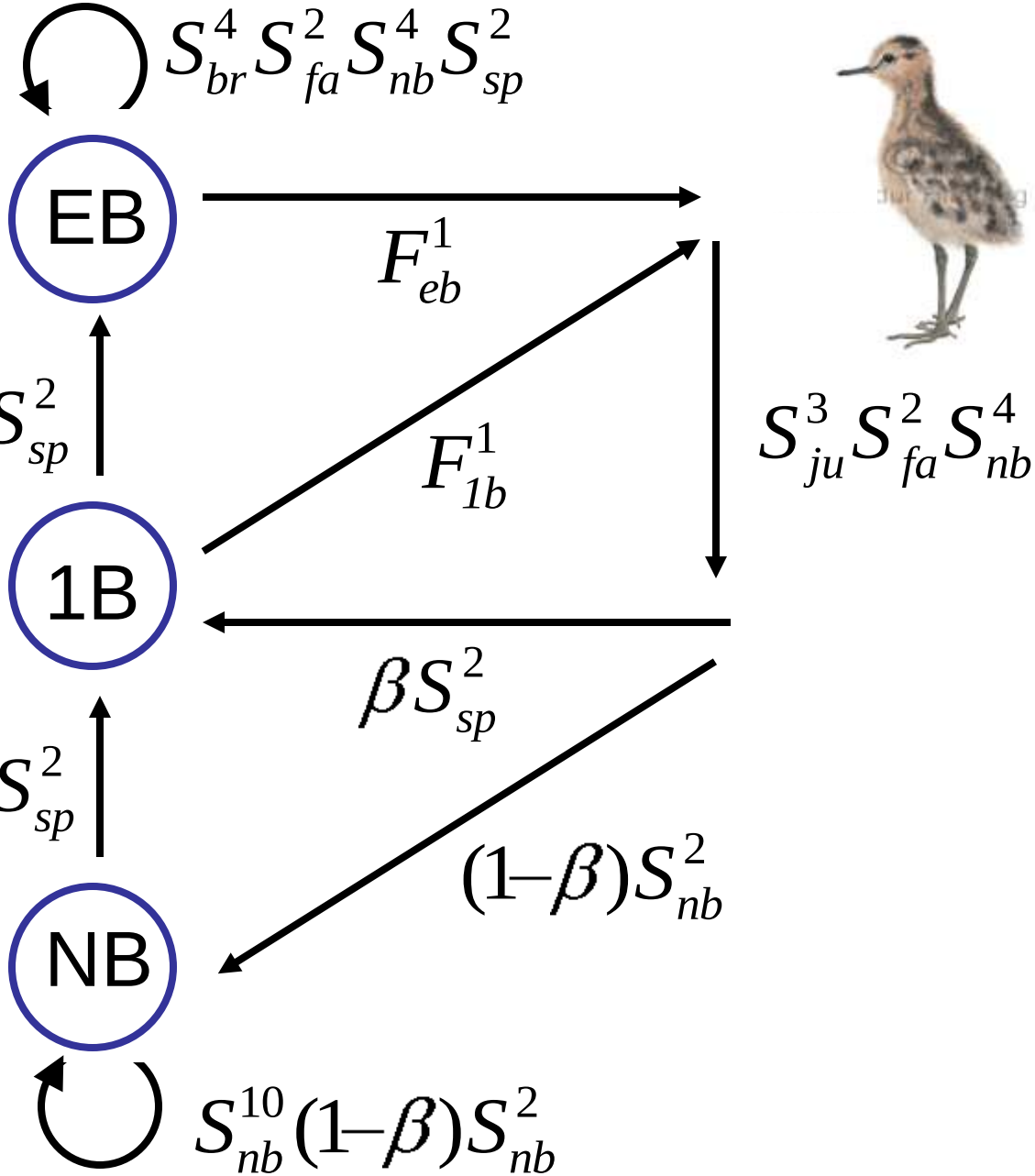
The Problem/El Problema: Shorebirds use vast areas, as these WHSRN sites illustrate.

We need a new approach to the science of shorebird declines./Necesitamos un nuevo enfoque de la ciencia de la disminución de las aves playeras.

Collecting demographic data provides an indirect approach for determining what factors are most likely limiting population growth:

- Adult survival (annual, seasonal)
- Nest survival
- Brood survival

ASDN allows targeted research and conservation at appropriate life history stages. (breeding, migration, wintering)



Demographic Model/Modelo Demográfico

Why conduct demographic work in the Arctic?/ ¿Por qué conducir el trabajo demográfico en el Ártico?

Arctic has:

- 20% of the world's shorebird species
- 30 million of the 100 million shorebirds in the world
- Some species show site fidelity, necessary to measure adult survival

Why a Network?/ ¿Por Qué Una Red?

- The Arctic is HUGE! Requires a collaborative approach to address large scale questions.
- Ability to study same species at multiple sites adds power to demographic analyses.
- Builds significant opportunities for "network projects", that rely on data collected over a large geographic area

The Network Enhances Existing Efforts/ La Red Mejora Los Esfuerzos Existentes

- Compliments existing large scale monitoring efforts under Arctic PRISM
- PRISM addresses population size and trend, but does not provide information on the demographic mechanisms behind declines

ASDN Sites active in 2011/ Sitos de activo en 2011

Partner Organizations/ Las Organizaciones de Socios

- Nome - Simon Fraser University & Kansas State University, Dov Lank & Brett Sandercock
- Cape Krusenstern - USFWS, River Gates & Rick Lanctot
- Barrow - USFWS, Brooke Hill & Rick Lanctot
- Ikpikpuk River and Prudhoe Bay - Wildlife Conservation Society, Joe Liebezeit & Steve Zack
- Colville River - USGS, David Ward & David Pavlik

Partner Organizations/ Las Organizaciones de Socios

- Canning River - USFWS & Manomet, Steve Kendall & Stephen Brown
- Mackenzie Delta - Environment Canada, Jennie Rausch & Lisa Pirie
- East Bay - Environment Canada & Paul Smith Consulting, Grant Gilchrist & Paul Smith,
- Churchill - Trent University & Cornell Lab of Ornithology, Erica Nol & Nathan Senner
- Bylot Island - University of Quebec at Rimouski, Joel Bety & Jean-Francois Lamarre

Memorandum of Understanding/ Memorando de Entendimiento

- Signed by 15 Organizational Partners
- Establishes Steering Committee
- Outlines cooperative approaches on:
  - Development of protocols
  - Support of field research sites
  - Sharing of data for project-wide analysis and co-authorship
  - Participation in additional Network Projects

Status of the Network/ Estado de la Red

- 9 Field sites active in 2010, and 10 Sites in 2011
- Two field seasons completed, three more planned
- Network-wide funding from USFWS Arctic LCC, USFWS Neotropical Migratory Birds Conservation Act, National Fish and Wildlife Foundation, Manomet Inc.
- NSF RCN program proposal being drafted

  Network Coordination
- Major funding for each site being provided by sponsoring partner organizations

Protocol Committee/ Comité de Protocolo

- Developed protocols, dataforms and databases for 2010 field season
- 2010 protocols revised for 2011 field season

Committee

- River Gates, USFWS & Manomet
- Joe Liebezeit, Wildlife Conserv. Society
- Paul Smith, Paul Smith Consulting
- Rick Lanctot, USFWS
- Brooke Hill, USFWS & UAF

Built on Existing Protocols/ Se Usa Los Protocolos Existentes Como Base

- Intensive nest searching techniques:
  - ✓Barrow shorebird studies – USFWS
  - ✓Tundra bird study – WCS
- Capture and banding techniques:
  - ✓North American Bander's Guide to Shorebirds – CWS
- Ecological correlates:
  - ✓Arctic WOLVES – multiple institutions

Network Databases/ Bases de Datos de la Red

Metadata

- Plot & sampling locations
- Daily species list
- Personnel effort

Demographics

- Adult banding
- Resight
- Nest survival

Ecological Correlates

- Snow & surface water cover
- Daily weather
- Lemmings counts
- Predator counts
- Terrestrial and aquatic inverts

Selection of Focal Species/ La Selección de Especies Focales

Selection based on likelihood of sites able to meet target numbers of nests & individuals (n = < 30)

Demographic Variables/ Variables Demográficas

- Nest survival
- Brood survival (Barrow)
- Adult summer survival
- Adult over-winter survival
- Age of first breeding
- Site and mate fidelity
- Natal philopatry

Environmental Variables/ Variables del Medio Ambiente

- Predator activity
- Food availability
- Lemmings and small mammals as alternative prey for predator-switching
- Climatic variables
- Timing of snow melt / water levels

Total Nests Found 2010/ Los Nidos Encontrados 2010

Site	SESA	DUNL	PESA	REPH	RNPH	WESA	WHIM	Others	Total
Nome	30				24	44		0	98
Cape Krusenstern	17	21			7	10		0	55
Barrow	59	66	42	73	7	9		37	293
Ikpikpuk	70	21	17	15	8			10	141
Prudhoe Bay	30	0	11	2	3			2	48
Canning	72	12	46	17	29			14	190
Mackenzie Delta	9				8		11	13	41
Churchill		26			15		20	25	86
East Bay		3		25				82	110
Total	287	149	116	132	101	63	31	183	1062

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Total Nests Found 2011/ Los Nidos Encontrados 2011

Site	SESA	DUNL	PESA	RNPH	REPH	WESA	WHIM	Others	Total
Nome	64			52		88		0	204
Cape Krusenstern	36	13		12		10		0	71
Barrow	41	70	111	12	160	10		51	455
Ikpikpuk	52	18	0	9	8			0	87
Colville	77	14	5	19	13			15	143
Canning	80	15	78	34	27			0	234
Mackenzie	16		10	22	0		10	15	73
Bylot			1					26	27
East Bay		2						59	61
Churchill		35			11		19	0	65
Total	366	167	205	160	219	108	29	166	1420

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Ikpikpuk	52	18	0	9	8			0	87
Colville	77	14	5	19	13			15	143
Canning	80	15	78	34	27			0	234
Mackenzie	16		10	22	0		10	15	73
Bylot			1					26	27
East Bay		2						59	61
Churchill		35			11		19	0	65
Total	366	167	205	160	219	108	29	166	1420

Total Birds Banded 2010/ Total de Aves Anilladas 2010

Site	SESA	DUNL	PESA	REPH	RNPH	WESA	WHIM	Others	Total
Nome	35				16	51			102
Cape Krusenstern	18	30			2	11			61
Barrow	85	105	26	61	8	15		36	336
Ikpikpuk	50	35	30	18	13			14	160
Prudhoe Bay	35	6	20	5	5			9	80
Canning	102	23	39	11	19			7	201
Mackenzie Delta	9				6		6	12	33
Churchill		46			6		39		91
East Bay		1		36				49	86
Total	334	246	115	131	75	77	45	127	1150

Total Birds Banded 2010/ Total de Aves Anilladas 2010

Site	SESA	DUNL	PESA	REPH	RNPH	WESA	WHIM	Others	Total
Nome	35				16	51			102
Cape Krusenstern	18	30			2	11			61
Barrow	85	105	26	61	8	15		36	336
Ikpikpuk	50	35	30	18	13			14	160
Prudhoe Bay	35	6	20	5	5			9	80
Canning	102	23	39	11	19			7	201
Mackenzie Delta	9				6		6	12	33
Churchill		46			6		39		91
East Bay		1		36				49	86
Total	334	246	115	131	75	77	45	127	1150

Total Birds Banded 2011/ Total de Aves Anilladas 2011

Site	SESA	DUNL	PESA	RNPH	REPH	WESA	WHIM	Others	Total
Nome	104			53		184		0	341
Cape Krusenstern	58	26		11		19		0	114
Barrow	58	123	50	8	44	10		67	360
Ikpikpuk	68	31		10	9			0	118
Colville	31	6	3	2	4			8	54
Canning	51	19	38	10	7			0	125
Mackenzie	15		8	11			4	16	54
Bylot								48	48
East Bay								22	22
Churchill		32		3			18	0	53
Total	385	237	99	108	64	213	22	161	1289

Number of Resights 2011/ Número de Avistamientos 2011

Site	SESA	DUNL	PESA	RNPH	REPH	WESA	WHIM	Others	Total
Nome	43			3		52		0	98
Cape Krusenstern	2	35		1		3		0	41
Barrow	26	28		1	3	2		6	66
Ikpikpuk	30	15		1	2			0	48
Colville	NA							0	0
Canning	37	7	1	5	0			0	50
Mackenzie	3						3	5	11
Bylot								9	9
East Bay		2						15	17
Churchill		21		1			12	0	34
Total	141	108	1	12	5	57	15	35	374

Demographic Analyses/
Los Análisis Demográficos

Nest survival

- Known fate models control for losses prior to nest discovery
- Allows nest checks at different schedules
- Input: date of discovery, dates bracketing nest completion, nest fate
- Nest covariates: age at discovery, habitat, latitude

Demographic Analyses/ Los Análisis Demográficos

Return rate

t_1		t_2 or t_{2+}
mark sample	$\xrightarrow{\text{RR}}$	% recaptured, % resighted or both

Index of adult survival but a product of four rates

Probability (θ)	Complement ($1-\theta$)
• True survival (S)	• Mortality
• Site fidelity (F)	• Permanent emigration
• Site propensity ($\gamma*$)	• Temporary emigration
• True detection rate ($p*$)	• Missed by observer

$$\text{RR} = S \times F \times \gamma* \times p*$$

Mark-Recapture Models (CJS)

Encounter histories

1 = detection, 0 = no detection

t_1		t_2		t_3		t_4
1	ϕ_1	0	ϕ_2	1	ϕ_3	1
	p_2		p_3		p_4	

CJS models estimate 2 probabilities:

- Apparent survival (ϕ) = $S \times F$
- Encounter rates (p) = $\gamma * \times p *$

Frequently $p < 1$

Limitations

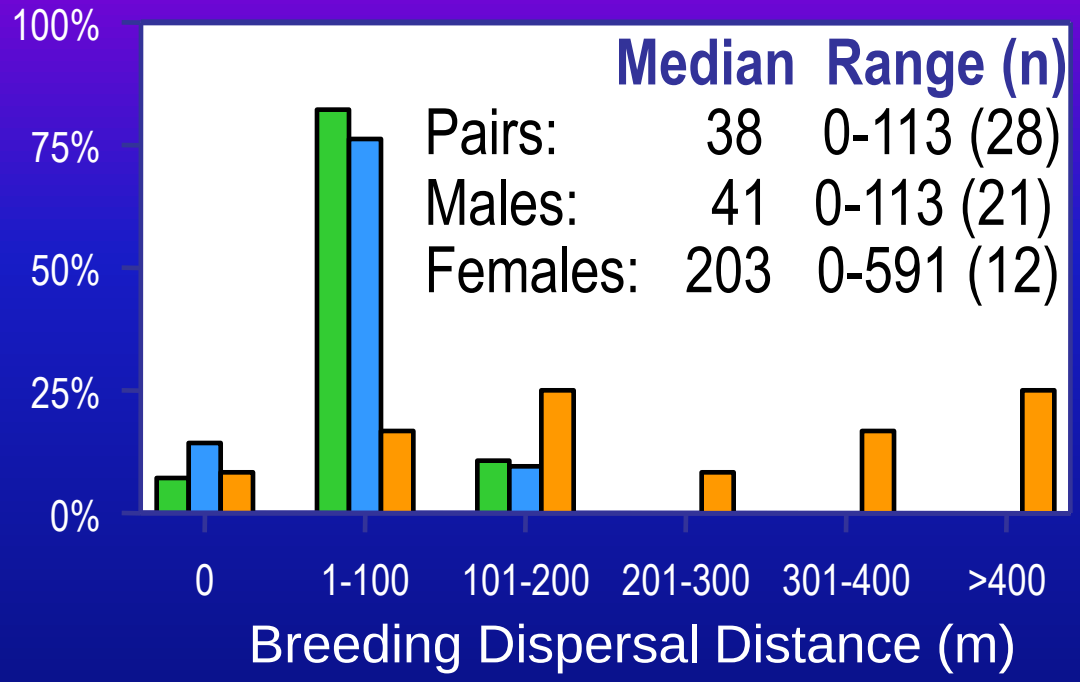
- Require 3-4 years
- $\phi \neq S$, models based solely on live encounter data cannot disentangle S and F
- ϕ of less value if F is low: juveniles, phalaropes, species using unstable habitats

To Interpret ϕ, *F* Is Needed

Semipalmated Sandpiper

$\phi_{mal} = 0.61$

$\phi_{fem} = 0.56$



Limitation

- Estimates of dispersal distance are biased if calculated from small study plots

Additional Network Projects/ Los Proyectos Adicionales de la Red

- Avian Influenza detection – Kim Trust
- Avian disease sampling – Samantha Wisely, Debbie Buehler, Jorge Santo Domingo
- Migratory connectivity of DUNL using geolocators – Steve Yezerinac
- SESA stable isotope project – David Mizrahi
- NDVI and nest initiation – David Ward
- Invertebrate phenology and pond characteristics – Mac Butler and Daniel Rinella
- Feather and blood collection for stable isotope and genetic investigations

Total Network Project Samples 2011/ Total de Muestras de los Proyectos de la Red 2011

Site	Feathers	Fecal	Genetic Blood	RNA Blood	Malaria Blood
Nome	261	58	172	59	81
Cape Krusenstern	113	61	104	93	66
Barrow	365	211	350	297	181
Ikpikpuk	115	99	59	55	56
Colville	53	34	36	14	16
Canning	122	54	75	55	32
Mackenzie	40	21	36		
Bylot	41	21	5	2	36
East Bay	22				
Churchill	12	21	31	10	13
Total	1144	580	868	585	481

Acknowledgments/Agradecimientos

- Network Site Partners Listed Previously
- Network Funders
  - USFWS Arctic LCC, USFWS Neotropical Migratory Bird Conservation Act, National Fish and Wildlife Foundation, Manomet Inc., and Network site partners
- Many thanks to Meredith Gutowski for the Spanish title translations!

Acknowledgments/Agradecimientos

Thanks to many other project participants who helped design the study or carry out the work in the field!

Gracias a los muchos otros participantes del proyecto que ayudaron a diseñar el estudio o llevaron a cabo el trabajo en el campo!

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