

# Restoration Options for Neotropical Migratory Birds: a Look Toward the Future

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# Outline

- ◆ NRDA overview
- ◆ NRDA and migratory birds
- ◆ Restoration framework
- ◆ Rationale for international off-site restoration
- ◆ Information needs & challenges
- ◆ Case study: South River, VA mercury contamination



Prothonotary Warbler, John Woodcock

# NRDA overview

- ◆ Resolved hundreds of cases
- ◆ Collected hundreds of millions of dollars for natural resource compensation
- ◆ Protected hundreds of thousands of acres of wildlife habitat
- ◆ Restoration projects from
  - ◆ Alaska to Argentina
  - ◆ Florida to New Zealand



Marbled murrelet, USFWS

# NRDA overview

- ◆ Trustee council makes restoration decisions (with public input)
- ◆ Nexus of restoration to the injury
- ◆ Preference for in-kind, in-place
- ◆ Species' life-history traits are vitally-relevant foci for restoration efforts



Sooty shearwater, USFWS

# Types of Restoration

- ◆ Purchase & protect quality habitat
- ◆ Decrease (other causes of) mortality
- ◆ Return habitat to pre-damage conditions
- ◆ Enhance or restore quality of other existing habitat
- ◆ Reintroduction/restocking of populations



# NRDA and Migratory Birds

- ◆ OPA projects – both on- and off-site restoration of waterbirds and shorebirds

Razorbills, USFWS



Species	Location	Type	Location
Sooty Shearwaters	New Zealand	predator ctl	2 CA oil spills
Ruddy Ducks	prairie potholes	habitat	MD oil spill
Common loons	Maine lakes	habitat	MA oil spill
Red Knots	Argentina/Chile	management	NJ oil spill
Razorbills	Gulf of Maine	predator ctl	VA oil spill
Brown Pelicans	Baja	habitat	CA oil spill
Ancient Murrelets	Canada	habitat	CA oil spill

# NRDA and Migratory Birds

- ◆ CERCLA-related projects
- ◆ Neotropical migratory songbirds
- ◆ Injury incurred at CERCLA/  
hazardous substance sites
- ◆ Populations may be limited by factors outside of  
CERCLA site
- ◆ Full restoration may require both on- and off-site  
projects that span international borders
- ◆ No historical examples of such a broad-scale  
approach



# Framework for restoration

- ◆ Establish restoration objectives
- ◆ Identify scientific information needs
- ◆ Assemble available information; collect new data
- ◆ Identify restoration possibilities
  - ◆ local
  - ◆ off-site (international)
- ◆ Assess likelihood of successful implementation
- ◆ Implement restoration actions
- ◆ Monitoring, adaptive management



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- ◆ Follow-up monitoring, adaptive management

# Rationale for international restoration

- ◆ Many bird species that breed in the US spend ~ 2/3 of the year south of the border
- ◆ Populations are affected by conditions experienced throughout the life cycle
- ◆ Winter conditions can be especially important
- ◆ Restoration of wintering habitat can improve success of on-site restoration efforts
- ◆ Cost/benefit (\$) ratio is greater in Neotropics

# Restoration objectives

- ◆ Target species, habitats
- ◆ Identify reasonable restoration types for target species and habitats
- ◆ Need to consider full life cycle
  - ◆ International projects for long-distance migrants
- ◆ Establish measures of success (abundance of target species, survival rates, productivity, diversity, etc.)

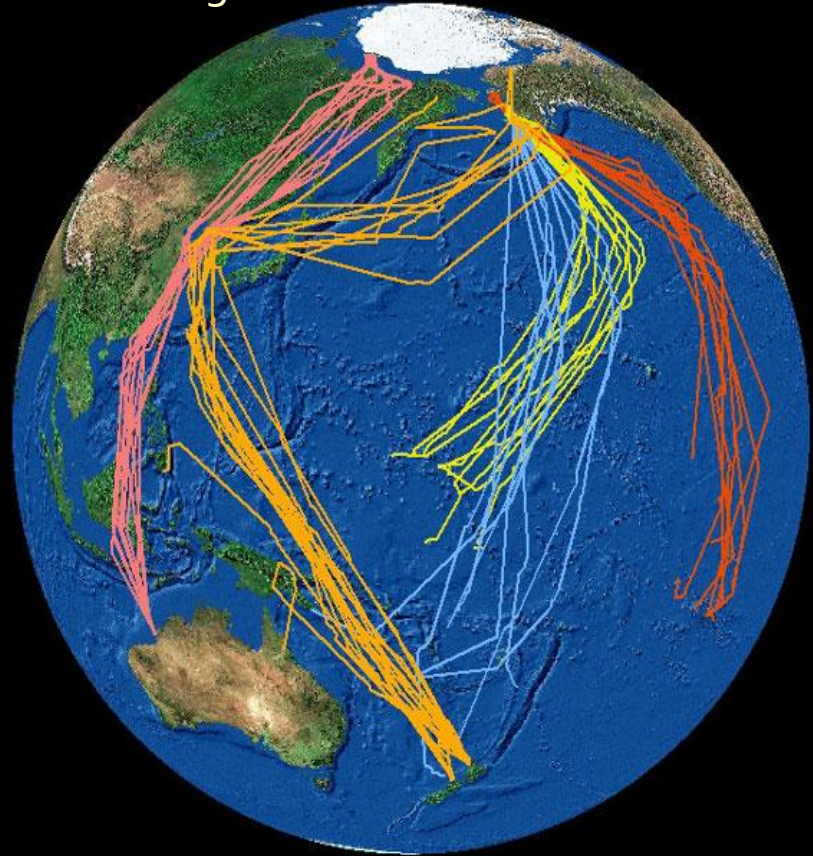
# Scientific information needs

- ◆ Assess migratory connectivity
- ◆ Assess population parameters:
  - ◆ Distribution (occupancy), abundance, vital rates
- ◆ Assess environmental drivers of populations
  - ◆ Habitat, climate

# Migratory Connectivity

- ◆ Satellite transmitters now providing detail for many large species

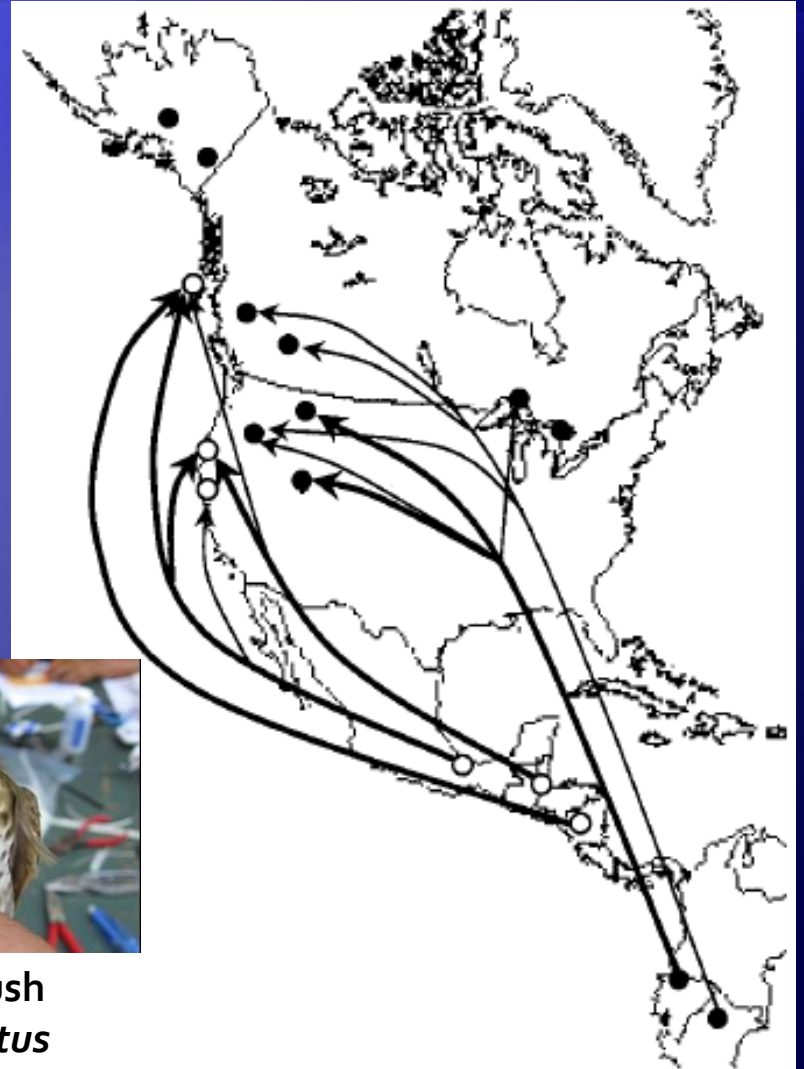
Bristle-thighed Curlew & Bar-tailed Godwit



Bob Gill, USGS Alaska Shorebird Project

# Migratory Connectivity

- ◆ More challenging for small species
  - ◆ Stable isotopes
  - ◆ Genetics
  - ◆ Geolocators
  - ◆ Morphometrics



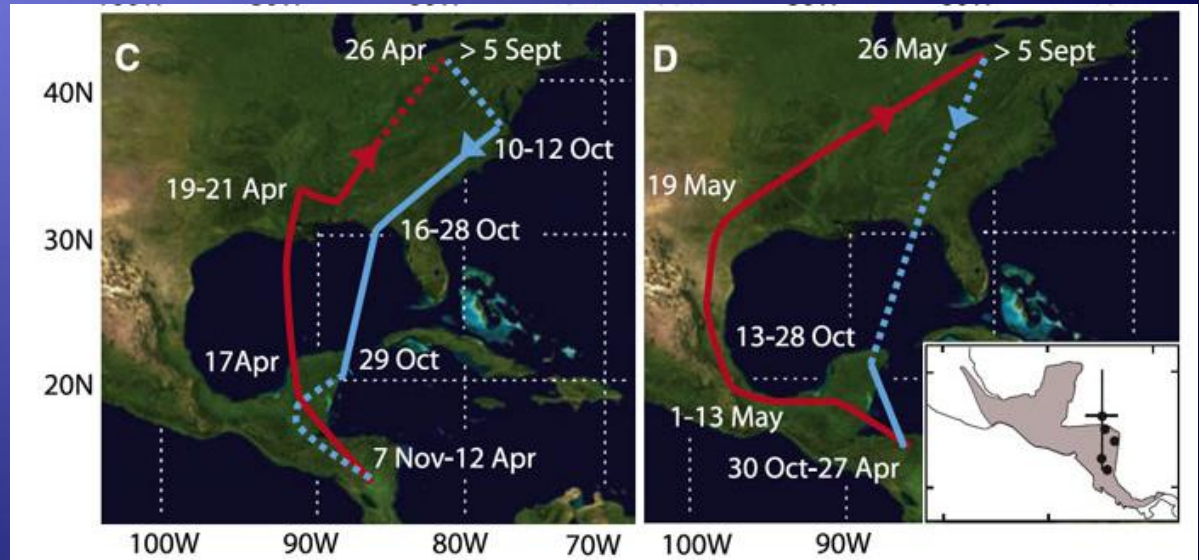
Swainson's Thrush  
*Catharus ustulatus*

from Kelly et al. 2005

# Migratory Connectivity

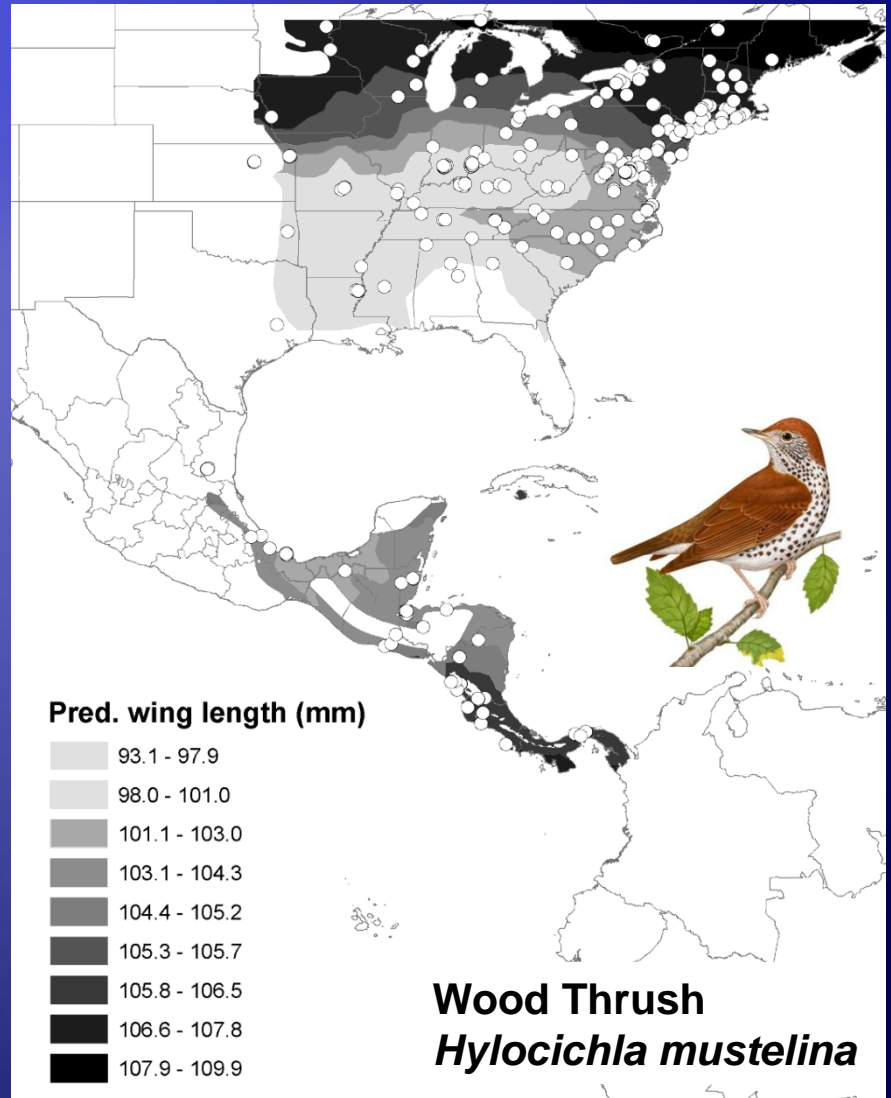
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**Wood Thrush**  
*Hylocichla mustelina*



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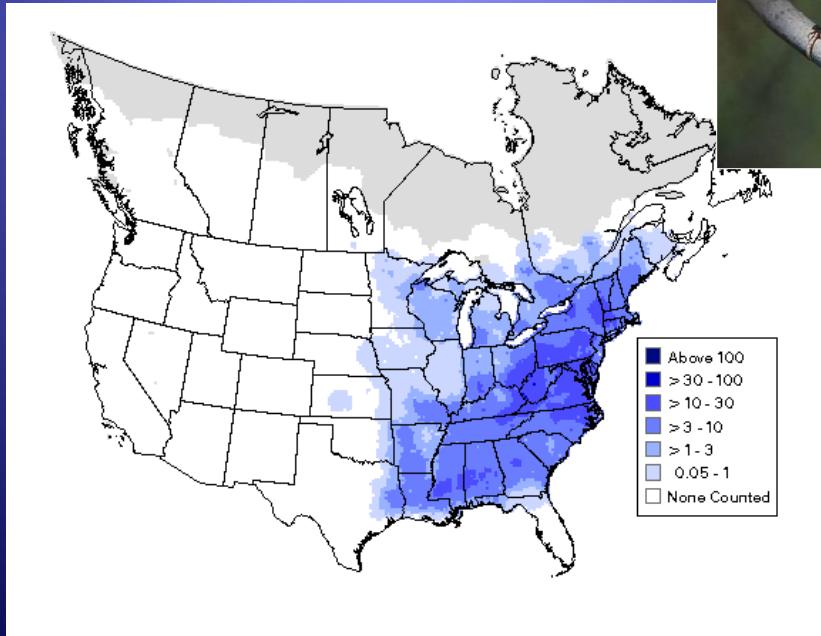


# Scientific information needs

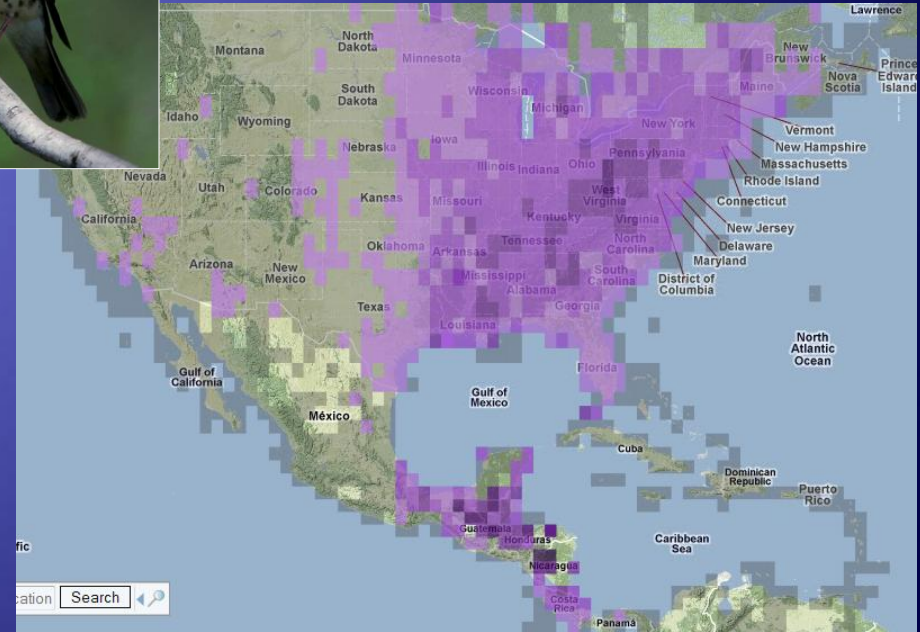
- ◆ Migratory connectivity
- ◆ Population parameters:
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# Population parameters: distribution, abundance

BBS



EBird

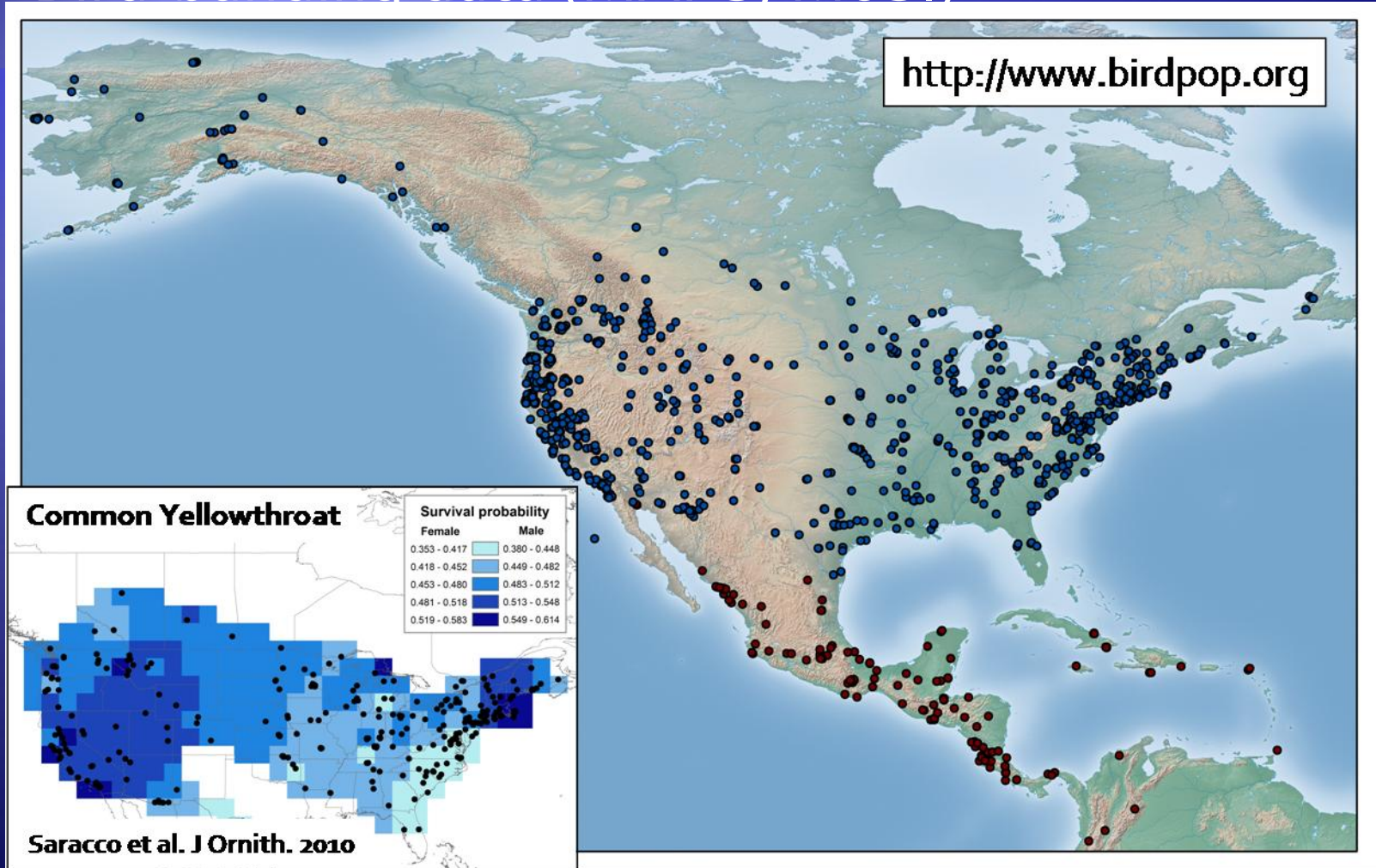


<http://www.pwrc.usgs.gov/bbs/results/>

<http://ebird.org/ebird/eBirdReports>

# Population parameters: vital rates

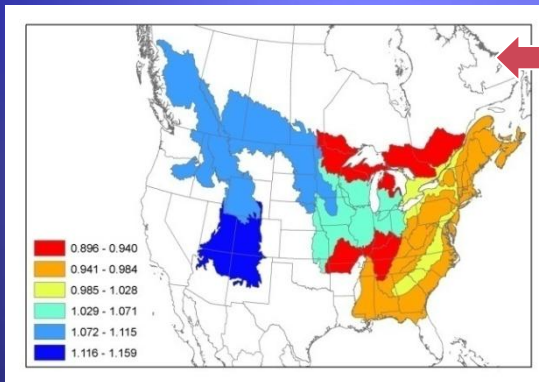
- ◆ Bird-banding data (MAPS, MoSI)



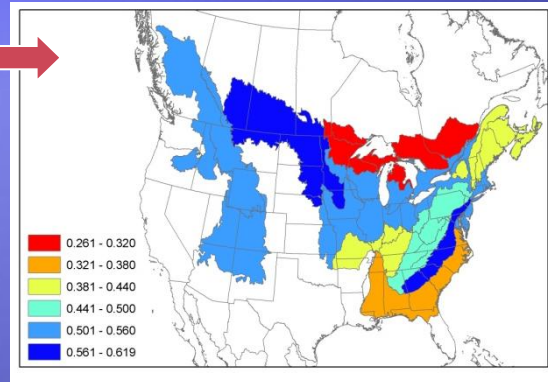
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Population Trend

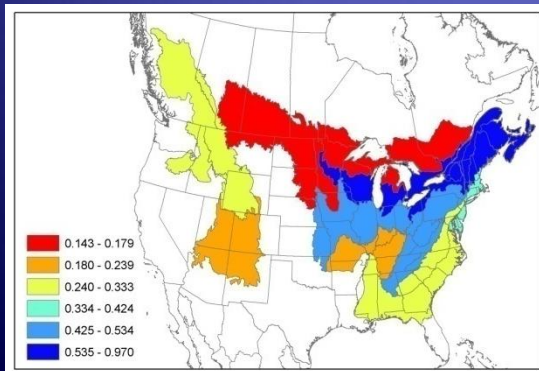


Adult survival

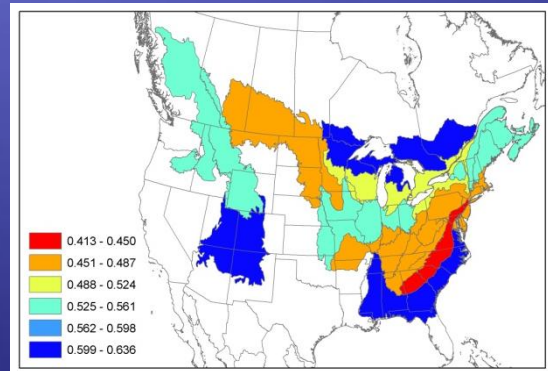


Gray Catbird  
(*Dumetella carolinensis*)

Productivity



Recruitment



Spatial variation in trend  
driven by adult survival

# Scientific information needs

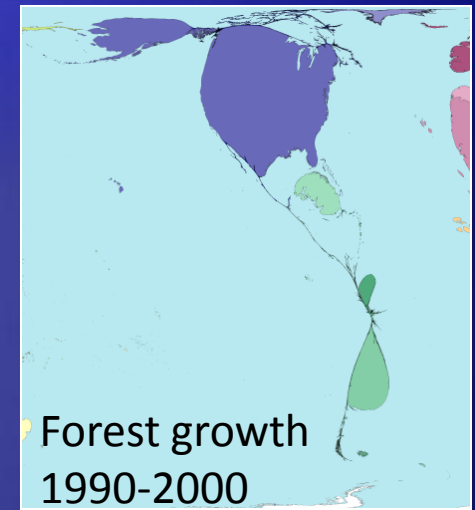
- ◆ Migratory connectivity
- ◆ Population parameters:
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  - ◆ Habitat, climate

# Environmental drivers of populations

- ◆ Local factors
  - ◆ e.g., forest cover, fragmentation
- ◆ Carry-over effects
  - ◆ Events at one point in life cycle affect demography at later stage
  - ◆ Seasonality of winter habitat – Climate Change

# Environmental drivers of populations

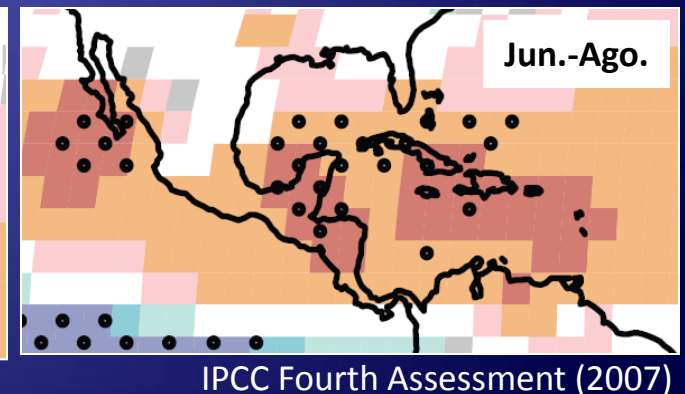
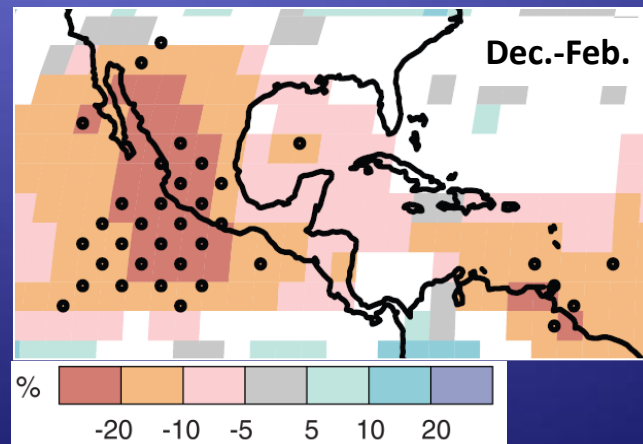
## Large-scale land-use change



Dorling et al. (2008) *The Atlas of the Real World*

## Climate change

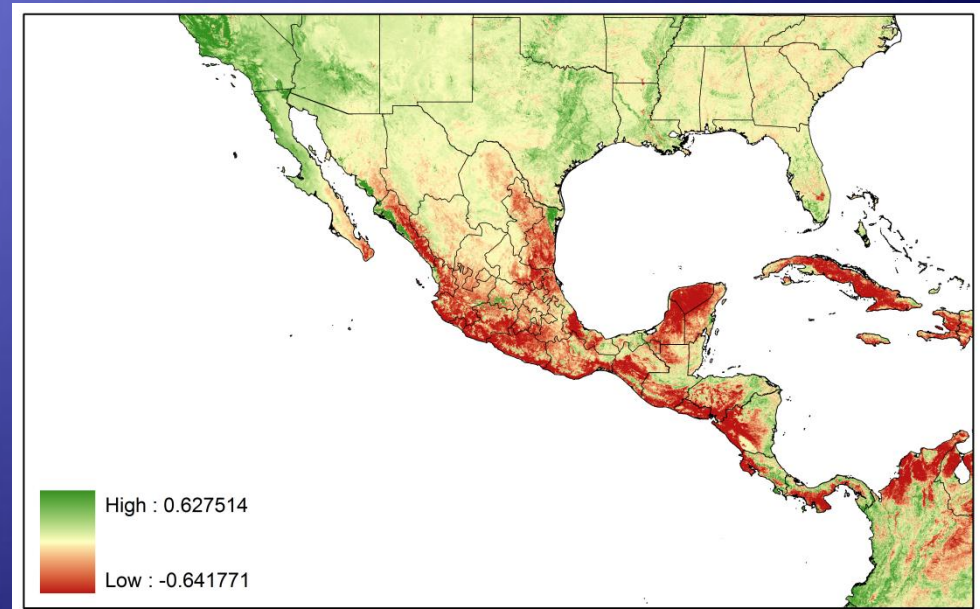
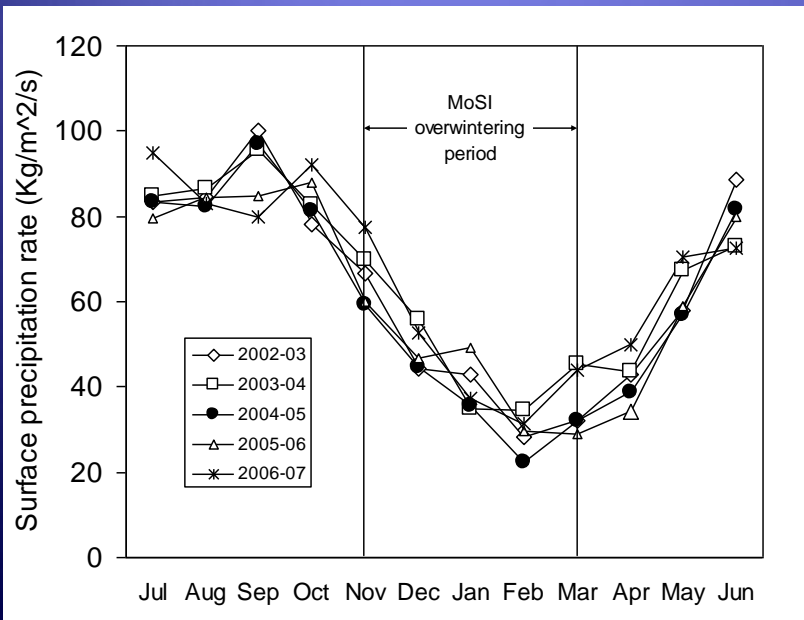
Predicted  
precipitation  
change between  
1980-1999 and  
2090-2099



IPCC Fourth Assessment (2007)

# Seasonality of winter habitat

- Overwintering period transitions from wet to peak dry seasons
- Dry forests drop leaves
- Many humid forests of Caribbean slope leaf out
- Higher quality habitats resilient to drying





# Case Study: South River mercury contamination in Virginia

- ◆ Partnership among industry, government agency, academic institution, and NGO
- ◆ Target habitats and species established
- ◆ In process of collecting and analyzing data to guide restoration scaling/crediting:
  - ◆ Breeding surveys in South/Shenandoah River basin completed this summer
  - ◆ Analysis of MoSI data 2003-2010 to guide with winter restoration efforts
- ◆ Identification of potential restoration sites and partners underway

# South River target species and habitats

- ◆ Forest predominant historical habitat
- ◆ Currently mosaic of agriculture, shrub, forest, and riparian/wetland
- ◆ Species selected to represent variation in natural habitats
- ◆ Detections on surveys in local landscape
- ◆ Data available to guide restoration
- ◆ priority for species of high conservation concern
  - ◆ Partners in Flight (PIF) ranking, USFWS

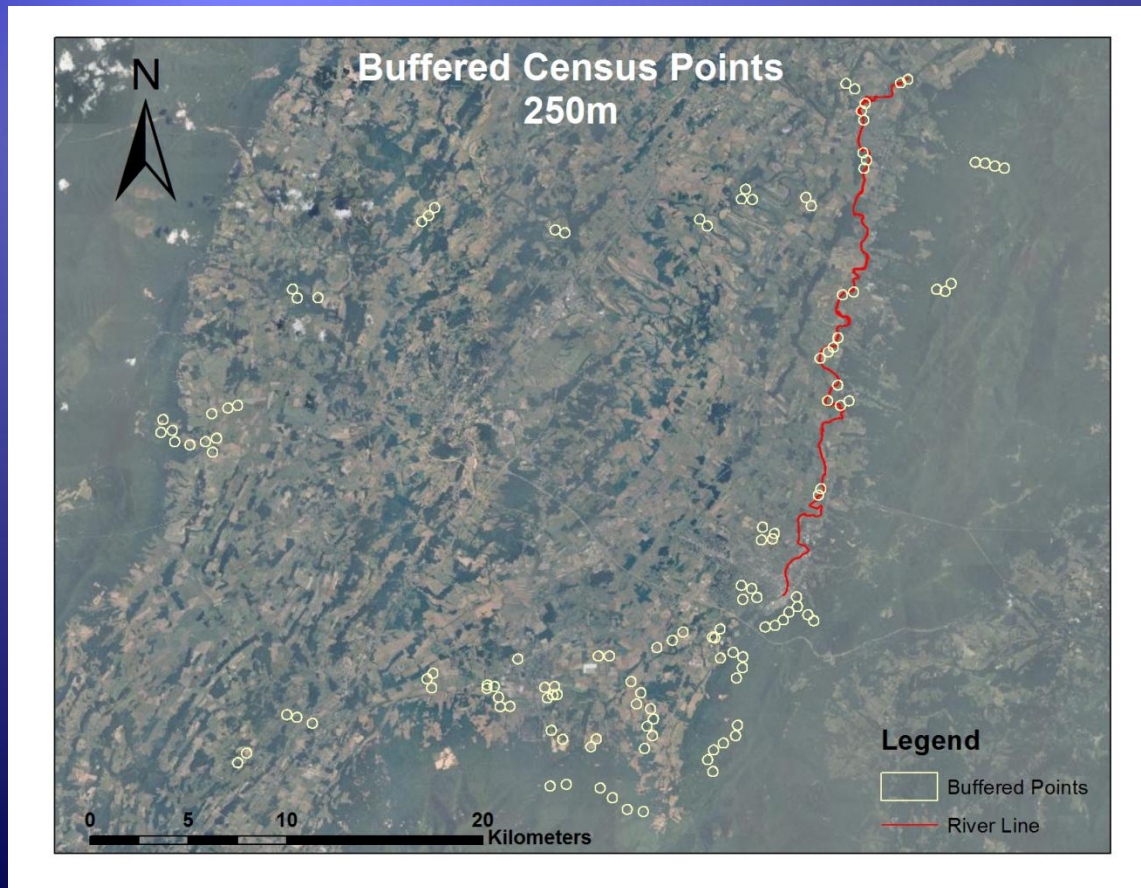


# South River target species and habitats

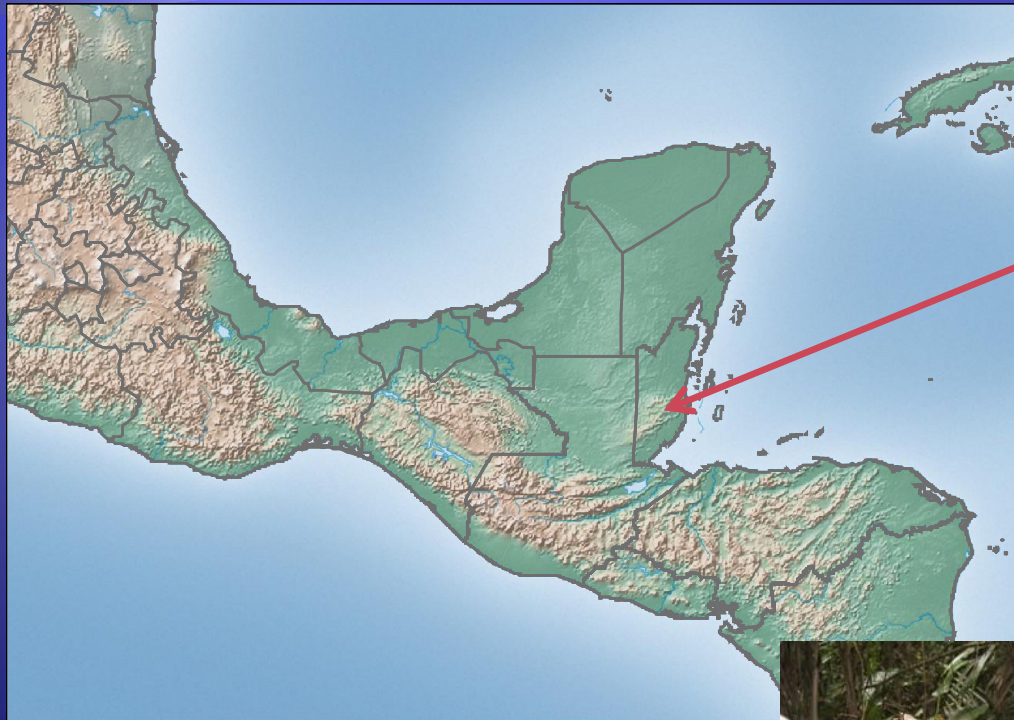
	Detected on South River Surveys 2005-06	Significant BBS decline 1966-09	USFWS National Species of Concern	PIF Continental Score $\geq 13$
Wood Thrush	X	X	X	X
Ovenbird				
Yellow Warbler	X	X		
Gray Catbird	X	X		
Kentucky Warbler		X	X	X
Black-and-white Warbler	X			
Common Yellowthroat		X		
Hooded Warbler				X
Worm-eating Warbler	X		X	X
Yellow-breasted Chat	X	X		
American Redstart	X			

# Breeding Surveys (July 2011)

- ◆ 180 point counts have been completed to:
  - ◆ derive habitat-specific species densities; and
  - ◆ develop a restoration scaling tool.



# Identification of off-site opportunities, partners



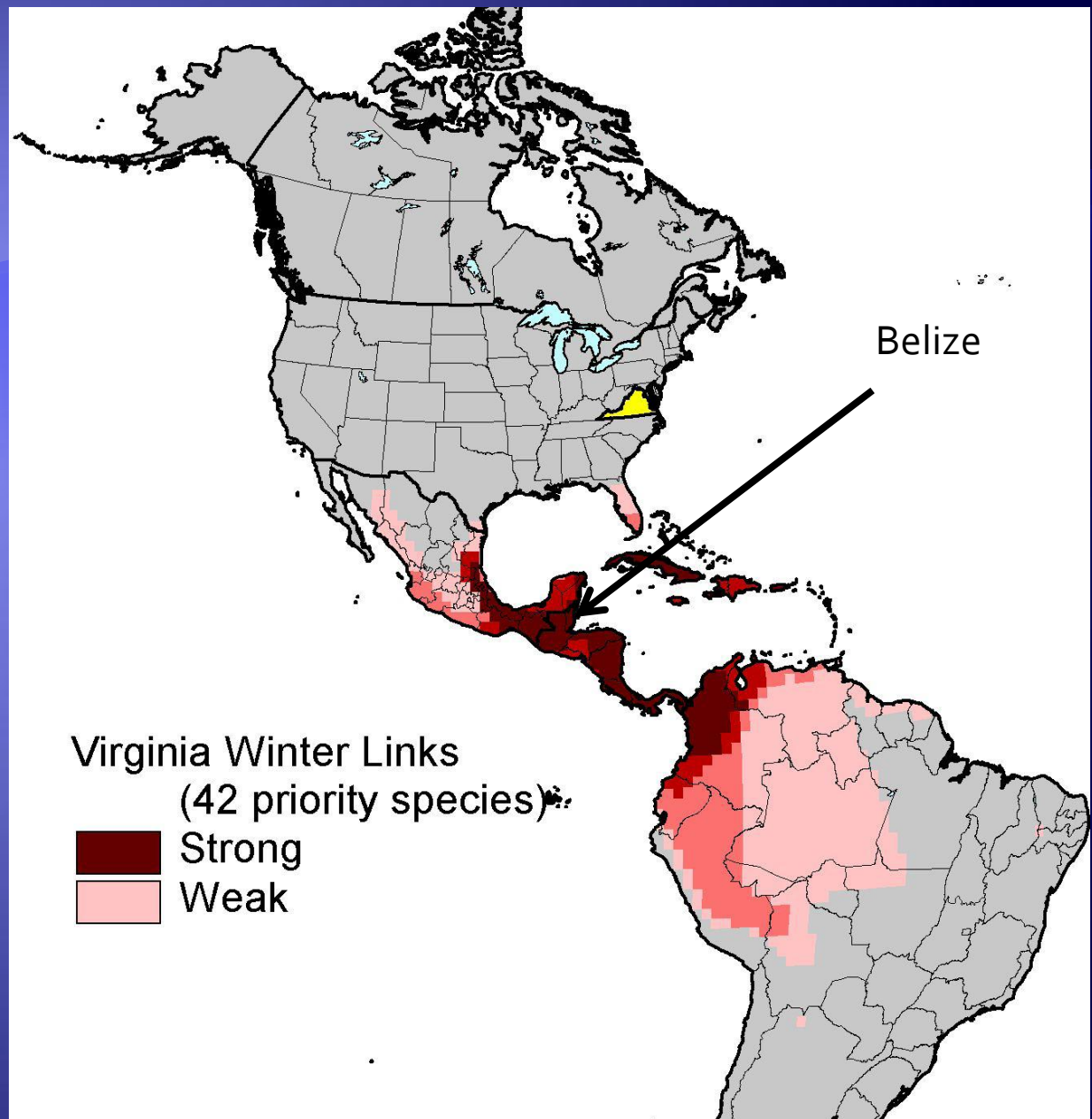
Belize



# Why Belize?

- ◆ Politically stable, English primary language
- ◆ Strong environmental ethic, yet has the usual pressures from development and economic growth
- ◆ Large private landholdings of conservation concern available for protection
- ◆ Established environmental non-profits present and are strong conservation stakeholders
- ◆ North American neotropical migrants are widely distributed and overwinter in high densities

# Neotropical migrant link is strong between Virginia and Belize



# Criteria for Belize site selection



- (1) High proportion and abundance of both
  - (a) neotropical migrants and
  - (b) highly ranked species of conservation concern (per Partners in Flight);
- (2) Overall high conservation value of property;
- (3) High connectivity with other protected properties;
- (4) Solid ability of land steward to protect and maintain the property;
- (5) Risk of development pressure and/or habitat degradation;
- (6) Cost reasonableness



# Belize Restoration Example 1 - Acquisition

- ◆ Belizean private land owner
- ◆ Managed by US Citizen (NGO)
- ◆ 1,153 acres
- ◆ Cost - \$1,500/acre
- ◆ Total Cost – Approximately \$1.8 million
- ◆ Status: Property could be sold at any time

# Belize Example 2 - Habitat Enhancement

Background: Primary forest area adjacent to NGO-controlled preserve area has been converted to agricultural land

- ◆ Farmers' local practice is to grow pineapple and/or bananas
- ◆ Monocultures with pesticide = poor bird habitat



# Belize Example 2 - Habitat Enhancement

- ◆ Support transitioning land to shade grown agricultural use - coffee, vanilla bean, etc.
- ◆ Avian monitoring to evaluate species diversity and abundance
- ◆ Use geolocators to track migration of birds from Belize as well as at impacted sites in the U.S. (coordinate with neotropical migrant education program)
- ◆ School to school outreach



# SUMMARY

## International Restoration Challenges

- ◆ Establish biological basis and need for the project(s)
- ◆ Establish governmental and local support
- ◆ Coordinate with other Federal programs
- ◆ Funding mechanisms
- ◆ Develop the project to guarantee performance
  - ◆ On site oversight
  - ◆ Legal protections
- ◆ Design a project that enables evaluation of success
- ◆ Conduct site visits when practical

# Summary

- ◆ NRDA-recovered funds have successfully restored habitats and populations of a variety of wildlife
- ◆ Projects involving migratory birds should consider costs/benefits of restoration at multiple sites that target different points of life cycle
- ◆ Science-based framework proposed to guide selection of restoration opportunities
- ◆ Case study in progress, but should provide model for leveraging variety of data to design, implement, and assess, multi-site restoration
- ◆ Post-implementation monitoring critical for gauging success

# Acknowledgements

- ◆ DuPont - Mike Liberati, Ralph Stahl
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- ◆ USFWS NMBCA funding

# QUESTIONS?

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