

MANAGING To ACCOMMODATE CHANGE: Climate Change and the National Wildlife Refuge System

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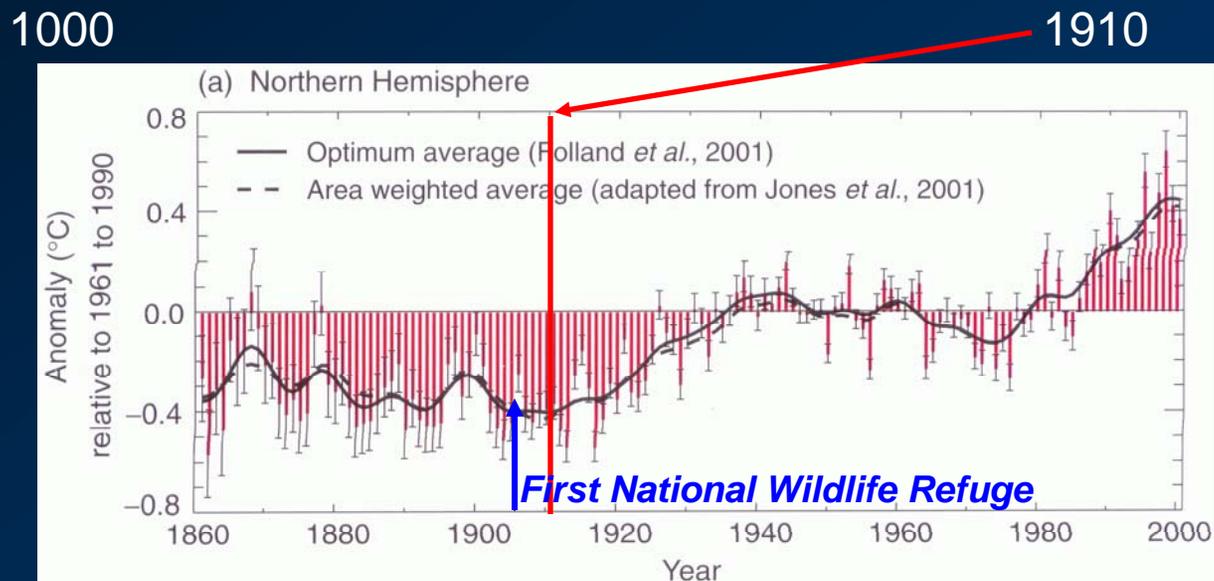
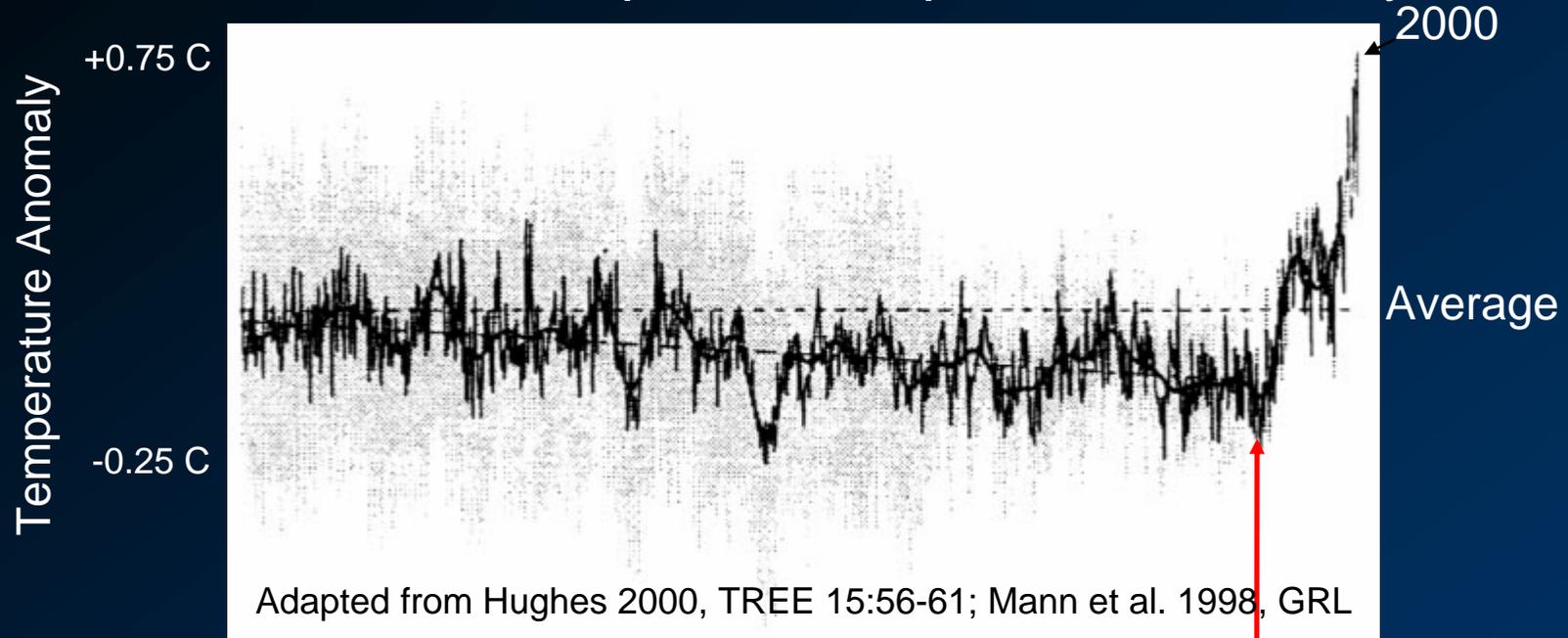
University of Idaho



Think about a place you love

- What was it when you first came to know it?
- What did it mean to you?
- What is it today?
- What are your hopes and dreams for its future?

Northern Hemisphere Temperature Anomaly



FWS REGIONS: Vulnerability to Biome Change from 1990 to 2100

Legend

- High Vulnerability
- Medium Vulnerability
- Low Vulnerability

R7

R1

R6

R3

R5

R8

R2

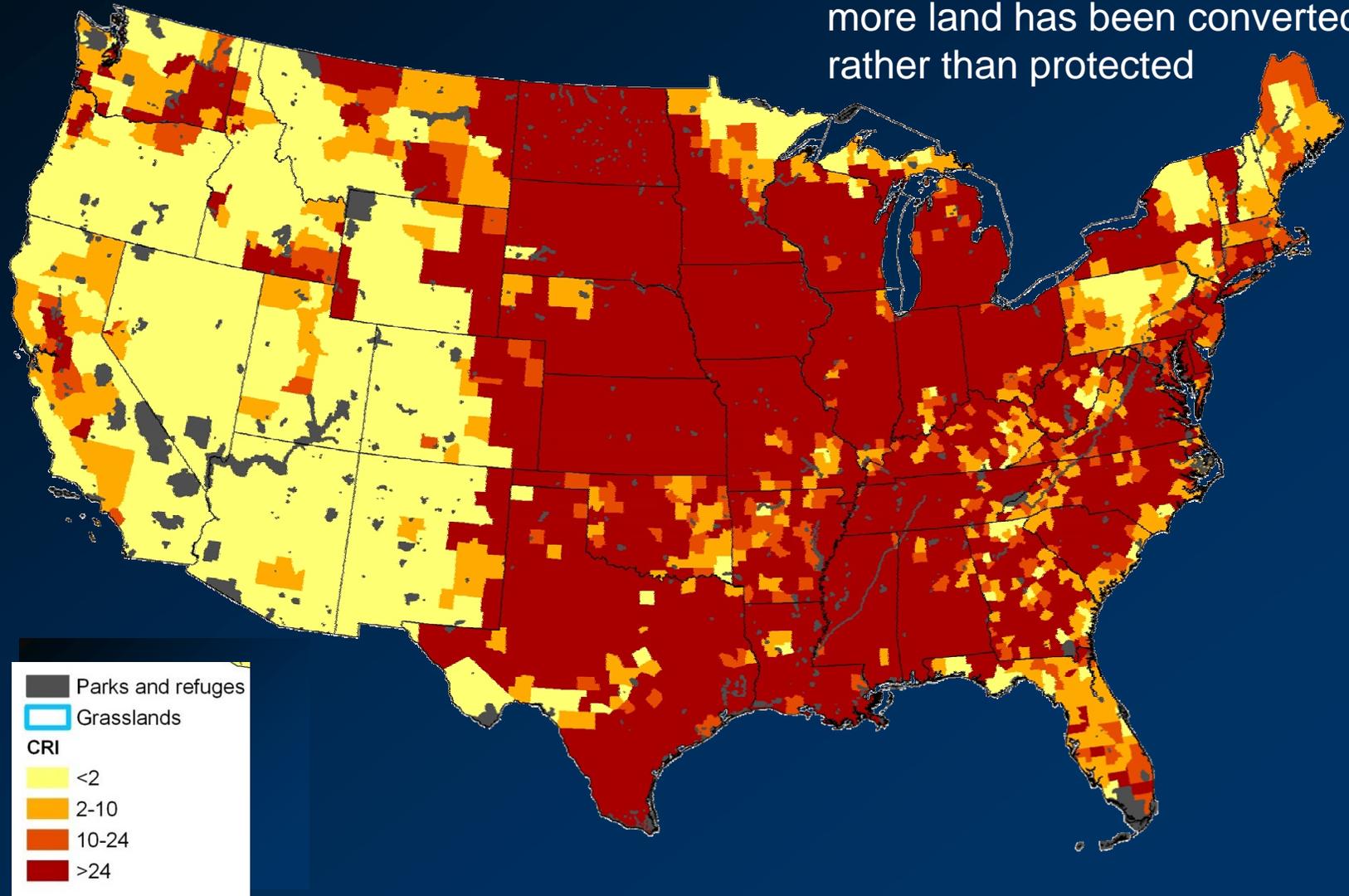
R4

Landuse Change



Conservation Risk

Higher number (red) indicates more land has been converted rather than protected



Where to go from here?



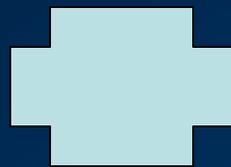


Effects of Global Climate Change

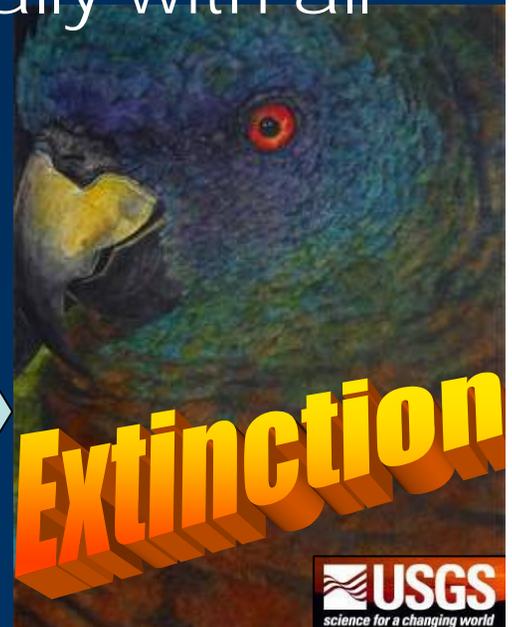
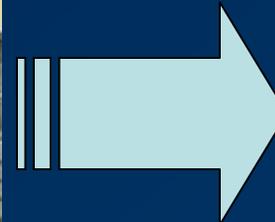
- Climate change likely to surpass habitat loss as the leading threat to biodiversity (Thomas et al. 2004)
- Climate change acts synergistically with all other stressors



Habitat loss



Climate change



Altered Species Distributions

90% decline in pop. of Sooty Shearwater (1987 – 1994) (Veit et al. 1997)



CA shoreline species shifting northwards (Barry et al. 1995)



Uncompahgre fritillary butterfly on brink of extinction (Britten et al. 1994)



Edith's checkerspot butterfly shifted range northward (Parmesan 1996, McLaughlin et al. 1999)



Polar bears increasingly using coastal areas as sea ice melts earlier and freezes later (Gleason et al. 2006, Schliebe et al. 2006)



© 2002 Gary Braasch



Altered Phenologies



89 of 100
flowering plants in
DC area
blooming 4.5
days earlier in
2000 vs. 1970.

Egg laying date
of NA tree
swallows ~ 9 days
earlier (1959 to
1991) (Dunn &
Winkler 1999)



Earlier arrival of
migrants (Root
et al. 2004)

Lilac
blooming ~4
days earlier
(NE)



Species Interactions

Competitive Displacement

- Red fox displaces Arctic fox

Herbivory

- Mountain pine beetle

Trophic cascade

- Elk wintering in summer habitat



Photo by: Cindy Lancaster

HIGHEST RISK SPECIES



Highest risk:

- Populations on the edges of species ranges
 - High altitude species
 - High latitude species
 - Coastal species
- Threatened and endangered species
- Narrowly distributed species
- Poor dispersers

A System Born in Crises

Refuge System Timeline

Overharvest
of birds and
mammals

1903

Pelican
Island NWR



Declining
waterfowl
numbers

1930s

Over 200
refuges
established for
migratory birds

Extinction of
wildlife

1966

61 Refuges
established
for T&E
species

Extinction and
Alteration of
Ecosystem
Services

21st century

Climate
change and
landuse
change

A black and white photograph of a duck, likely a mallard, swimming in a pond. The water is dark, and there are lily pads and reeds visible. The duck is in the center, facing left. The background shows more reeds and water.

309 refuges will lose
waterfowl species as a
result of range contraction.

229 refuges will gain or
retain waterfowl species as
a result of range expansion
or stable range.

Pidgorna 2007 Dissertation

- Evidence from Pleistocene glaciations indicates that most species responded ecologically by shifting their ranges poleward and upward in elevation rather than evolutionary through local adaptation (e.g. morphological changes)

Protected Areas Insufficient With Global Climate Change

- Too small;
- Too fragmented;
- Embedded in an inhospitable matrix;
 - Anthropogenic, competing land uses
- Expected community shifts
 - e.g. tundra to northern boreal forest



Barriers to climate change adaptation

- Lack of knowledge of climate change impacts
- Uncertainty
- Limited conservation resources (Staff and money)
- Institutional barriers
- Political will

How to respond to climate change and associated complexities?

- Ignore
- Resist
- Reduce non-climate stressors
- Triage
- Mitigate
- Anticipate and adapt
 - Manage to accommodate and exploit change

New tools, new ideas and new relationships are needed

- Nontraditional partnerships.
- Thinking across boundaries and scales.
- Strategic Habitat Conservation
- Thinking across disciplines.
- The reintegration of conservation areas into the American landscape (Rosenzweig, 2003).

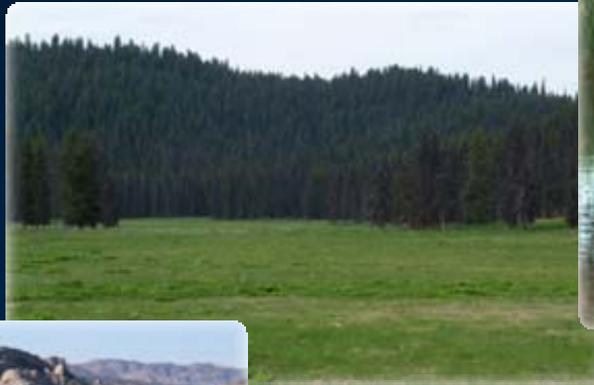
Management opportunities for Individual Refuges

- Increase resilience, reduce stress



Management opportunities for the National Wildlife Refuge System

- Increase representation and redundancy





You've got to know
when to hold 'em

Know when to fold 'em

Know when to walk
away

And know when to run.

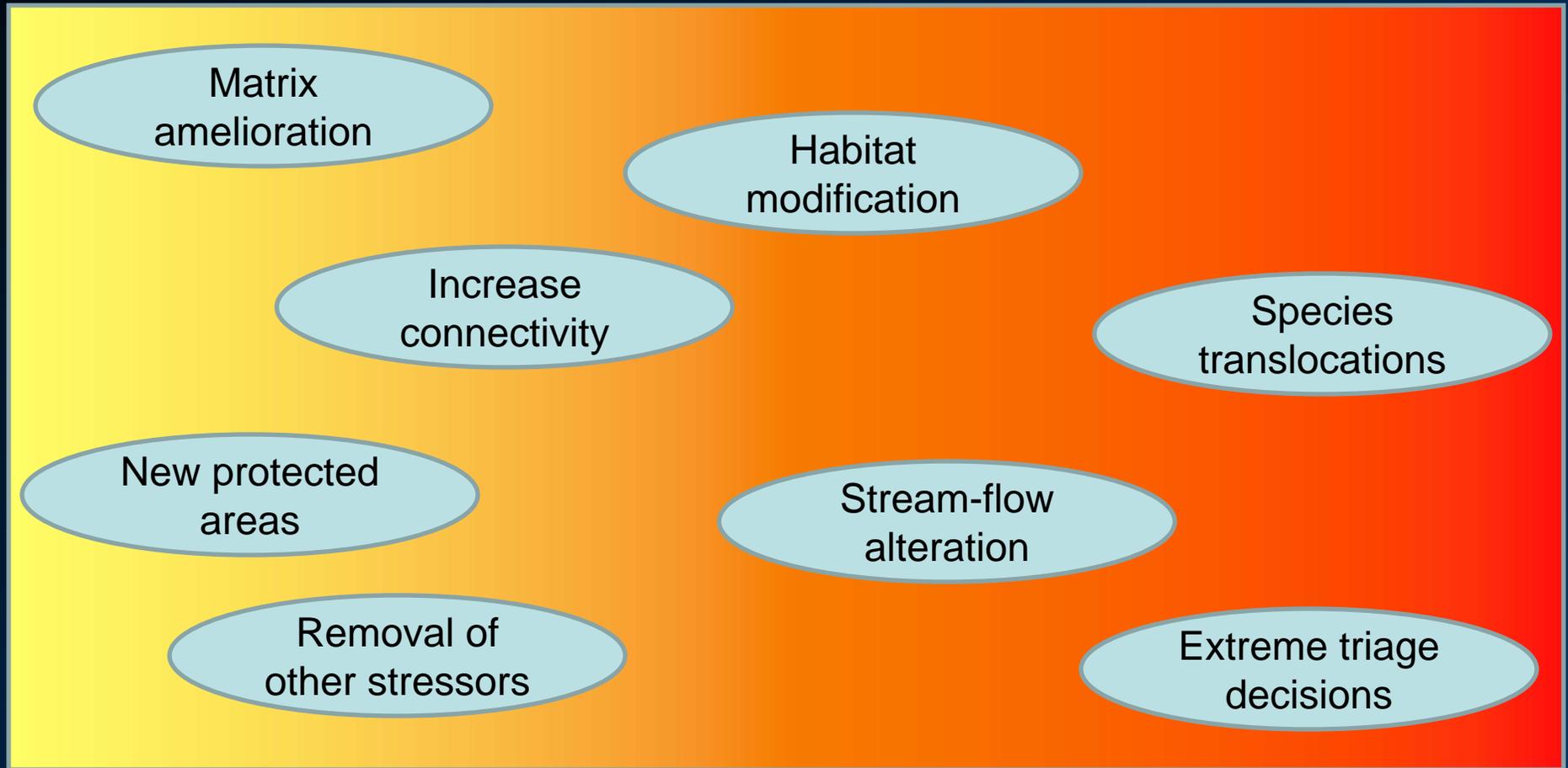
Opportunities

- Educational Centers
 - use refuges as educational centers to inform public of climate change effects on wildlife and ecosystem processes
- Cooperative conservation partnerships
 - Increase influence on matrix lands
- Multiagency management of species e.g. harlequin duck
- Models for energy efficient living
- Researcher/manager workshops
- Inventory current management practices to determine usefulness of response to climate change

What can we do in the next six months?

- Develop strategic vision for America's conservation landscape
- Identify most vulnerable conservation targets
- Identify critical management-relevant research needs
- Identify most vulnerable protected areas
- Evaluate possible climate scenarios and management responses

Management Strategies



Lower risk

Higher risk

Summary

- Climate change is pervasive but will have variable effects.
- Exploit opportunities and prepare for negative effects.
- Management for static conservation targets is impractical.
- Species with limited dispersal abilities are at greatest risk.
- Acknowledge interaction among climate & other stressors.
- Act now to avoid irreversible losses (and save \$\$ and species).
- Model possible futures at all relevant management scales.
- Initiate comprehensive & multi-scale collaborations.
- Increase the effective conservation footprint of refuges.

The Final Act

Are we trying to save
the current players in the
evolutionary play...



Or an ecological setting
that allows the play
to continue?

America's Conservation Landscape 2076: Where, What, Who?

“And it is your obligation to... move forward... in a way that does not denigrate, dilute or diminish in the slightest degree that which came before you, because many thousands of men and woman gave their careers, and some even gave their lives, for what you are working toward— saving dirt.”

--Lynn Greenwalt

Websites of Interest

- National Phenological Network

<http://www.usanpn.org>

- Currently collecting information on timing of leaf out, flowering, fruit ripening, leaf color change, etc, with opportunities to collect information on phenology of animals soon to come.

- E-bird Tracker

<http://ebird.org>

- electronic gateway to information on bird sightings . It can alert visitors about which birds have been seen and where. Help refuge record a daily record of birds build a more complete checklist and provide information about bird distribution, migration , breeding etc Provide insights on climate change, population trends

- Partners in Flight

<http://www.partnersinflight.org/pubs/ts/04-connections/>

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