Naturalmente Juntos - Naturally Together: Avian Species Relationships of Rocky Mountain National Park, Colorado, with Monteverde, Costa Rica

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Sister Cities International

"Promoting peace through mutual respect, understanding a cooperation—one individual, one community at a time."

- 1956: Pres. Eisenhower, People-to-People citizen diplomacy initiative.
- Long-term partnership between two communities in two countries approved by top-elected officials
- Diversity of activities can be carried out: municipal, business, professional, educational, cultural

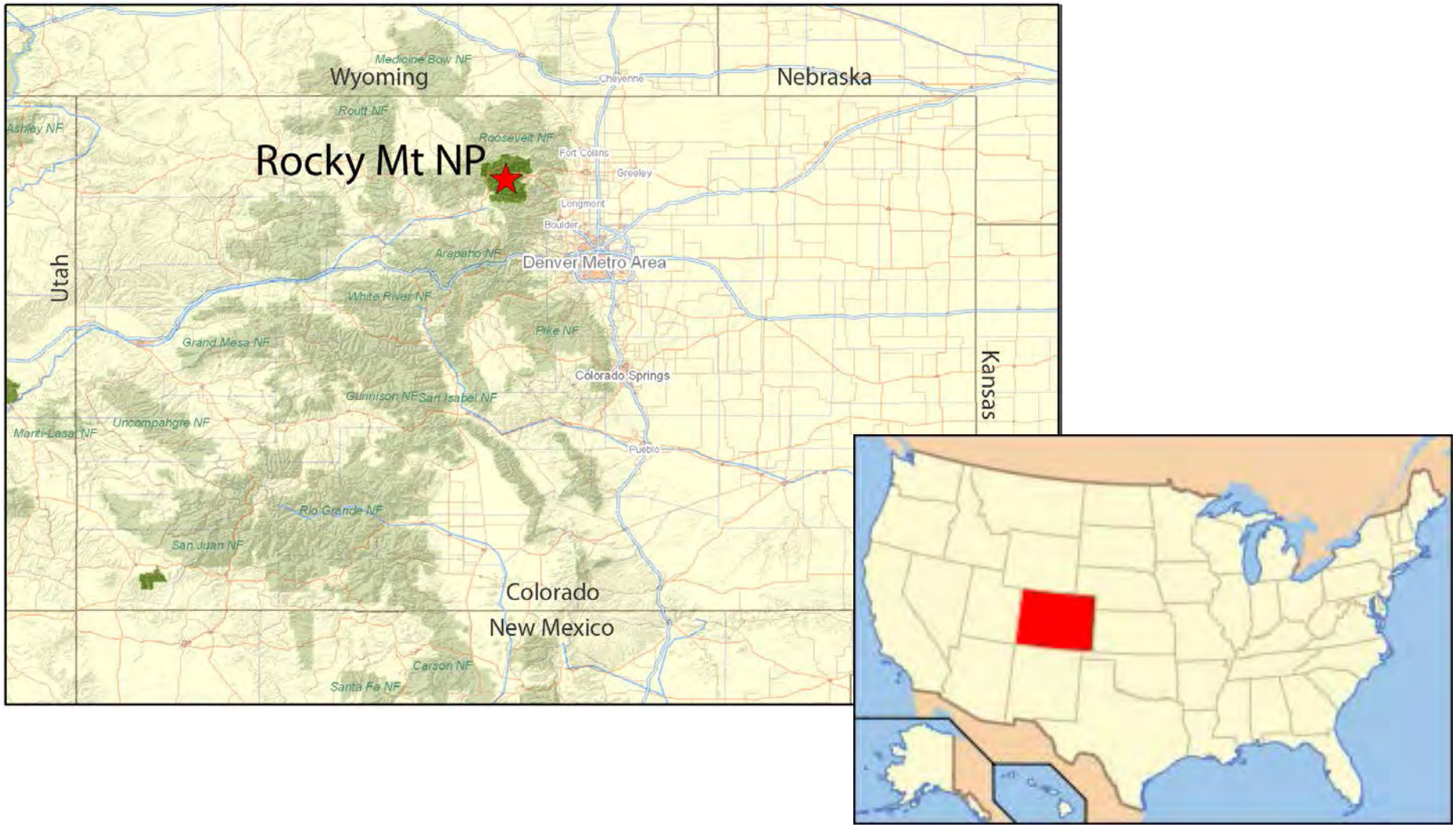
Sister Cities Relationship

- Estes Park, Colorado (pop. 6,555) and Monteverde, Costa Rica (pop. 6,750)
  - Rocky Mt. NP has a representative on the Estes Park Sister Cities board.
  - 2010: developed three priorities for relationship development
    - One priority was species conservation

Objectives of this species conservation project

- To encourage positive relationships between gateway communities of protected areas
  - e.g., participation with Sister Cities organization of Estes Park
- To enhance species conservation through global partnerships
  - Education
  - Public relations
  - Collaboration

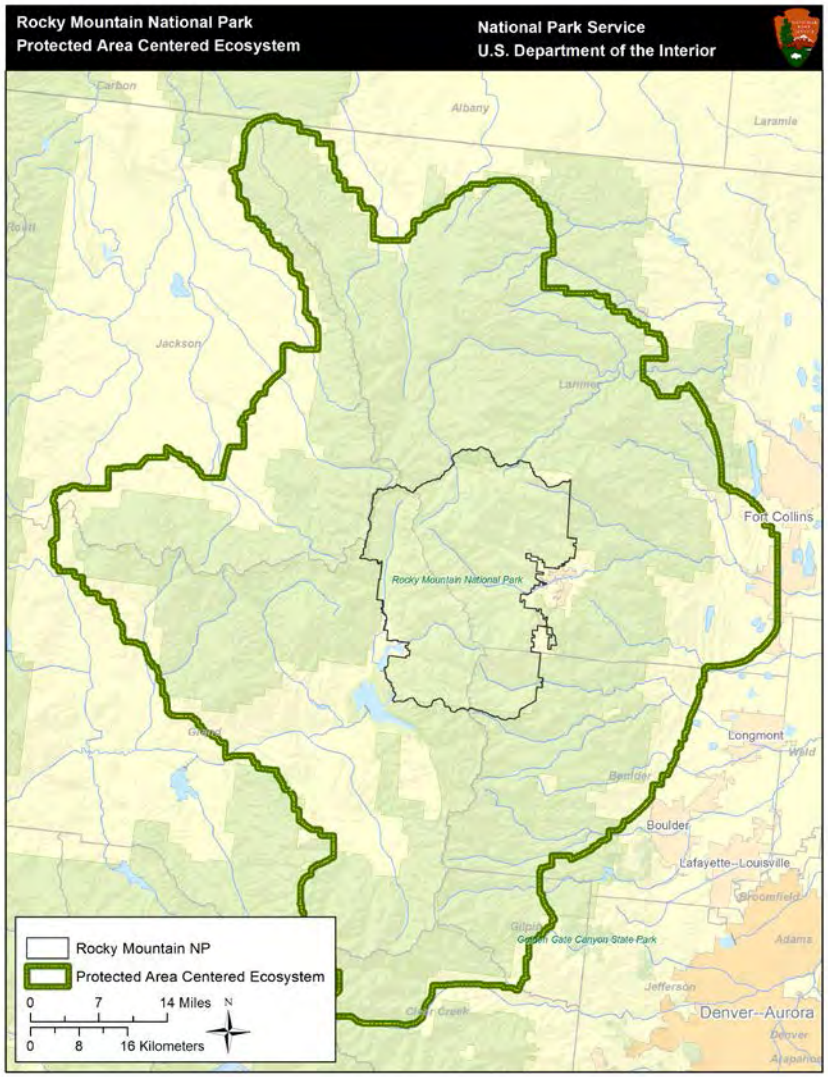
Location: Rocky Mountain National Park, Colorado



Location: Monteverde, Costa Rica

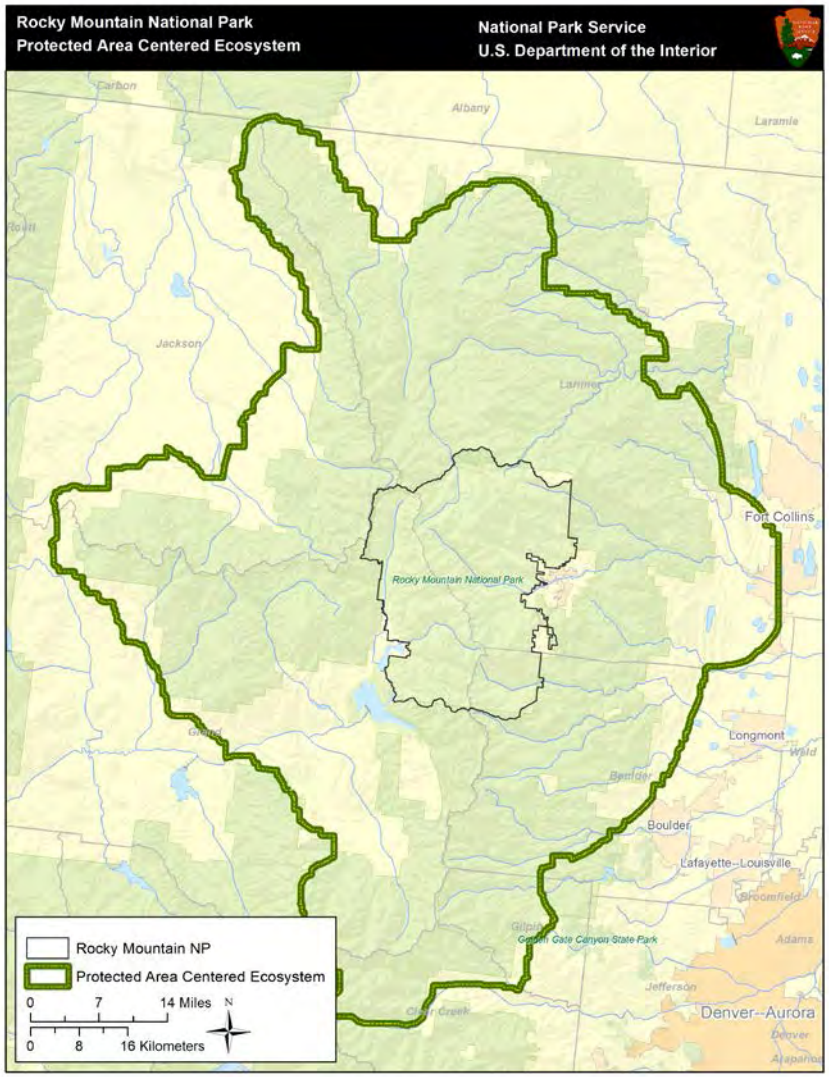
Protected Areas: Rocky Mountain National Park

- Protected as part of the National Park Service and as a Biosphere Reserve
- Audubon-designated Rocky Mountain Global Important Bird Area (IBA)
- PACE: Protected Area Centered Ecosystem



Protected Areas: Rocky Mountain National Park

- What is a Protected Area Centered Ecosystem (PACE)?
  - National Parks represent protected subsets of larger ecosystems.
  - PACE identifies the larger ecosystem, which may be less-protected or unprotected.
  - Identifying the PACE can help focus research, monitoring, and collaborative conservation attention.



Protected Areas are not Islands

- Wildlife depend on a variety of habitats in different locations
  - Scale of variation in a PACE depends on species
- An example in Colorado: Puma
  - Rocky Mt NP monitors and researches puma populations in collaboration with multiple state and federal organizations
- A larger-scale example: Migratory birds
  - Many species that breed within the PACE and North America winter in Mexico, Central and South America.
  - Countless organizations are involved in management of species and their habitats.

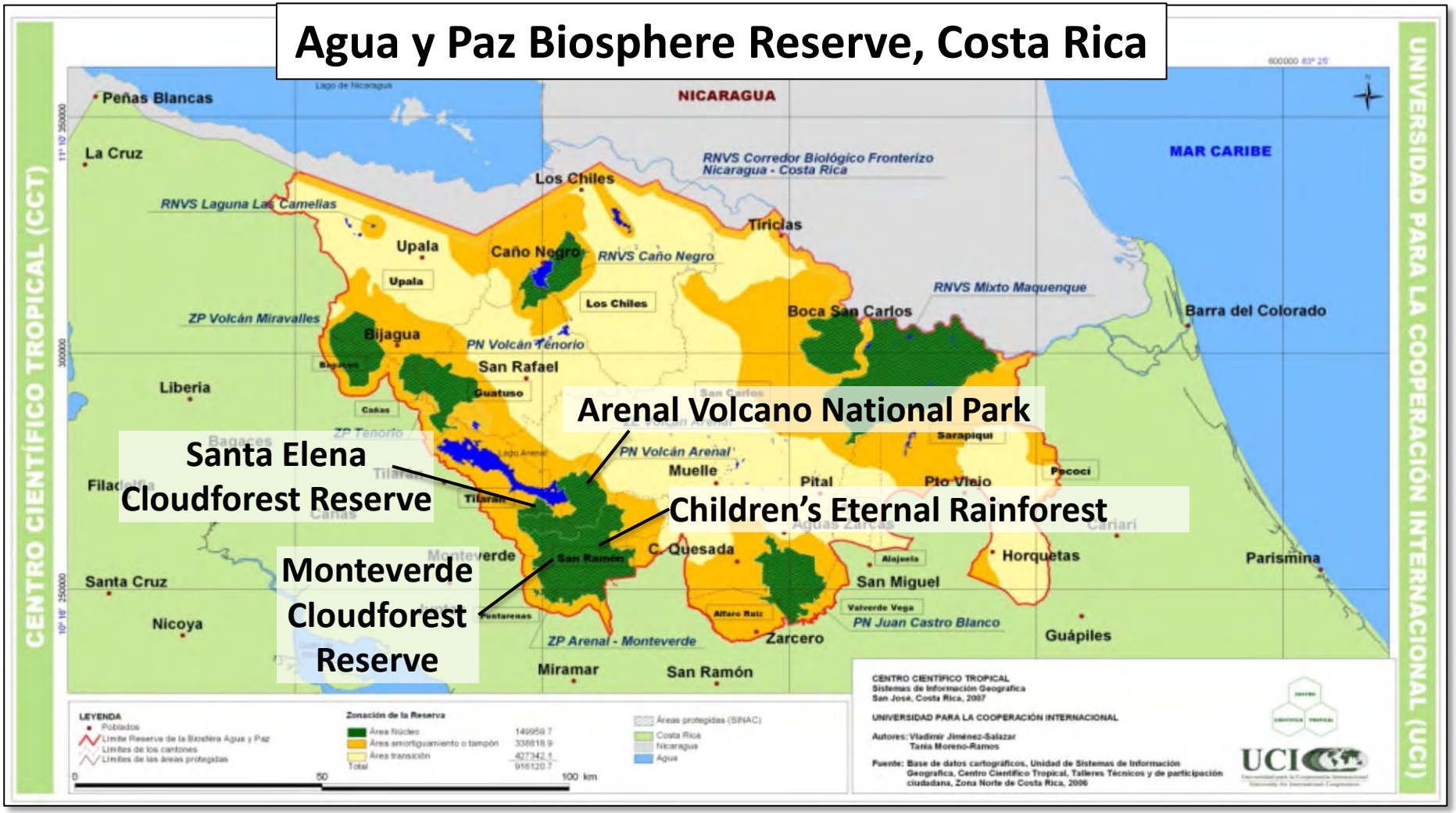
Protected Areas: Costa Rica

Santa Elena Cloud Forest Reserve

Bosque Eterno de los Niños
Monteverde, Costa Rica

AREA DE CONSERVACION ARENAL
COSTA RICA
MINAE-SINAC

Agua y Paz Biosphere Reserve, Costa Rica



Protected Areas: Costa Rica

Audubon-designated Arenal-Monteverde Important Bird Area (IBA) overlaps protected areas.

Both Areas Are Located Along the Continental Divide

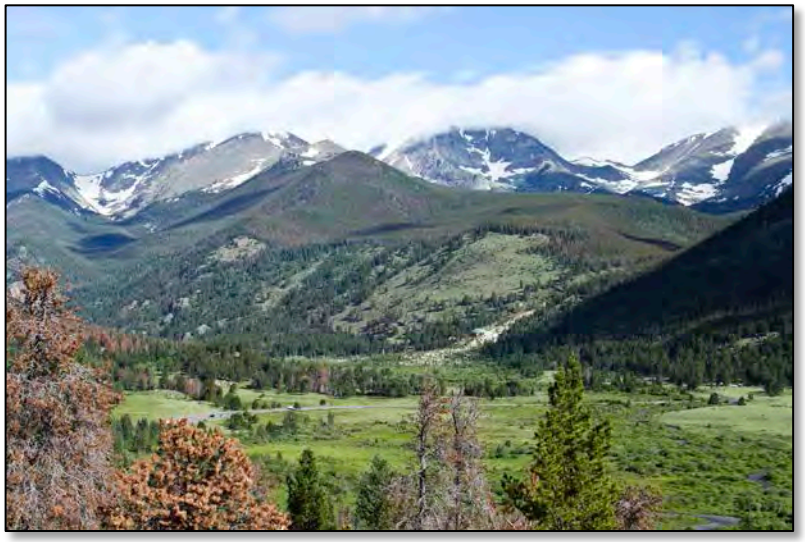
There are more than 2100 miles (3380 km) of continental divide between Rocky Mountain National Park and Monteverde, Costa Rica.

Ecotourism

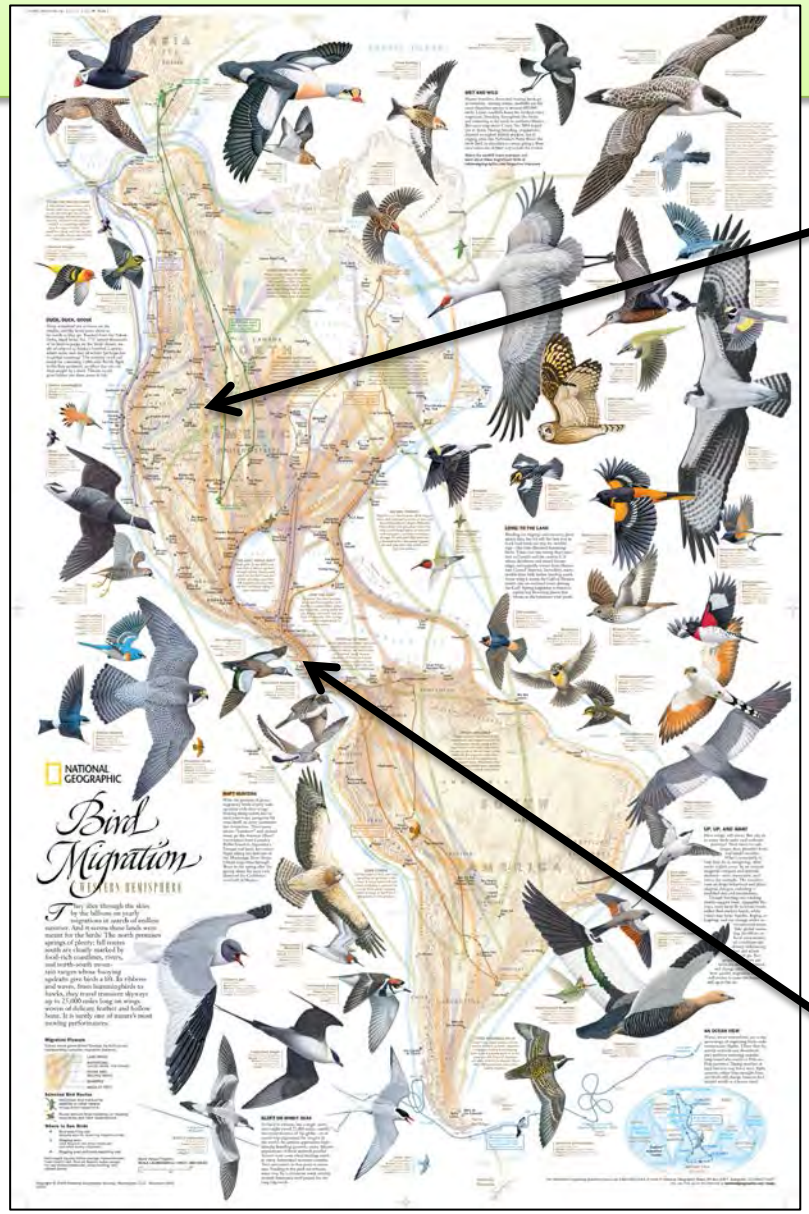
- Rocky Mountain NP receives about 3 million visitors per year, primarily during the summer months.
  - Bird watching is a recreational activity for ~500,000
- The Monteverde area receives about 135,000–200,000* visitors per year.
  - Almost all do some bird watching.

Mountain Ranges

- Rocky Mountain National Park
  - Rocky Mountains, 7,840–14,259ft (2,390–4,346m)
- Monteverde
  - Cordillera de Tilarán, 1,970–6,043ft (600–1,842m)



Neotropical Bird Migration Patterns



Rocky Mountain National Park

Migratory bottleneck over narrowing land mass of southern Mexico and Central America

- Concentrated species diversity
- Habitat conservation important in these areas

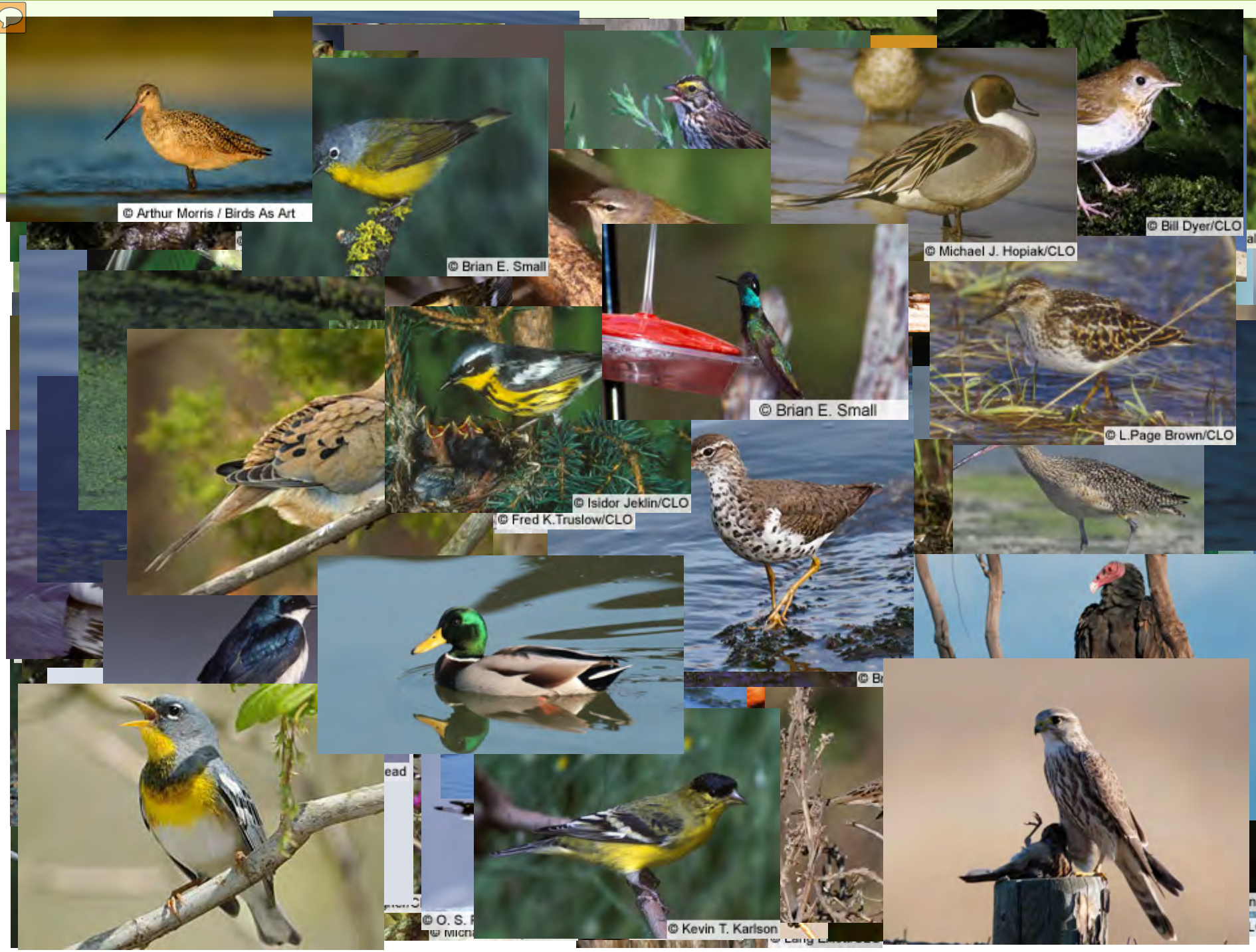
Monteverde, Costa Rica

Why is this an important issue?

- Birds without boundaries
  - Migration routes cross many states and countries
  - Migratory birds use a variety of habitats in numerous locations throughout their yearly cycle.
- We can’t leave the protection of these species to chance.
  - It take more than one protected area to protect a species.
  - Collaboration across boundaries is important for species conservation.

Shared Bird Species: Connecting Rocky Mountain NP to Monteverde

- Rocky Mountain National Park shares more than 150 species of birds with Costa Rica.
- Of those 150+ species, Rocky Mountain shares 55 species with the Monteverde area.
- This presentation focuses on four representative species to tell a story.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Shared Birds: Four Focal Species

- Focus on four species
  - Chosen based on factors such as commonality in both locations, migratory status, visibility to visitors (even inexperienced birdwatchers), and potential susceptibility to climate change.

Swainson's Thrush

Wilson's Warbler

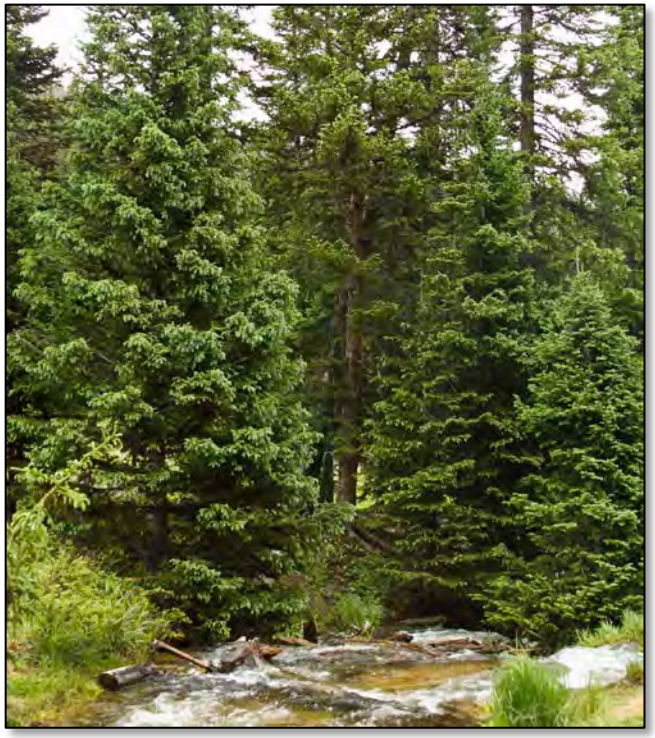
Yellow Warbler

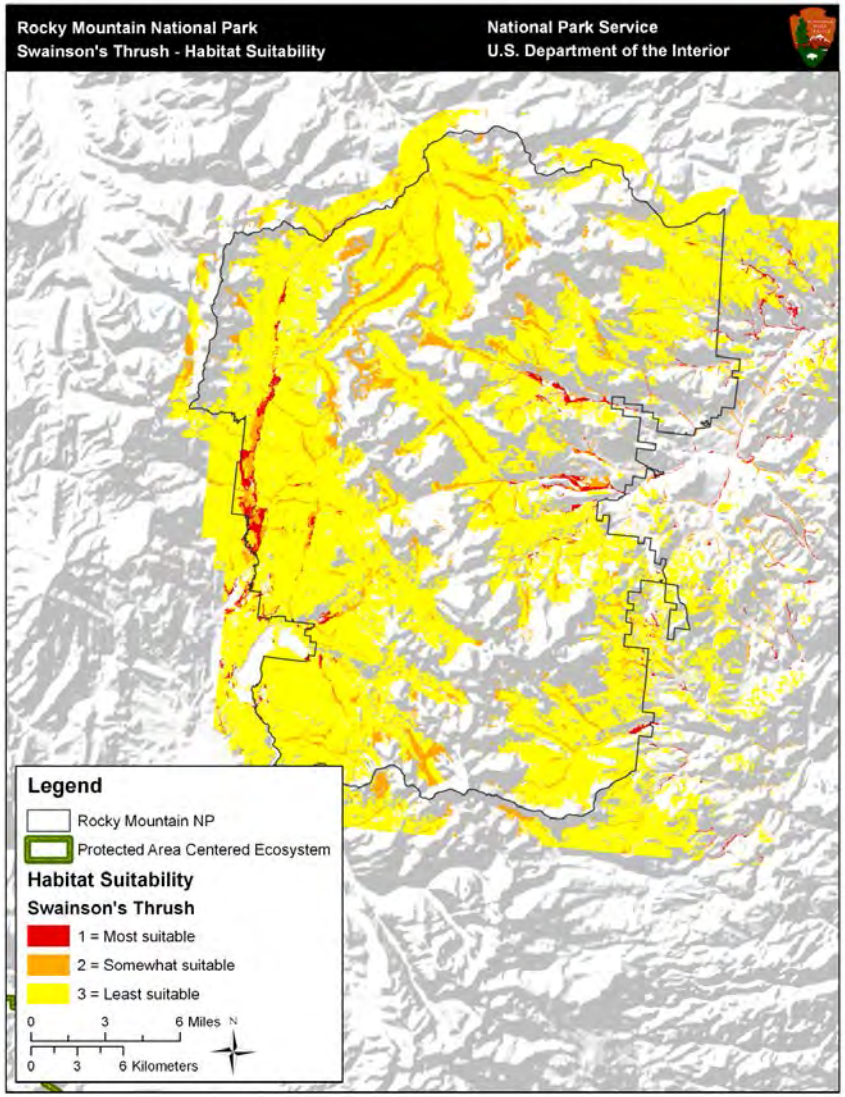
Western Tanager

Swainson's Thrush (*Catharus ustulatus*)

Swainson's Thrush: Breeding Habitat in Rocky Mountain NP

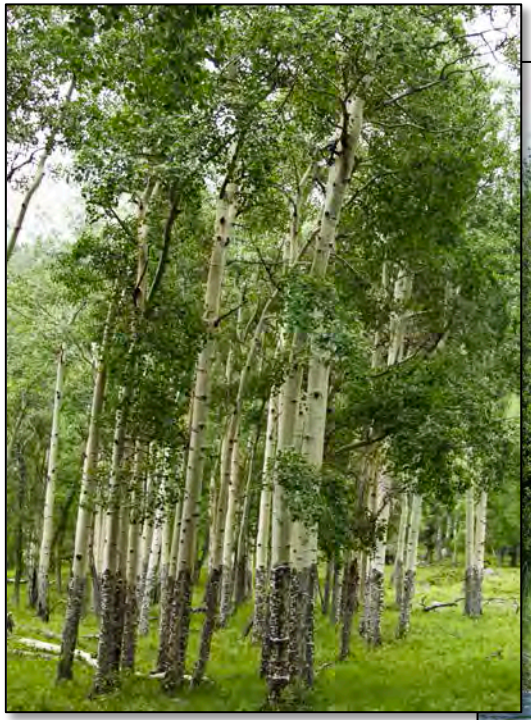
- Coniferous forests (spruce-fir: *Picea* spp., *Abies* sp.)
- Deciduous riparian or aspen (*populus* spp.) forests
- Mountain riparian thickets, wet montane meadows

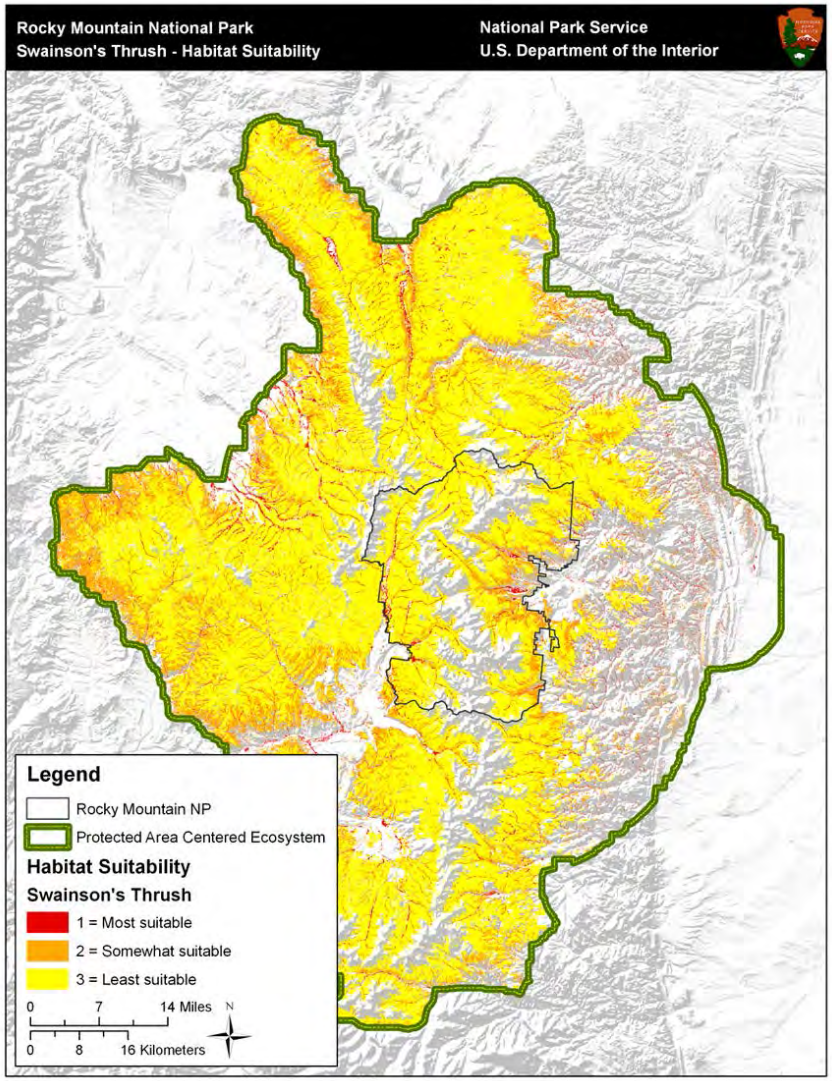




Swainson's Thrush: Breeding Habitat in the PACE

- Found from 7,000–11,033 ft (2,134–3,363 m)
- Coniferous and aspen forests, willow and alder riparian thickets

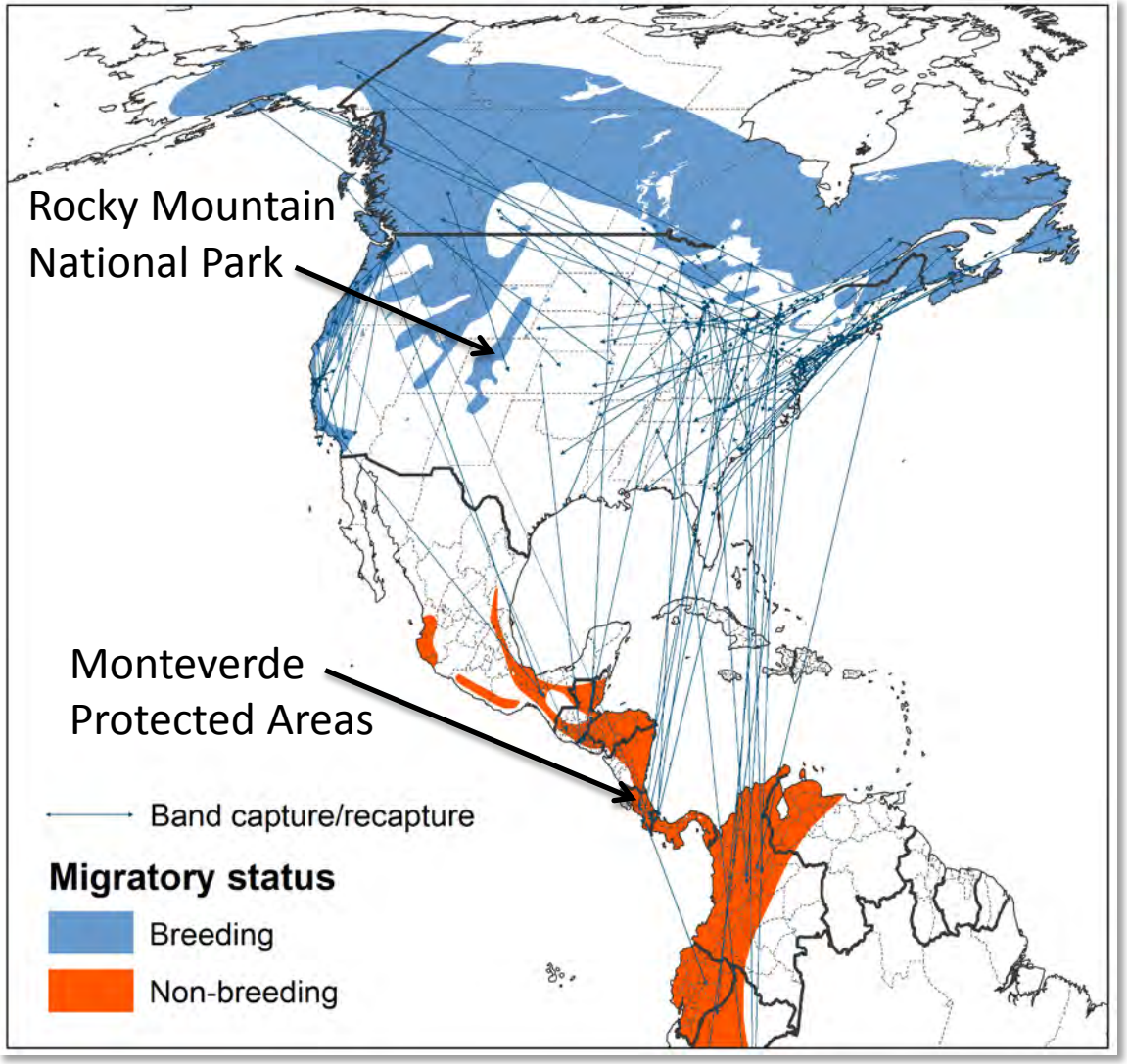




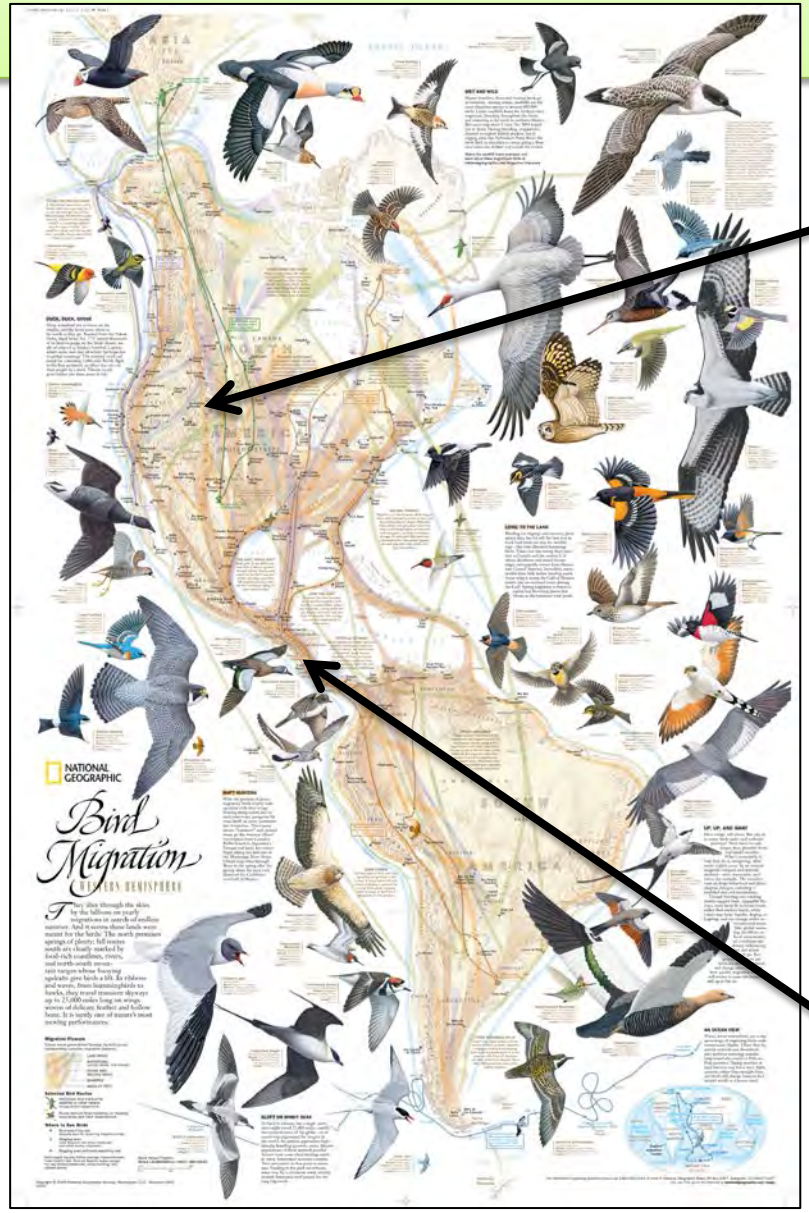
Swainson's Thrush: Winter Habitat in Costa Rica

- Associated with herbaceous shrubs, small trees, and fruiting plants in secondary forest and large trees in primary forest.
- In Costa Rica, more common in secondary forest than primary forest and most migrate through Costa Rica to S. America.
- During migration apt to occur almost anywhere, including urban areas and open country.

Swainson's Thrush: Migration Information from Bird Banding Data



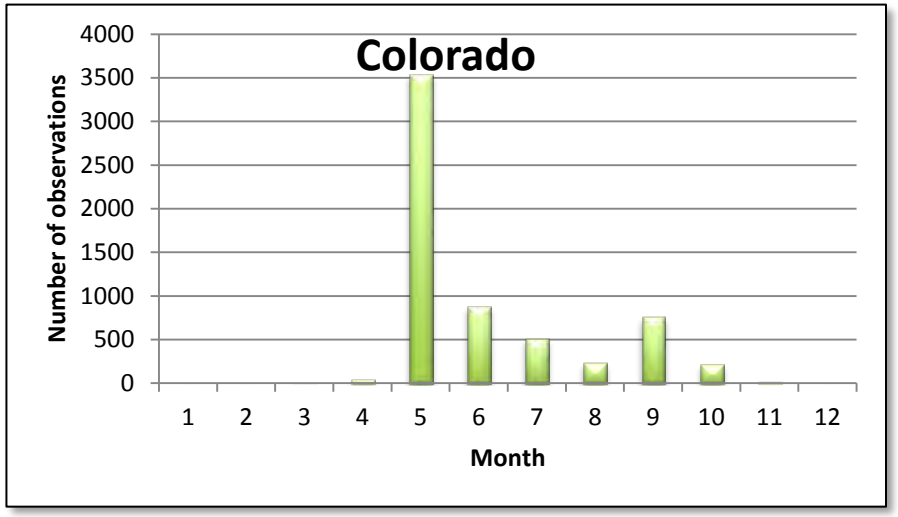
Bottleneck Migration Pattern

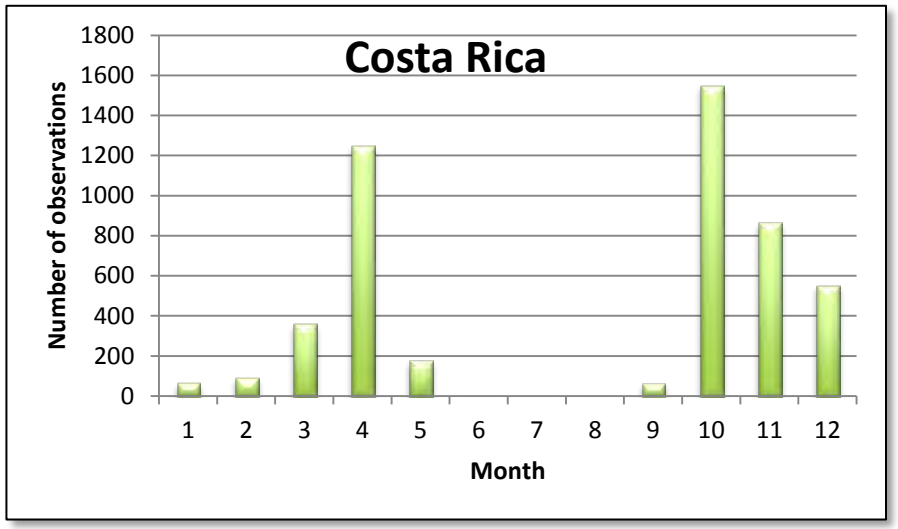


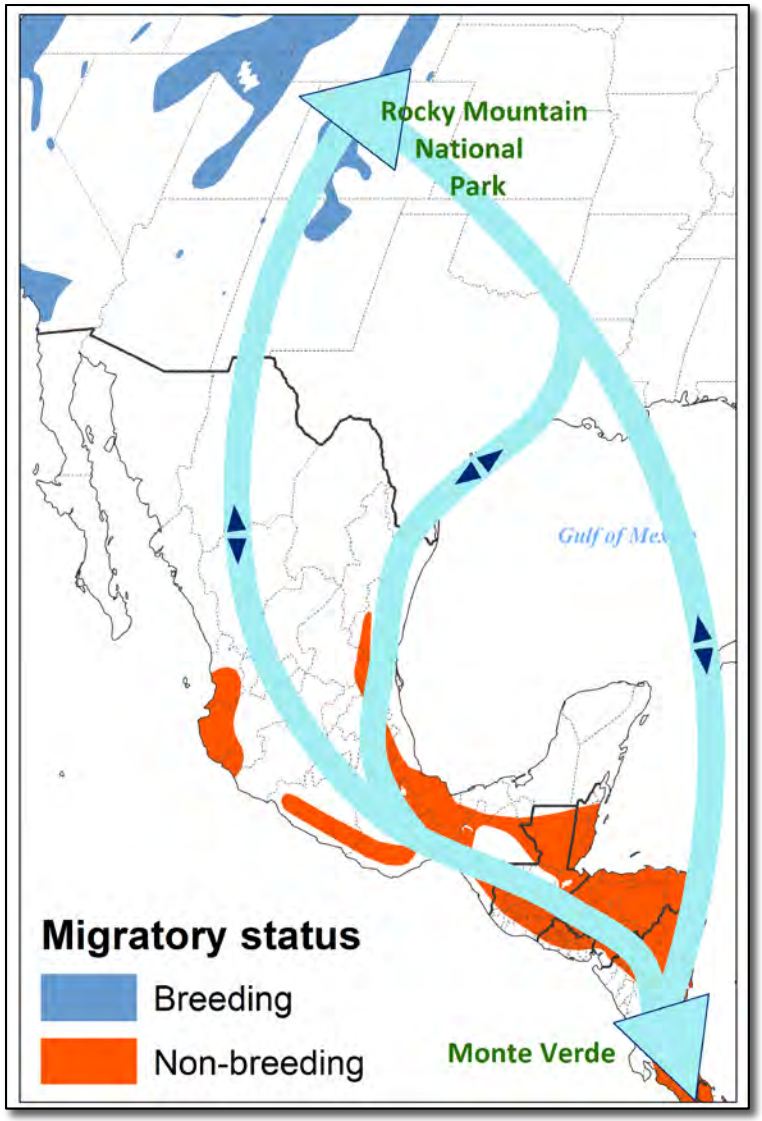
Rocky Mountain National Park

Monteverde, Costa Rica

Swainson's Thrush: Migration







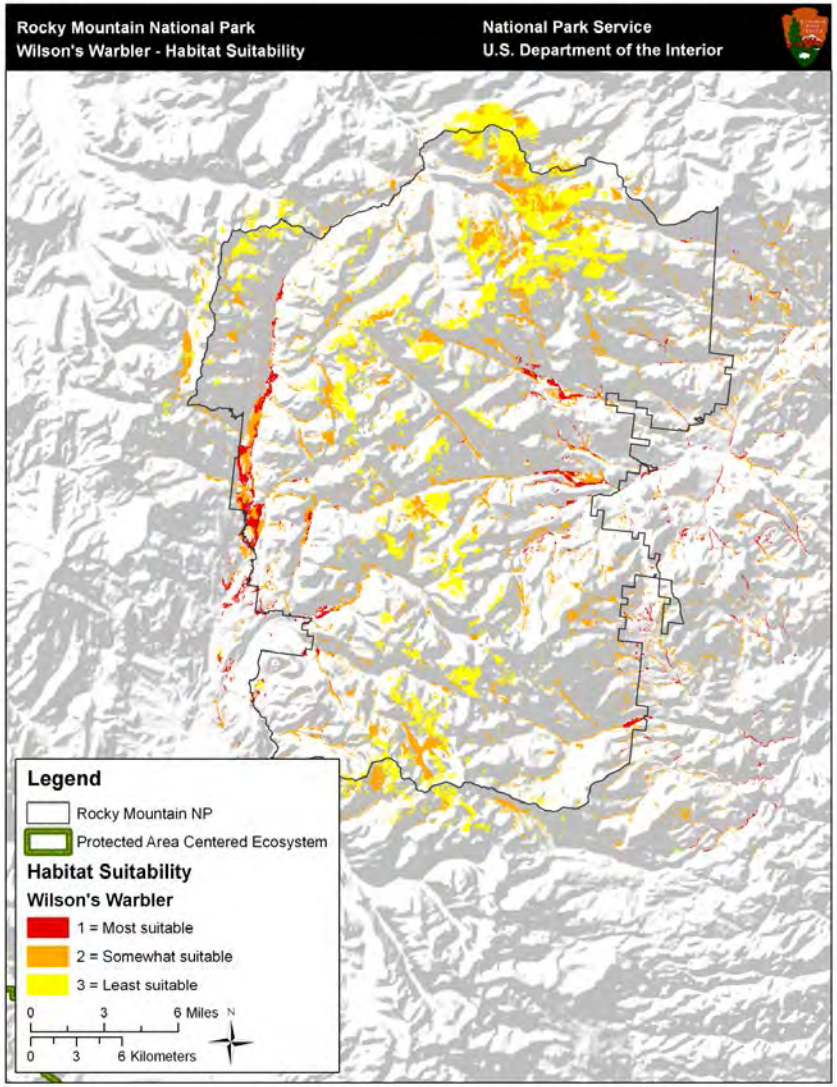
Swainson's Thrush: Conservation Implications Within Breeding Range

- Common, but declining even where abundant, including Colorado
- Decline in willow habitat in Rocky Mt NP due to willow dieback and ungulate browsing
  - Park's 2007 Elk and Veg Mgmt Plan is reversing this trend
- Overall reasons for decline are unclear but could include:
  - Loss of breeding habitat
  - Loss of riparian habitat due to development and grazing
  - High predation rates
  - Low nest-success rates (Corvid predation?)
  - Brown-headed Cowbird parasitism can be a problem in grazed areas or near ecotones in Rocky Mt NP.

Wilson's Warbler (*Wilsonia pusilla*)

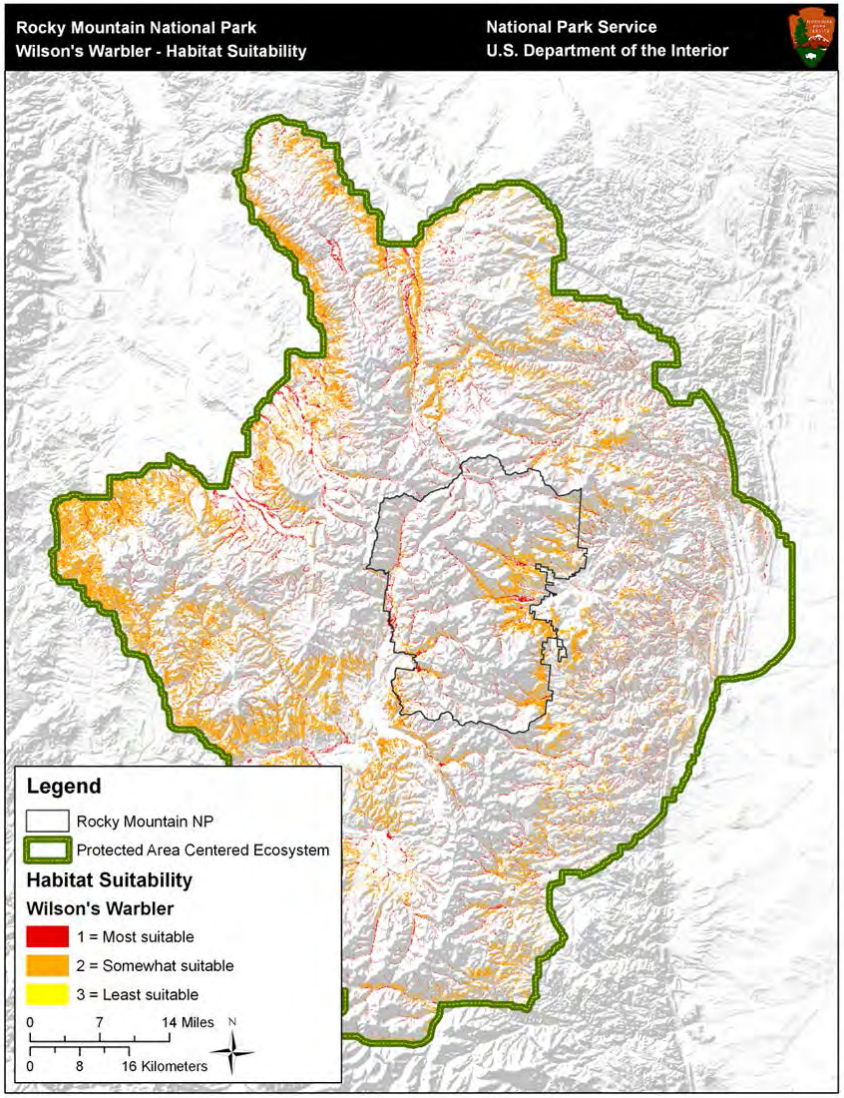
Wilson's Warbler: Breeding Habitat in Rocky Mountain NP

- Montane willow (*Salix* spp.) riparian habitat and alpine zone
- Bog birch (*Betula glandulosa*) and shrubby cinquefoil (*Potentilla fruticosa*) with understory of forbs, mosses, and sedges (*Carex* spp.).
- May include edge of coniferous or aspen (*Populus tremuloides*) forests.



Wilson's Warbler: Breeding Habitat in the PACE

- Found from 6,000–12,000 ft (1,829–3,658 m)
- Riparian willow (*Salix* spp.) or alder (*Alnus incana*) thickets

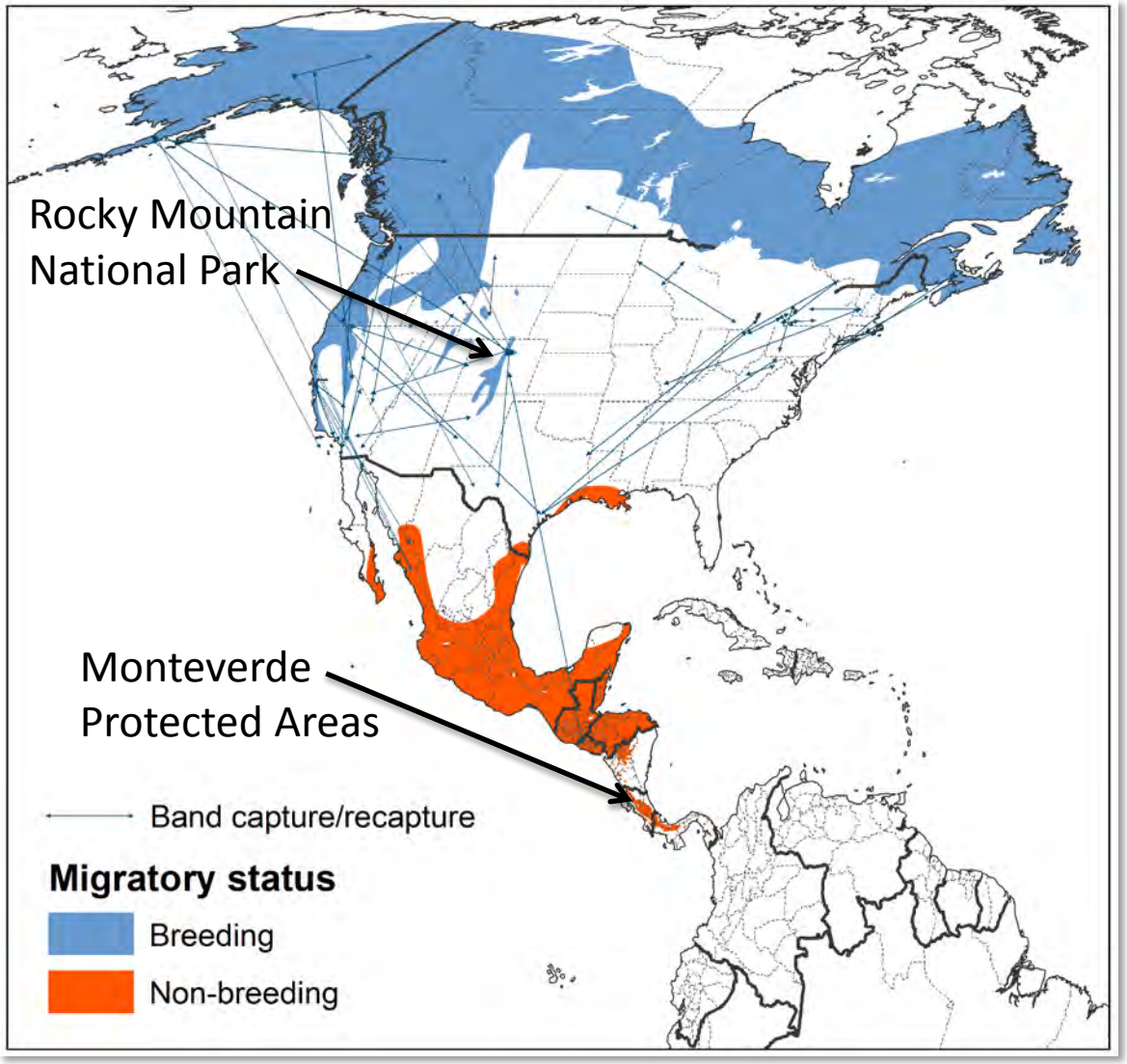


Wilson's Warbler: Winter Habitat in Costa Rica

- Habitat generalist ranging from coastal lowlands into high-altitude cloud forest.
- Most abundant in tropical evergreen and deciduous forest, cloud forest, pine-oak forest, and forest edge habitat.
- Also found in mangrove undergrowth, secondary growth, thorn-scrub, dry washes, riparian gallery forest, mixed forests, brushy fields and plantations.
- Winters mainly above 3,000ft (914m).
- Sexes may segregate by habitat in some areas
  - females predominant in seral stages of secondary forest
  - males predominant in primary evergreen forest

Wilson's Warbler: Winter Habitat in Costa Rica

Wilson's Warbler: Migration Information from Bird Banding Data



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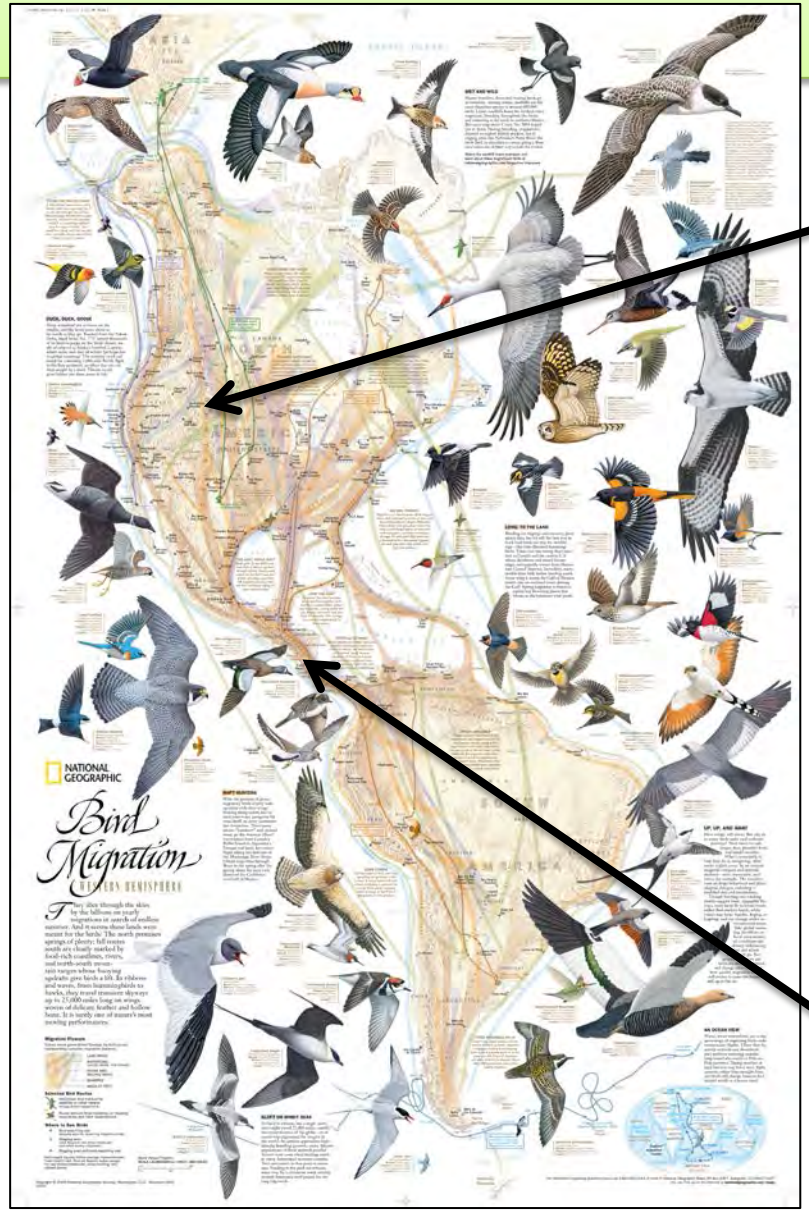
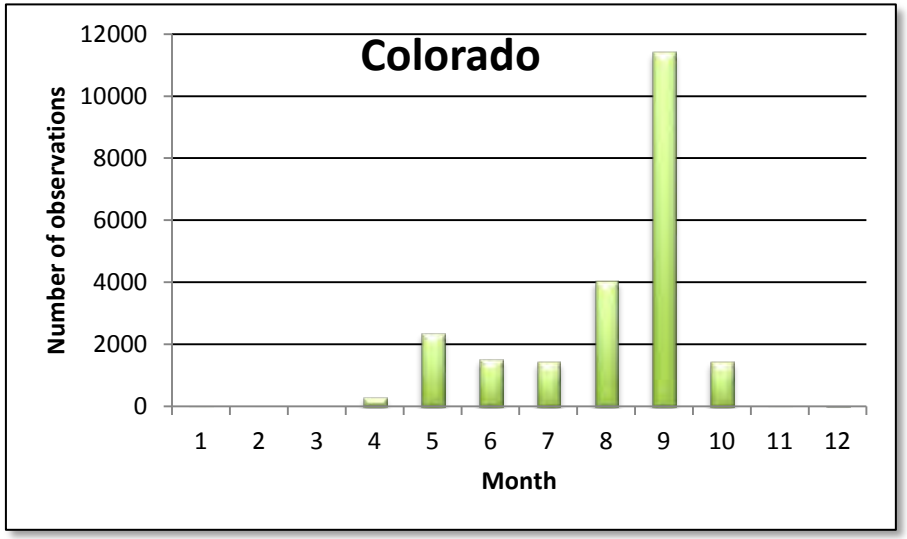
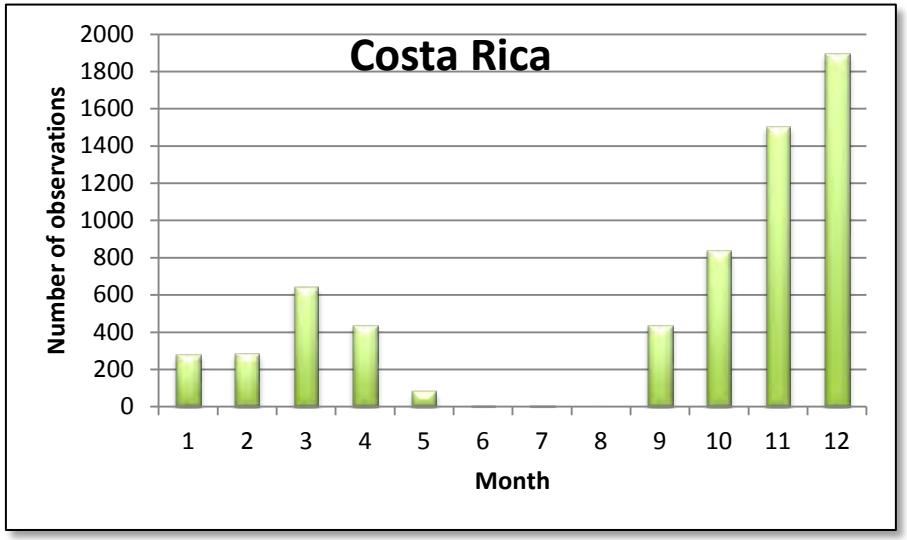


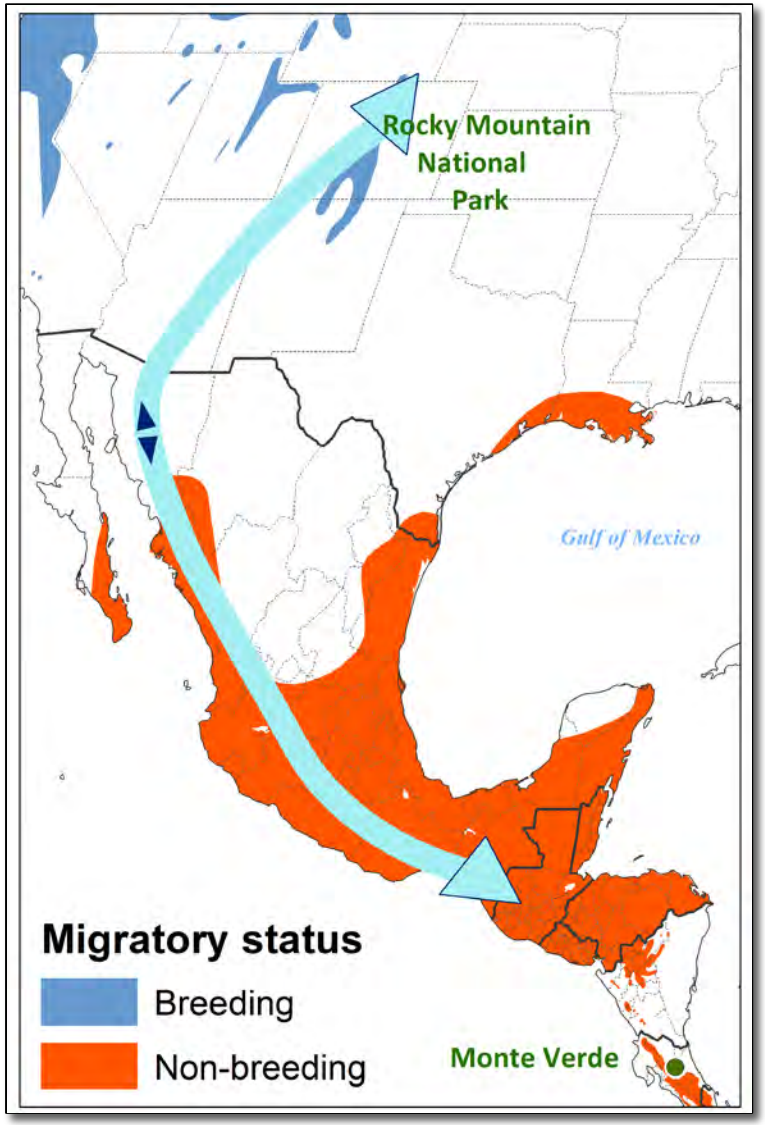
Rocky Mountain National Park

Monteverde, Costa Rica

Wilson's Warbler: Migration







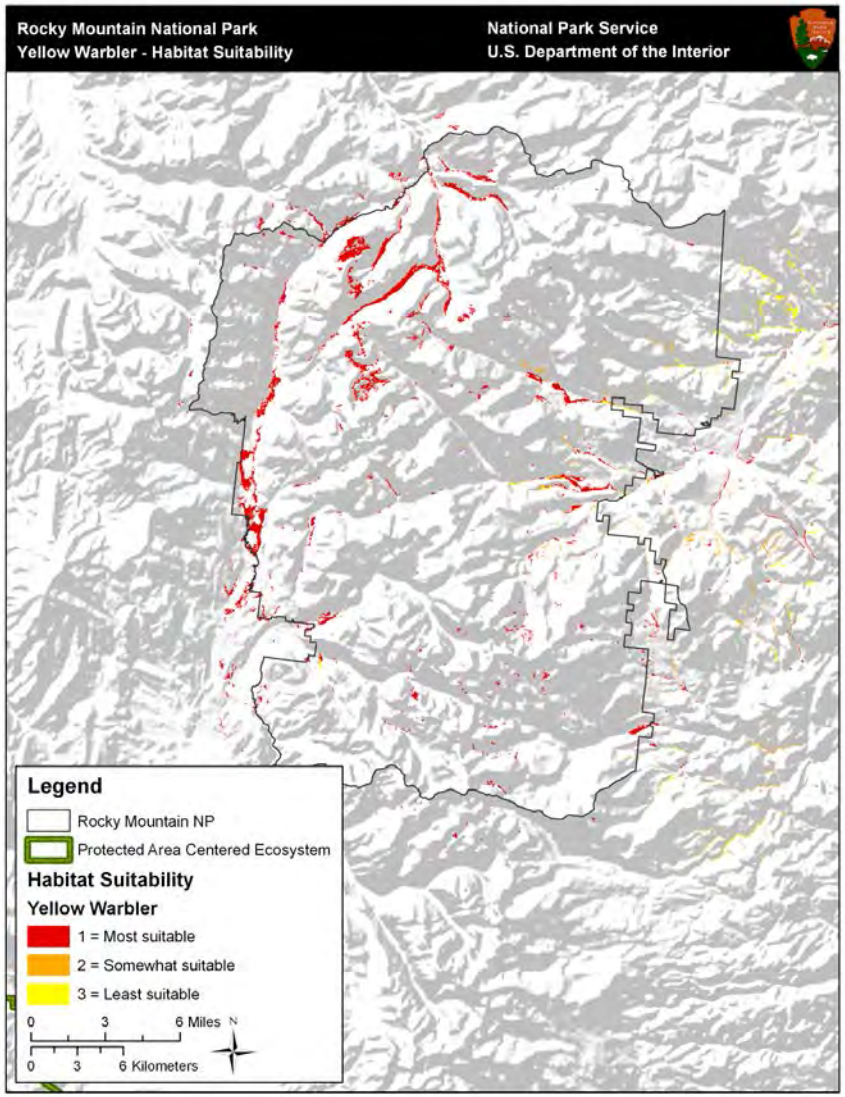
Wilson's Warbler: Conservation Implications Within Breeding Range

- Declined 2%/yr from 1980–1999 for unknown reasons
- Riparian habitat provides critical stopover sites in the SW U.S., but comprises less than 1% of the landscape. Habitat loss at any one stopover point will differentially affect specific breeding populations.
- Breeds primarily in willow
  - Declining condition of willow habitat in Rocky Mt NP has decreased habitat for Wilson's warblers.
  - Shifts in leaf area index (LAI) impact insects, which consequently impact bird fat.

Yellow Warbler
(*Dendroica petechia*)

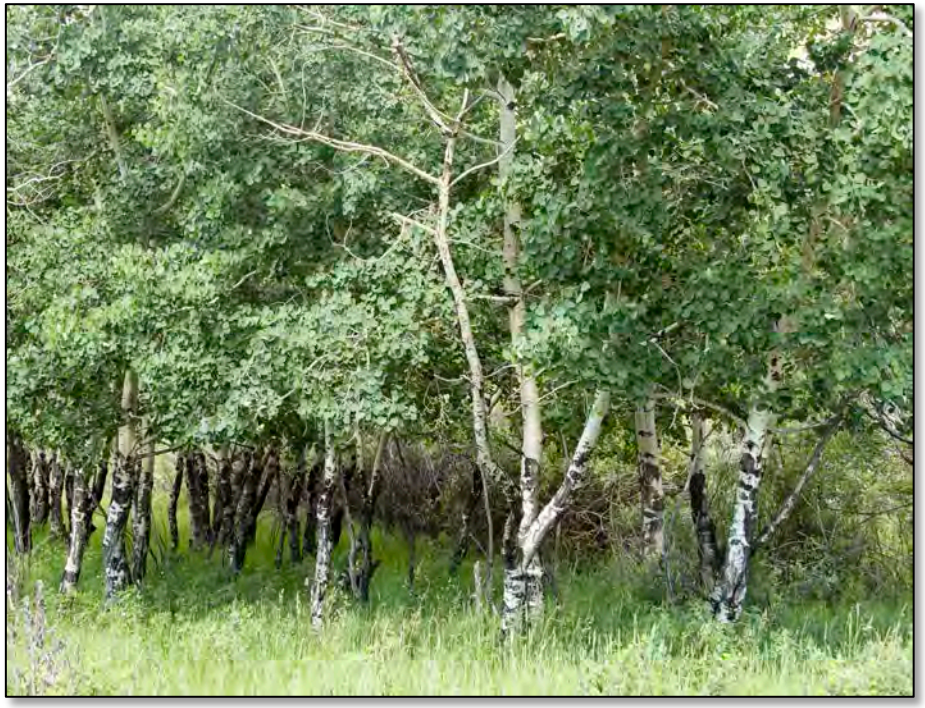
Yellow Warbler: Breeding Habitat in Rocky Mountain NP

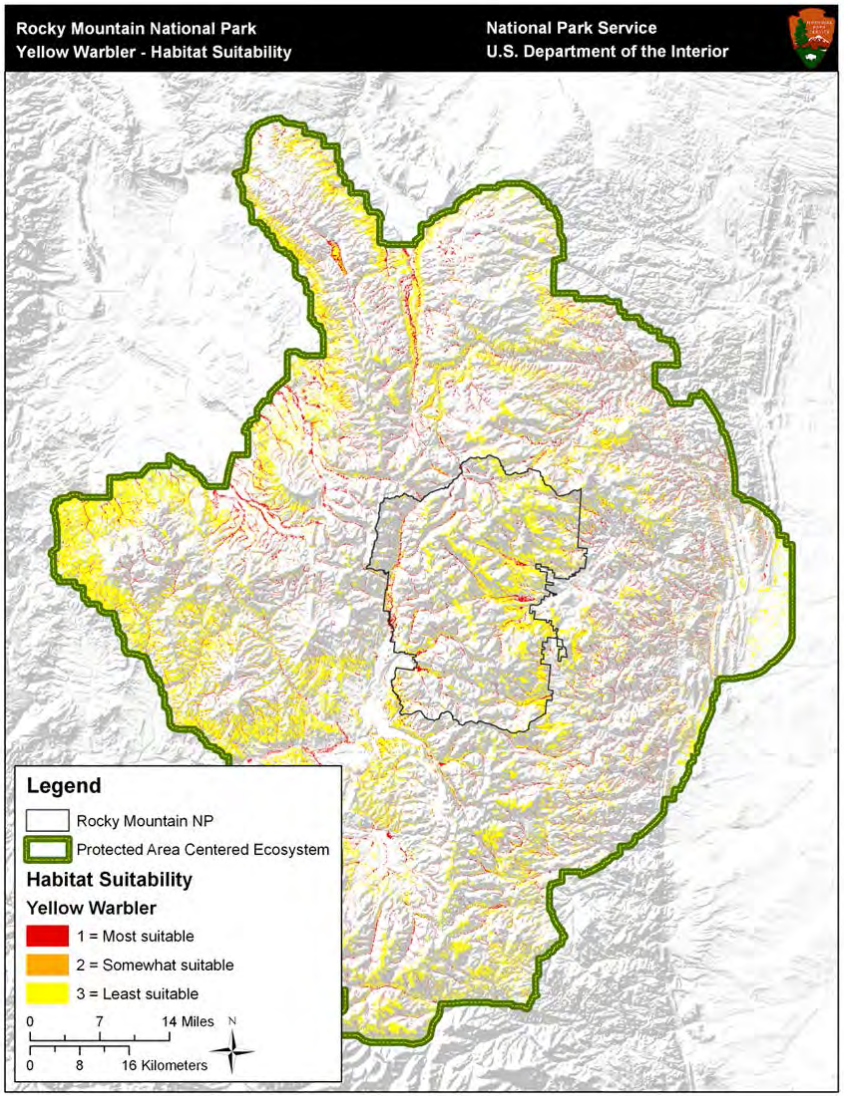
- Wet, deciduous thickets dominated by willows (*salix* spp.)



Yellow Warbler: Breeding Habitat in the PACE

- Commonly found between 6,000–8,500 ft (1,829–2,591 m)
- Habitat generalist, but requires deciduous vegetation such as cotton wood, willow, alder and aspen.

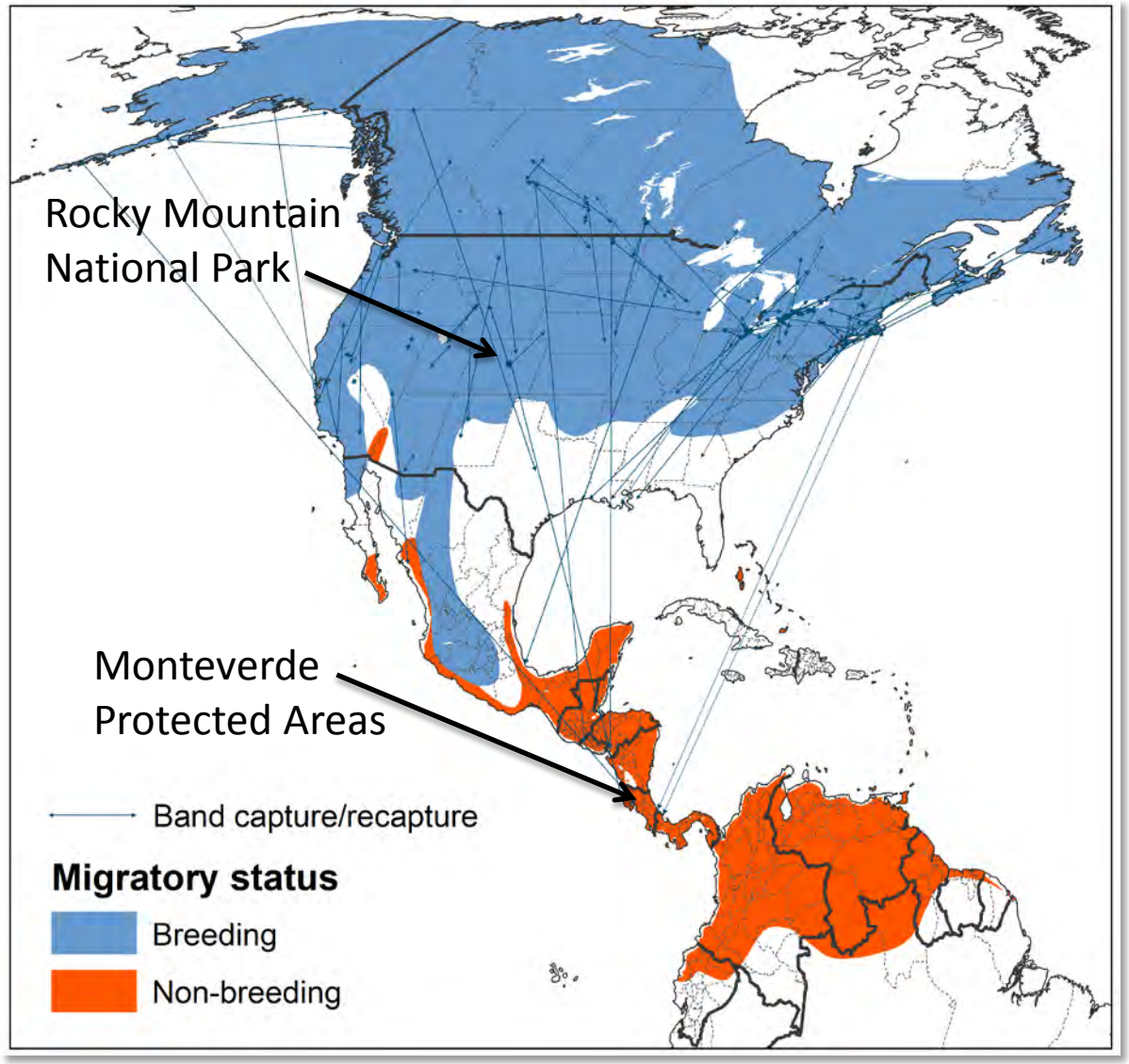




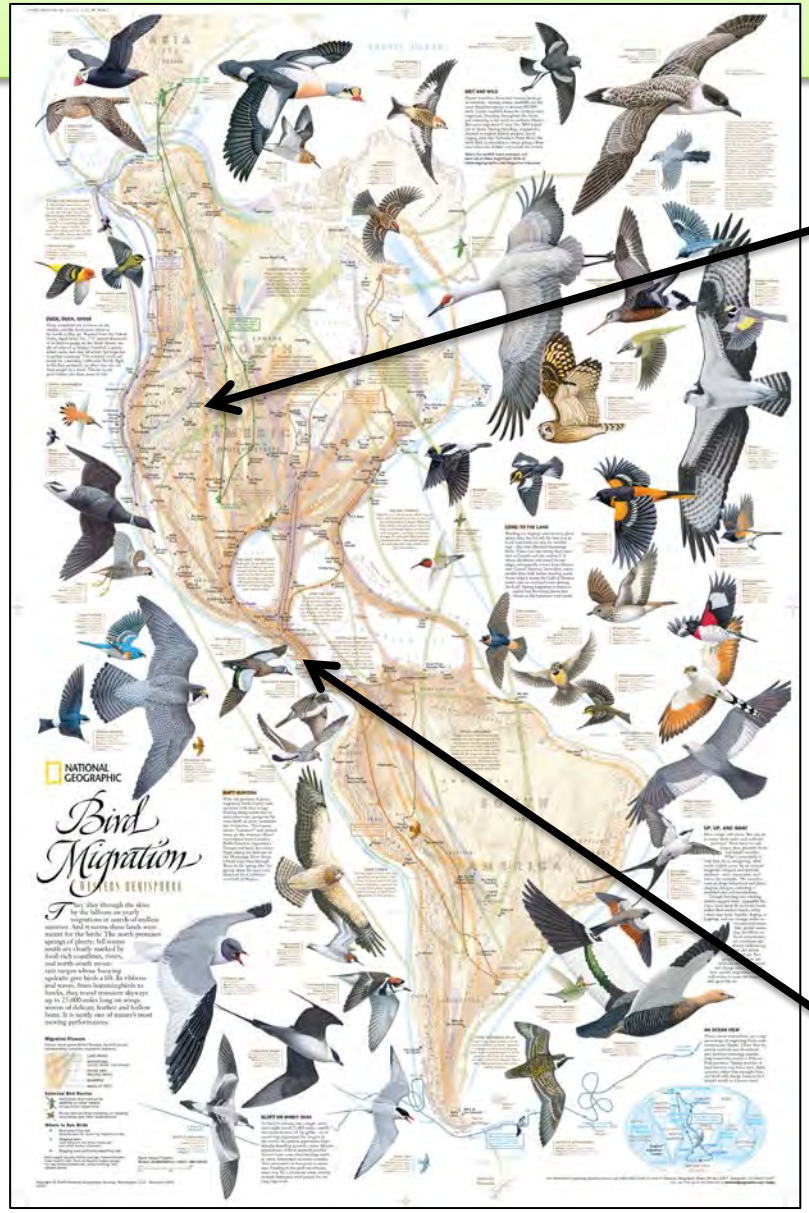
Yellow Warbler: Winter Habitat in Costa Rica

- Variety of wooded and scrubby habitats, including gardens, town plazas, secondary growth, brushy pastures and hedgerows, forest edge, riparian woodlands, wooded marshes, agricultural lands, and other semi-open areas
- Common from lowlands to 5,000 ft (1,524 m)

Yellow Warbler: Migration Information from Bird Banding Data



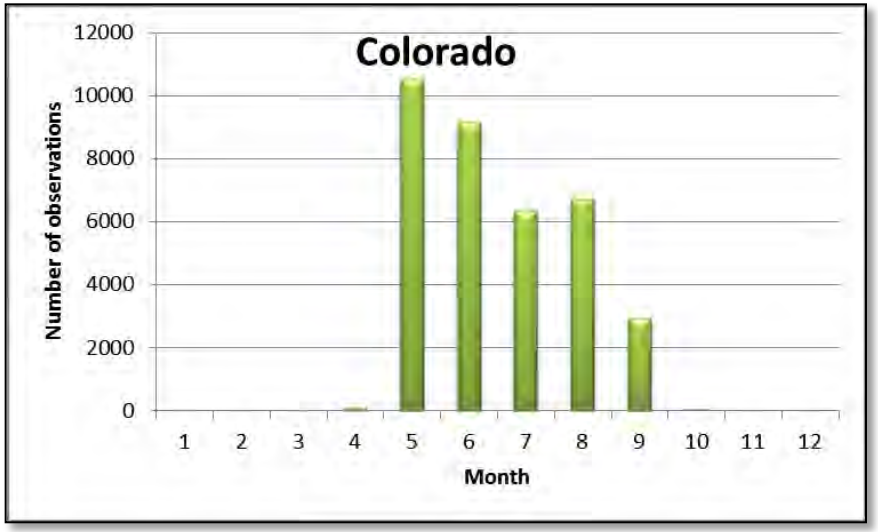
Bottleneck Migration Pattern

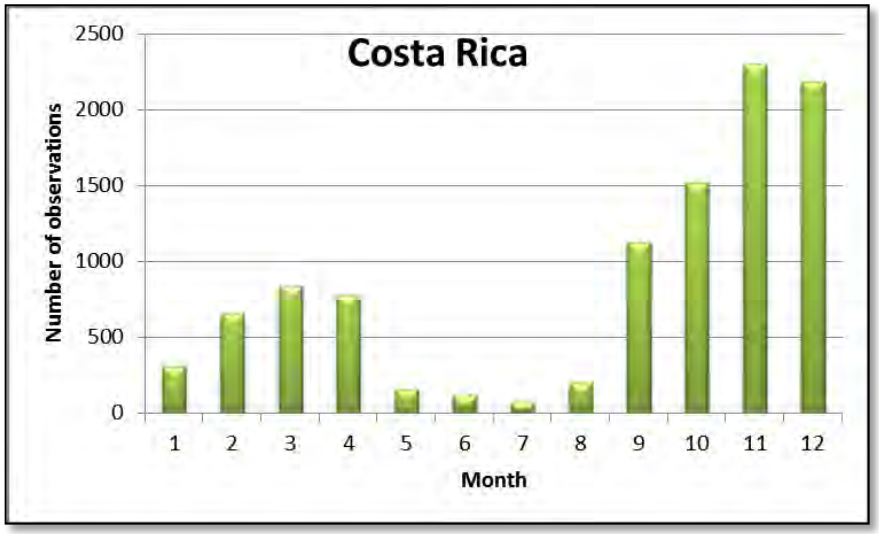


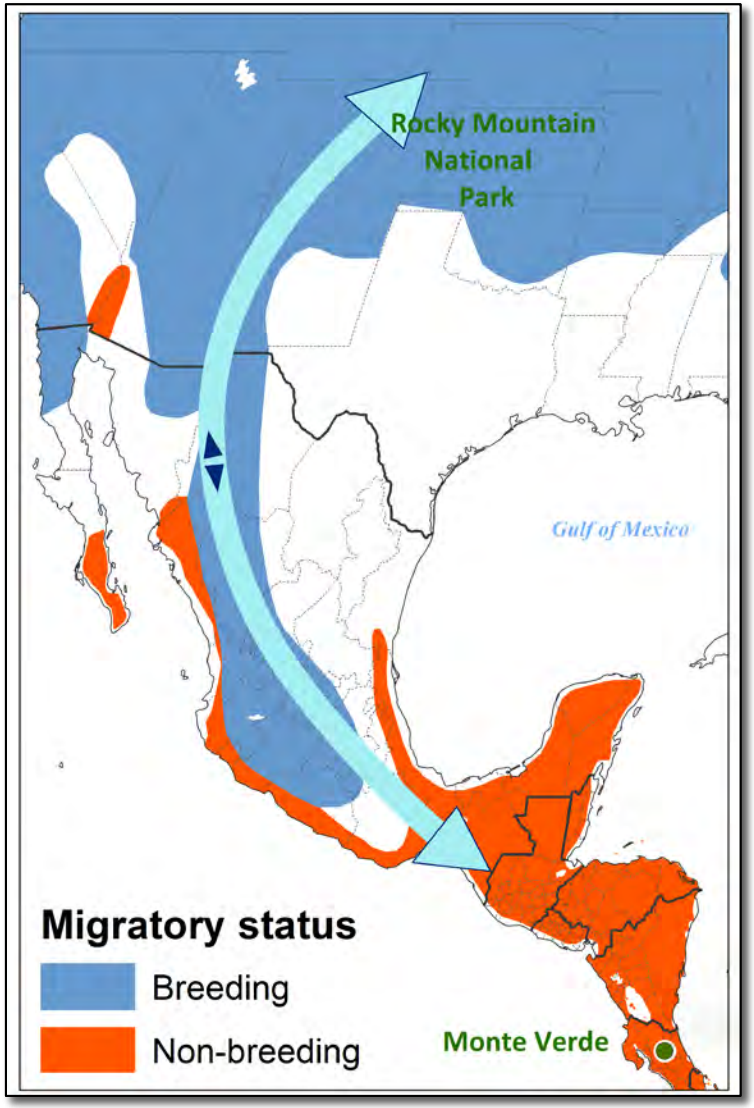
Rocky Mountain National Park

Monteverde, Costa Rica

Yellow Warbler: Migration



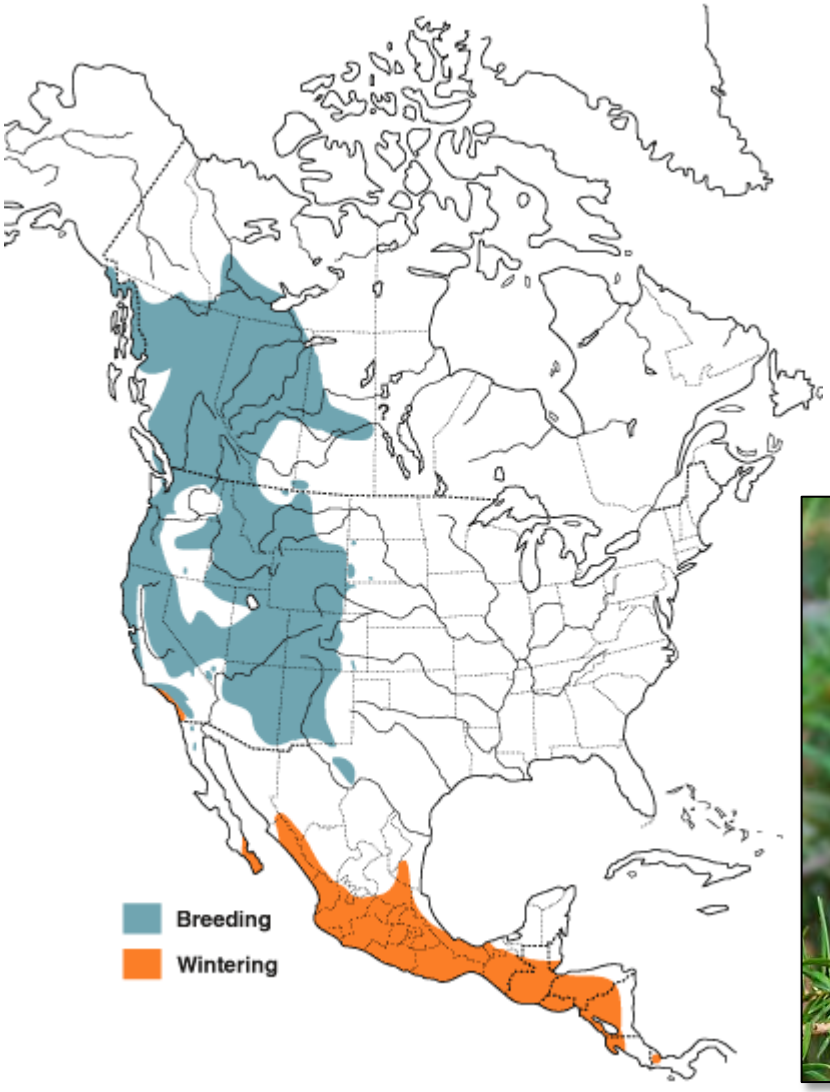




Yellow Warbler: Conservation Implications Within Breeding Range

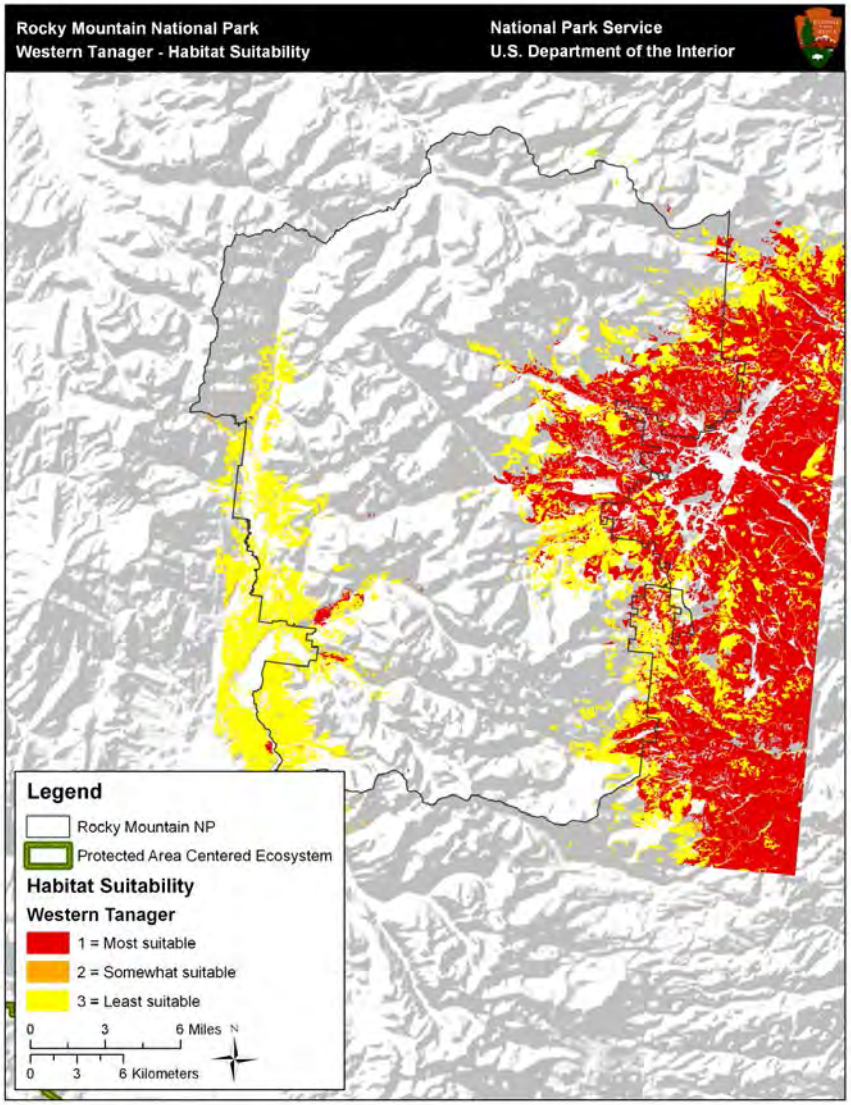
- Yellow warblers increased from 1980-1999.
- Cowbird parasitism is a problem in some areas, especially where grazing occurs in riparian willow habitat.
- Is generally increasing around Rocky Mt
- Of four focal species, most limited by the availability of suitable breeding habitat but climate change may expand its breeding habitat

Western Tanager
(*Piranga lucoviciana)*



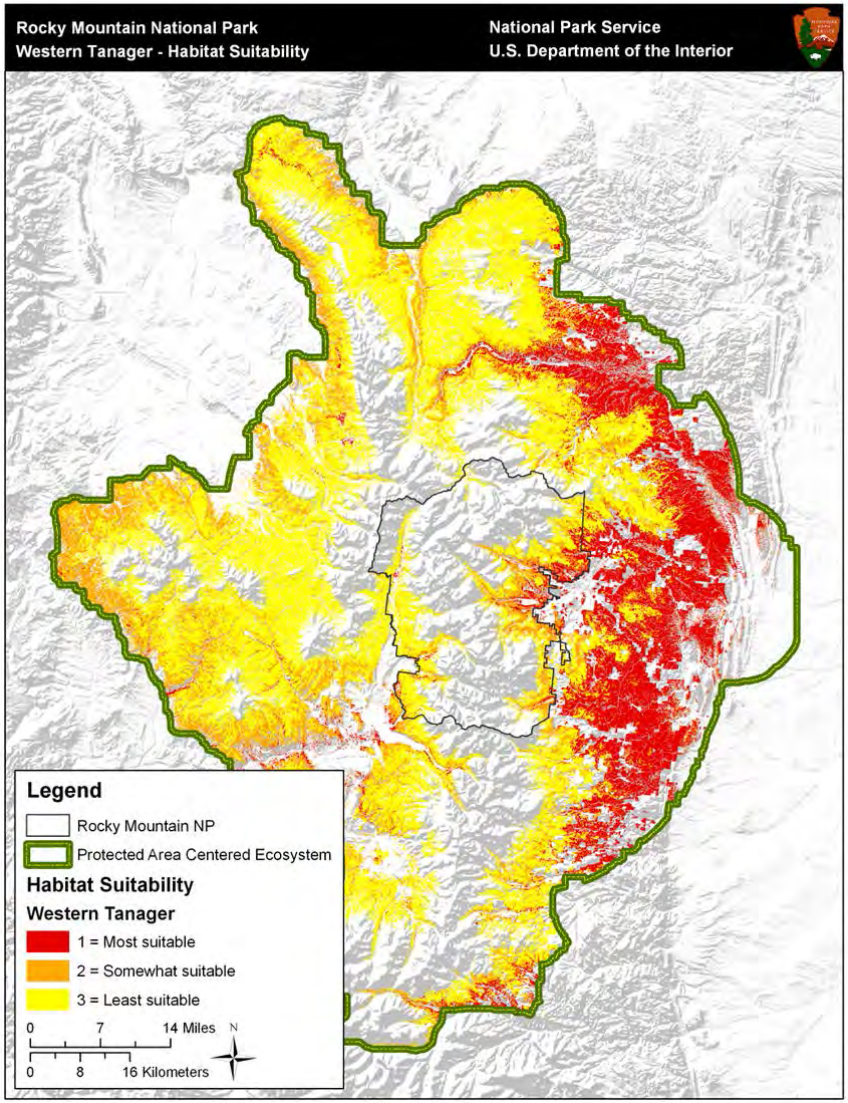
Western Tanager: Breeding Habitat in Rocky Mountain NP

- Common in ponderosa pine (*Pinus ponderosa*), Douglas fir (*Pseudotsuga menziesii*), and aspen (*populus* spp.)



Western Tanager: Breeding Habitat in the PACE

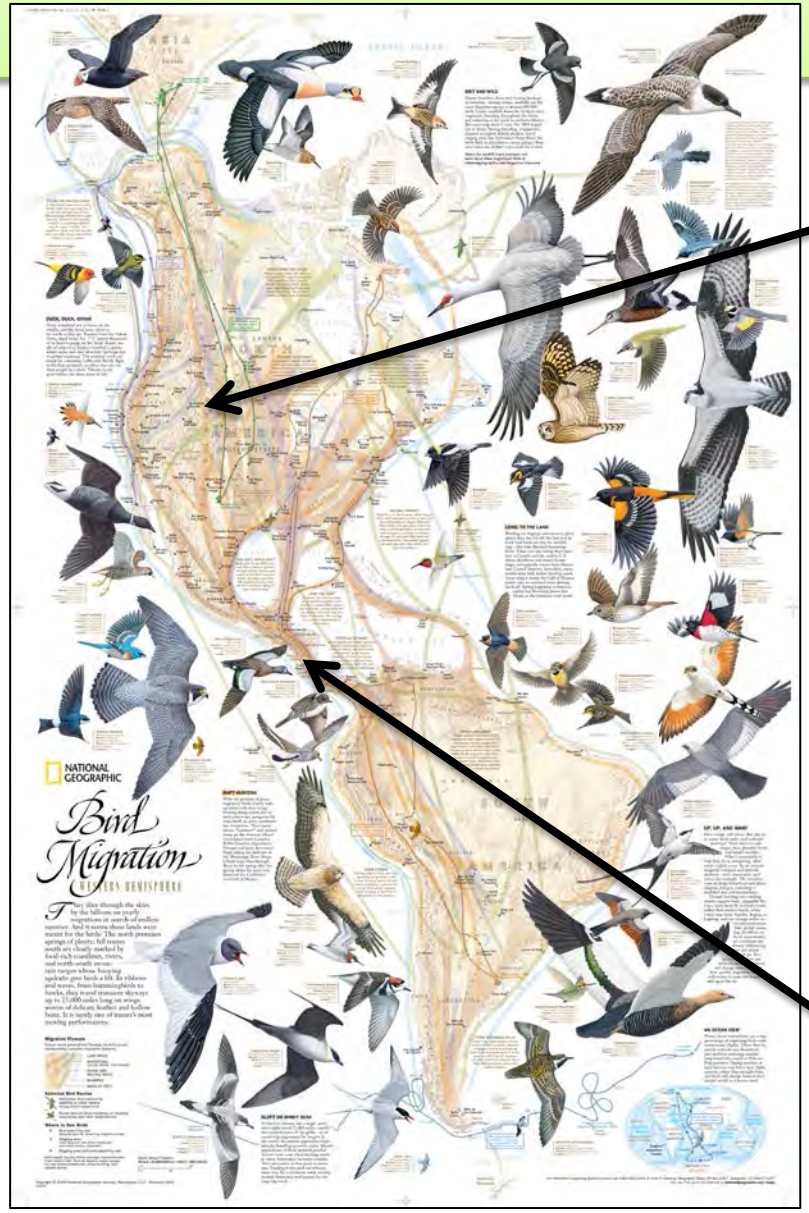
- Found primarily from 5,500–9,000 ft (1,676–2,743 m)
- At lower elevations found in small numbers in pinyon-juniper woodlands and oak shrublands.



Western Tanager: Winter Habitat in Costa Rica

- Deciduous forest canopy, scrub and second-growth, semi-open habitats, and hedgerows.

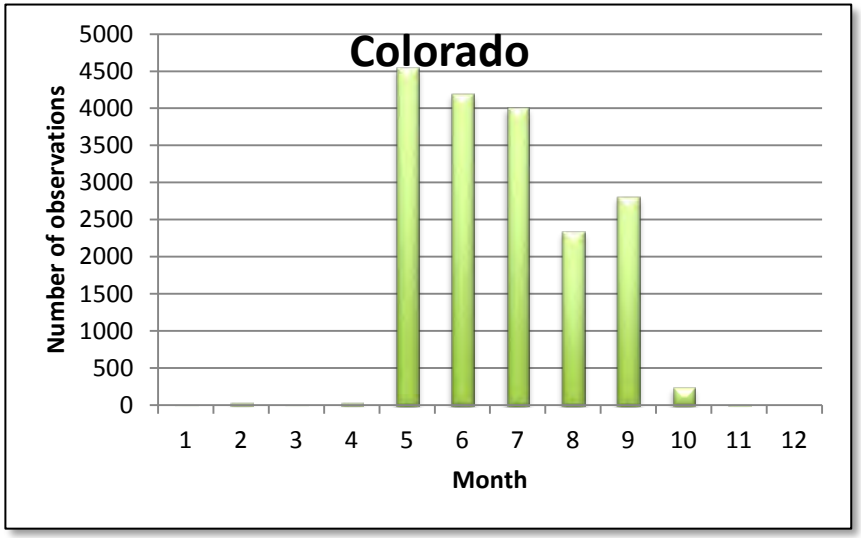
Bottleneck Migration Pattern

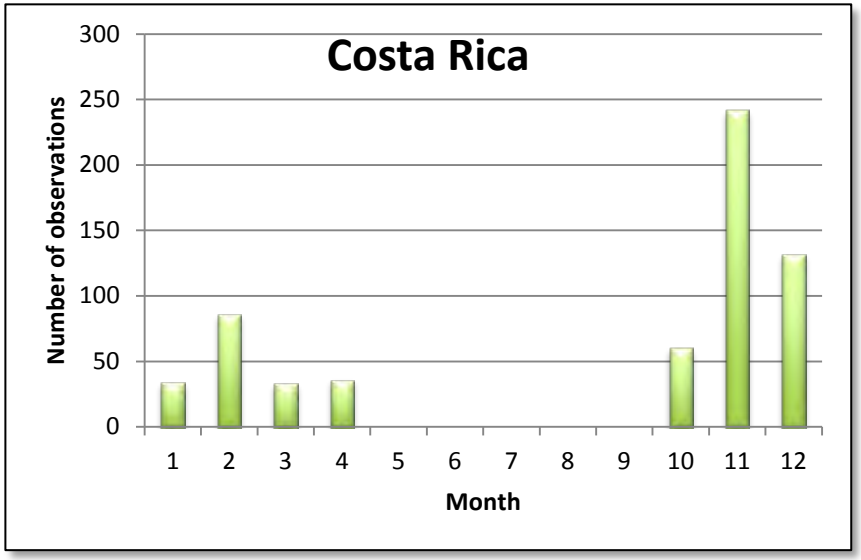


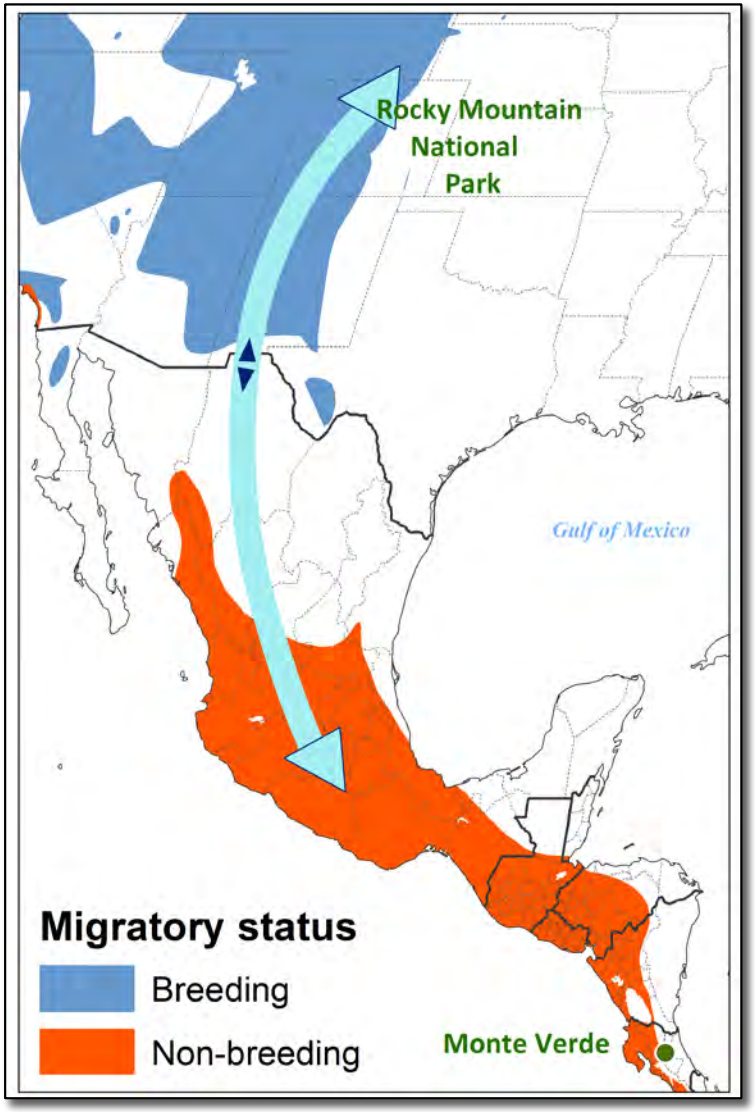
Rocky Mountain National Park

Monteverde, Costa Rica

Western Tanager: Migration







Western Tanager: Conservation Implications Within Breeding Range

- Riparian and montane stopover sites in the southwestern U.S. are important to western tanagers.
- Cowbird parasitism
- Declining throughout the Rocky Mt area

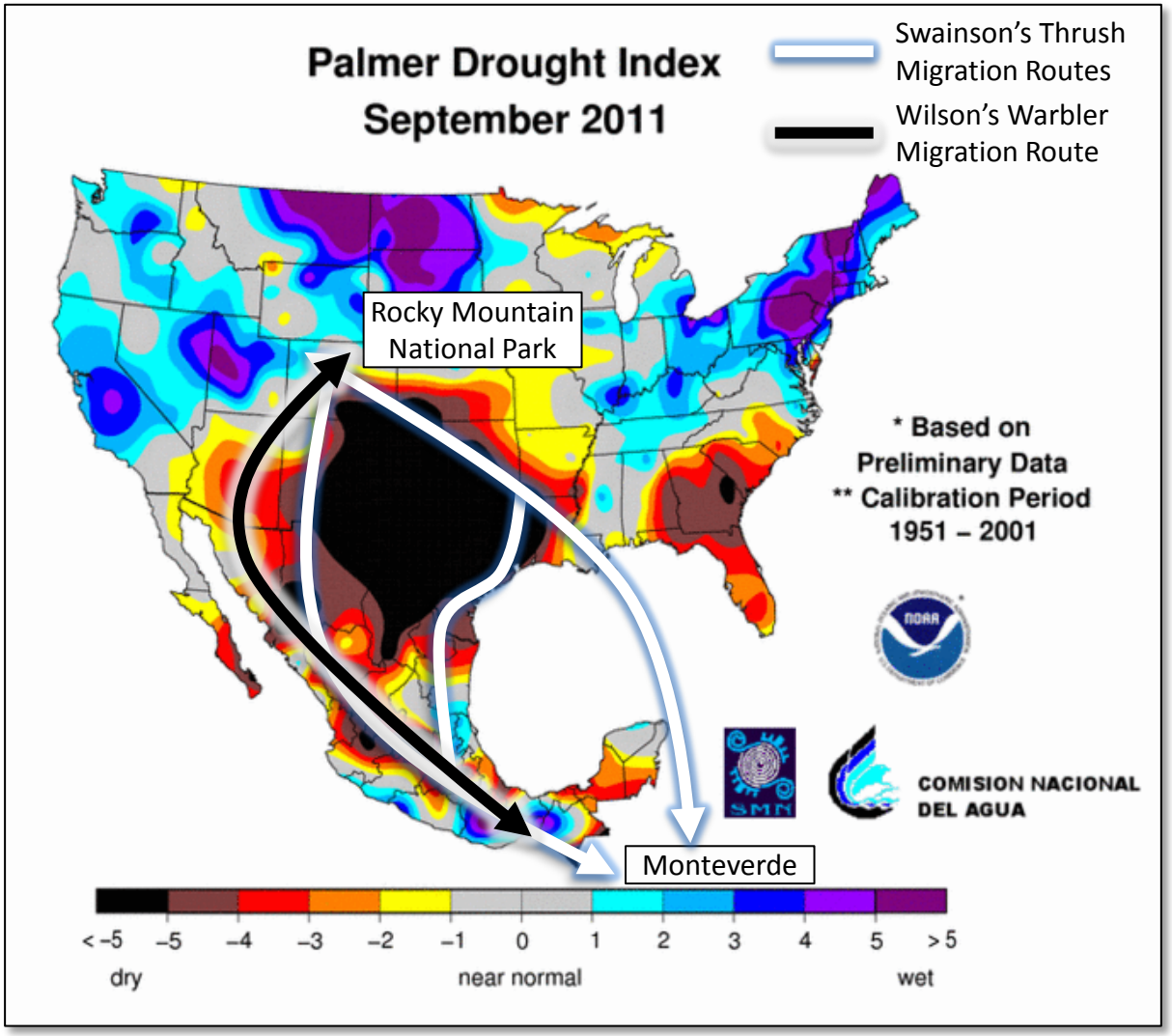
Climate Change

- Climate change science is a relatively new frontier.
- Information is available on potential broad-scale impacts of climate change and species' general responses.
- It is difficult to narrow down impacts to particular species.
  - We can't always apply generalizations with confidence.
- Then, it's difficult to link findings for particular species to management actions.

Climate Change and Neotropical Migrants

- Effects on breeding ranges differ between regions
- Increases in the severity and frequency of droughts in the American Southwest are likely to have negative impacts on the ability of species to migrate through this area.

Climate Change and Neotropical Migrants



Migrating birds may have to travel over thousands of miles of impacted habitat in the southern U.S. and northern Mexico.

Climate Change and Neotropical Migrants

- Elevational vs. latitudinal climate change impacts
  - Elevational:
  - Latitudinal:
- Most vegetative communities will move northward, but it is unclear if forests or other habitats will be able to keep pace with the rate of climate change. It is even more unclear if the fauna (i.e., birds) associated with these habitats will be able to adjust to such changes.
  - In the Rocky Mts. new veg communities could move into higher elevation areas displacing communities such as alpine tundra.

What does the future hold as species relate to climate change?

One way to assess the vulnerability of species:

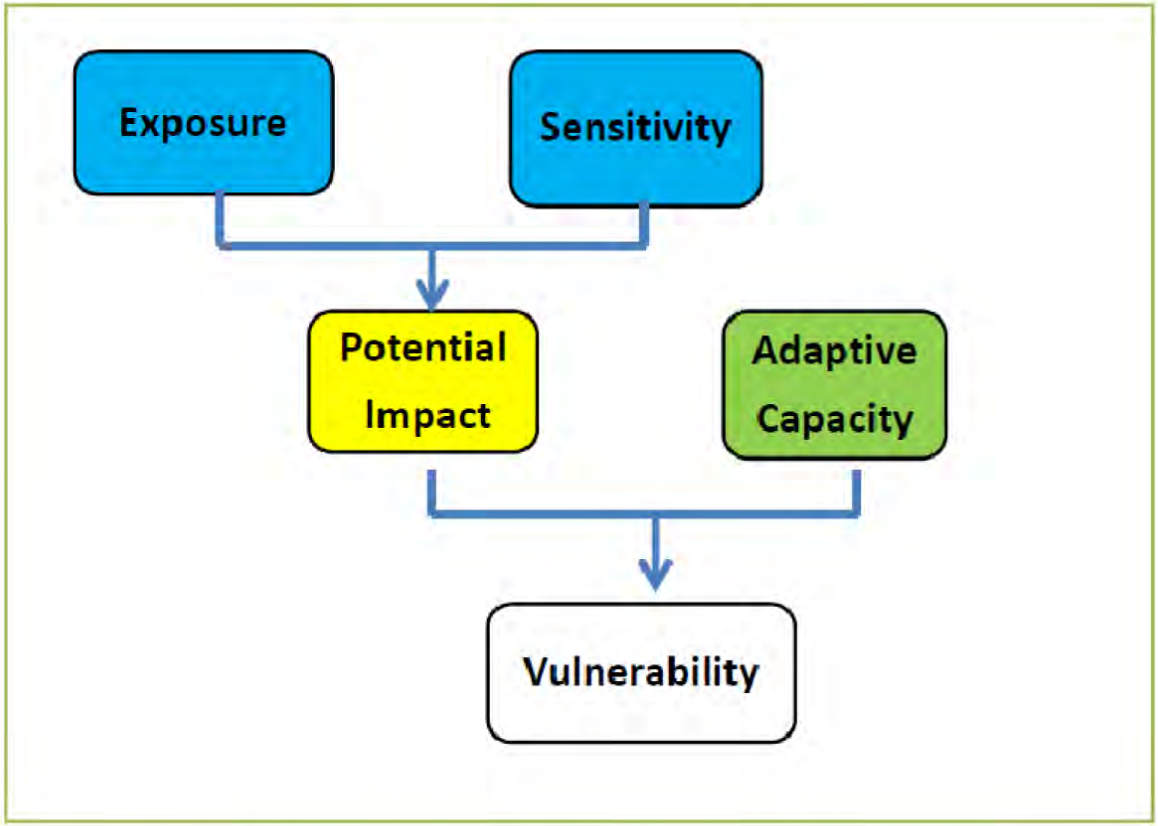
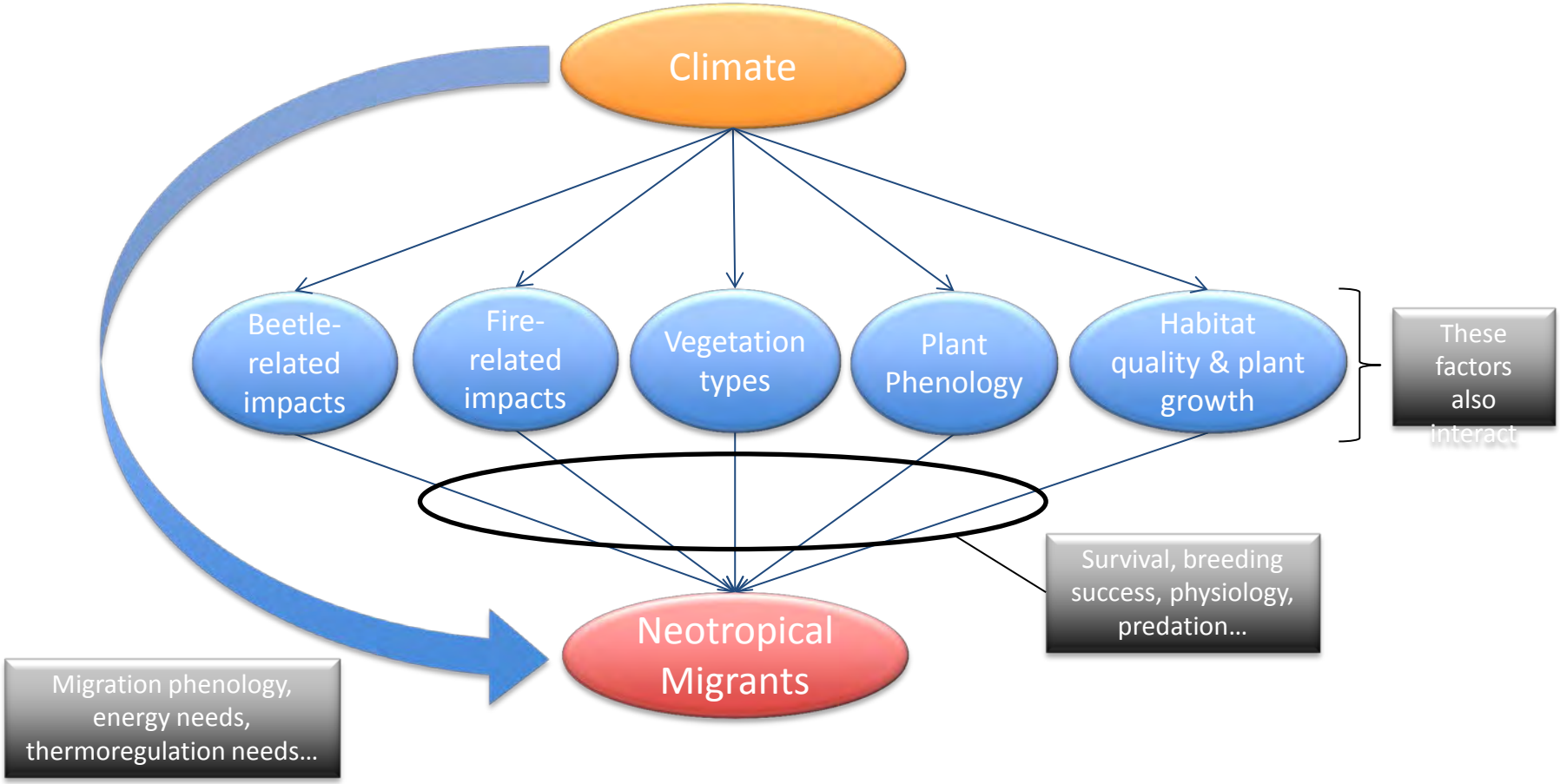


Figure 2.1. Key components of vulnerability, illustrating the relationship among exposure, sensitivity, and adaptive capacity.

Figure from *Scanning the Conservation Horizon: A Guide to Climate Change Vulnerability Assessment*.

Some Examples of Climate Change Impacts on Neotropical Migrants

Examples of the direct and indirect effects of climate change on the breeding ecology of neotropical birds in Rocky Mountain NP.



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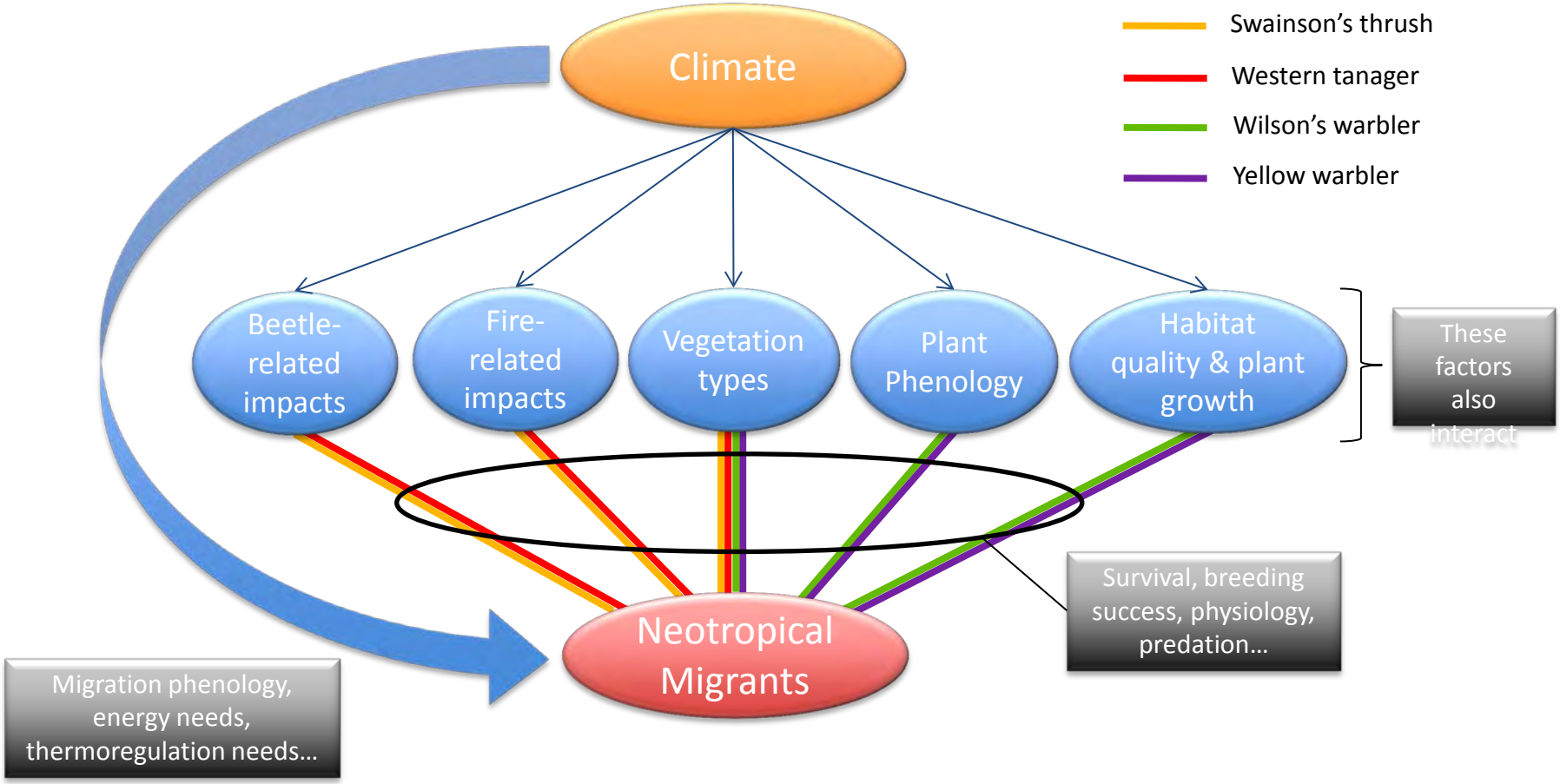


Climate Change and Neotropical Migrants

- Despite big-picture explanations, species have individualized responses to climate change that don't always follow general patterns.
  - This increases the challenge for managers.
- Using current knowledge of climate change and bird responses to climate change, we can create working hypotheses of particular species' response.
- These hypotheses can help prioritize areas for future research.

Potential Impacts of Climate Change on our Focal Species

- Following are working hypotheses of potential impacts of climate change on our four focal species.

Swainson's Thrush

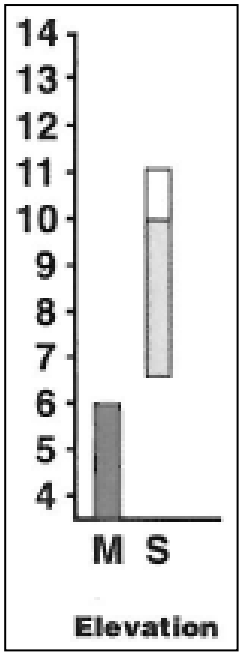
Wilson's Warbler

Yellow Warbler

Western Tanager

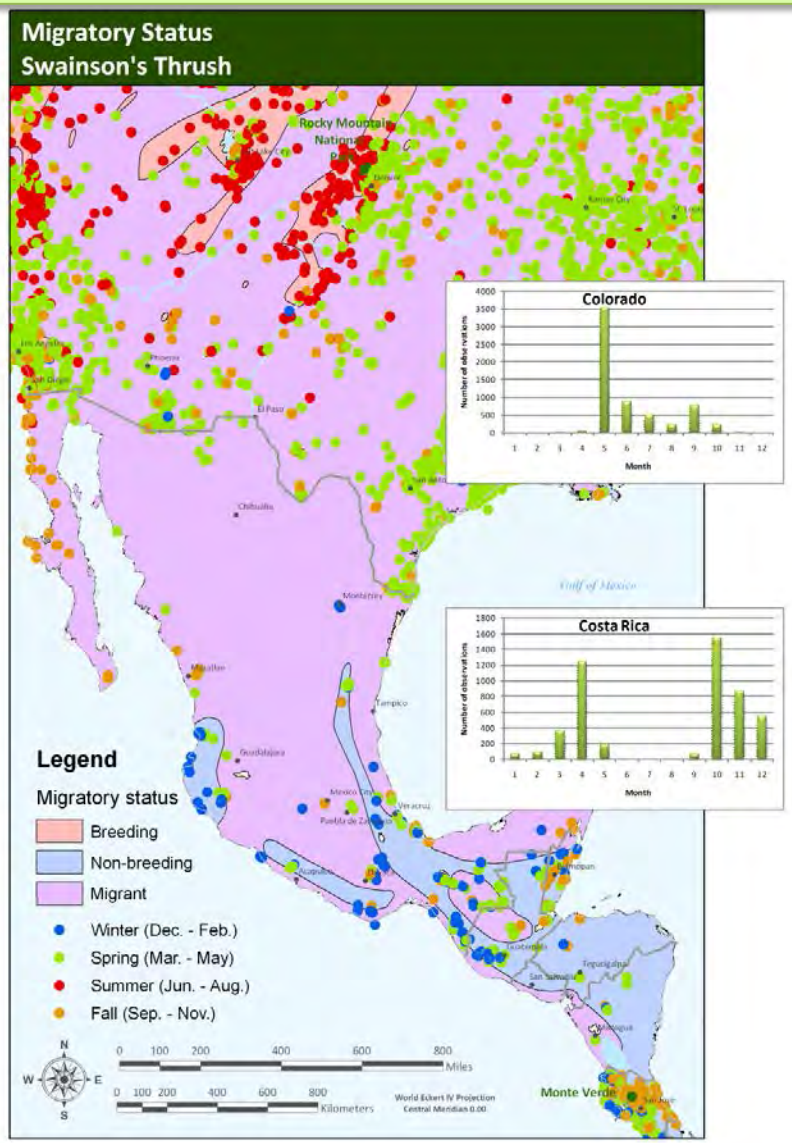
Swainson's Thrush: Elevational Impacts of Climate Change

- Doesn't breed at elevations much below Rocky Mt NP (graph below: S = summer, M = migration)



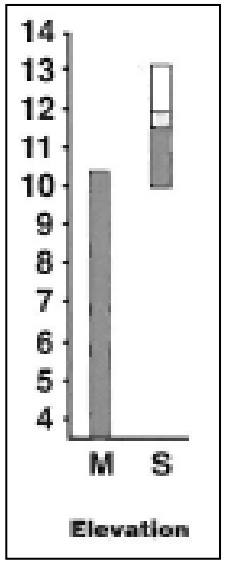
Swainson's Thrush: Latitudinal Impacts of Climate Change

- Rocky Mt NP is near the southern limit of breeding range.
- Climate change could push breeding range further north causing the extirpation of the species from Rocky Mt. NP



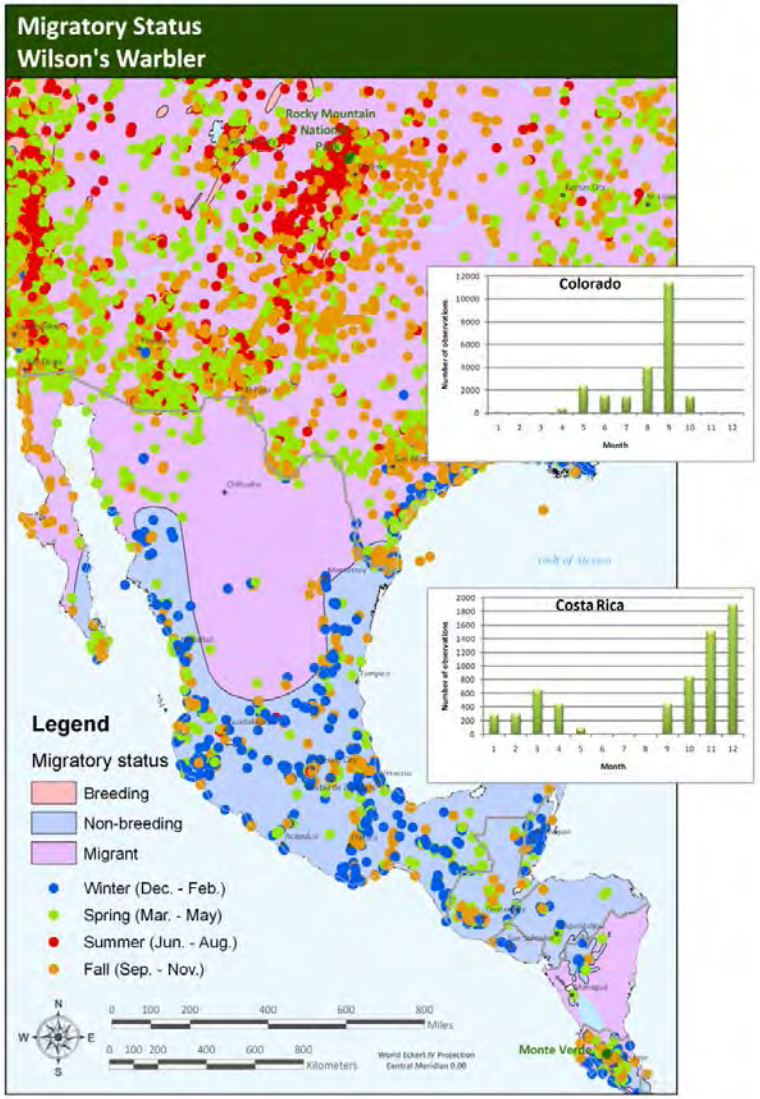
Wilson's Warbler: Elevational Impacts of Climate Change

- Breeds at elevations above the lower limit of ROMO (graph at right: S = summer, M = migration)
- Breeds primarily in willow, which is showing a decline in stature due to climate change and other factors.



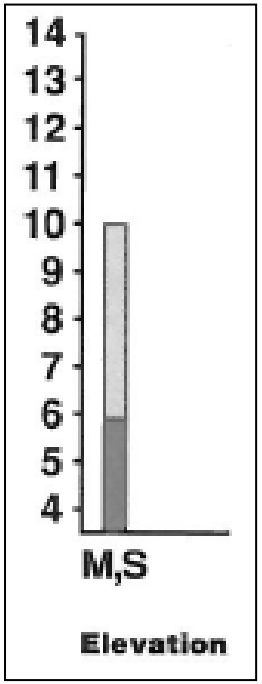
Wilson's Warbler: Latitudinal Impacts of Climate Change

- Rocky Mt NP is near southern limits of breeding range.
- High philopatry and reliance on stopover sites in SW U.S. indicates that any negative impacts to riparian habitat caused by climate change (declining rainfall or stream flow, higher temperatures that affect riparian vegetation and insects in those areas) will negatively affect this species.



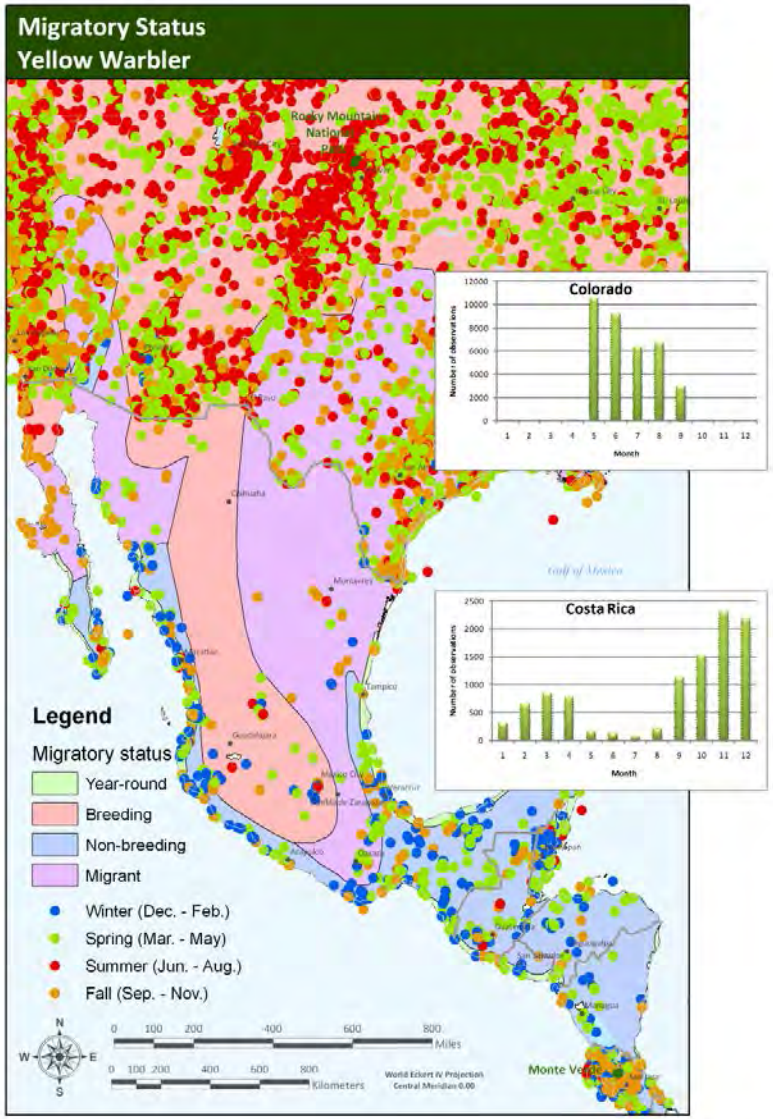
Yellow Warbler: Elevational Impacts of Climate Change

- Breeds at elevations well below Rocky Mt (graph below: S = summer, M = migration)



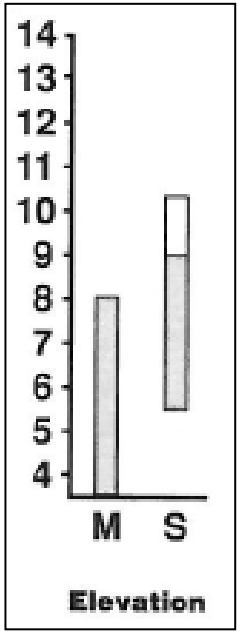
Yellow Warbler: Latitudinal Impacts of Climate Change

- Not near southern end of breeding range in Rocky Mt



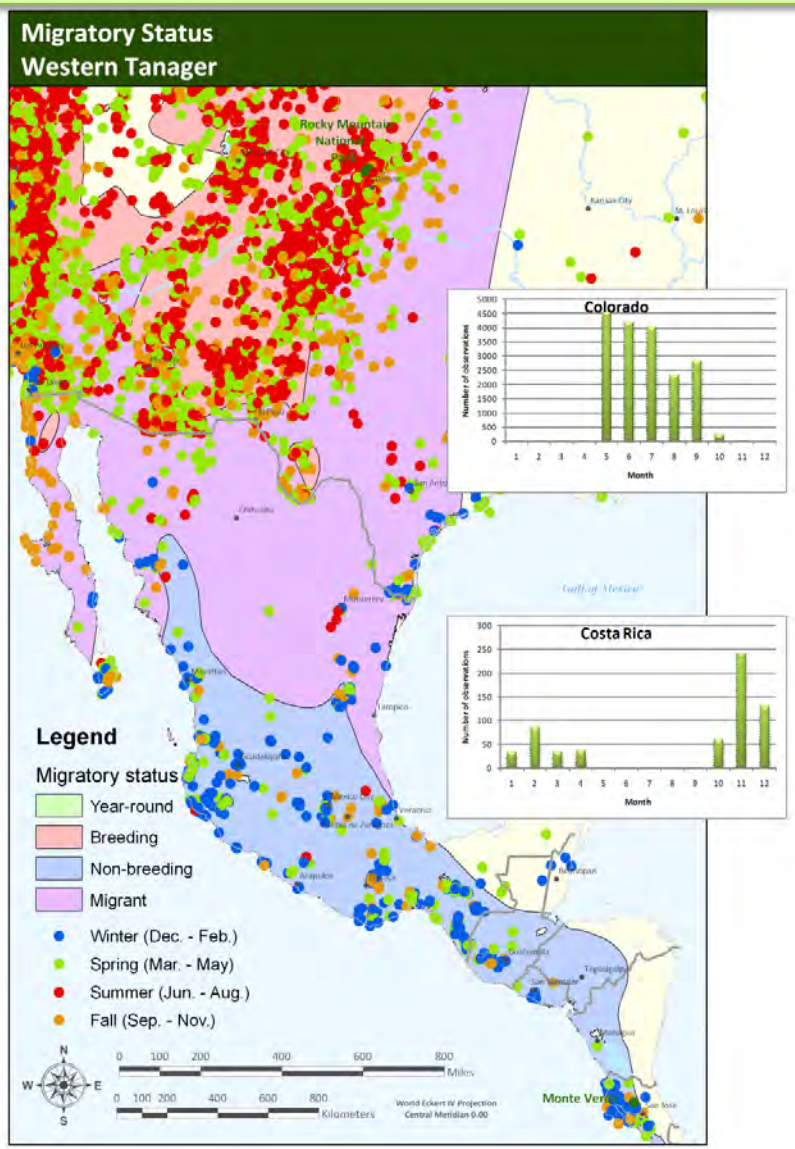
Western Tanager: Elevational Impacts of Climate Change

- Breeds at elevations well below Rocky Mt (graph below: S = summer, M = migration)



Western Tanager: Latitudinal Impacts of Climate Change

- ROMO is on the edge of its habitat range
- Declining throughout Rocky Mt Area
- Western tanager habitat loss in the park: Climate change could increase fire frequency in ponderosa pine, which is already dying off rapidly due to the mountain pine beetle



Management Actions

- ROMO-specific example
- Implementation of Elk and Veg Mgmt Plan

Management Actions

- Protecting migration is a process
  - LCC's
- May add to new relationships/coalitions
- Using new technology such as geolocaters to better define migration corridors and stopover sites.
- Collaborate with other NPS and protected areas in protecting important migration corridors and stopover sites.

Connections: Migration

- Migratory birds use a variety of habitats in different locations over the course of their yearly cycle.
- Many of these areas are not protected or are not managed for migratory species.
- Climate change can affect the spatial and temporal patterns of migratory species.
- Much is unknown about the migratory routes, habitats, and time of use for these species.
  - We need to learn more to help connect the dots.

Connections: Protected Areas

- Important Bird Areas (IBAs)
  - Audubon Society program used to identify conservation priorities
  - There are IBAs along migration routes of selected species.

Conclusion

- We can’t leave the protection of these species to chance.
- These four species show examples of the connectedness of different protected areas
  - Complexity of migration patterns
  - Likely sensitivity to climate change
  - A compelling need for collaboration to promote species conservation

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