

Ecological Response Modeling:
Part II
Applications

Scanning the Conservation Horizon

Overarching Conservation Goal(s)

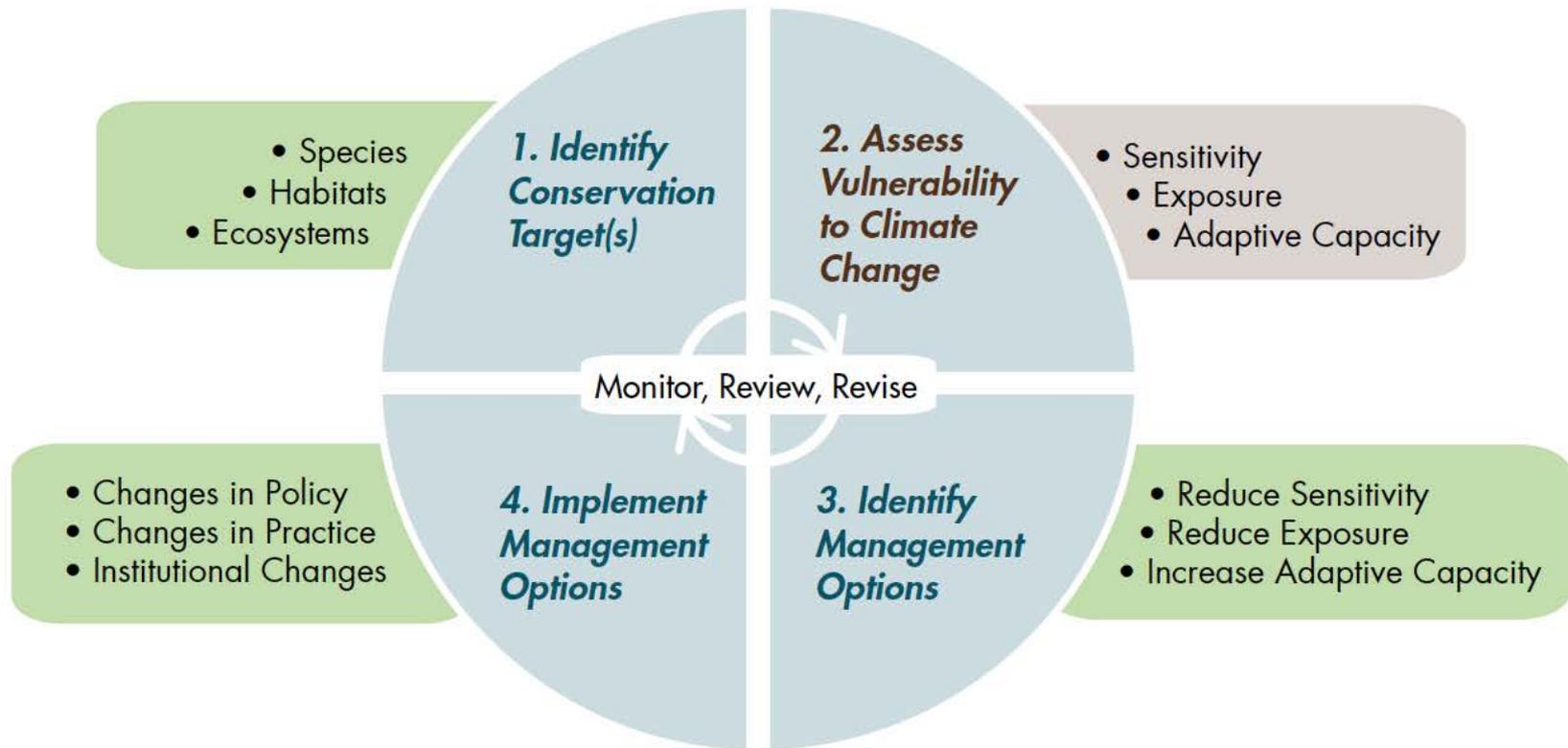
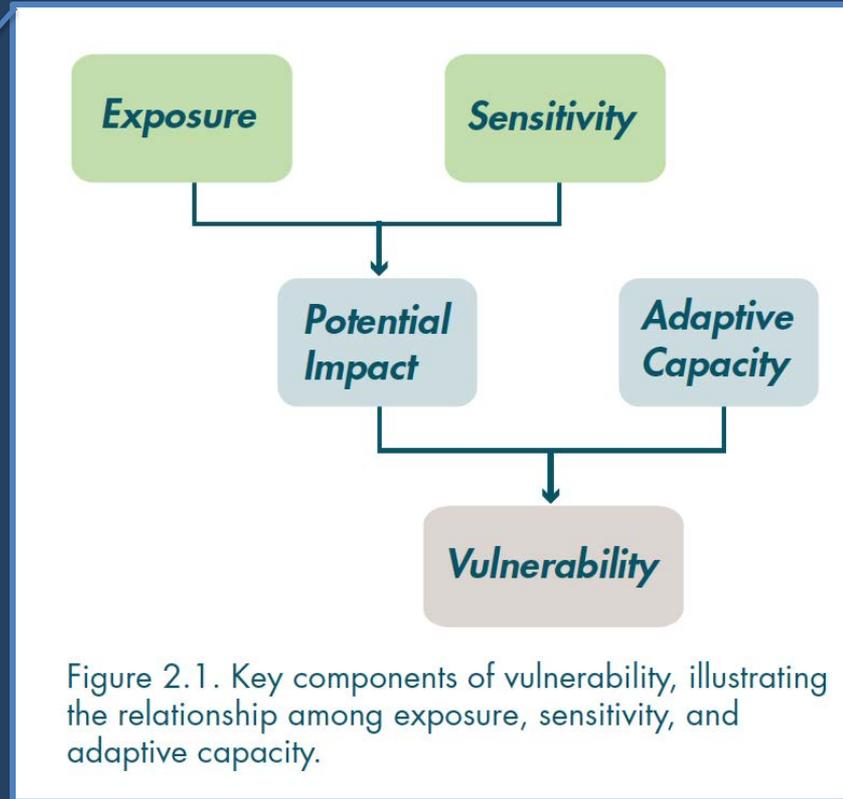


Figure 1.1. Framework for Developing Climate Change Adaptation Strategies

Scanning the Conservation Horizon



Conservation Goal(s)

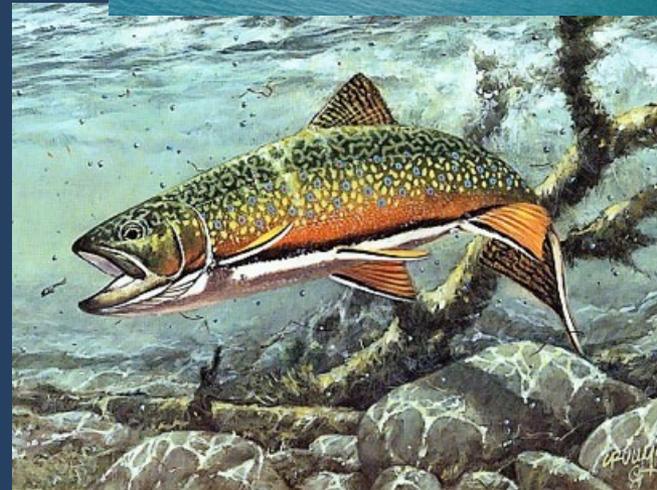
2. Assess Vulnerability to Climate Change

- Sensitivity
- Exposure
- Adaptive Capacity

Review, Revise

Ecologically Defined Assessment Targets

- Vegetation/Habitat types
 - Specific (“blue-oak woodland”)
 - General (“wetlands” “grasslands”)
- Individual Species
- Physical structures
 - Sea ice, glaciers
- Physical processes
 - Cold-water streams
 - Fire frequency
- Ecosystem Services
 - Storm protection
 - Water production
 - Carbon sequestration



Types of ecological response models

- Conceptual models
- General characterization models
- Expert opinion models
- Habitat or occupancy models
- Vegetation/habitat response models
- Physiologically based models
- Ecological models

Case study 4*:
Vulnerability of Massachusetts Fish
and Wildlife Habitats to Climate
Change

* In Scanning the Conservation Horizons

Ecologically Defined Assessment Targets

- **Vegetation/Habitat types**
 - 24 specific habitats (table C4.1)
- Individual Species
- Physical structures
 - Sea ice, glaciers
- Physical processes
 - Cold-water streams
 - Fire frequency
- Ecosystem Services
 - Storm protection
 - Water production
 - Carbon sequestration



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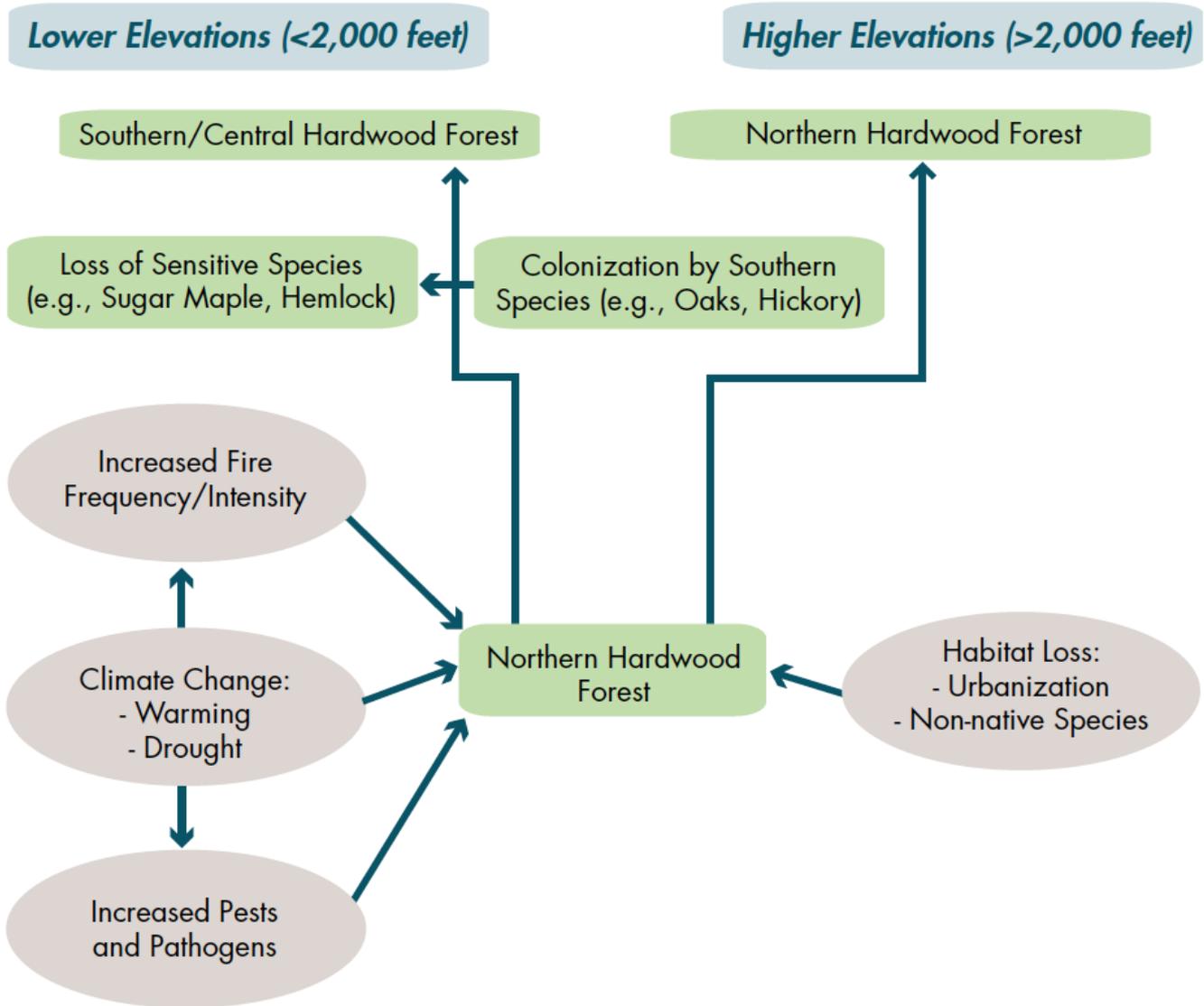
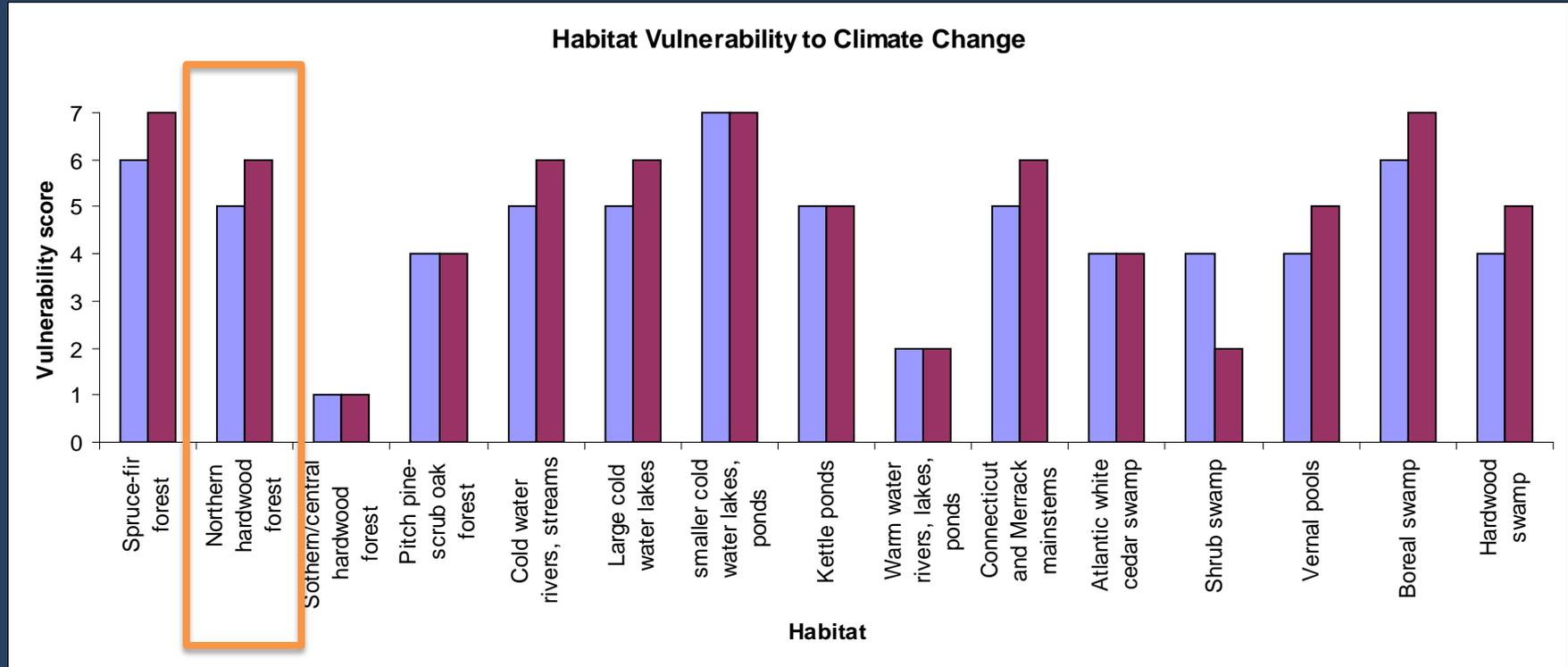
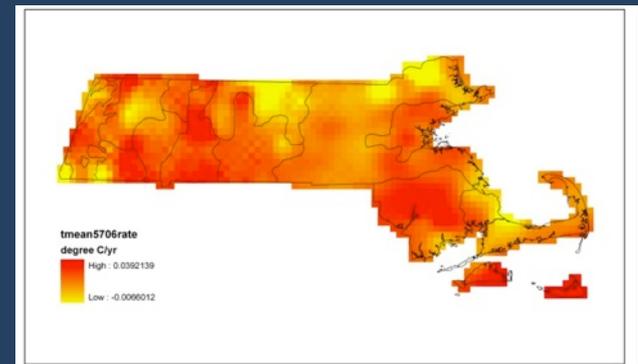


Figure C4.2. Conceptual model of how climate change and other stressors might affect Northern Hardwood Forest in Massachusetts.

Massachusetts Habitat Assessment



■ Double CO₂
■ Triple CO₂

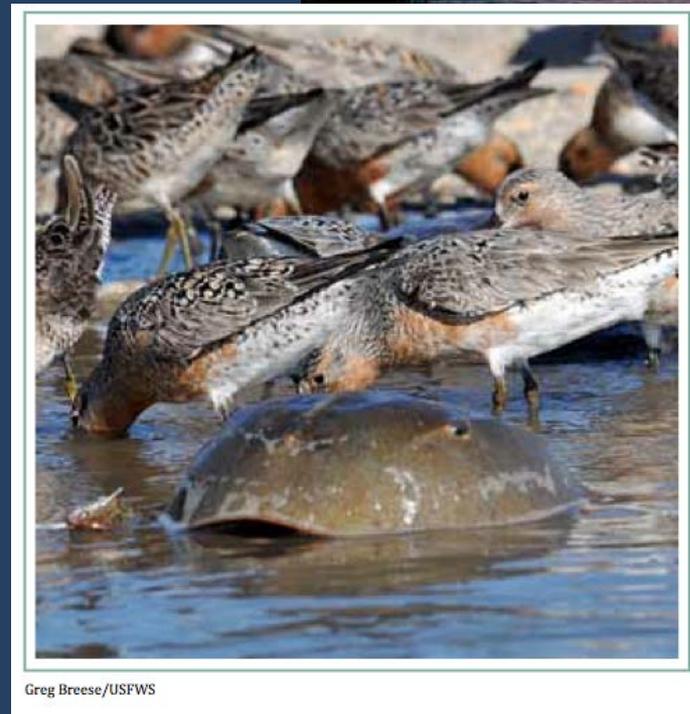


Case study 5*:
Vulnerability to Sea-Level Rise in
the Chesapeake Bay

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Ecologically Defined Assessment Targets

- Vegetation/Habitat types
- Individual Species
- Physical structures
 - Sea ice, glaciers
- Physical processes
 - Cold-water streams
 - Fire frequency
- Ecosystem Services
 - Storm protection
 - Water production
 - Carbon sequestration



Greg Breese/USFWS

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Two step Vulnerability Assessment

- Coastal Habitat Study

feeding into



- Marsh Bird Study



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Coastal Habitat: SLAMM

Sea Level Affecting Marshes Model

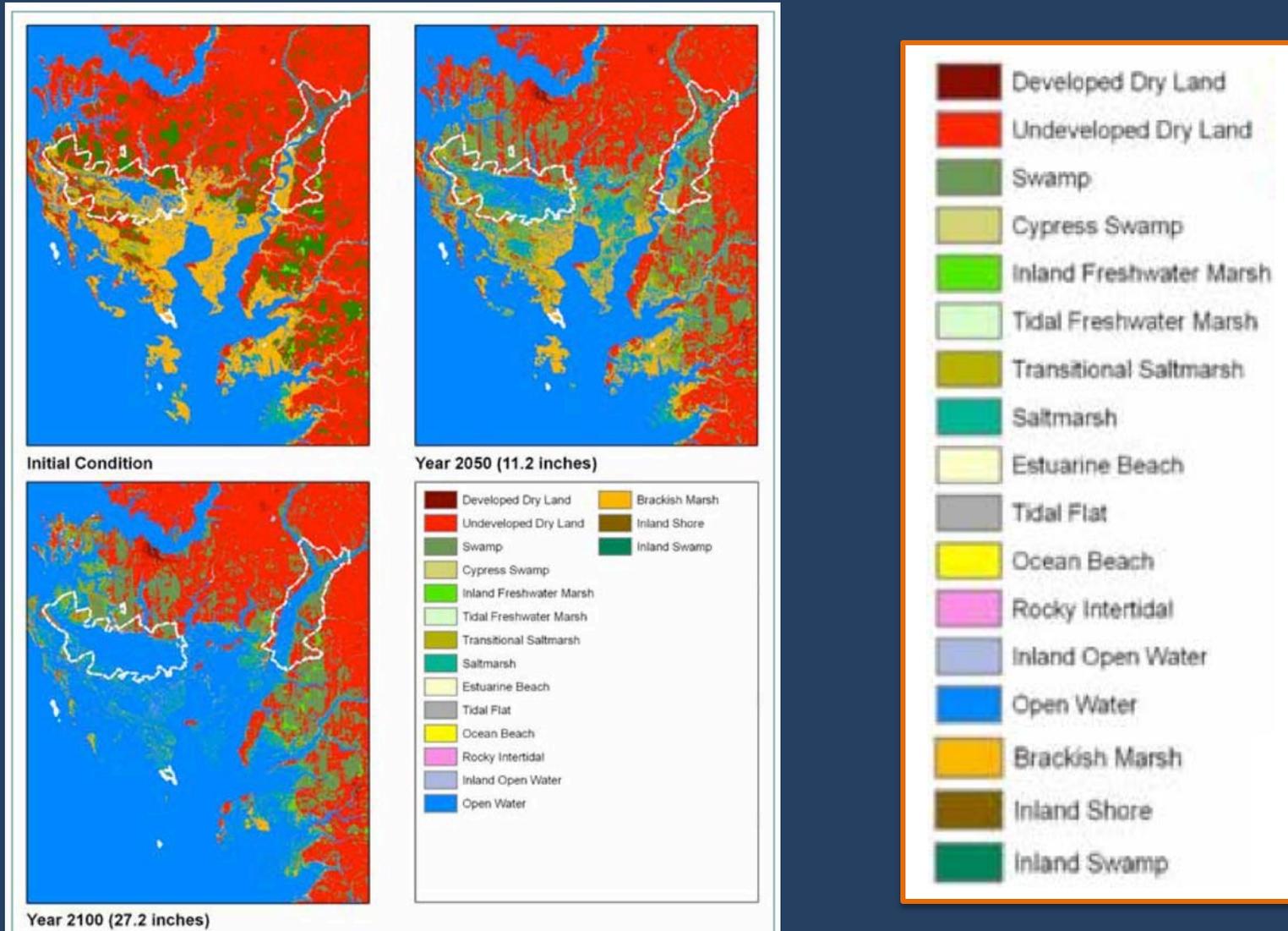


Figure C5.1. Sea level rise and marsh conversion projections for Blackwater National Wildlife Refuge, Maryland (Glick et al. 2008a).

Marsh Bird Study: Available Habitat

Considered seven marsh birds of concern

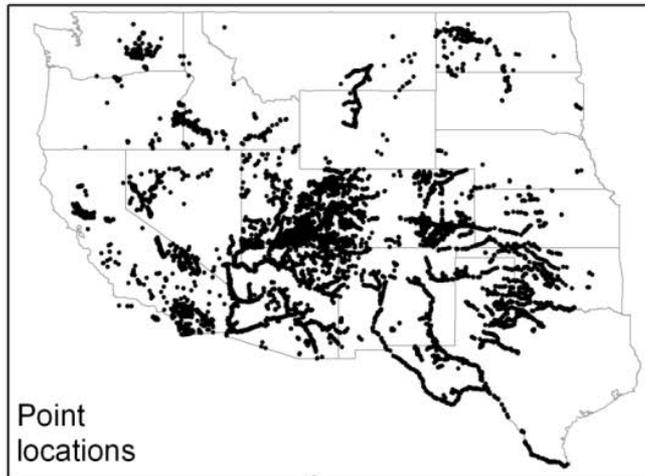
Available Habitat modeled by:

1. Geographic distribution of the study area
2. Bird to wetland habitat-type associations
3. Patch-level incidence rates for each area class

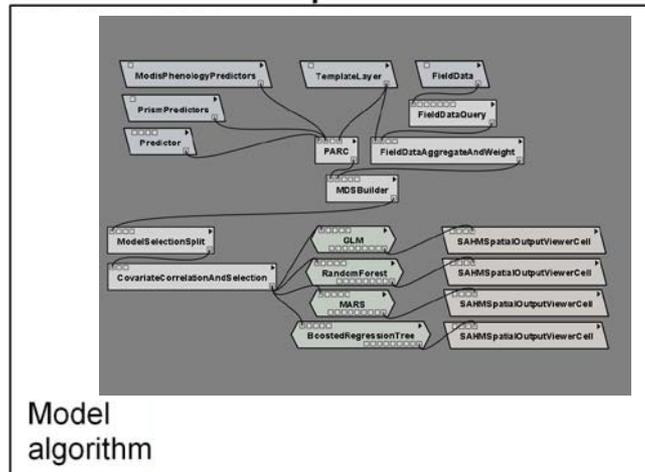
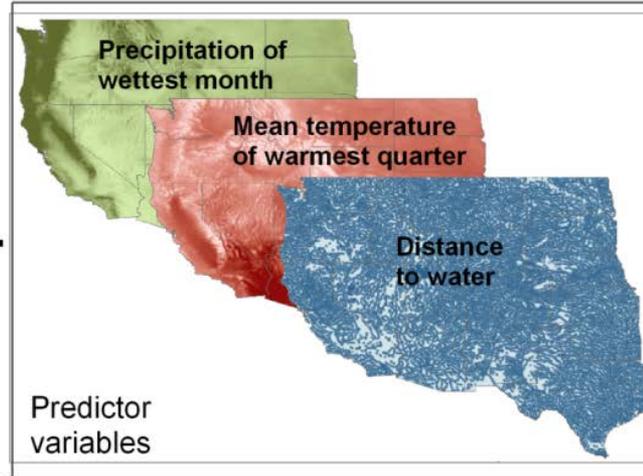
Conclusion

Dramatic changes in the bird community on a regional scale.

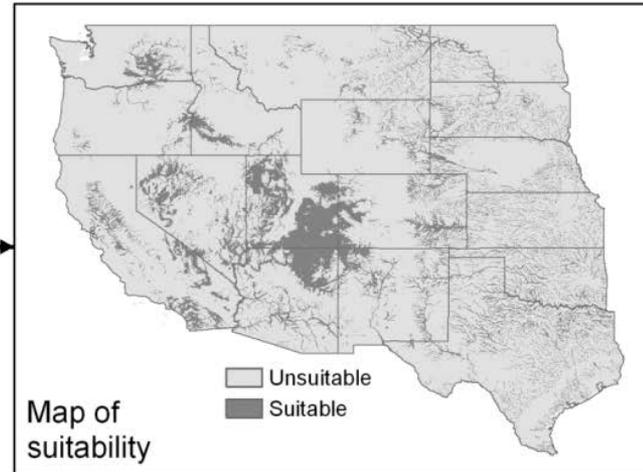
Modeling in general...



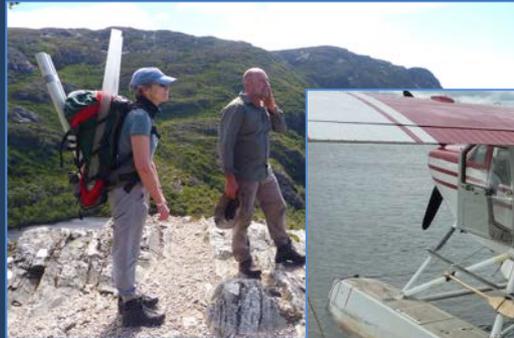
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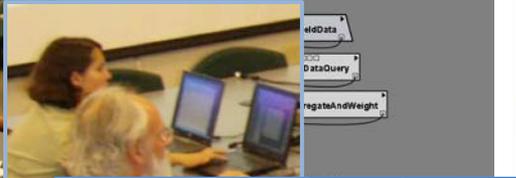
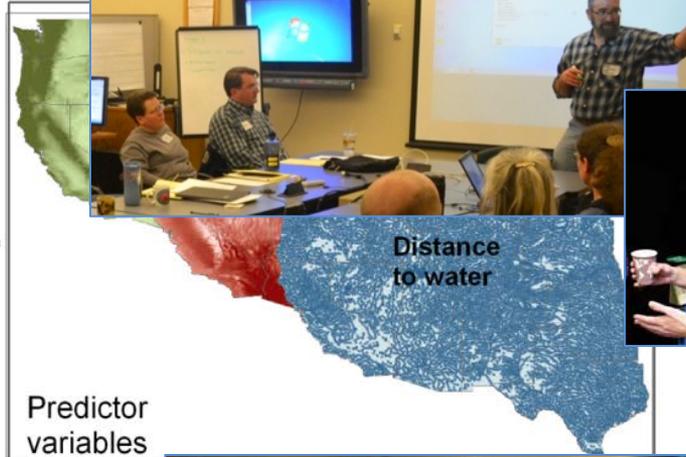
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Collaboration is essential



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Model algorithm



