Science Theme #4:

“Climate impacts on land-use and land-cover change”

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LCCs Fundamental Objective

To define, design, and help partners deliver landscapes that can sustain natural and cultural resources at desired levels nationwide.
LCC Partners
Examples of Decisions of LCC Stakeholders

Given a **regional context** of widespread **land use change and development** and a **changing climate**, and **goals** of sustaining fish and wildlife populations and their ecosystems:

- **Land protection**: what areas are most important to protect to allow systems to persist and adapt to change?
- **Land management**: how should current natural areas be managed to help them persist and adapt?
- **Ecological restoration**: where should efforts to restore degraded ecosystems be focused?
Science Needs to Address Stakeholder Questions

• What is the current capacity of the landscape to sustain wildlife populations and ecosystems?

• How will climate change and land use change affect future capacity of the landscape to support wildlife and ecosystems?

• How can this scientific information be organized and synthesized to support decision making?
Foundational Products

Habitat Classification – Terrestrial

RCN Project of Northeast state fish & wildlife agencies

NatureServe/TNC - NE Wildlife Habitat Classification & Mapping Project

LCC and CSC expanding classification and map into Canada

Hierarchical classification 144 habitat systems

Stakeholder Outreach and Science Planning Meeting, January 2013
Selecting and Using Representative Species

- Northeast regional approach for surrogate species
- “...a species whose habitat needs, ecosystem function, or management responses are similar to a group of other species.”
- assumption: conservation planning and actions for a representative species will also address the needs of other species in that group.
- To help guide strategic decisions about how much of what habitat conservation actions are needed where to sustain populations
Case study: 
*Designing Sustainable Landscapes*

University of Massachusetts Amherst

• One of the first North Atlantic LCC science projects (initiated 2010)

• Developing a modeling framework and decision support tools for conservation, management, and restoration given current conditions and future forecasts

• In 2012, expanded from 3 pilot areas to full Northeast
Engaging Managers in Designing DSTs

In three pilot areas:

Three workshops, October 2012:

- Increase understanding among conservation decision makers
- Actively involve potential users to make decision support tools relevant and useful
- Begin a long-term collaboration on shared conservation efforts across a broad landscape

Pilot study areas

Stakeholder Outreach and Science Planning Meeting, January 2013
Assess the capability of current and potential future landscapes to provide integral ecosystems and suitable habitat for a suite of representative species, and provide guidance for strategic habitat conservation.

Landscape Change Assessment Design = LCAD Model
The Designing Sustainable Landscapes Team

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The Designing Sustainable Landscapes Project

Phase I, 2012
• Kennebec, middle Connecticut, and Pocomoke/Nanticoke watersheds

Phase II, 2014
• 13 northeastern states
The LCAD model

Ecological Settings

Abiotic:
• Temperature (2)
• Energy (1)
• Moisture & hydrology (3)
• Chemical & physical substrate (3)
• Physical disturbance (2)

Vegetation:
• Potential dominant life form
• Above-ground biomass
• Tree diameter (qmd)
• Stem density

Anthropogenic:
• Traffic
• Development (2)
• Impervious
• Barriers (2)
Drivers:
• Urban growth
• Sea level rise
• Natural disturbance
• Anthro. disturbance

Scenarios:
• SRES
• Other uncertainty

Ecological Settings
Succession
Hydrology
Fish

Landscape Change
Drivers:
- Urban growth
- Sea level rise
- Natural disturbance
- Anthro. disturbance

Scenarios:
- SRES
- Other uncertainty

Succession

Ecological Settings

Fish

Hydrology

Species

Ecosystems

Landscape Change

Climate-habitat capability index

Index of Ecological Integrity (IEI)

Landscape Assessment
Drivers:
- Urban growth
- Sea level rise
- Natural disturbance
- Anthro. disturbance

Scenarios:
- SRES
- Other uncertainty

Succession

Ecological Settings

Drivers:
- Urban growth
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Species
- Climate-habitat capability index

Ecosystems
- Index of Ecological Integrity (IEI)

Landscape Change

Fish

Hydrology

Landscape Assessment

Conservation scenarios

Landscape Design
Landscape Assessment

Drivers:
- Urban growth
- Sea level rise
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Ecological Settings

Fish

Hydrology

Scenarios:
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Conservation scenarios

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Scenarios:
- SRES
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Conservation scenarios

Climate Change

Landscape Design

Landscape Assessment
Landscape change, SRES A2 scenario 2010 - 2080

Stochastic, dynamic landscape change simulation at 10-year intervals
Zone of Persistence = Persistent future habitat and suitable climate within the species’ current optimal area
Ecological Impact, 2080

Larger negative values indicate effective loss of ecological integrity between current and future timesteps.
Case study: Designing Sustainable Landscapes
University of Massachusetts Amherst

Next Steps for Land Use/Land Cover

• Incorporate other major drivers (e.g. forest management)
• Incorporate forest age and structure, early successional and agricultural lands
• Track changes in land use/land cover?
• Compare to and increase consistency with LCC National Network
Project website:

www.umass.edu/landeco/research/nalcc/nalcc.html

- Overview
- Technical documents
- Data

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