NEW HAMPSHIRE EPSCoR

Linking Education, Research, and Economic Development
nhepscor.org

Alternative Land Cover Scenarios for Coastal NH & Potential Impacts on Ecosystem Services

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NH EPSCoR Track-1 Project
Interactions Among Climate, Land Use, Ecosystem Services, and Society

NSF Award #EPS-1101245

ECOSYSTEMS + SOCIETY

Coastal NH Climate Summit: Science to Support Action

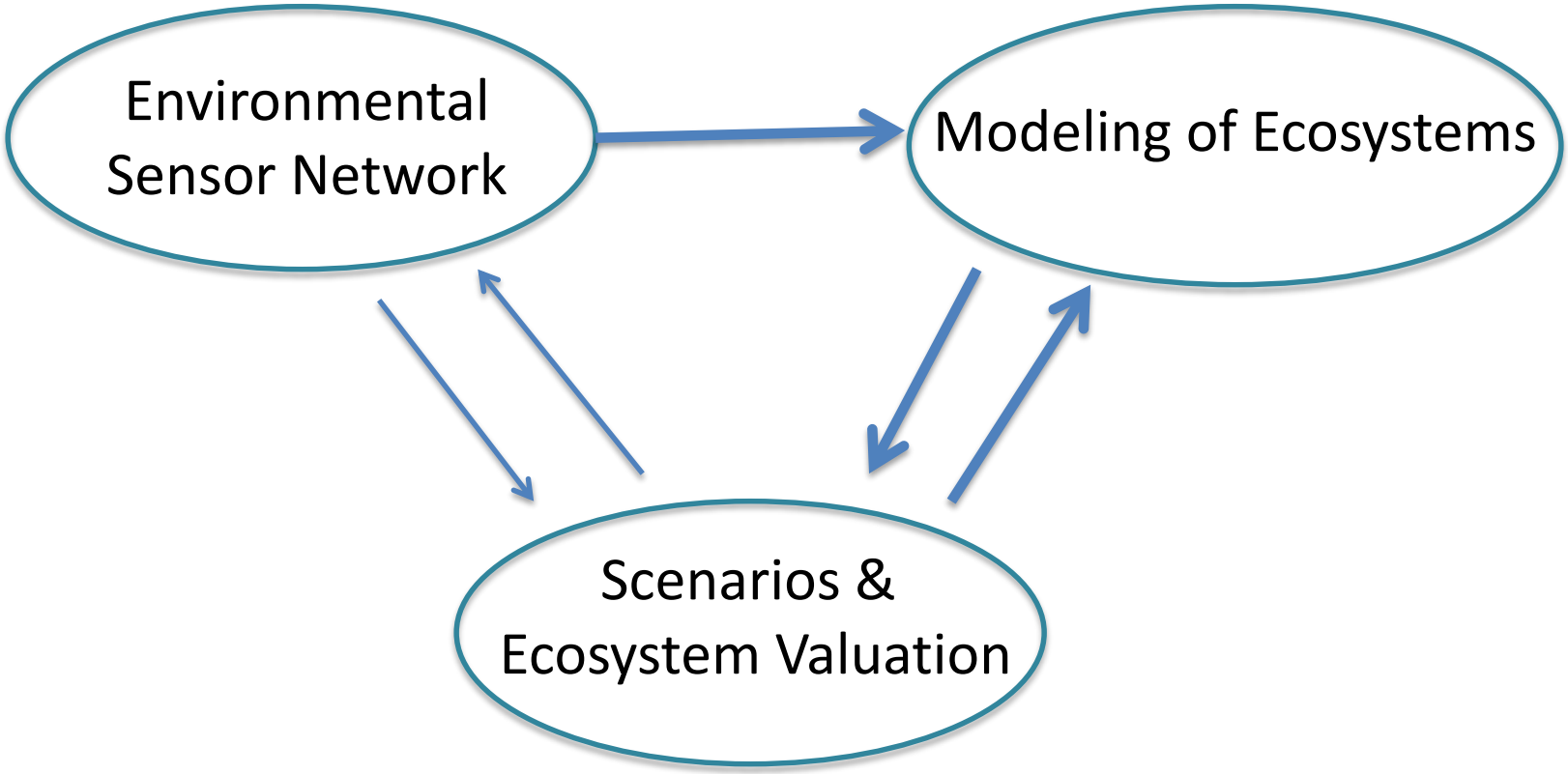
19 June 2015, Greenland NH

University of New Hampshire
Plymouth State University
Keene State College — Wisdom to make a difference.
UNH Manchester
Saint Anselm College
Granite State College — University System of New Hampshire
Dartmouth College
Great Bay Community College
White Mountains Community College

ECOSYSTEMS + SOCIETY

Interactions Among Climate, Land Use, Ecosystem Services, and Society

Research Objective: Better understand New Hampshire's dynamic ecosystems and characterize stakeholder attitudes and values for the services they provide (current & future).



http://www.epscor.unh.edu/ Data Discovery Center:http://epscor-ddc.sr.unh.edu

ECOSYSTEMS + SOCIETY

New Hampshire Land Cover Scenarios

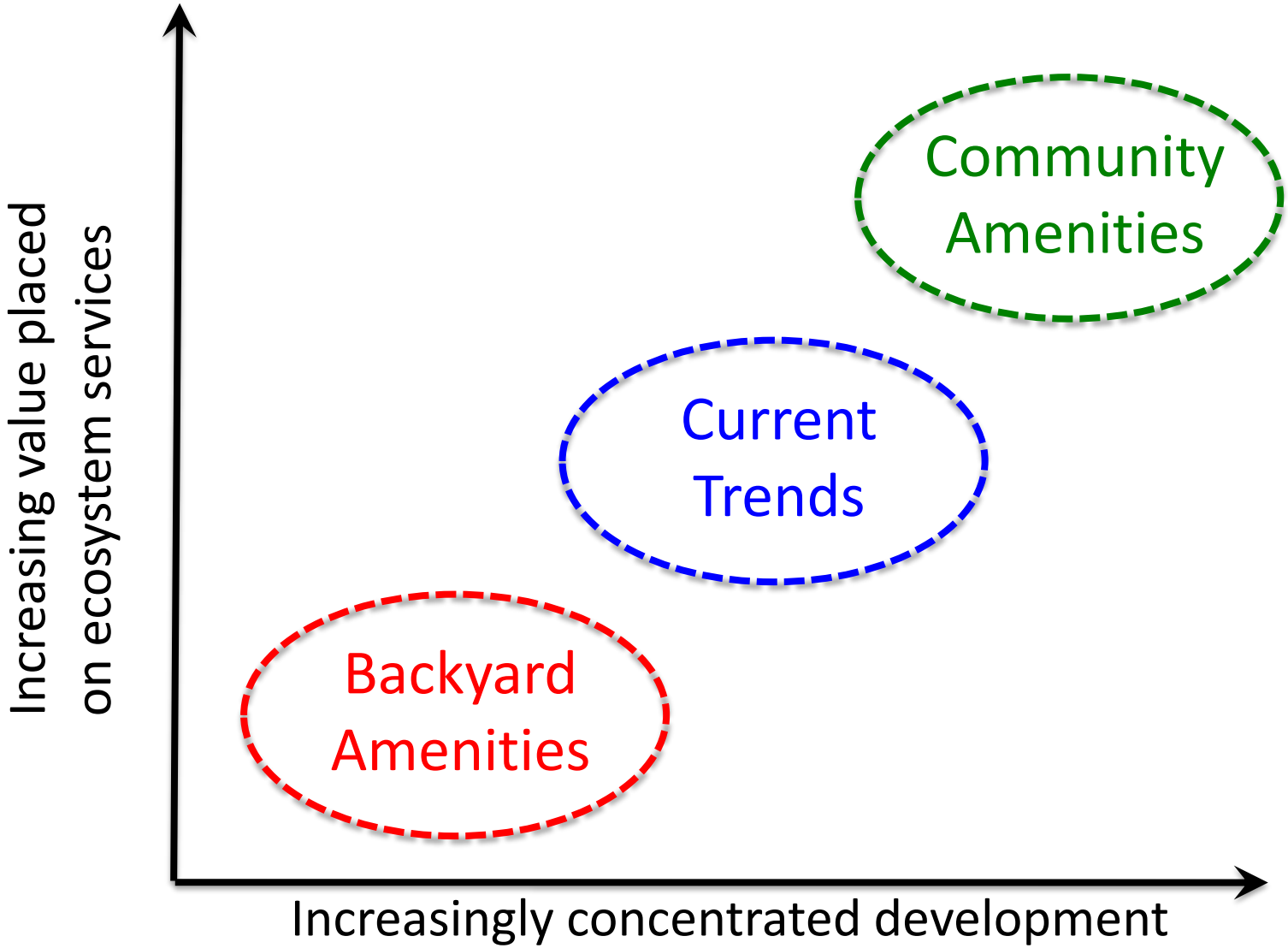
- Produce narrative descriptions and MAPS of land cover
- Range of *possible* future conditions
- Reflect key informant perspectives & existing plans/visions
- Maps provide boundary conditions for process models

Backyard Amenities

Current Trends

Community Amenities

Community Amenities with Ag



Additional considerations: population, economic development, policies & behavior, transportation, water & sewer, conserved land & wetlands, energy, regional variability.

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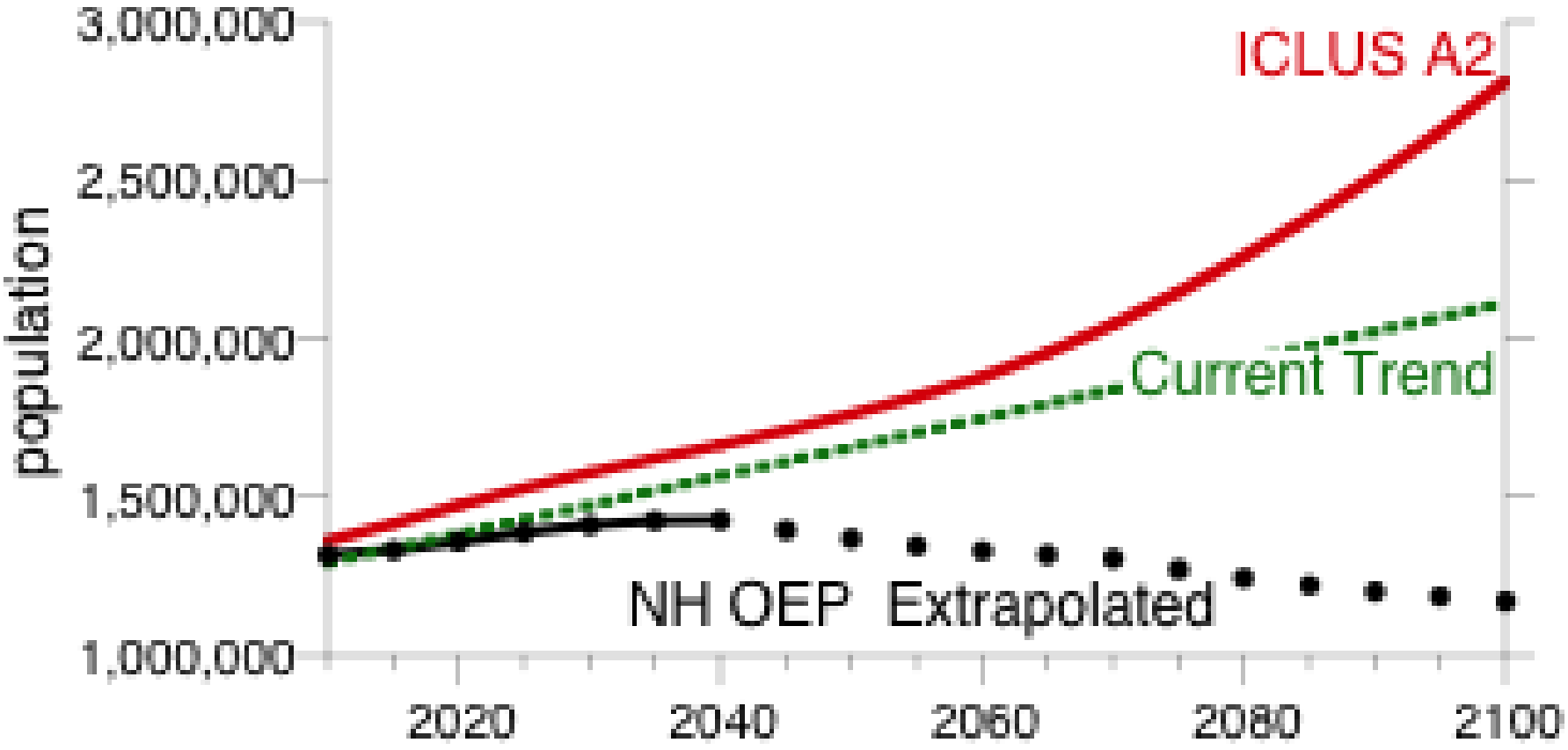
New Hampshire Population Projections



ICLUS A2: Bierwagen et al., 2010, PNAS 107;
US EPA 2009: http://cfpub.epa.gov/ncea/global/recordisplay.cfm?deid=203458
NH OEP: RLS Demographics (2013) http://www.nh.gov/oep/data-center/population-projections.htm

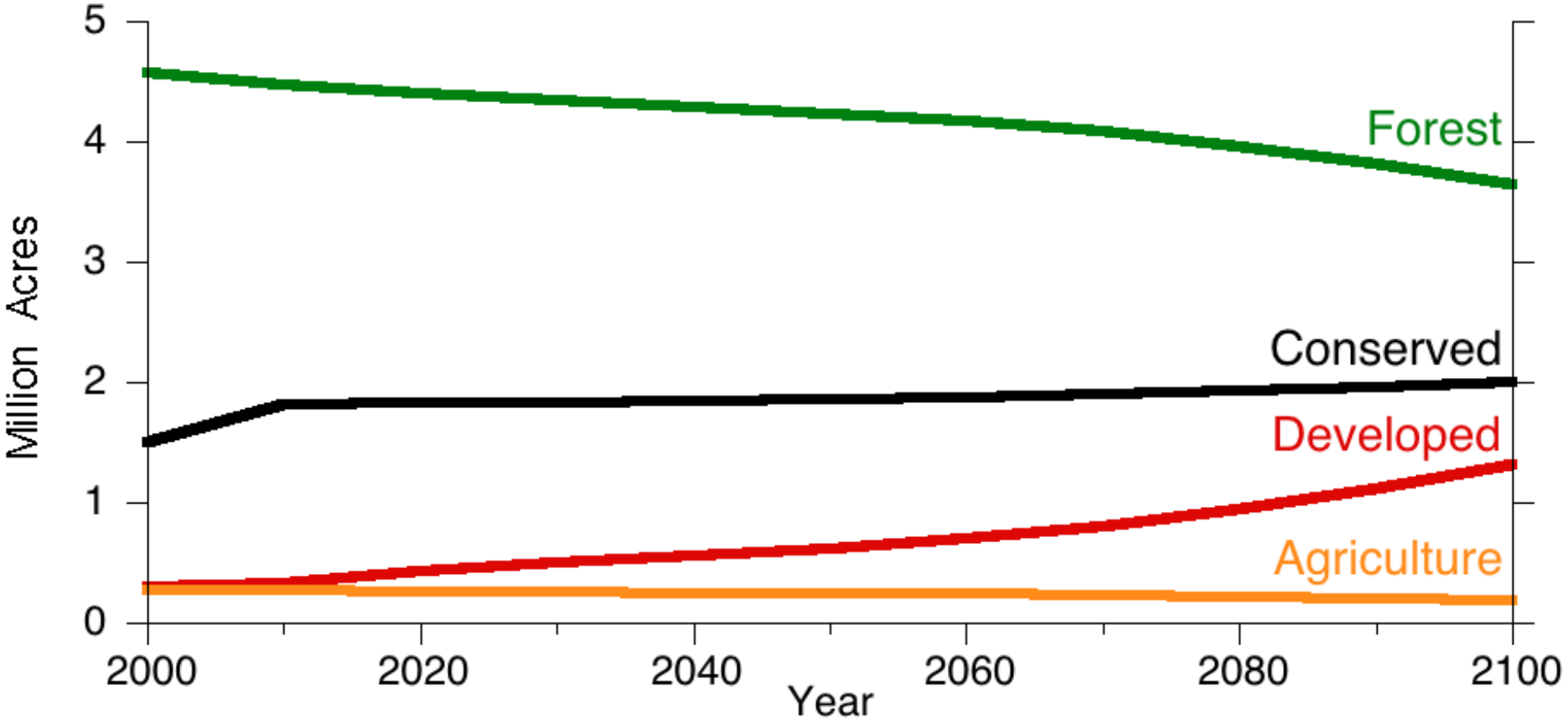
ECOSYSTEMS + SOCIETY

Backyard Amenities (Dispersed)

- Characterized by high population increase, robust economic growth, weak regulatory environment.
- Developed lands expand to accommodate population growth, primarily in single family homes on large lots. New houses concentrated in southeast, and along Interstates 93 & 89.
- Forested land decreases primarily via liquidation harvests. Forest management practices have less emphasis on ecosystem services.
- Modest agricultural expansion is eventually offset by loss to development.
- Number of wells & septic system expand; public water and sewer infrastructure do not expand.
- Increase in roads and traffic.

ECOSYSTEMS + SOCIETY

Backyard Amenities (Dispersed)



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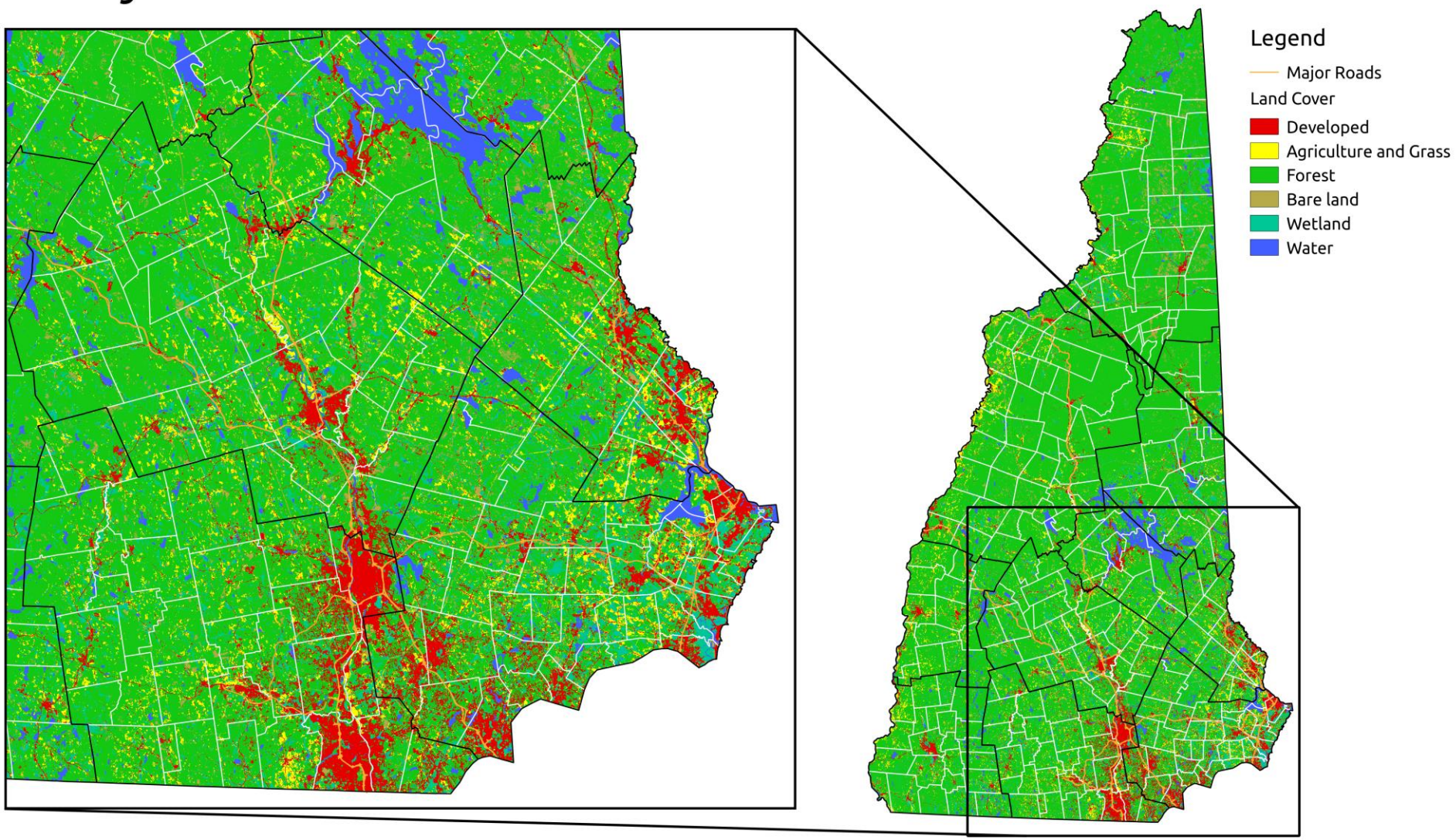
Backyard Amenities (Dispersed)



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Community Amenities (Concentrated)

ECOSYSTEMS + SOCIETY

- Characterized by strong regulatory environment; economic growth takes place within in-fill and redevelopment of urban cores and village centers.
- Population is accommodated higher density residential dwellings
- No existing forest or ag land is developed
- Policies at both state and local levels support conservation and management of land and forests for their multiple uses and ecosystem services.
- Modest agricultural expansion
- Investment in public water and sewer infrastructure
- Expansion of public and non-motorized transportation

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Community Amenities (Concentrated)

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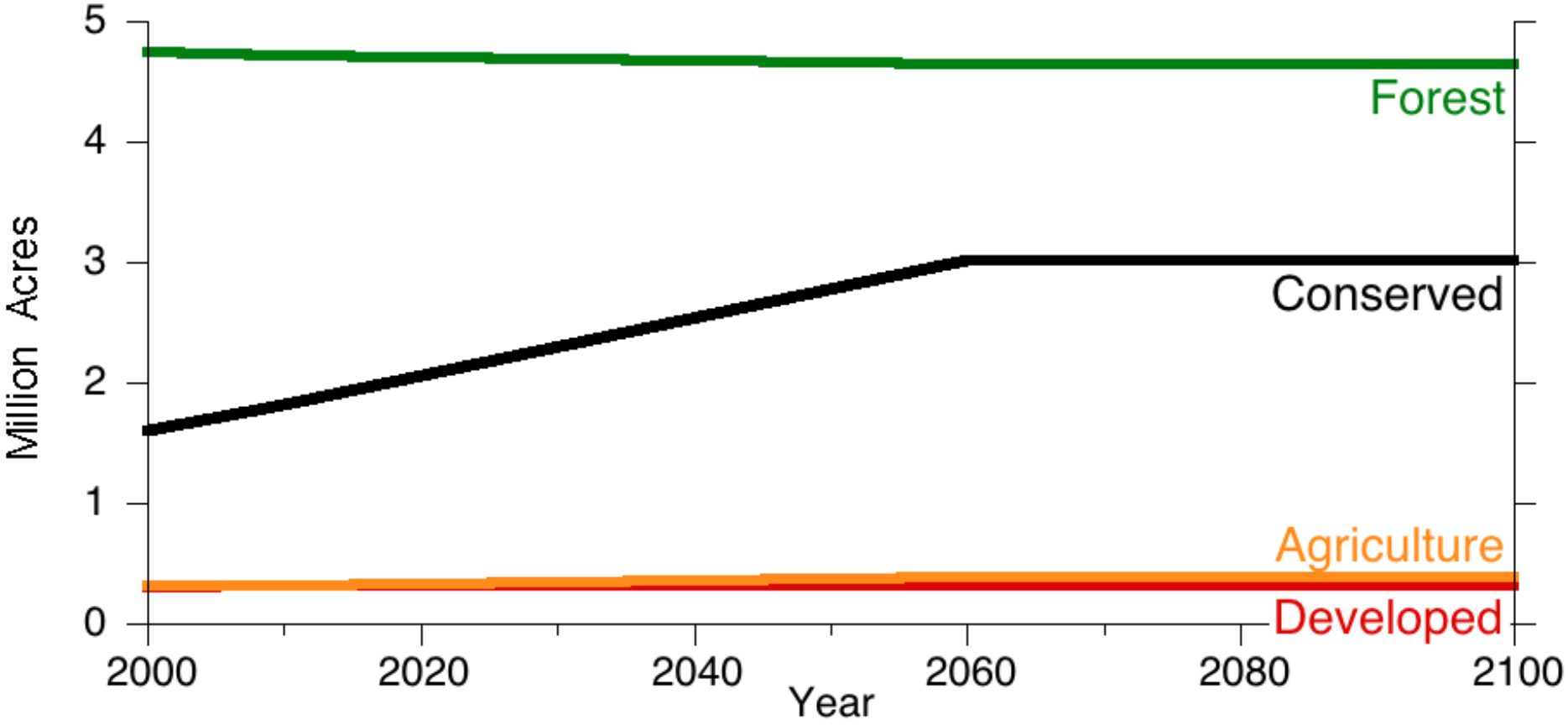

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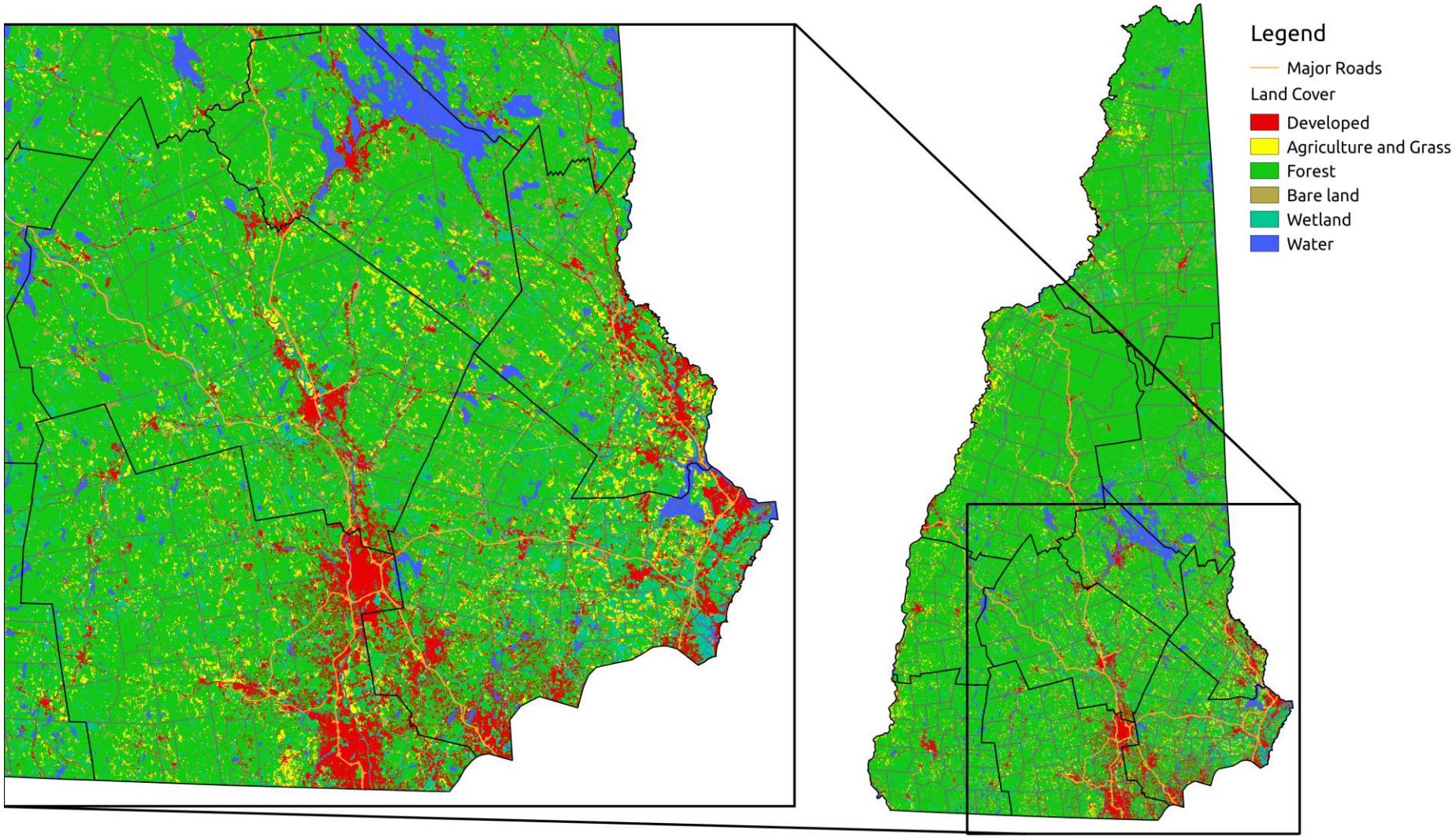
Community Amenities (Concentrated)

Community Amenities: 2010 - 2100



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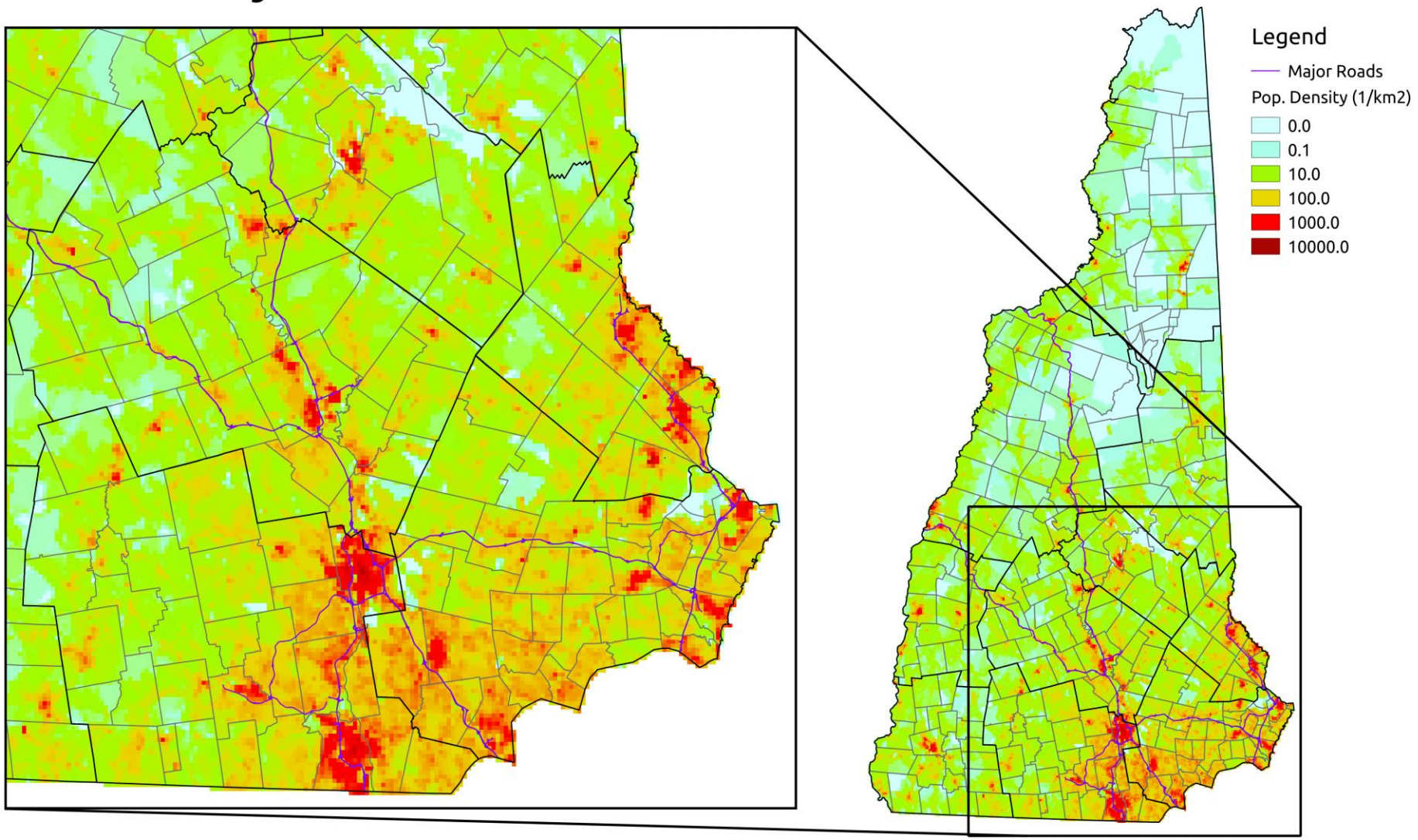
Community Amenities Population Density



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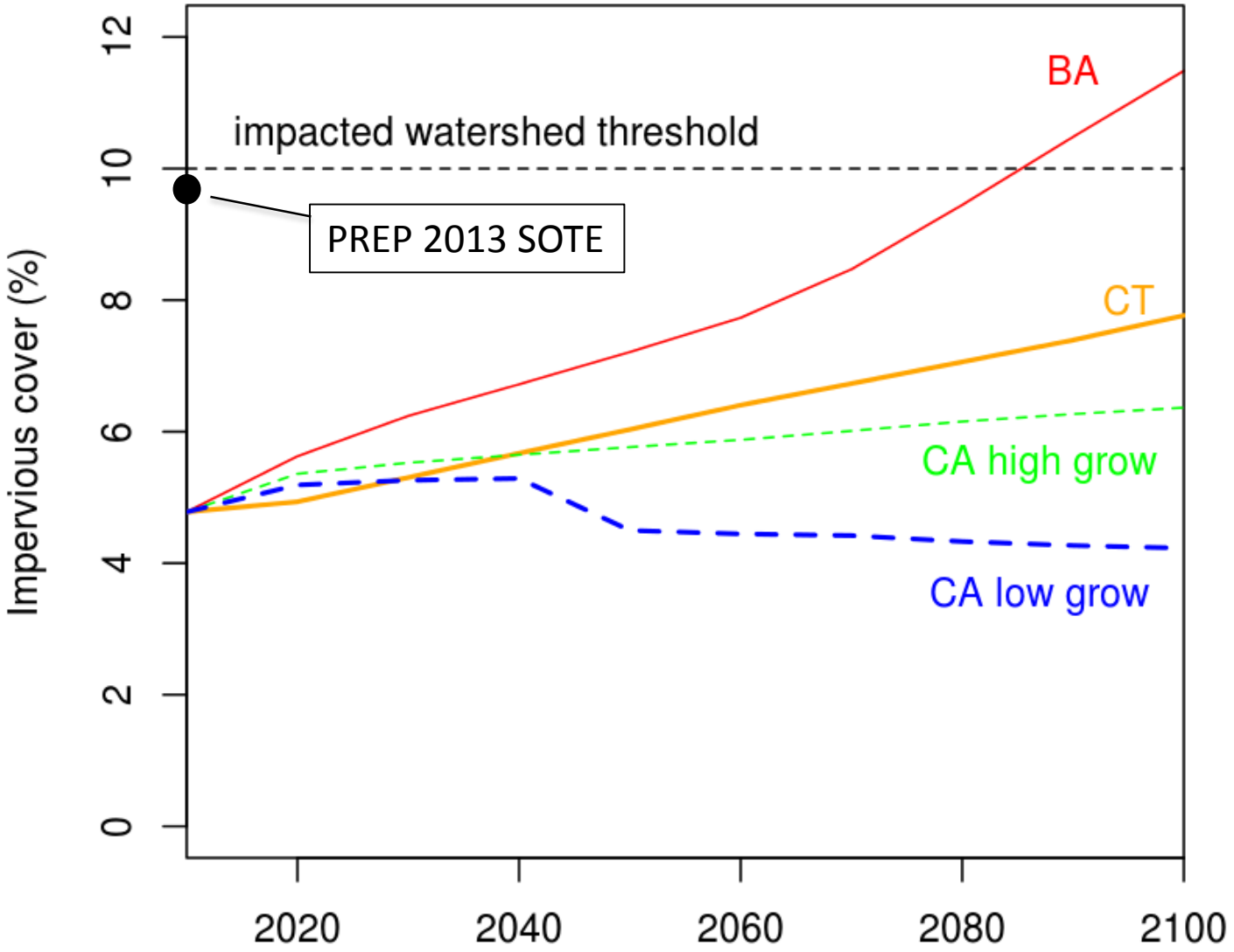
ECOSYSTEMS + SOCIETY

Projected Changes in Impervious Cover in Great Bay Watershed



ECOSYSTEMS + SOCIETY

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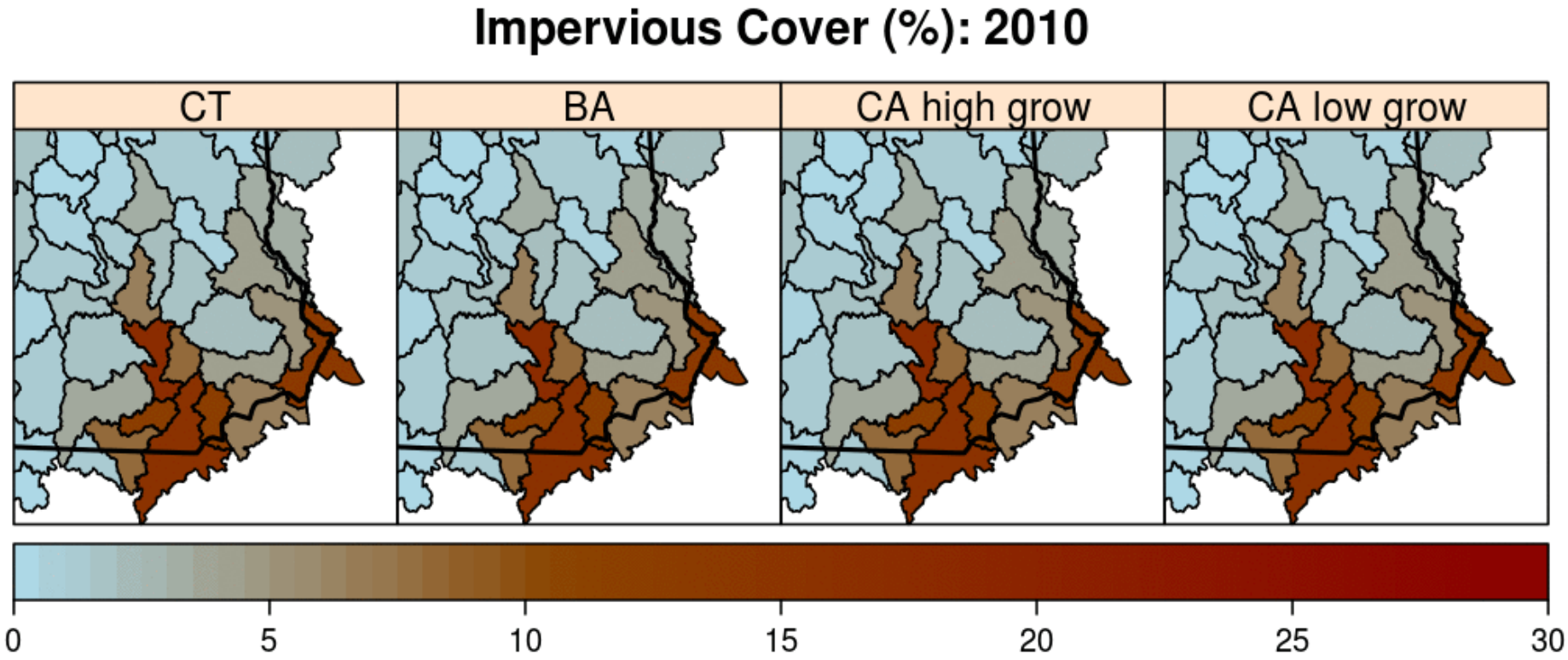

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Land Cover Scenarios – Next Steps

- MAPS provide boundary conditions for models
  - FrAMES, PnET, LANDIS, WRF
- Translate qualitative descriptions into model inputs
  - Narratives → Scenarios → Models
- Feedback from Stakeholders
  -Hopes & expectations? Range of possibilities?

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Scenarios

"Scenarios are a tool for ordering one's perceptions about alternative future environments in which one's decisions might be played out."

"Alternatively: a set of organized ways for us to dream effectively about our own future."

"Scenarios are *not* predictions."

Schwartz (1991) The Art of the Long View. Doubleday

ECOSYSTEMS + SOCIETY

Interactions Among Climate, Land Use, Ecosystem Services, and Society

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ECOSYSTEMS + SOCIETY

Prediction vs. Projection

Prediction

Conveys a sense of certainty

Can be used to design specific response strategies

Probability can be assigned

Projection

Associated with possibility of something happening - given a set of plausible, but not necessarily probable, circumstances

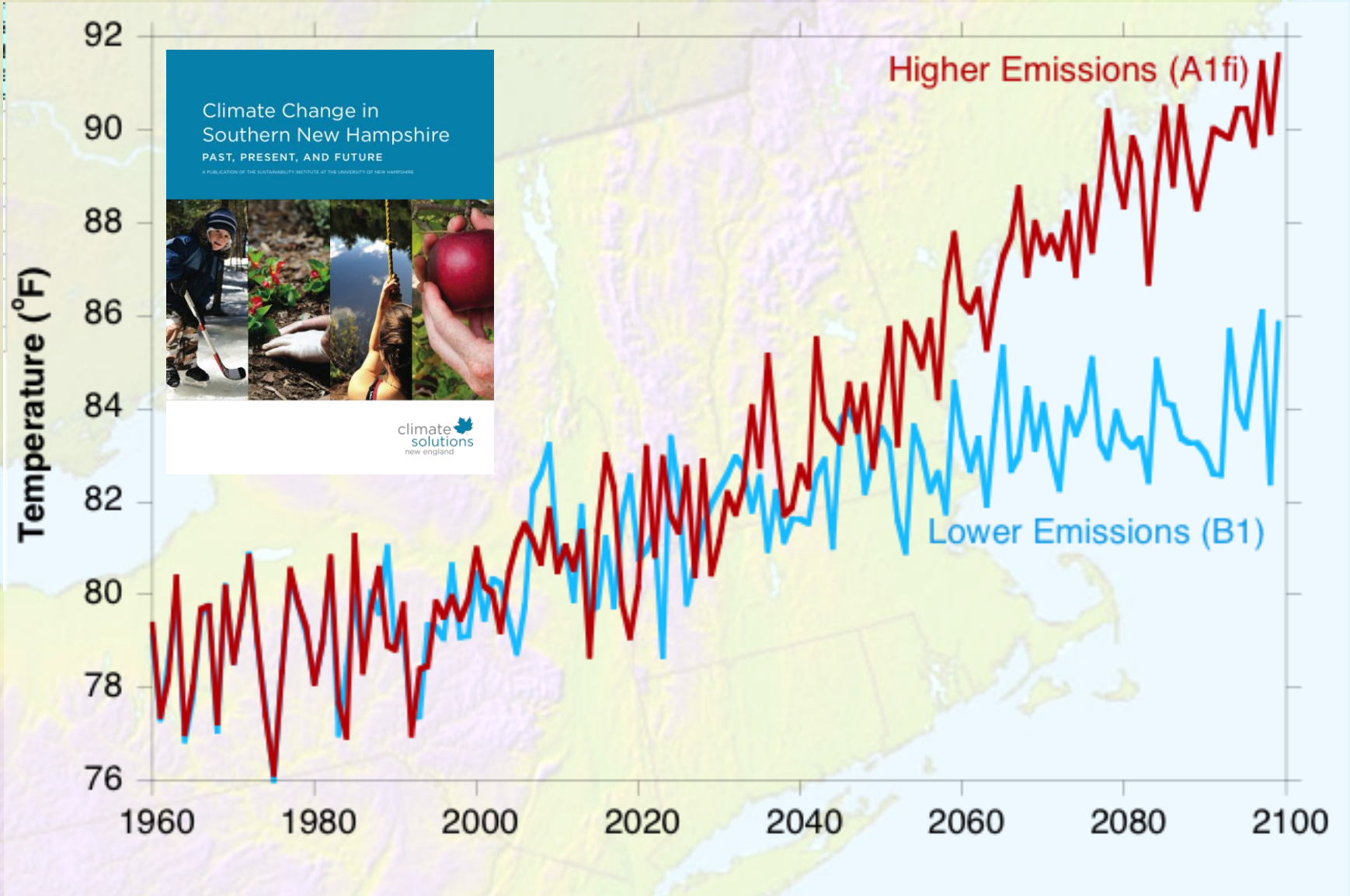
Provide a range from which to consider a range of response strategies

Forcing scenarios are an educated guess, without an associated probability (i.e. NOT *probable*, but merely *possible*)

Bray and von Storch (2007) Prediction of Projection? The Nomenclature of Climate Science. *Science Communication* 30(4), 534-543.

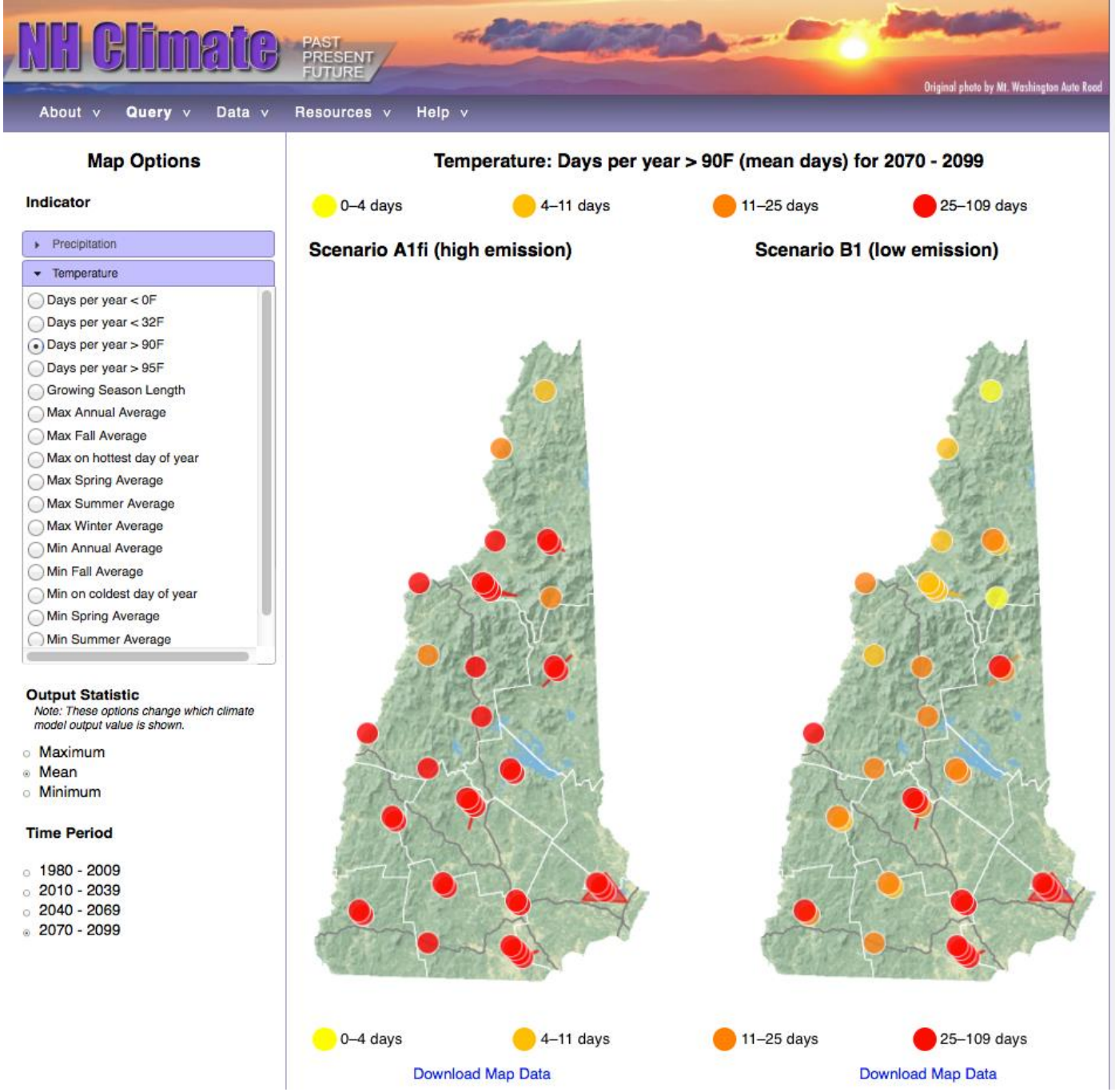
Southern NH: Average Summer MAXIMUM Temperature 1960-2099

Average of statistically downscaled simulations from 4 GCMs



Climate Change in Southern NH: Past, Present, and Future (2014): http://www.climatesolutionsne.org

Data & Model Output available from: Data Discovery Center: http://epscor-ddc.sr.unh.edu



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NH Land Cover Scenarios
Key Informant Interviews

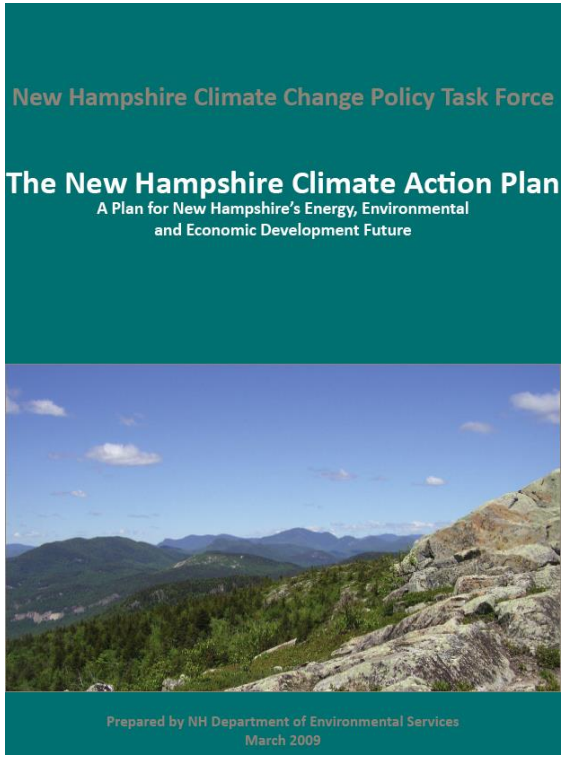
Interview Questions:

What would you **LIKE** New Hampshire to look like in 2-4 decades?

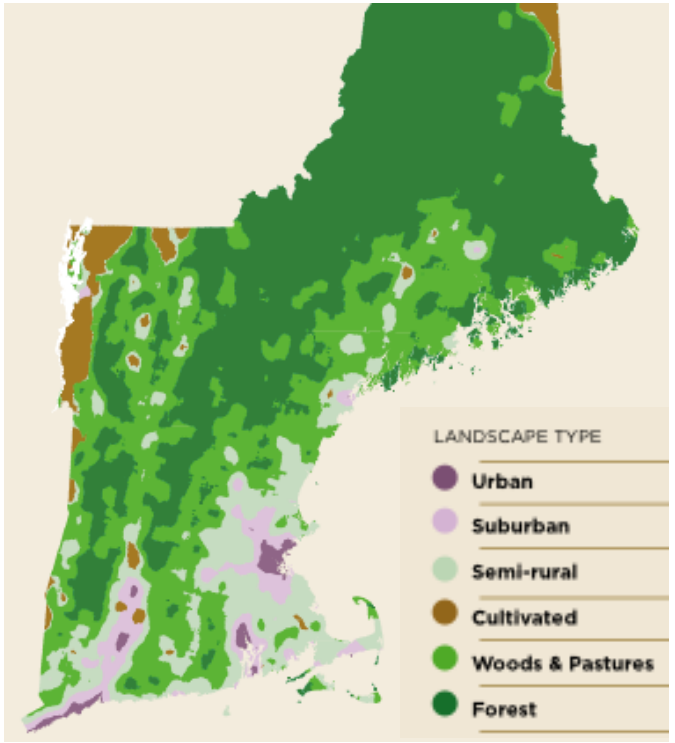
What do you **EXPECT** New Hampshire to look like in 2-4 decades?

Stakeholders	No.	Date	Sector
Neil & Louise Tillotson Trust Advisory Committee	10	Dec 2012	Mixed
NH Energy and Climate Collaborative	12	Jan 2013	Mixed
NH Water & Watershed Conference	30	March 2013	Acad&Con
NH EPSCoR Ecosystems & Society Team	50	March 2013	Acad&Con
NH EPSCoR Statewide Committee	12	March 2013	Mixed
Commissioners – Regional Planning Commission	9	June 2013	Gov
NH State Agencies (DES, HHS, DRED)	20	June 2013	Gov
Granite State Futures	20	Sep 2013	Gov
Society for the Protection of NH Forests – BoD	9	June 2014	Env
Society for the Protection of NH Forests – Staff	20	July 2014	Env
Nature Conservancy (NH) & Northern Forest Center	10	July 2014	Env
Innovative Natural Resource Solutions LLC	3	Aug 2014	Acad&Con; Timber
NH Home Builders Association	3	Aug 2014	B&I

NH Climate Action Plan



A New England Food Vision
Omnivores Delight



A Granite State Future
2013 Statewide Survey

96% view protecting water quality as a high priority

NH EPSCoR
Science & Technology Plan

An economic development focus on NH's innovation system . . .

ECOSYSTEMS + SOCIETY

Current Trends

- Characterized by linear extrapolation of trends from 1996 to 2011
- Growth in developed lands occurs primarily in southeast
- Forest subject to mosaic of different management practices
- Modest agricultural expansion
- Models investment in public water and sewer infrastructure
- Land continues to be conserved

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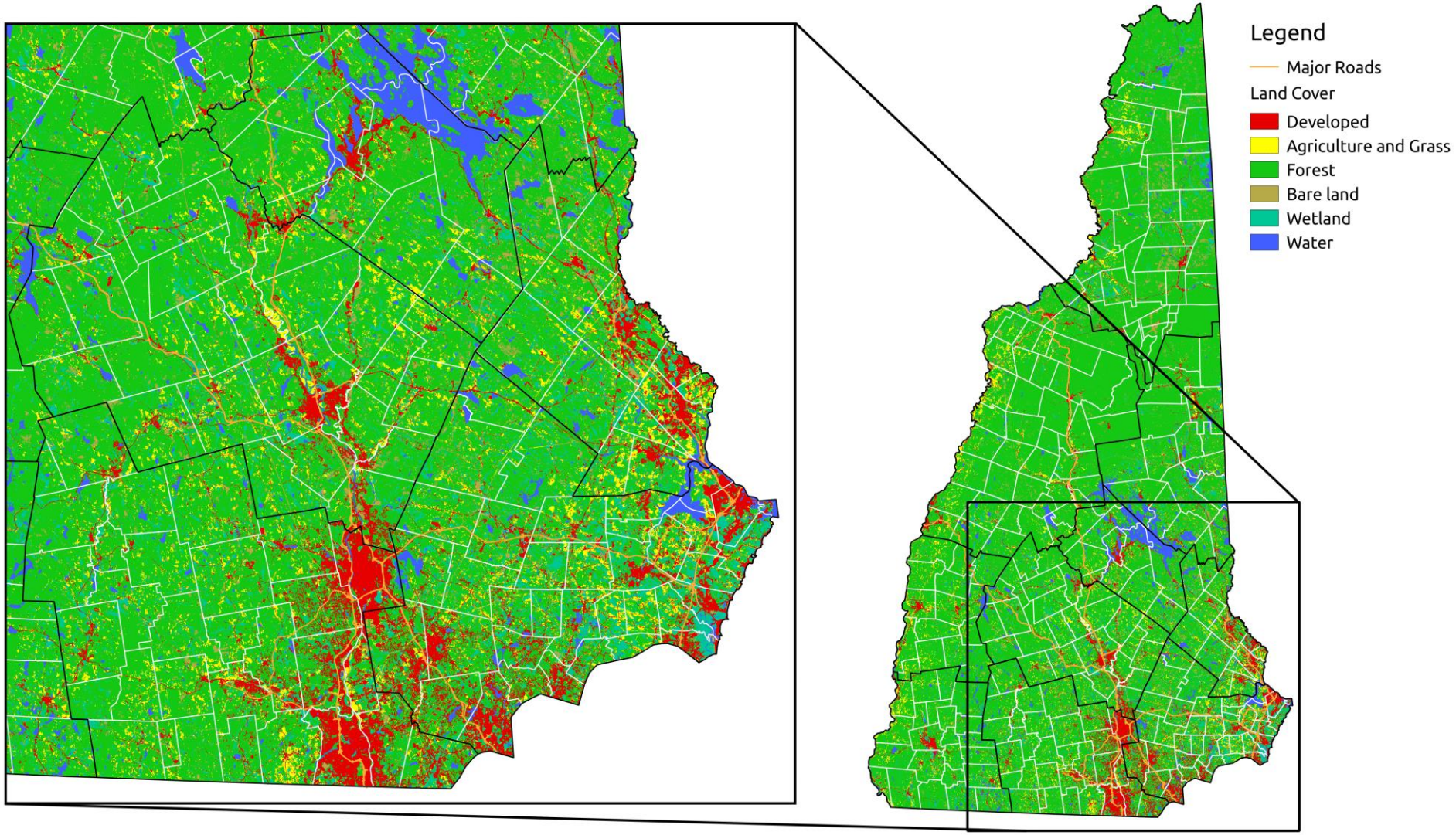
Current Trends

Current Trends: 2010



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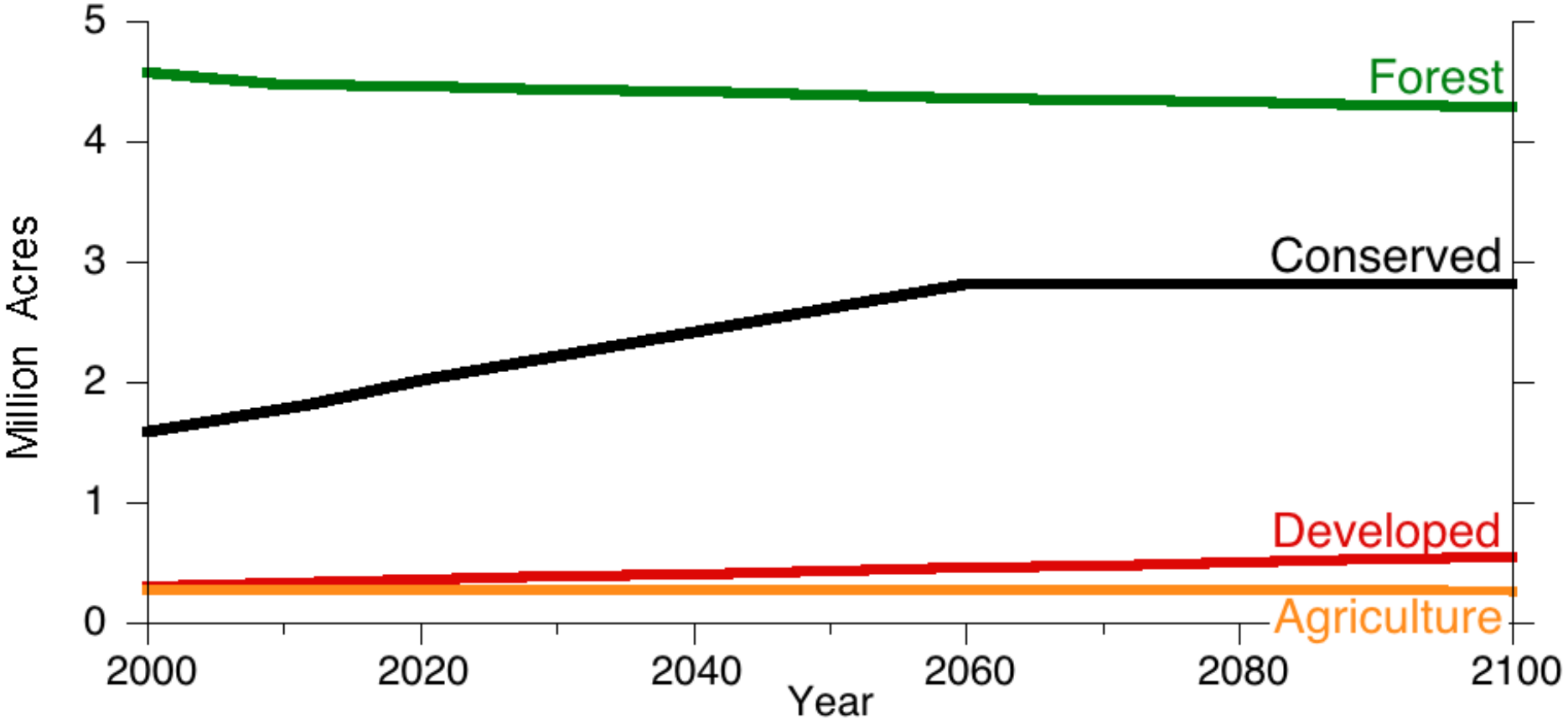
Current Trends



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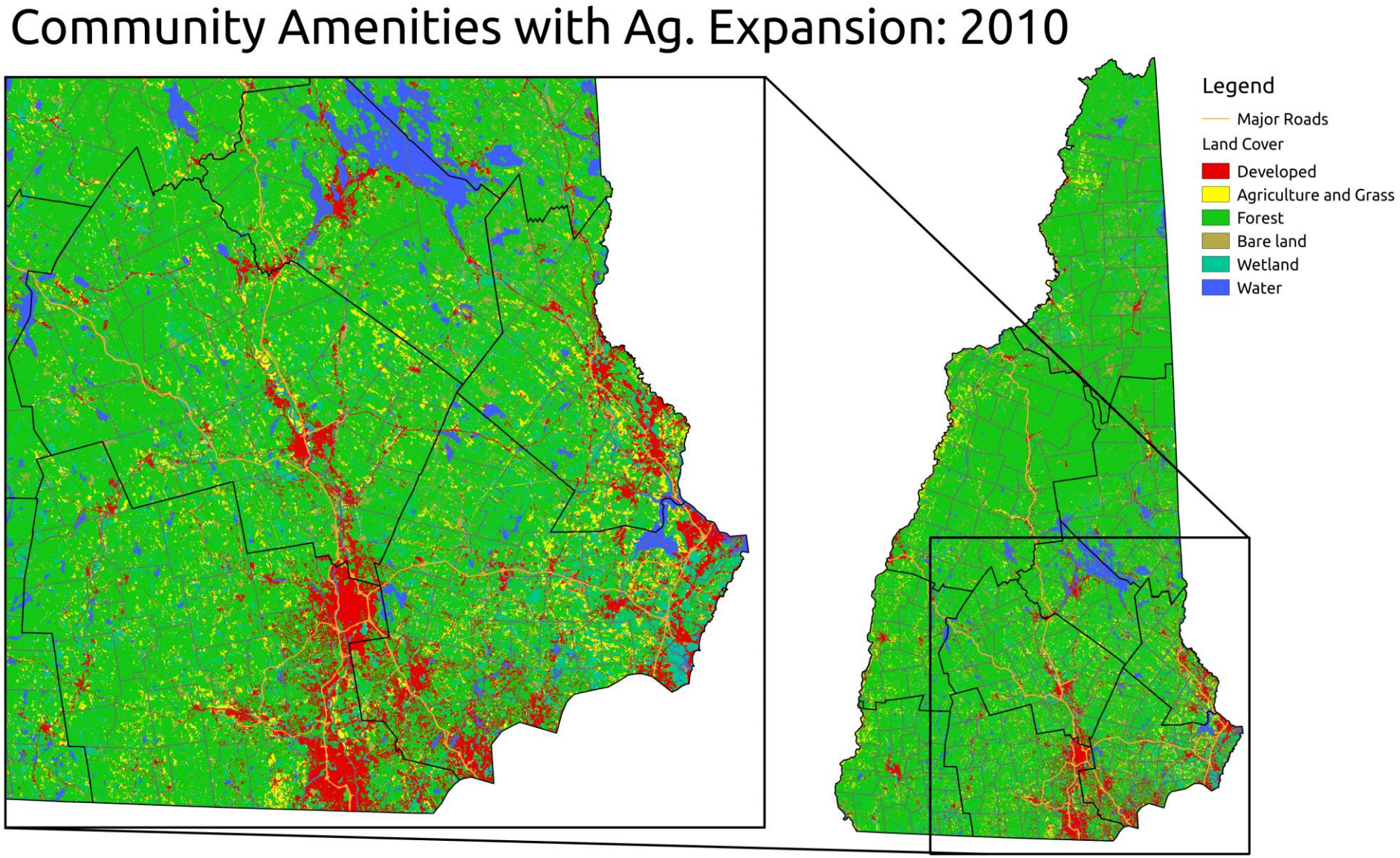
Community Amenities with Agricultural Expansion

- Development same as Community Amenities
- Area of agricultural land triples by 2060.
- Ag land managed to maximize ecosystem services and minimize environmental impact.
- Forest area decreases 12% from 4.7 to 4.1 million acres by 2060.
- Forestry management shifts toward maximizing wood production, and increased carbon storage, habitat connectivity, and habitat diversity.
- Efforts to avoid erosion and negative impacts on rivers and lakes are emphasized.

Community Amenities with Ag Expansion



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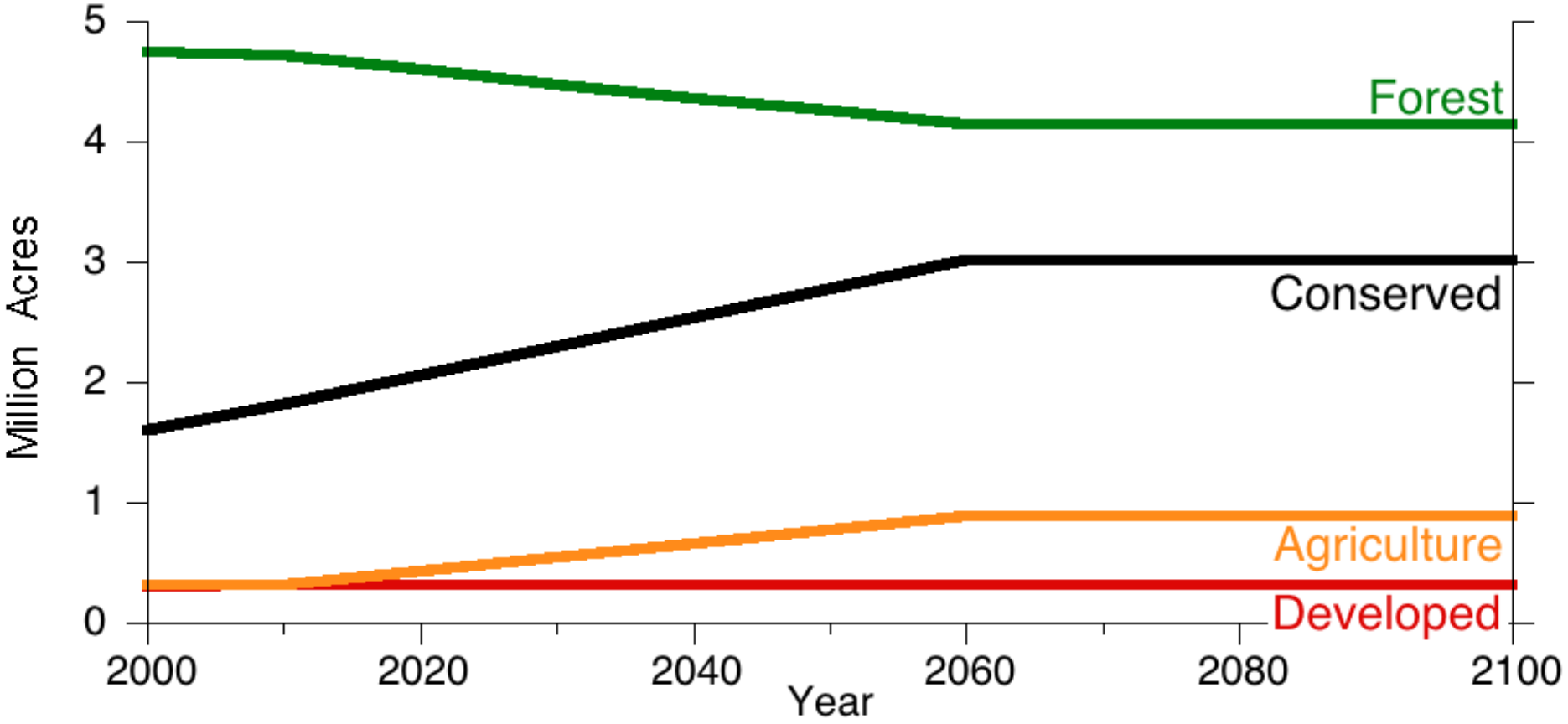

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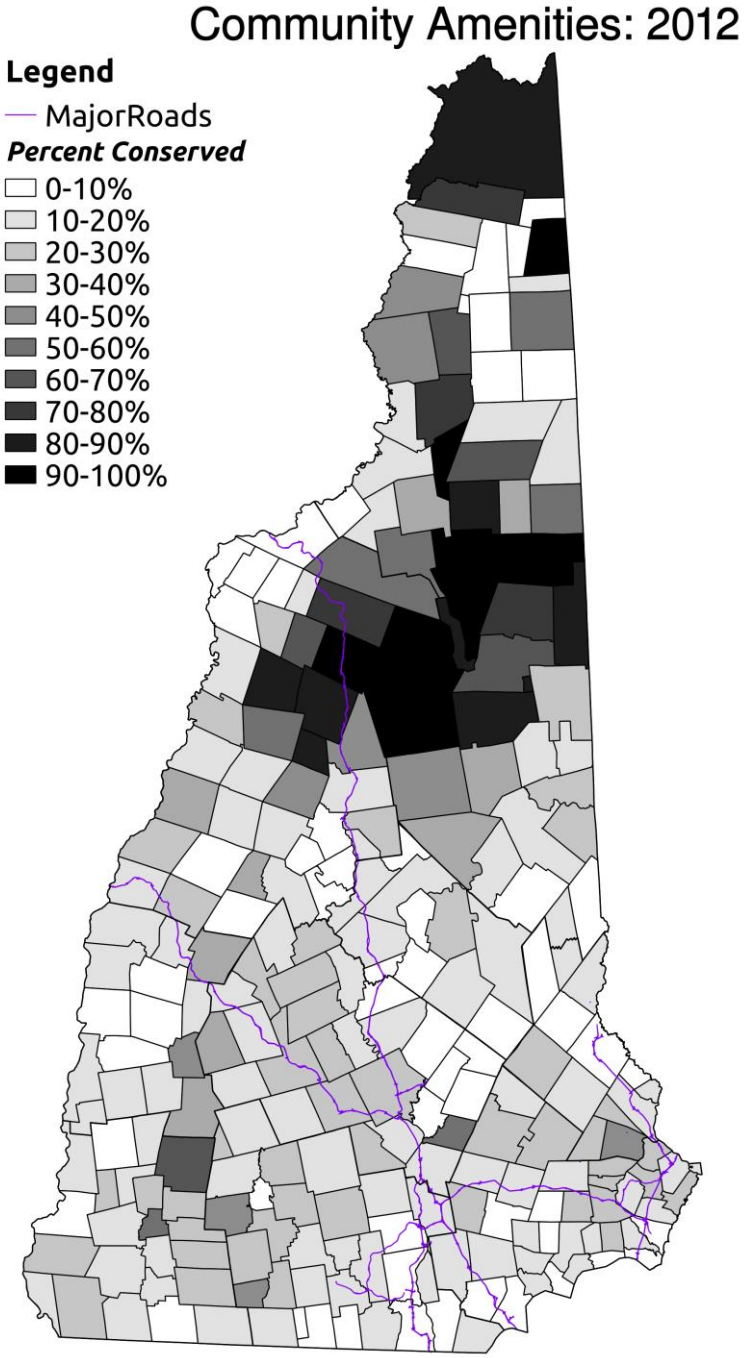
Community Amenities (Concentrated)

Conserved Land



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