

FACT SHEET 4: LAND COVER SCENARIOS

New Hampshire's Changing Climate, Land Cover, and Ecosystems

Given the significant challenges and uncertainties associated with predicting long-term changes in human activities, scenarios provide a framework for projecting long term changes in land cover and investigating potential impacts on ecosystems and the services they provide, such as clean water, food, wood for fiber, fuel, or timber; protection from flooding, climate regulation (via carbon storage and changes in surface reflectivity), recreational opportunities, and cycling of key nutrients such as nitrogen.

We have developed a suite of land cover scenarios for New Hampshire extending out to 2100 that span a continuum from spatially dispersed development with a low value placed on ecosystem services (*Backyard Amenities*) to concentrated development with a high value placed on ecosystem services (*Community Amenities* family).

BACKYARD AMENITIES

Rapid population growth across southern New Hampshire is combined with traditional zoning and a rollback of policies and practices to protect natural landscapes and ecosystem services. Financial incentives encourage landowners to make forested and agricultural land available for industrial parks and residential subdivisions. The primary form of land cover change is residential development on 1-2 acre lots. Housing development occurs primarily in the southeast and eventually spills northward along major highways (I-89 and 93; **Figure 1**). Conservation of forests and farmland is reactive, not proactive.

Residential development occurs primarily outside of urban cores where land costs are lower and municipal services lacking. Homes rely on wells and septic systems and the automobile is the primary form of transportation. The composition of undeveloped land remains similar to the present day, mostly forest with a small amount of agriculture (primarily hay and pasture).

LINEAR TRENDS

The *Linear Trends* scenario represents a future with economy, practices, and rates of change similar to those over the period from the 1990s to 2010. Preference for local control, resistance to policy change at the municipal level, and traditional business interests are counterbalanced by continued activity by the local and regional land trusts and a growing cultural value of protection of forests, farmland, and ecosystem services, producing a mixture of conventional development and expanding land conservation (**Figure 1**).

COMMUNITY AMENITIES

Policies and investment support conservation of land for working forests and agriculture and the growth of renewable energy. No additional land is developed beyond what is already developed. Instead, in areas with growing population, urban cores and village centers are redeveloped to accommodate expanding populations. Concentrated redevelopment facilitates expansion of public water and sewer.

Within the **Community** family, population growth and intensity of redevelopment differs between the *Large Community* (rapid population growth) and *Small Community* (relatively little change in population) variants, and land cover change outside

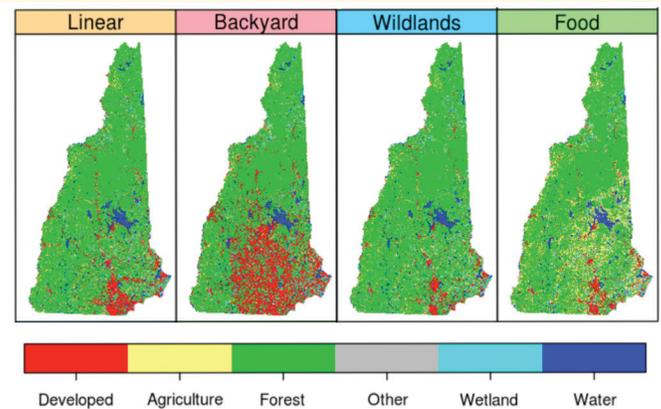


Figure 1. Scenarios for land cover in 2100. Maps are shown for the Linear Trends (Linear) scenario, the Backyard Amenities (Backyard) scenario, and two scenarios from the Community Amenities family: Protection of Wildlands (Wildlands) and Promotion of Local Food (Food) scenarios.

of developed areas differs between the *Food* (agricultural land area in New Hampshire more than quadruples in order to meet the target of supporting 50% of New England calories produced within New England) and *Wildlands* (nearly all undeveloped land remains as forest) variants (**Figure 1**).

Conservation of forests and farmland is strategic and proactive, with new conservation including rare habitats and corridors between existing conserved land. Forests and farmland are managed to maximize ecosystem services and minimize environmental degradation.

IMPLICATIONS

Impervious Cover (Figure 2): Statewide impervious cover more than doubles for the *Backyard* scenario, whereas there is only a very slight increase in the *Large Community* scenario. There is only a small difference in impervious cover between the *Large* and *Small* community scenarios, despite the large difference in population.

Conserved Land (Figure 3): Scenarios also produce contrasting results for land conservation, with only 750 km² of new land conserved in scattered fragments in the *Backyard* scenario, compared with 4,000 km² for the *Linear Trend* scenario, and 4,700 km² for the *Community Amenities* family. Despite similar

total land conservation between the *Linear* and *Community* scenarios, the spatial distribution is very different: new conservation in the *Linear* scenario is fragmented and haphazard, compared to the targeted and contiguous land conservation in the *Community* scenario.

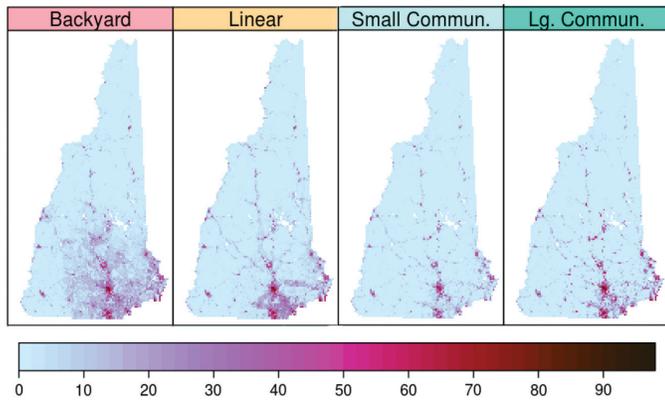


Figure 2. Impervious cover for the land cover and population scenarios with impervious cover shown as a percentage of each grid cell.

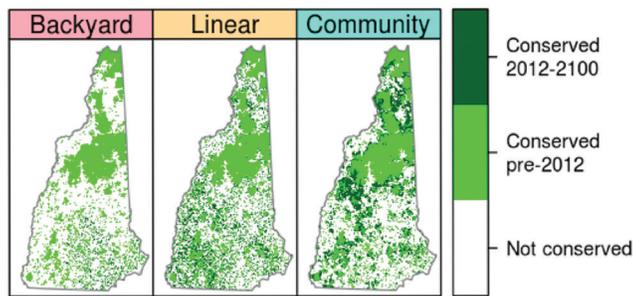


Figure 3. Scenarios for land conservation in 2100.

SUMMARY

We developed contrasting scenarios of plausible land cover futures for the state of New Hampshire. These land cover scenarios were used as input for NH EPSCoR terrestrial and aquatic ecosystem modeling (described in Fact Sheets 4, 5 and 6) and assessment of the future value of ecosystems (Fact Sheet 13), as well as new research on the human dimensions of land cover change (Fact Sheets 11 and 14).

METHODS

To develop land cover scenarios for the state of New Hampshire for 2020-2100, stakeholder input was elicited via key informant interviews with stakeholder groups from five sectors: environmental nonprofits, business and industry, timber interests, state agencies, and academics and natural resources management consultants. Stakeholders were prompted to describe what they *would like* and what they *expect* New Hampshire to look like two to four decades in the future. We combined themes from stakeholder responses with published plans, visions, and surveys to develop a suite of qualitative scenario narratives.

Maps of future land cover and conserved land for each scenario were then generated by quantifying the scenario narratives and simulating land cover change in decadal time steps starting with a base map of present land cover and conserved land. Focal land cover classes for identifying change were developed land, forest, and agriculture. Our maps also included wetland, surface water, and other land cover.

REFERENCES

- Thorn, A. and others (In Review).** New Hampshire Land Cover Scenarios: Part I. stakeholder engagement, scenario narratives, and land change simulation. *Ecology and Society*.
- Thorn, A. and others (In Review).** New Hampshire Land Cover Scenarios: Part II. Implications for habitat, watersheds and local food production. *Ecology and Society*.

ACCESS TO DATA: Data Discovery Center, ddc-landcover.sr.unh.edu

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