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### Nature-Based Municipal Flood Resilience and Conservation Priorities in New Hampshire's Coastal Watershed

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# NATURE-BASED MUNICIPAL FLOOD RESILIENCE AND CONSERVATION PRIORITIES IN NEW HAMPSHIRE'S COASTAL WATERSHED

Negotiating  
Conflicts Over  
Adaptive and  
Integrated Flood  
Management in  
New Hampshire's  
Watersheds



This project is supported by the USDA  
National Institute of Food and  
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Experiment Station Award  
#NH00651.



Great Bay Resource Protection Partnership Meeting  
September 10th, 2020

Lubberland Creek (credit: Jerry Monkman)

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SRPC, RPC, PREP, GBNERR



**University of  
New Hampshire**

# Land conservation - a non-structural approach to flood risk management

## Retention

Protect areas where floodwaters are stored to prevent inundation of downstream communities

## Prevention

Protect floodplains to avoid added risk from new construction and infrastructure



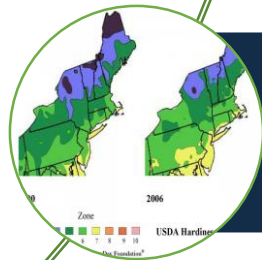
Adapt to the effects of sea-level rise



Reduce fluvial flooding



Reduce coastal storm surge flooding

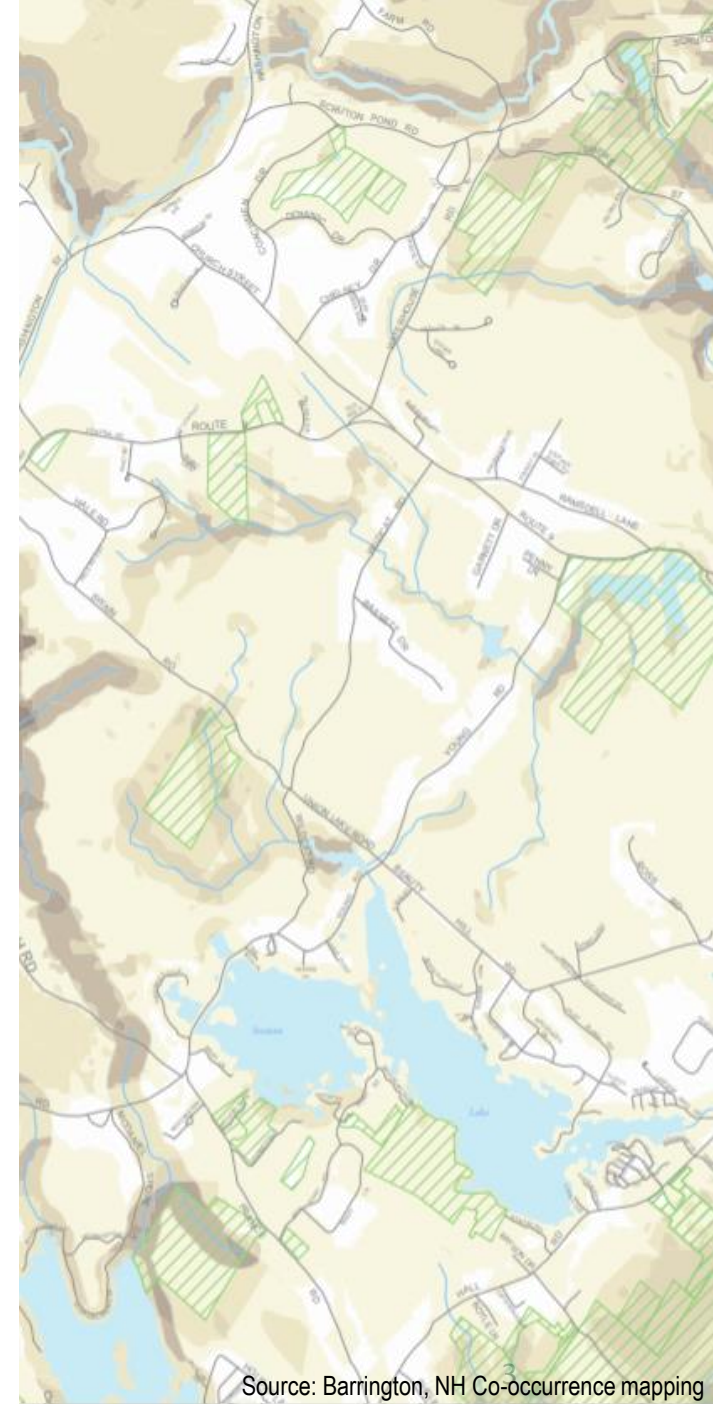


Mitigate climate change impacts



# How do NH municipalities implement land conservation to manage coastal and riverine flood risks?

- What kinds of land conservation criteria do municipalities use?
  - Is flood mitigation incorporated?
  - Are the criteria prioritized or ranked? By what process?
- What explains differences?
  - Who participated in developing/updating criteria?
  - What was the decision-making process?
  - Were the criteria informed by state, watershed, regional or other plans?



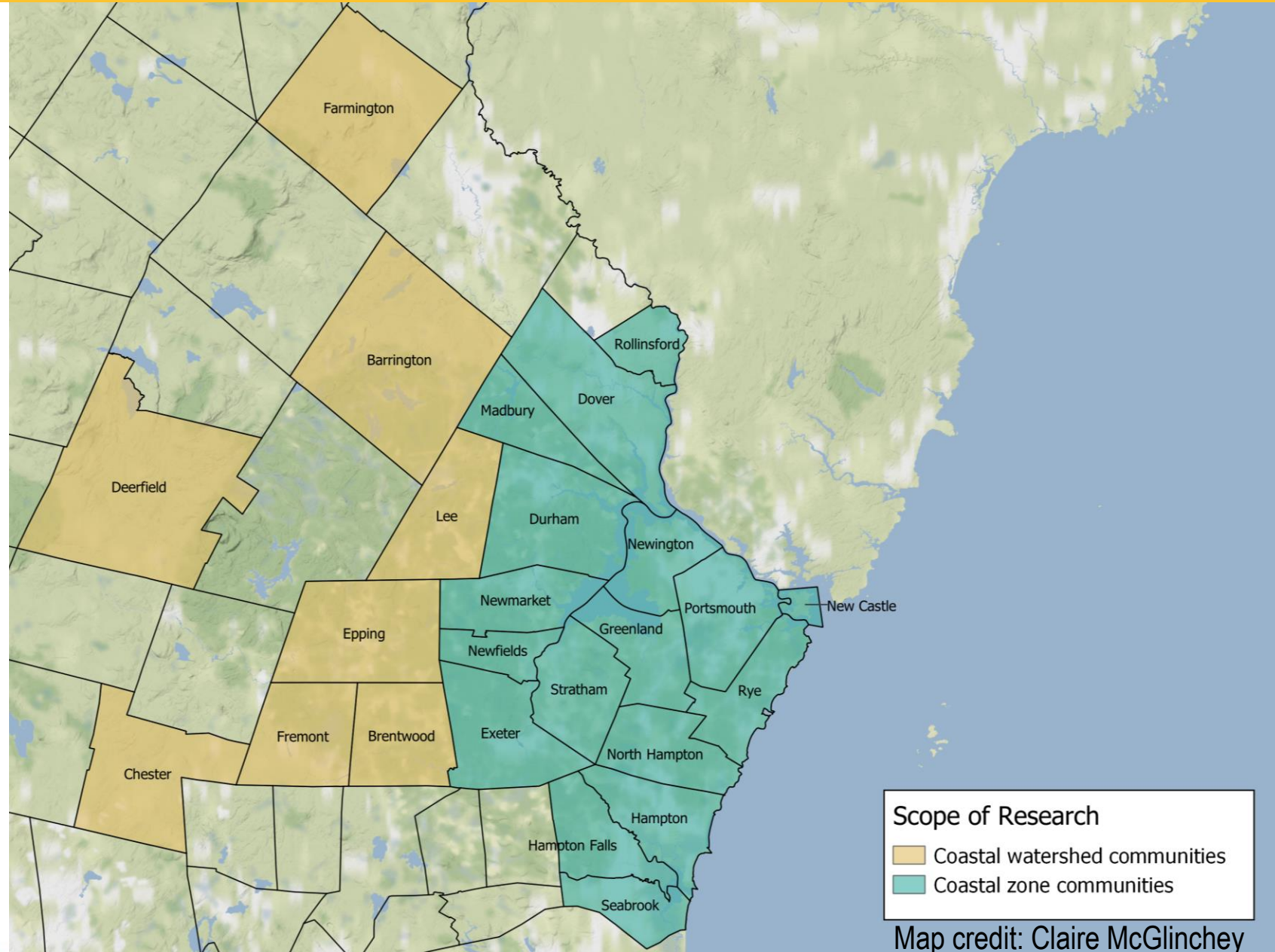
Source: Barrington, NH Co-occurrence mapping

# Data Sources and Methods: Semi-structured interviews



28 interviews with officials  
from 25 municipalities  
e.g. conservation  
commission chairs, town  
planners

Qualitative analysis of  
themes from research  
questions



Map credit: Claire McGlinchey



# Data Sources and Methods: Planning documents

## The Land Conservation Plan For New Hampshire's Coastal Watersheds

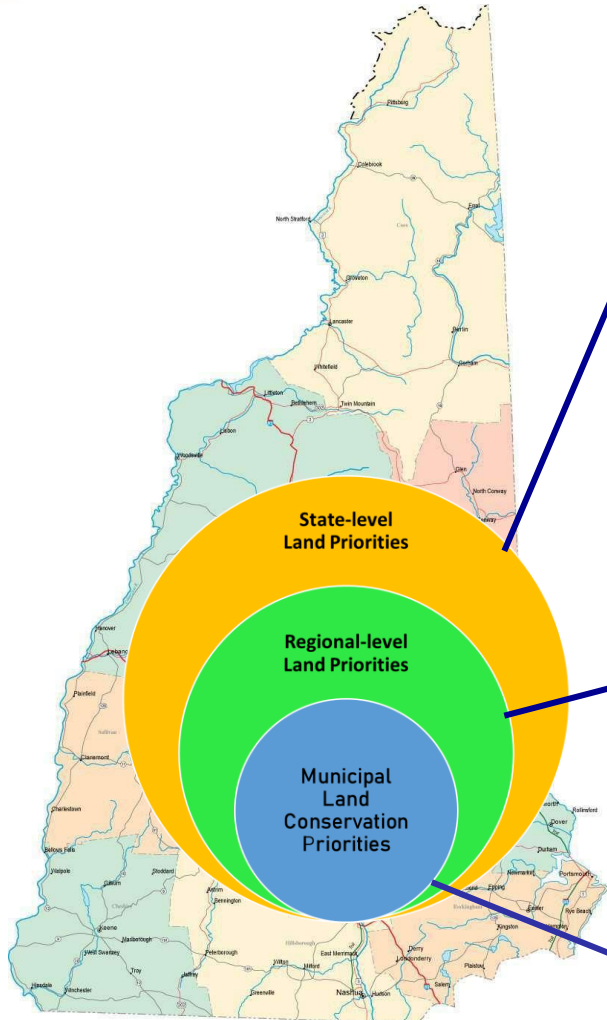
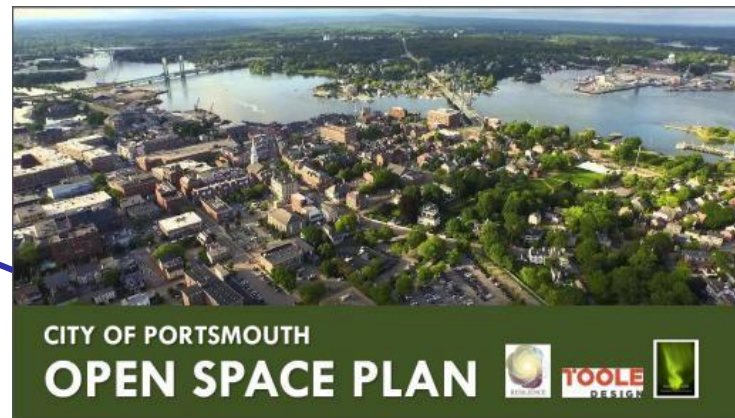
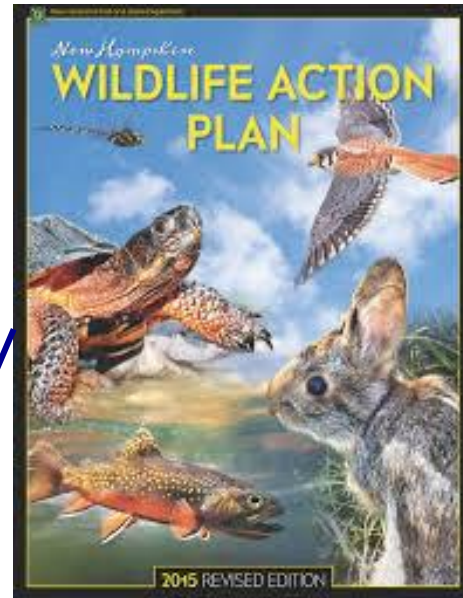


### Land Conservation Priorities for the Protection of Coastal Water Resources:

*A Supplement to The Land Conservation Plan for New Hampshire's Coastal Watersheds*

TECHNICAL REPORT

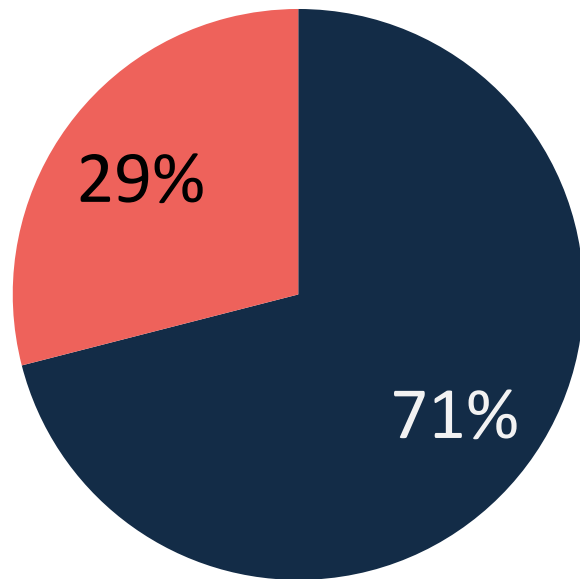
Prepared By



# Findings: Land conservation criteria on the books...and in practice

Does your municipality have selection criteria currently in use for land protection and conservation?

n= 24 municipalities



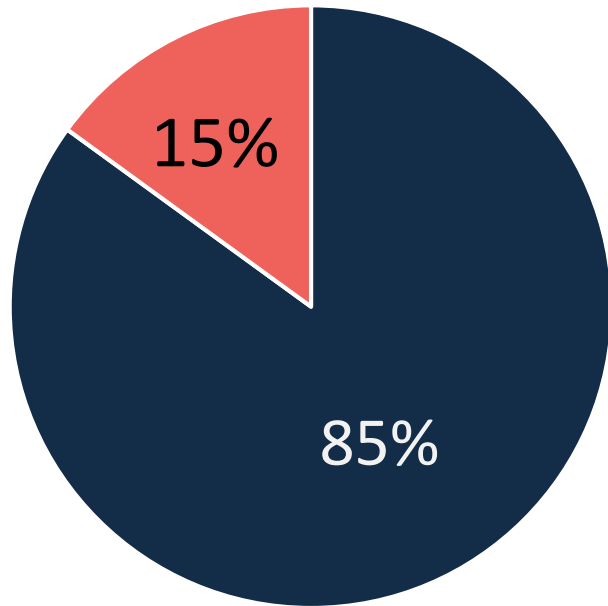
■ YES ■ NO

But...

- Land conservation criteria exist in municipal strategic documents for nearly all communities
- Potential disconnect between strategic planning and implementation

# Findings: Municipalities use very different kinds of land conservation criteria

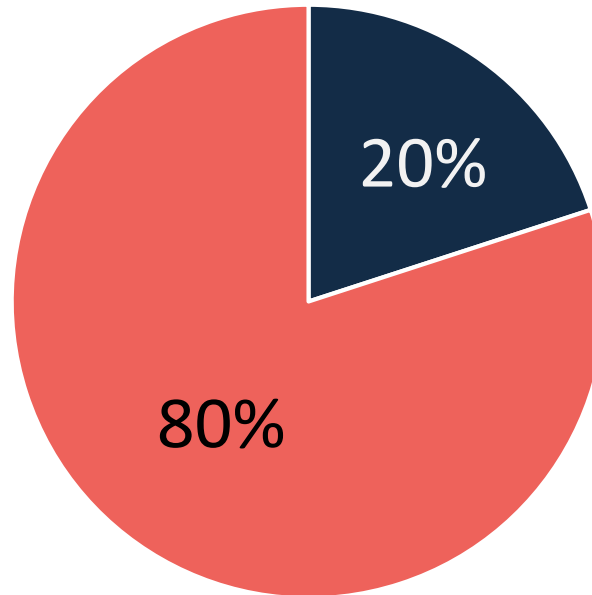
## Water Resources Protection



■ YES ■ NO

n = 20 municipalities

## Flood Mitigation



■ YES ■ NO



City of Dover Flood, 2007 (credit: City of Dover)

*"We have some conservation easement lands on the Cocheco River that flood whenever there's a flood...The fact that it's conserved helps maintain that natural area."*

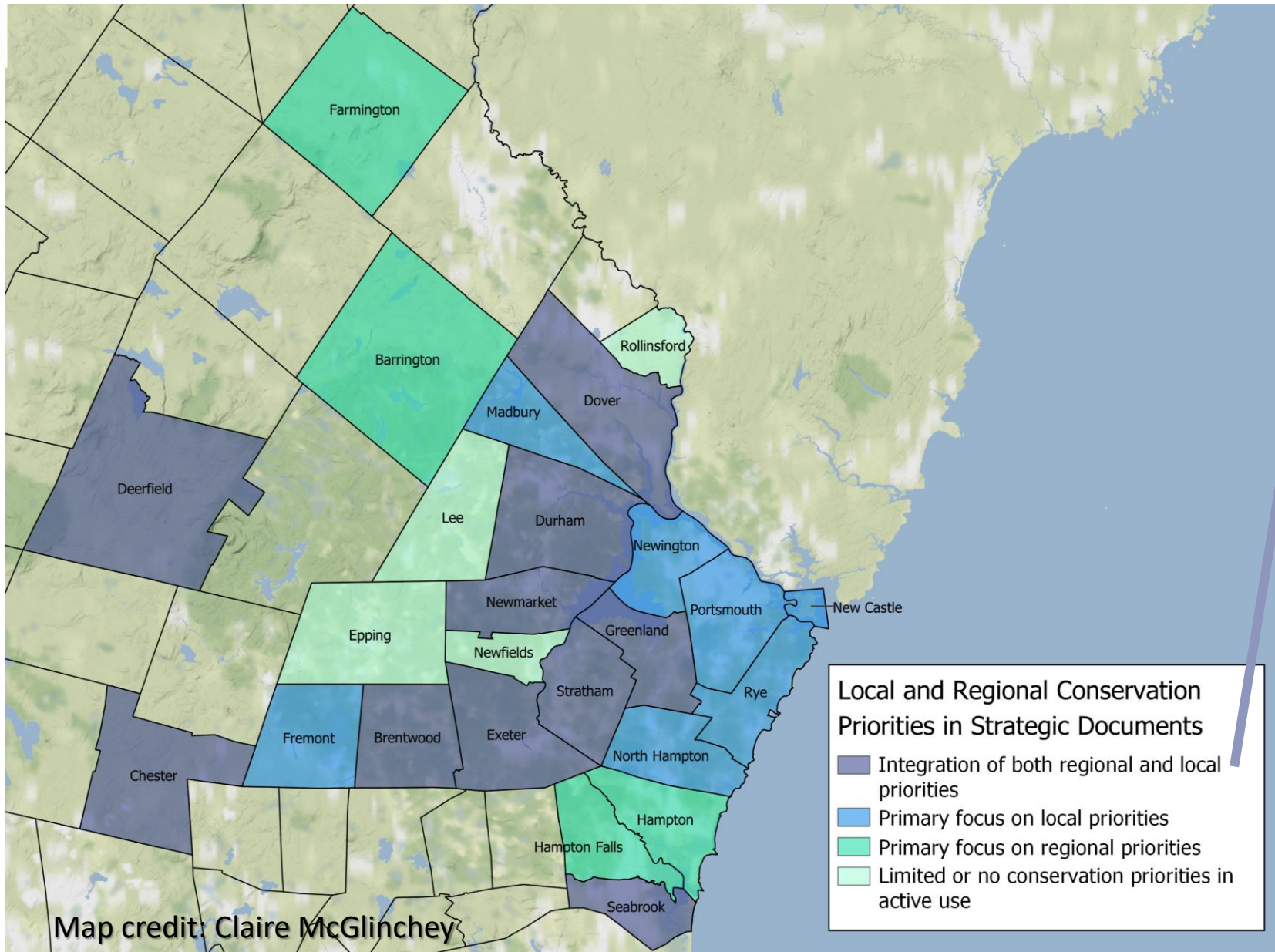
- Steve Bird, Planner, City of Dover, NH

### Community Benefits:

- Water resources protection
- Flood mitigation
- Climate regulation
- Nutrient cycling and uptake
- Soil retention and formation
- Aesthetic/scenic value
- Community character
- Recreation
- Public access
- Historic value
- Wood supply



# Findings: Local and regional priorities in land conservation



Map credit: Claire McGlinchey

## Communities with integration of regional and local priorities

- 0/3 communities that do not include water resources protection in land conservation criteria
- 3/4 communities include flood mitigation in land conservation criteria

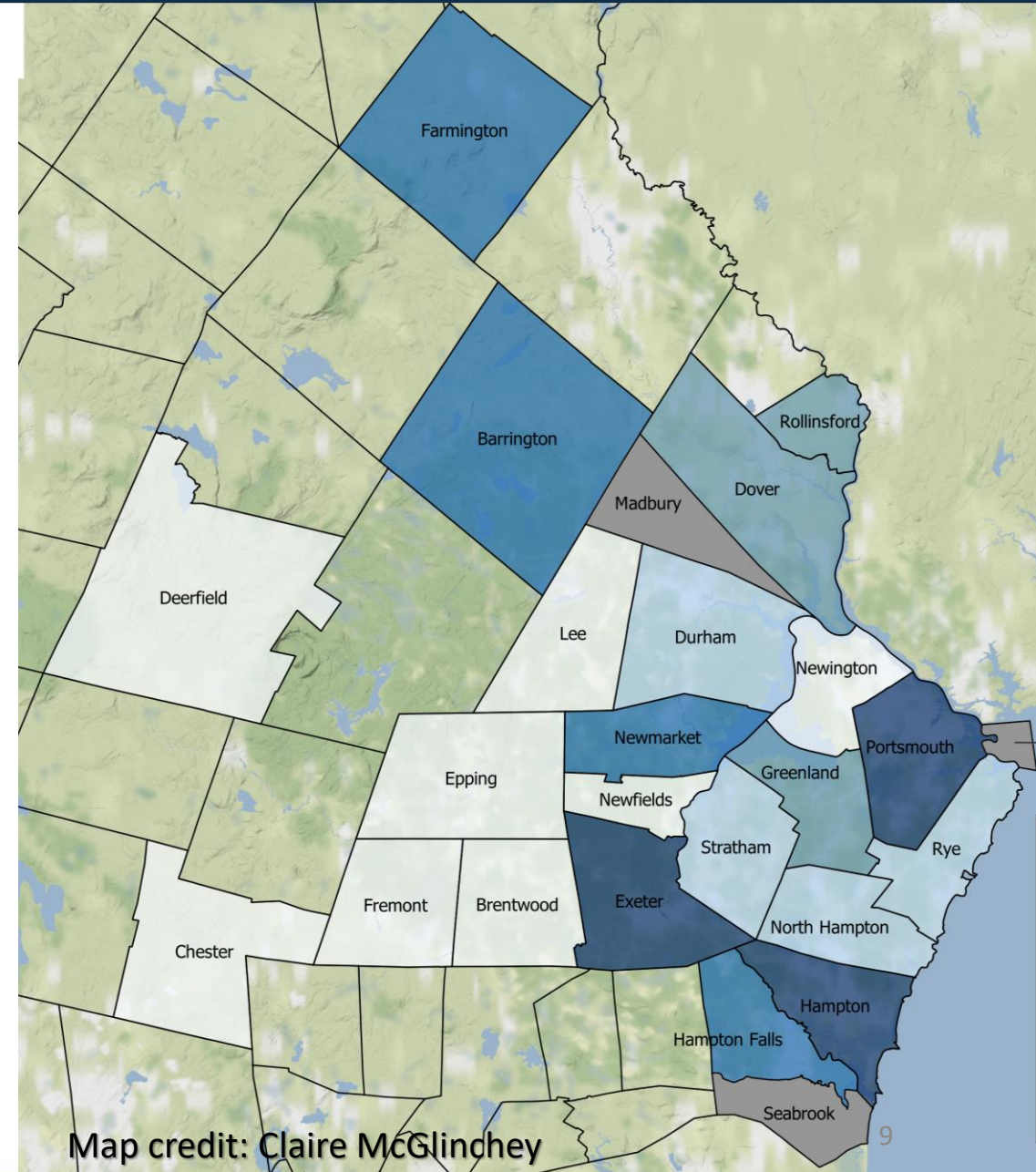
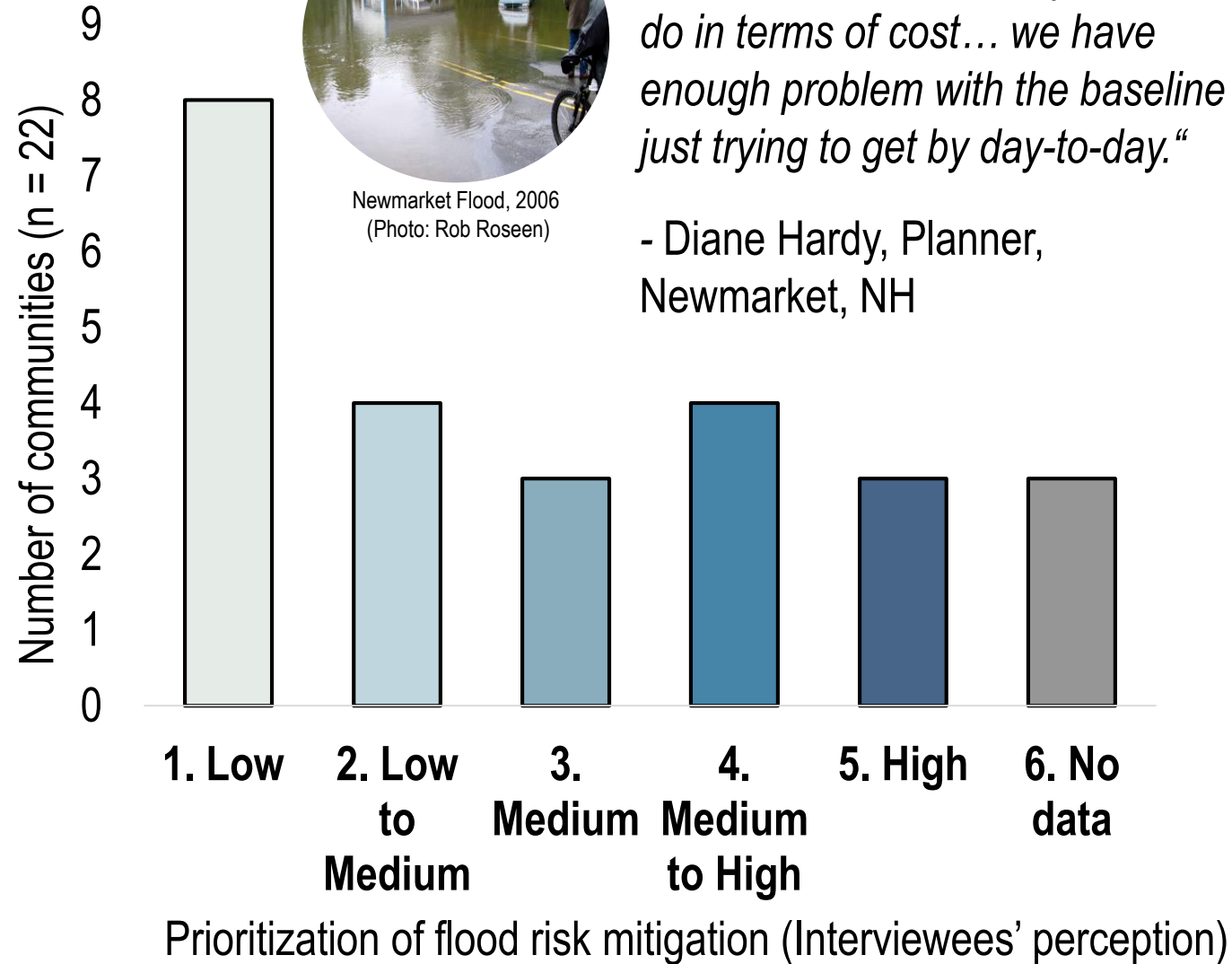
# Findings: Prioritization of flood risk mitigation (Interviewees' perception)



Newmarket Flood, 2006  
(Photo: Rob Roseen)

*“There's a balancing act between what makes sense today for us to do in terms of cost... we have enough problem with the baseline just trying to get by day-to-day.”*

- Diane Hardy, Planner,  
Newmarket, NH





Municipality: **Dover**  
 County: **Strafford County**

**Institutional Arrangement**

Conservation Commission<sup>1</sup>

Open Lands Committee<sup>2</sup>

**Strategic Municipal Document**

Master Plan - Stewardship of Resources Chapter<sup>2</sup>

Master Plan - Conservation and Open Space Chapter

Conservation Lands Audit and Online Inventory<sup>2</sup>

**Funding**

Dover Conservation Fund

Open Space Bond

Grants and Donations

**Local Conservation Land Owner and Easement Holders<sup>2</sup>**

Grantee

Audubon Society

<sup>1</sup> City of Dover Department of Planning and Community Development, "Master Plan - Conservation and Open Space Chapter "Conserving Special Places," 2012, [https://www.dovernh.gov/DocumentCenter/View/1000/OpenSpaceConservation\\_MasterPlan.pdf](https://www.dovernh.gov/DocumentCenter/View/1000/OpenSpaceConservation_MasterPlan.pdf)

<sup>2</sup> City of Dover Department of Planning and Community Development, "City of Dover Master Plan - Stewardship Resources Chapter" 2015, [http://www.dovernh.gov/DocumentCenter/View/1000/OpenSpaceConservation\\_MasterPlan.pdf](http://www.dovernh.gov/DocumentCenter/View/1000/OpenSpaceConservation_MasterPlan.pdf)

**A. Open Space Protection – Local Land Conservation Framework**

Dover Conservation Commission was established in 1973. Dover's conservation efforts have been motivated by the following goals: to preserve the changing rural character of Dover, and to slow the rate of residential development in an effort to manage increasing costs of providing municipal services. Advisory group with the objective of identifying open lands which are environmentally sensitive, of historic importance, or open space in the path of development. Open lands would be prioritized for acquisition or other forms of protection in coordination with City Council and the Conservation Commission.

This chapter of the Master Plan was updated in 2012. The main focus of this chapter is on the protection and management of Dover's Open Space. The chapter includes information on the City's Open Space Inventory, which is a map-based inventory of open space in the City. The inventory is used to identify areas of open space that are environmentally sensitive, of historic importance, or open space in the path of development. The inventory also includes information on the City's Open Space Fund, which is a fund established to provide financial support for the acquisition and management of open space.

Established in 1999, 100% Land Use Change Tax is allocated to the Conservation Fund. CIP bond authorization issued in 2004 and 2005. The total amount of \$2 million. More than \$5 million in grant contributions were received from the following sources: the Nature Conservancy, the Federal Farm and Ranchland Protection Program and the State Land and Community Heritage Investment Program. A large percentage of the available money was in the form of matching funds.

Restoration and Conservation Projects in NH

Project Name	Municipality	Waterbody	Type of land	Ownership	Grant Holder
Potter Farm	Groveton, NH	Upper Connecticut River	Forest	Private	State of NH (NHFG)
Brunault property - Upper Connecticut River Floodplain Forest Protection & Restoration	Colebrook, NH	Upper Connecticut River	Forest	Private	State of NH (NHFG)/TNC
Suncook River Stabilization and Infrastructure Protection Project	Epsom, NH	Suncook River	Waterway	Private and Public	Multiple owners

**Database of nature-based flood risk management projects**

Town	Focus Areas	Note	Name	Description	Date	Source
Newmarket	Land Conservation Criteria		Scenic Views	Protects scenic views from public roadways or recreation areas	2/02	Newmarket Open Space Commission, T
Newmarket	Land Conservation Criteria		Waterways and Wetland	Contains rivers, riparian corridors, salt marsh, estuary, floodplains, prime	2/02	Newmarket Open Space Commission, T
Newmarket	Land Conservation Criteria		Wildlife Habitat	Contains significant wildlife habitat, rare plants or animals, or exemplary	2/02	Newmarket Open Space Commission, T
Newmarket	Land Conservation Criteria		Working Lands	Contains significant wildlife habitat, rare plants or animals, or exemplary	2/02	Newmarket Open Space Commission, T
Newmarket	Land Conservation Criteria		Other - Threat of Conversion	The property is under immediate threat of development	2/02	Newmarket Open Space Commission, T
Newmarket	Land Conservation Criteria		Other - Donation Opportunities	Acquisition is intended in donation, bargain sale, or other scenario that	2/02	Newmarket Open Space Commission, T
Newmarket	Land Conservation Criteria		Other - Threat of Conversion	The property is under immediate threat of development	2/02	Newmarket Open Space Commission, T
Newmarket	Land Conservation Objectives		Highest quality wildlife habitat	NH Fish and Game Wildlife Action Plan	2/06	Ellen Snyder and Ibis Wildlife Consulting
Newmarket	Land Conservation Objectives		Ecologically significant areas	Land Conservation Plan for NH's Coastal Watersheds (2006), Co-occu	2/06	Ellen Snyder and Ibis Wildlife Consulting
Newmarket	Land Conservation Objectives		Large unfragmented blocks of forest and farmland > 500 acres		2/06	Ellen Snyder and Ibis Wildlife Consulting
Newmarket	Priority/Focus Areas		Follet's Brook and Newmarket Plains	Aquifer Corridor along NH Route 152, Lee Hook Road, Langs Lane, and,	2/06	Ellen Snyder and Ibis Wildlife Consulting
Newmarket	Priority/Focus Areas		Neal Mill and Old Lee Road	Piscassic River	2/06	Ellen Snyder and Ibis Wildlife Consulting
Newmarket	Priority/Focus Areas		Tuttle Swamp	Along the Lamprey River, Piscassic River, Lubberland Creek, and Follet's	2/06	Ellen Snyder and Ibis Wildlife Consulting
Newmarket	Priority/Focus Areas		South Bay	Shackford Point on Great Bay west to New Road and south to Newfields	2/06	Ellen Snyder and Ibis Wildlife Consulting
Newmarket	Priority/Focus Areas		South Bay	Moody Point north through Lubberland Creek and Jeffs Hill to the Durhan	2/06	Ellen Snyder and Ibis Wildlife Consulting
Newmarket	Priority/Focus Areas		South Bay	Lamprey River below the McCallen Dam, includes Herra Point	2/06	Ellen Snyder and Ibis Wildlife Consulting

**Expected products**

Actors (Agency/Entity)	Primary Function	Description
NH Department of Safety Division of Homeland Security and Emergency Management	Non-regulatory	Based on FEMA requirement, the State of New Hampshire Multi-hazard mitigation plan deals with reduction and elimination of long-term risk to human life and property from hazards.
NHDES Wetlands Bureau	Regulatory	The functions and values of wetlands to be lost are identified. Compensatory mitigation is a tool to achieve the replacement or protection of similar wetland functions and values lost through a project.
New Hampshire Coastal Risk and Hazards	Non-regulatory	Focus on the risks and hazards that uniquely or particularly affect coastal watersheds. Increased coastal flooding hazards associated with sea-level rise, and extreme precipitation events are the primary focus.
NH Office of Strategic Initiatives, Planning	Non-regulatory	The program is responsible for monitoring and protecting the conservation values of conservation easement lands in which the State of New Hampshire has invested.
NHDES Watershed Management Bureau	Non-regulatory	The program provides funding and staff assistance to municipalities, and other local and regional groups who protect clean water, restore coastal habitats, and help make communities more resilient to flooding and other natural hazards.
NH Department of Transportation	Non-regulatory	Flood control measures such as culverts replacements, stormwater management, erosion control and water retention measures

**Overview of flood mitigation-related programs and regulations in NH**



Municipality: **Dover**  
County: **Strafford County**

### A. Open Space Protection – Local Land Conservation Framework

#### **+** Institutional Arrangement

Conservation Commission <sup>1</sup>	Dover Conservation Commission was established in 1973. Dover's conservation efforts have been motivated by the following goals: to preserve the changing rural character of Dover, and to slow the rate of residential development in an effort to manage increasing costs of providing municipal services.
Open Lands Committee <sup>2</sup>	Advisory group with the objective of identifying open lands which are environmentally sensitive, of historic importance, or open space in the path of development. Open lands would be prioritized for acquisition or other forms of protection in coordination with City Council and Conservation Commission. The Open Land Committee was established in 2000.

#### **Strategic Municipal Documents**

Master Plan - Stewardship of Resources Chapter <sup>2</sup>	2016 Dover's Master Plan Chapter integrates Natural Resources, Historic and Cultural Resources, Energy Resources, Natural Hazards, and Coastal Management.
Master Plan – Conservation and Open Space Chapter <sup>2</sup>	This chapter of the Master Plan was updated in 2012. The main focus of this chapter is on the protection and management of Dover's valuable Open Space resources. It includes a list of conservation land and recommendations for future action.
Conservation Lands Audit and Online Inventory <sup>3</sup>	City-wide inventory of all protected lands in the City of Dover which was conducted in 2011. For each conservation parcel, a profile sheet has been prepared. Information for each property includes name, size, tax parcel number, type of protection, use limitations, and registry of deeds book and page information.

#### **Funding**

Dover Conservation Fund	Established in 1999. 100% Land Use Change Tax is allocated to the Conservation Fund
Open Space Bond	CIP bond authorization issued in 2004 and 2005. The total amount of \$2 million.
Grants and Donations	More than \$5 million in grant contributions were received from the following sources: the Nature Conservancy, the Federal Farm and Ranchland Protection Program and the State Land and Community Heritage Investment Program. A large percentage of the available money was in the form of matching funds. <sup>1</sup>

# Assessment sheets - municipal summaries

## Land Conservation Prioritization Strategies

### Timeline of Dover's conservation efforts

1973	The City Council established a Conservation Commission.
1980 - 1990	Real estate boom lead to the adaption of new zoning regulation to protect natural resources: Groundwater Protection Ordinance (1985), Conservation District Ordinance (1987), Wetlands Protection District Ordinance (1988) Several large properties Parks & Forbes tract (23 acres), Tamposi & Lehouiller tract (13 acres), and the Watson land (37 acres) were donated to the city.
1991	Gabriel conservation land (105 acres) near County Farm Cross Road was protected by a conservation easement purchased with LCHIP funds in 1991.
1990 - 1992	Bellamy River Wildlife Management Area (460 acres) was protected from the LCHIP program
1999	The City Council approved 100% of Land Use Change Tax for Dover Conservation Fund as a reaction to the loss of public access to Barbados pond.
2000	New Master plan together with natural resource ordinances started a new era in Dover's conservation efforts. The Open Lands Committee was established.
2004	New comprehensive criteria for open space acquisition and protection were established.
2004- 2005	The City passed conservation bonds in 2004 and 2005 totaling \$2 million for conservation-related purchases.
2005 - 2008	Large properties such as Measured Progress, Tuttle's Farm, Hunt, and Frazer were protected.
2011	City-wide inventory of all protected lands in the City of Dover.
2016	Open Lands Committee updated land protection criteria.

The Town's current conservation strategy is proactive and participatory. The 2012 Master Plan Conservation and Open Space Chapter update were guided by The Volunteer Citizen Steering Committee consisting of a community board member, Conservation Commission member, Open Lands Committee member, and several citizens. The conservation commission is looking for more conservation easements for the future, but the lack of funding is an issue because the conservation fund is funded solely from the Current Land Use Change tax. The Current Use program doesn't bring enough funding for protection of properties and the town is dependent on matching grants from state and federal agencies, and conservation-related organizations. The Open Space Committee criteria were updated several times since their introduction in 2004.

The scoring of properties based on the conservation criteria is done for properties with willing owners who wish to protect their land. Landowners approach Conservation Commission or Open Lands Committee and start the negotiation process. The Conservation Commission usually has multiple landowners that they work with simultaneously. The scoring based on conservation criteria ranks projects based on their suitability for conservation in Dover. The Conservation Commission and Open Lands Committee efforts are dependent on decisions of the City Council which changes every two years. Therefore, conservation projects once scored and selected, move forward at a relatively fast pace. The conservation criteria are regularly revisited and updated based on new data from regional plans, master plans, and municipal plan updates.

# Assessment sheets - municipal summaries

## Land Conservation Criteria<sup>5</sup>

Relation to existing conservation lands/contiguity	Conservation and Open Space Master Plan Map and Dover Online Map Site with Conservation Layer added. Points: 3 – Abuts existing pending project or existing conservation land,
--	--

<sup>5</sup> Open Lands Committee, "2016 Criteria Ranking Sheet" (City of Dover, NH, 2016).

	2 - in <u>close proximity</u> existing conservation lands. 0 – Does not abut existing conservation land
Relation to Coastal Watershed Plan	Coastal Watershed Plan Core Focus Area (CFA- Dark Orange) and Supporting Landscape (SLa- Light Orange). Points: 3 - ANY within CFA, 2 – ANY within SLa, 0 – Meets none of the above
Drinking Water Protection	Groundwater Protection Zones Map from the Planning Department. Points: 3 – Overlays primary water supply protection area, 2 – Overlays secondary water supply protection <u>area</u> , 0 – meets none of the above.
Contribution to Surface Water Quality	GRANIT Mapper under Water Resources for Surface Water. Points: 3 – Project contains or fronts on the Bellamy, <u>Cochecho</u> or Salmon Falls river, or is located within 300 feet of a river/ lake, 2 – Surface water, wetland or vernal pool present, 0 – Project does not afford protection to surface water supplies
Habitat Quality	Use NH F&G's 2015 Wildlife Action Plan (WAP) to view highest-ranked habitats maps. Pink (state), green (region) or gold (supporting landscape) is present in the project area. Points: 3 – Pink or Green in the project area, 2 – Gold (supporting landscape) in the project area, 0 – None
Agricultural Soil Quality	Use GRANIT Mapper and turn on Farmland Soils. Points: 3 – contains 50% or more soils of local, state or prime importance; 2 – contains 10% - 49% significant soils; 1 – contains less than 10% significant <u>soils</u> , 0 – contains no significant farm soils.
Historic or cultural site, structure or features	Parcel has historical or cultural features such as a cemetery, archaeological site or other example of heritage. Points: 3 – Several such features exist on the property, 2 – One such feature exists on the property, 0 – No such features exist on the property
Public access allowed	The landowner is willing to allow public access on the property including but not limited to hiking, bicycling, X-country skiing, or educational



# Overview of municipal land conservation priorities

	Town	Land Conservation Criteria/Objectives/Goals / Focus Areas	Note	Name	Description	Date	Source
240	Dover	Land Conservation Criteria		Contribution to Surface Water Quality	GRANIT Mapper under Water Resources for Surface Water. Points: 3 – Project co	2016	Open Lands Committee, "2016 Criteria Rankin
241	Dover	Land Conservation Criteria		Habitat Quality	Use NH F&G's 2015 Wildlife Action Plan (WAP) to view highest-ranked habitats m	2016	Open Lands Committee, "2016 Criteria Rankin
242	Dover	Land Conservation Criteria		Agricultural Soil Quality	Use GRANIT Mapper and turn on Farmland Soils. Points: 3 – contains 50% or mo	2016	Open Lands Committee, "2016 Criteria Rankin
243	Dover	Land Conservation Criteria		Historic or cultural site, structure or features	Parcel has historical or cultural features such as a cemetery, archaeological site or	2016	Open Lands Committee, "2016 Criteria Rankin
244	Dover	Land Conservation Criteria		Public access allowed	The landowner is willing to allow public access on the property including but not lim	2016	Open Lands Committee, "2016 Criteria Rankin
245	Dover	Land Conservation Criteria		Scenic Viewshed	Parcel features scenic vistas visible from public roadways, or waterways. Points: 3	2016	Open Lands Committee, "2016 Criteria Rankin
246	Dover	Land Conservation Criteria		Agricultural features	The parcel is a farm, or maintained as cropland, pasture, hayfields, or open field. P	2016	Open Lands Committee, "2016 Criteria Rankin
247	Dover	Land Conservation Criteria		Other	The project has an unusual or significant feature not captured in above ranking. Poi	2016	Open Lands Committee, "2016 Criteria Rankin
248	Dover	Land Conservation Criteria		Size of project # of acres:	Points: 3 – Project is >20 acres, 2 – Project is between 11-19 acres, 1 – Project is	2016	Open Lands Committee, "2016 Criteria Rankin
249	Dover	Land Conservation Criteria		Existing development threat	Points: 1 – Project is threatened by development, 0 – No known risk for developm	2016	Open Lands Committee, "2016 Criteria Rankin
250	Dover	Land Conservation Criteria		Stewardship/Monitoring	Points: 3 – Abuts existing pending project or existing conservation land, 2 - in close	2016	Open Lands Committee, "2016 Criteria Rankin
251	Dover	Land Conservation Criteria		Reserved rights	Points: 3 – Do not anticipate any complicated reserved rights, 2 – Several reserved	2016	Open Lands Committee, "2016 Criteria Rankin
252	Dover	Land Conservation Criteria		Forest Management Plan	Points: 3 – Has Forest Management Plan, 0 – Does not have a forest manager	2016	Open Lands Committee, "2016 Criteria Rankin
253	Dover	Land Conservation Criteria		Degree of Known Leverage	Points: 3 – Project is a strong candidate for grants or outside funding sources and/c	2016	Open Lands Committee, "2016 Criteria Rankin
254	Dover	Land Conservation Criteria		Financial Considerations	Points: 3 – Parcel or CE to be donated by owner, 2 – Significant bargain sale, 0 –	2016	Open Lands Committee, "2016 Criteria Rankin
255	Dover	Land Conservation Criteria		Likelihood of success	Points: 3 – Survey available and no outstanding family issues 2 – Survey available	2016	Open Lands Committee, "2016 Criteria Rankin
256	Dover	Land Conservation Objectives		Protection of Open Space	Identify and pursue permanent legal protection of key open space areas based upo	2012	City of Dover Department of Planning and Cor
257	Dover	Land Conservation Objectives		Connectivity of Open Space and recreation	Where possible, link open space areas and recreation facilities in an effort to establi	2012	City of Dover Department of Planning and Cor
258	Dover	Land Conservation Objectives		Public Access	Improve, protect and encourage public access to Dover's natural resource areas.	2012	City of Dover Department of Planning and Cor
259	Dover	Land Conservation Objectives		Sustainable Development	Encourage all new developments to protect and where possible, enhance valuable	2012	City of Dover Department of Planning and Cor
260	Dover	Land Conservation Objectives		Public/Private Partnership	Encourage public/private partnerships between the City and land protection groups	2012	City of Dover Department of Planning and Cor
265	Durham	Land Conservation Criteria		Protect natural resources	a) Existing farms and land that have productive forest or farmland soils that meet lo	2008	Durham Conservation Commission, "Town of D
266	Durham	Land Conservation Criteria		Enhance public access	Enhance public access to open space and opportunities for passive, nature-oriente	2008	Durham Conservation Commission, "Town of D
267	Durham	Land Conservation Criteria		Maintain prominent scenic vistas and viewsheds	Maintain prominent scenic vistas and viewsheds that are important to Durham's rur	2008	Durham Conservation Commission, "Town of D
268	Durham	Land Conservation Criteria		Large blocks and corridors of unfragmented land	Build upon, create, and connect large blocks and corridors of unfragmented land w	2008	Durham Conservation Commission, "Town of D
269	Durham	Land Conservation Criteria		Maintain prominent scenic vistas and viewsheds	Maintain prominent scenic vistas and viewsheds that are important to Durham's rur	2008	Durham Conservation Commission, "Town of D
269	Durham	Land Conservation Criteria		Enhance public access	Enhance public access to open space and opportunities for passive, nature-oriente	2008	Durham Conservation Commission, "Town of D
269	Durham	Land Conservation Criteria		Protect natural resources	a) Existing farms and land that have productive forest or farmland soils that meet lo	2008	Durham Conservation Commission, "Town of D
269	Dover	Land Conservation Objectives		Public/Private Partnership	Encourage public/private partnerships between the City and land protection groups	2012	City of Dover Department of Planning and Cor

# Next steps: Interviews with conservation organizations

## How do NH conservation organizations implement land conservation to manage flood risks?

- What kinds of land conservation criteria are in use?
  - Is flood mitigation incorporated?
  - Who commonly participates in developing conservation criteria?
- What is the role of conservation organizations' criteria and objectives in flood mitigation planning and implementation?
  - 2-3 case studies of flood risk management projects





# Thank you!

Environmental Policy, Planning,  
and Sustainability Lab  
@EPPSlab



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Lubberland Creek (credit: Jerry Monkman)

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UNH Cooperative Extension,  
SRPC, RPC, PREP, GBNERR

