Riparian Buffers – what are they and what do they do?

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Sea Grant Connecticut

UCONN COLLEGE OF AGRICULTURE, HEALTH AND NATURAL RESOURCES EXTENSION

What is a riparian corridor (buffer)?

- "Riparian" refers to the area by the banks of a river, stream, or other body of water.
- "Corridor" refers to a designated zone or strip of land of a specified width along the border of an area
- So a "Riparian Corridor" is the natural vegetation and soil cover adjacent to a river, stream, or other body of water.

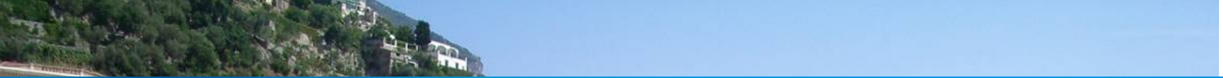



Photo by Mike Burke

Why should we care about creating, managing or restoring riparian corridors?

Riparian Corridor Functions

- Water Quality
- Biodiversity
- Protection and Safety
- Economic Opportunities
- Productive Soils
- Aesthetics and Visual Quality
- Outdoor Recreation

When we think about watersheds, wetlands protection, and water quality we need to think about the areas adjacent to the wetlands… riparian corridors

WATER QUALITY AND BUFFERS

OBJECTIVES

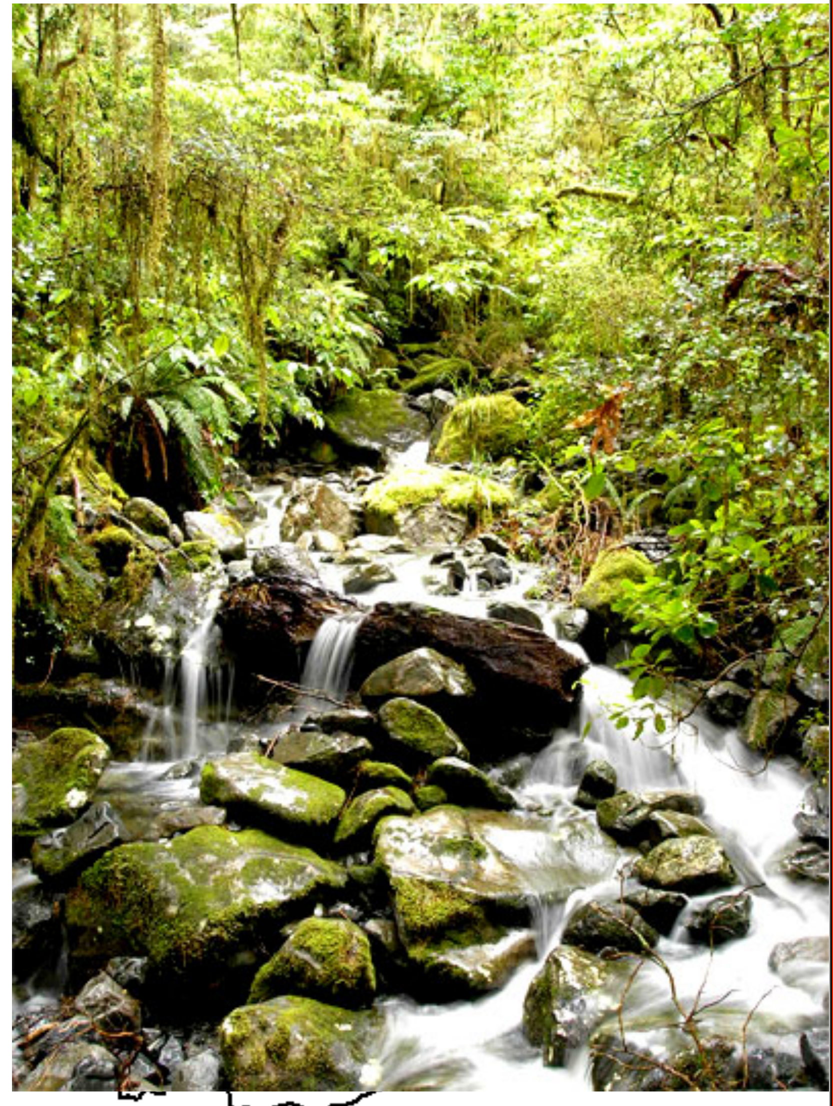
- Reduce erosion and runoff of pollutants
- Remove pollutants from water runoff and wind

FUNCTIONS

- Slow runoff to increase infiltration
- Trap pollutants in surface runoff
- Trap pollutants in subsurface flow
- Stabilize soil and reduce flooding
- Reduce bank erosion

Water Quality & Riparian Corridors

- Riparian corridors are often most effective along smaller or low-order streams than larger or higher-order streams.
- Groundwater recharge areas, ephemeral streams, and other areas where runoff collects are important to buffer.



Nitrogen and Buffers

Phosphorus and Buffers

The University of Georgia states that a buffer should be at least 50 feet wide to adequately remove phosphorus; 100 feet is a sufficient width for nearly all conditions. Best to combine buffer areas with strategies to reduce phosphorus at its source.

Buffers and Pesticides

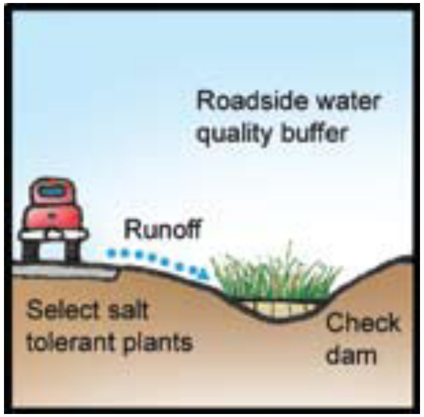
The sorption coefficient (Koc) describes the tendency of a pesticide to bind to soil particles. Sorption retards movement, and may also increase persistence because the pesticide is protected from degradation. The higher the Koc, the greater the sorption potential.

CONSIDERATIONS for a BUFFER:

- Maintain or increase infiltration
- Increase buffer widths for pesticides with low Koc values
- Increase buffer widths for pesticides with high solubility
- Select plants with high pesticide tolerance

Buffers and Impervious Surfaces

Buffers can trap sediments from impervious surface runoff but are less effective for dissolved pollutants. Buffers are most effective when combined with LID practices that minimize impervious cover.



Surface runoff is higher where there are increased impervious surfaces or cultivated areas – particularly with steep slope and finer textured soils.

Sligo Creek (MD) Golf Course Stream Restoration

Riparian Corridor Functions

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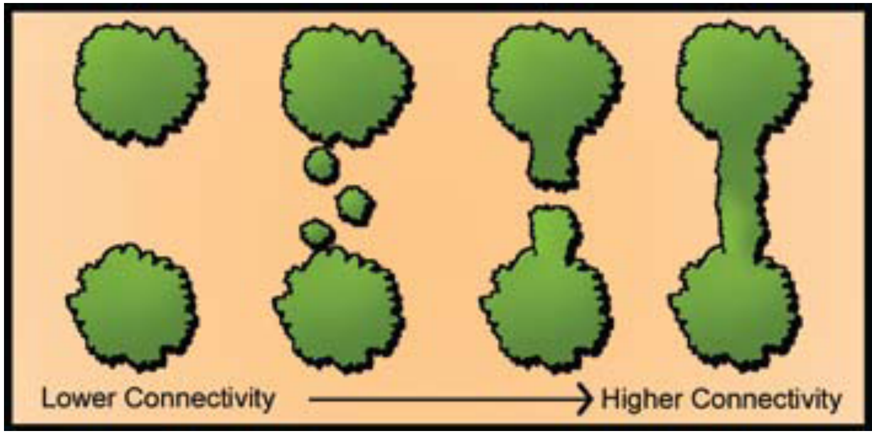
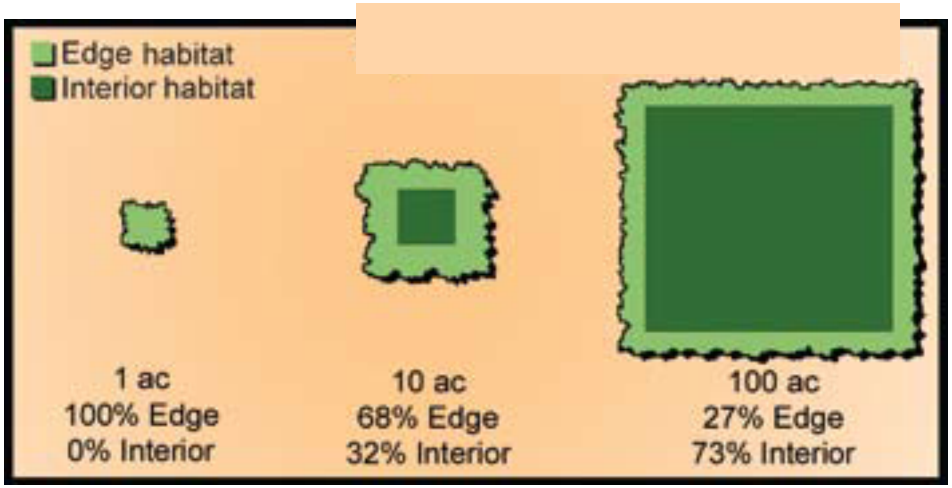
Biodiversity and Buffer Functions

- Increase aquatic and terrestrial habitat areas
- Protect sensitive habitats
- Restore connectivity
- Increase access to resources
- Provide shade to maintain water temperature

Biodiversity

- Patch size (generally, larger animals need larger patches)
- Connectivity
- Edge effect





The more edge, the more likely is establishment by invasive species.

Fisheries – water quality and water temperature

Woody debris often very important for the larval stages of many insects.

Adding woody debris to a pool for amphibians and turtles.

Riparian Buffers and Aquatic Species

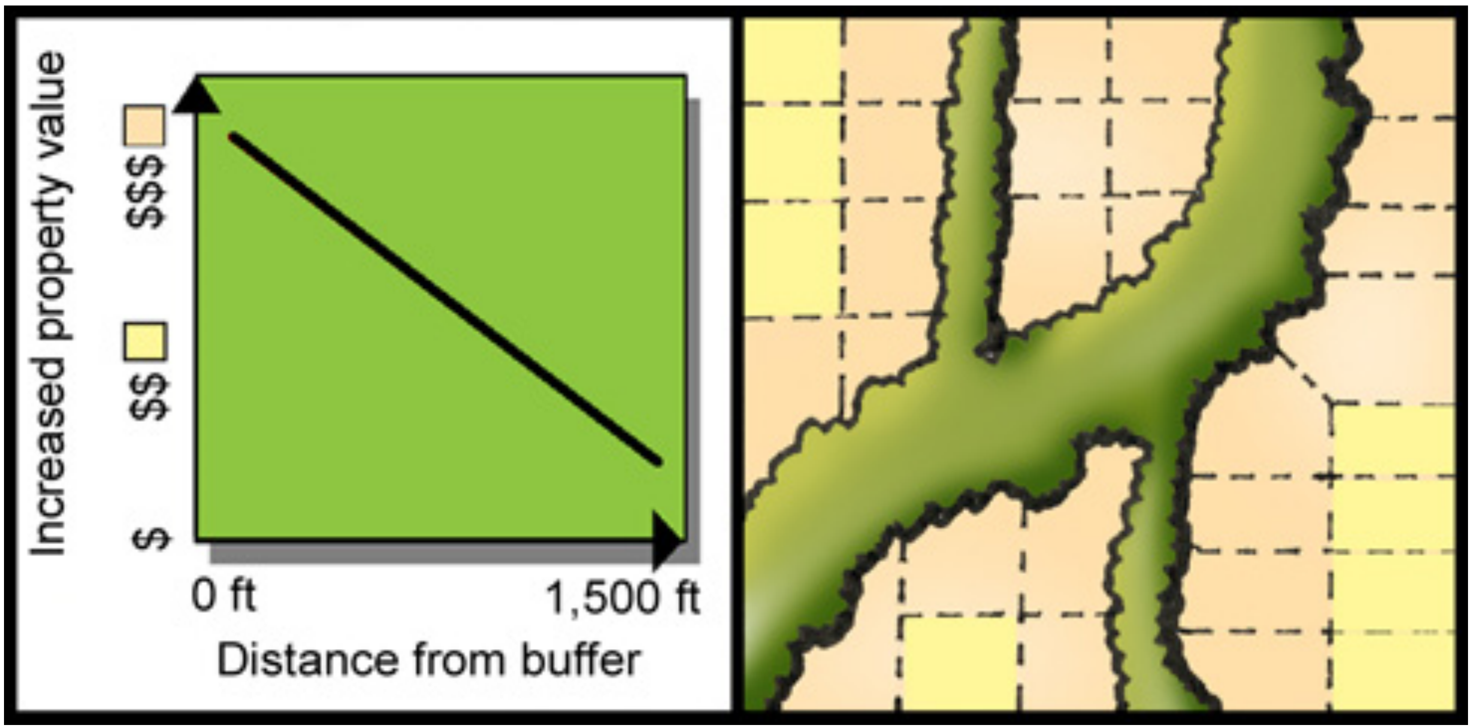
Buffers and Productive Soils

- Reduce energy of water runoff
- Reduce wind energy
- Stabilize soils
- Improve soil quality
- Remove soil pollutants

Economic benefits of buffers

- Minimizing property damage
- Decreasing public investment in stormwater management, flood control, and pollution removal
- Increasing property values
- Reducing land maintenance costs (in comparison with managed areas) (Schueler 1995)

Increased property values near buffers



The Economics of Riparian Corridors

- New York City's water supply from the Catskill Mtns watershed has an estimated cost of $6 to $8 billion in capital investment and $300 million annual operating and maintenance costs that would be needed for **drinking water filtration facilities** to replace the natural filtration of City's water supply. To preserve these services, the City of New York is investing $1.5 billion in the Catskill Mountain watershed for stream setbacks, stream fencing, and a range of best management practices to preserve the natural water filtration services of the riparian areas.

Riparian Corridor Functions

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Protection and Safety

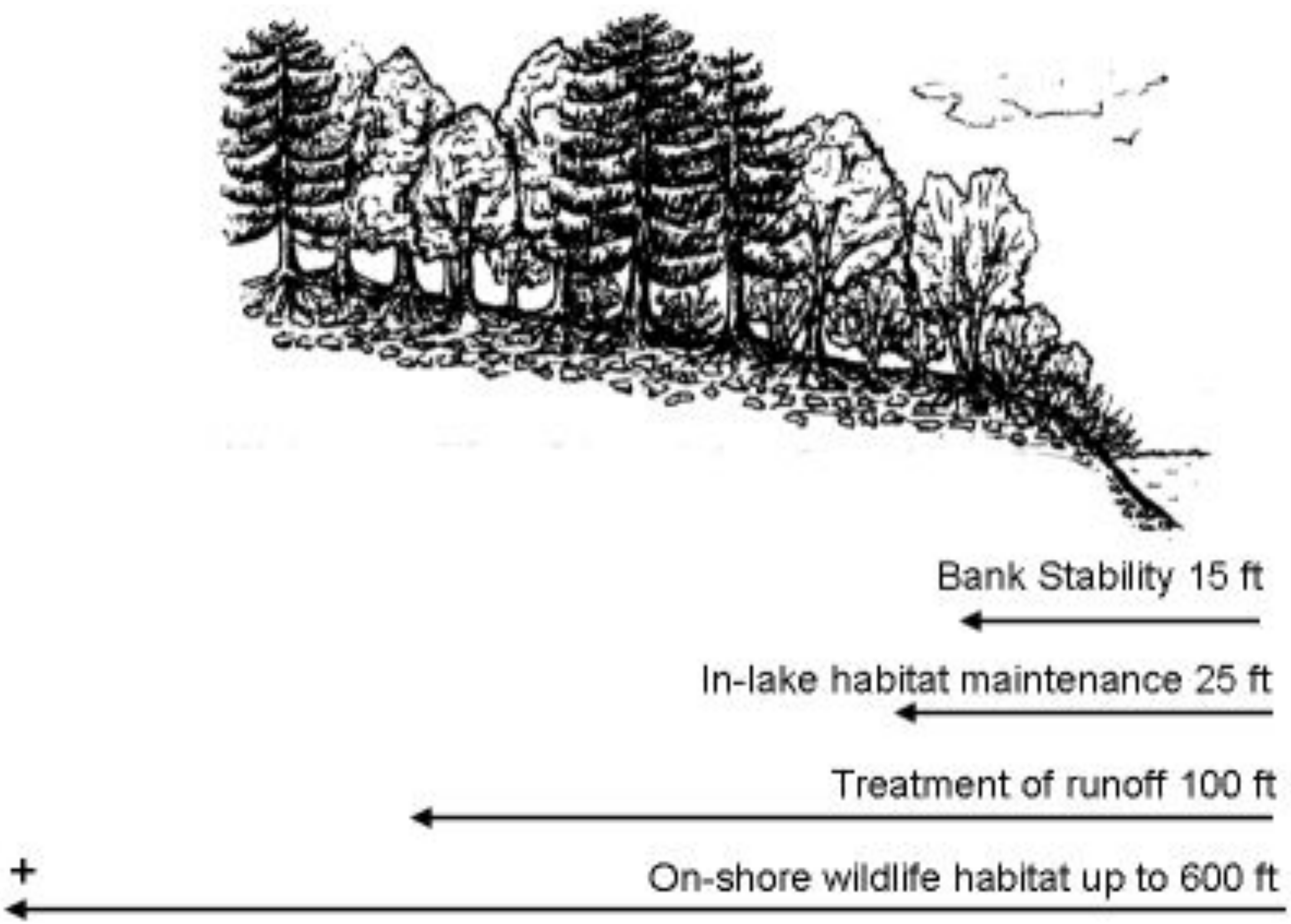
Flood control

Shoreline Protection and Erosion Control

Riparian Corridors Functions and Values

- first line of defense against the impacts of impervious surfaces
- slow runoff
- protect shorelines from erosion
- aid in flood control
- filter or trap pollutants
- provide habitat and corridors for wildlife
- shade waters for fisheries enhancement

How big should a buffer be to provide water quality protection and/or improvement?



It depends…. on site conditions: location within the watershed, soil type and slope, hydrology AND what the function of the buffer is.

Category	Minimum Width		Notes	Source
WATER QUALITY				
Water temperature	15 ft	5 m	For small streams, forested	Palone and Todd, 1998
POLLUTANTS				
Nitrates	35 ft	11 m		Palone and Todd, 1998
Pesticides	45 ft	14 m		Palone and Todd, 1998
Sediment				
General	25 ft	8 m	On slopes <16%; Expand by 5 ft by each 1% in slope	Palone and Todd, 1998
Sand	10 ft	3 m		Wilson, 1967
Silt	50 ft	15 m		Wilson, 1967
Clay	300 ft	91 m		Wilson, 1967

Riparian Corridor Widths for Specific Objectives

Bottom line: bigger is better

Small riparian corridors (25 – 50 ft)

- Help to protect water quality
- Streambank stabilization
- Provide small scale travel routes
- May provide nesting/ basking sites

Large riparian corridors (> 50 ft)

- Provide habitat components to more species
- Help to reduce secondary inputs
- Increased water quality protection
- Flood control
- Provide large scale corridors

UCONN

College of Agriculture and Natural Resources

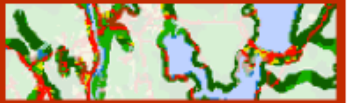
Center for Land Use Education and Research

CLEAR

version 2 Connecticut's Changing Landscape

Connecticut's Changing Landscape (CCL)

2006 Statewide Riparian Corridor Analysis



Riparian Home

About the Project

Interactive Map

Statewide Information

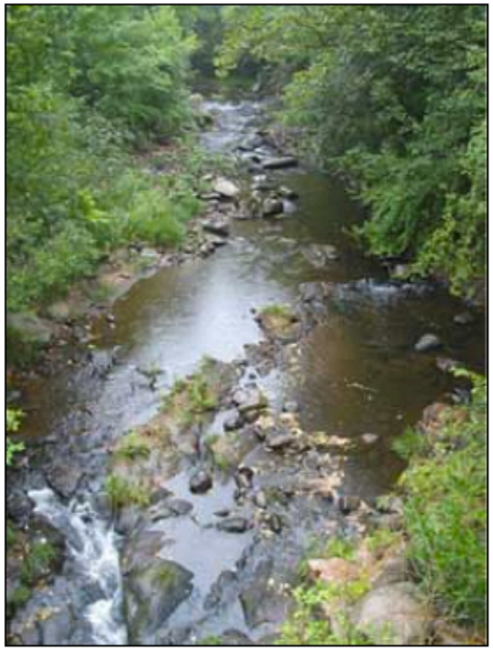
Your Town

More on Riparian Corridors

2006 Statewide Riparian Corridor Analysis

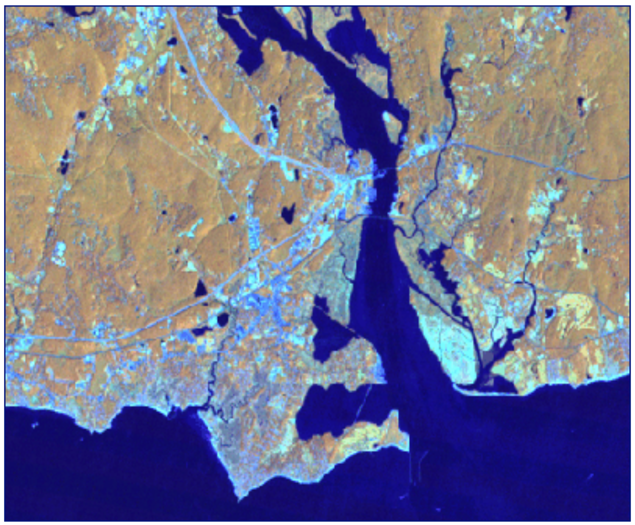
This part of CLEAR's Connecticut's Changing Landscape project looks at land cover and land cover change within riparian corridors of Connecticut. Riparian, or streamside, corridors are known to be environmentally important areas critical to stream stability, pollutant removal, and both aquatic and terrestrial wildlife habitat. These areas are often known as "buffer" areas, but are not to be confused with regulatory review zones, which are often also called buffers. This study looks at land cover and land cover change within these riparian areas for the period 1985 – 2006.

View the 2006 Statewide Riparian Corridor Analysis Summary (pdf - 916 KB)

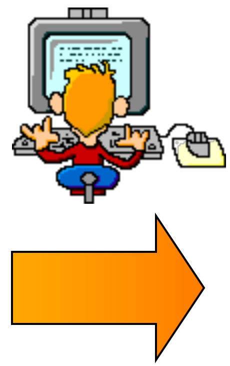


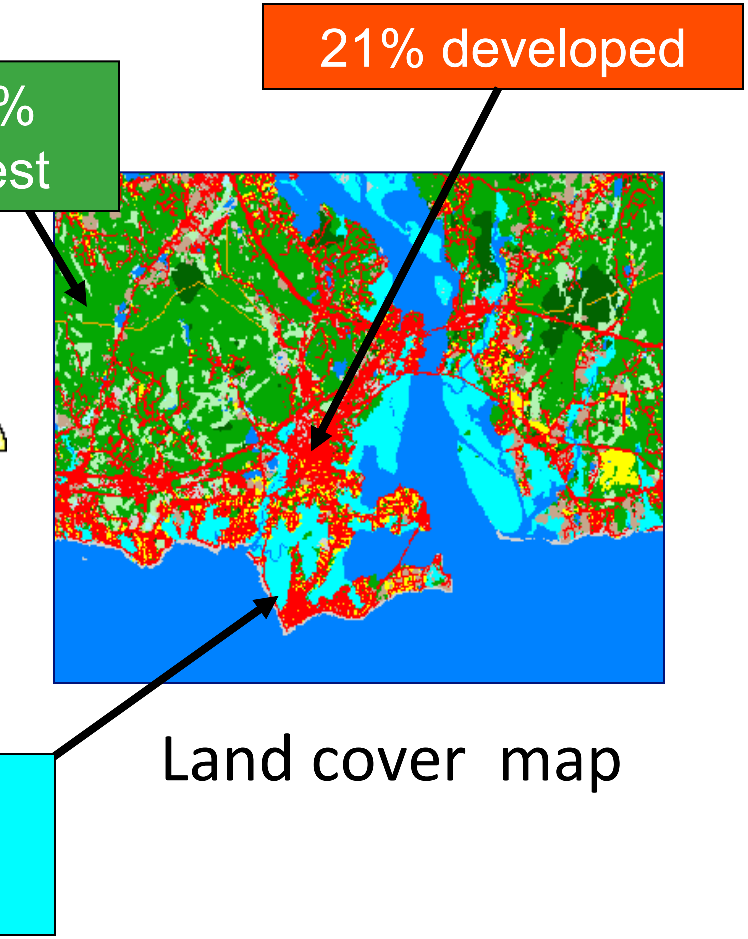
http://clear.uconn.edu/Projects/riparian/index.htm

What is land cover?



Satellite image

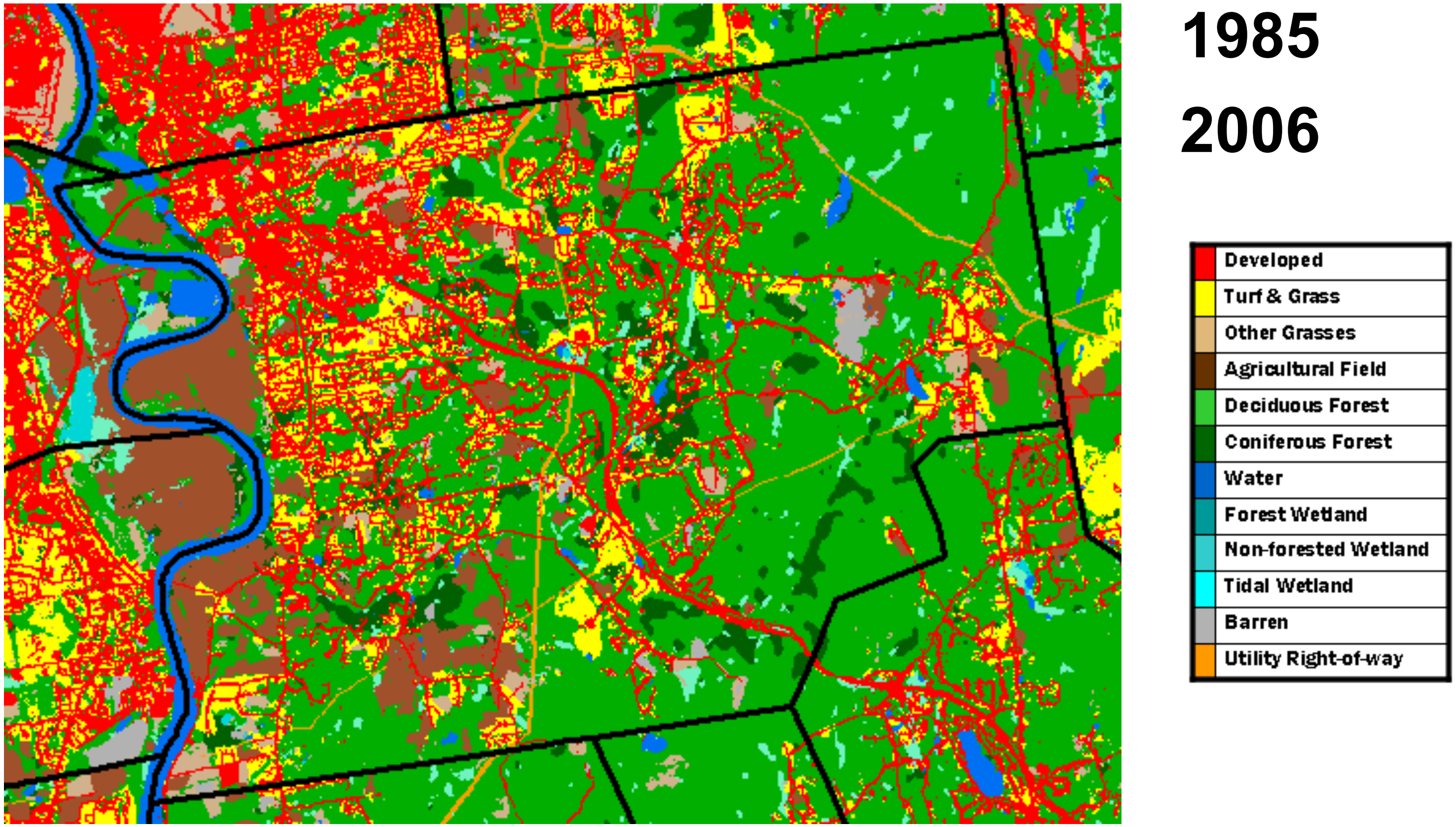




Land cover map

Quantify and Compare

Increase in Development:	1613 acres
Loss of Forest:	1778 acres
Loss of Ag Field:	1306 acres



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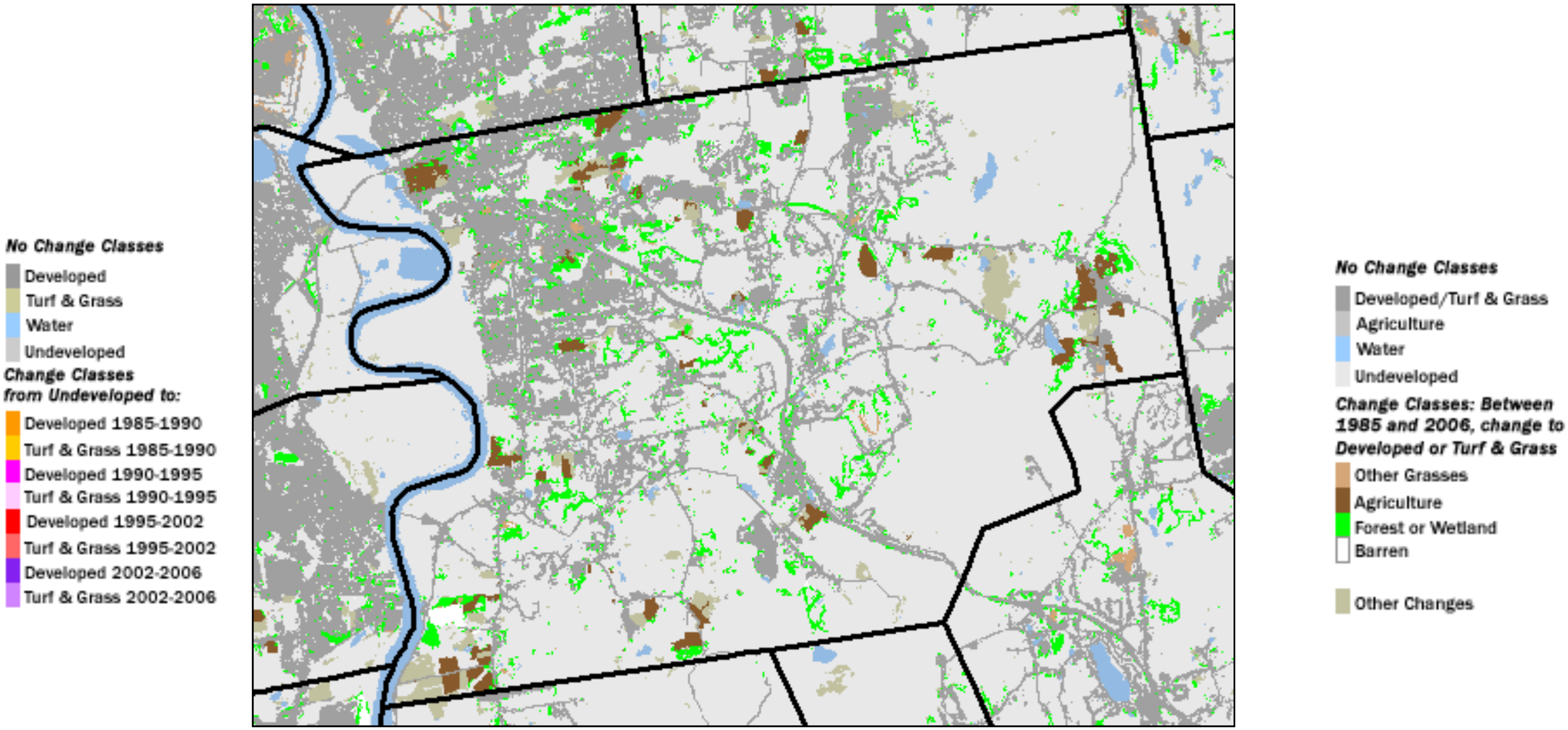

Website

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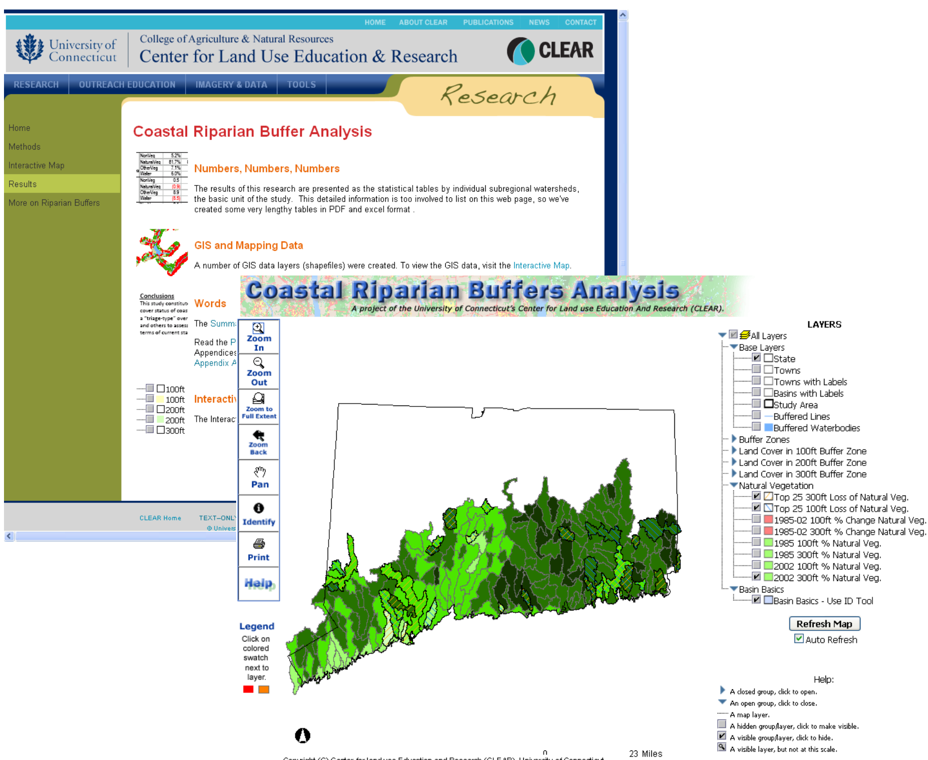
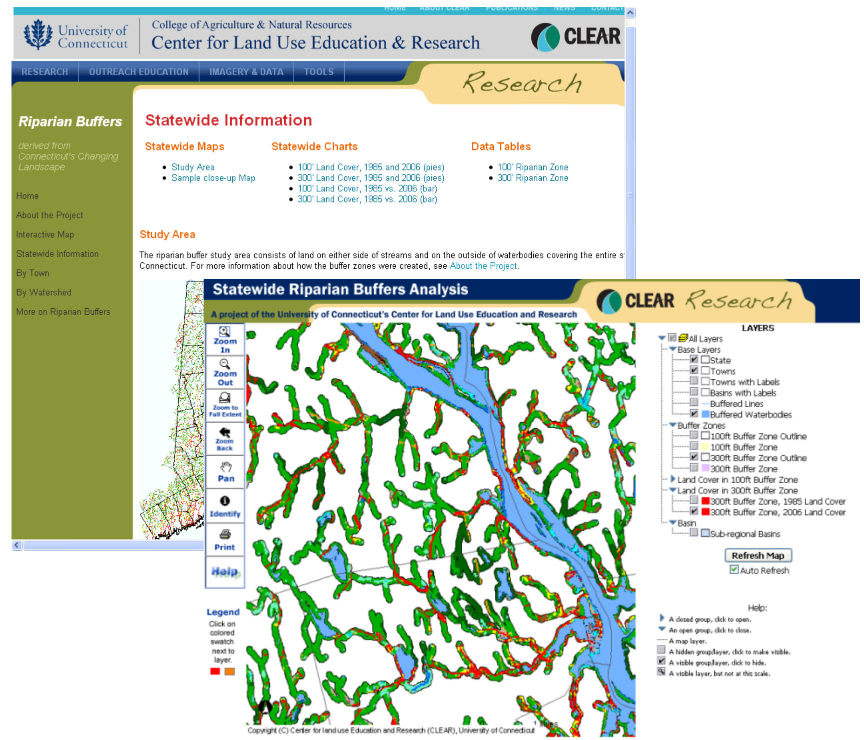
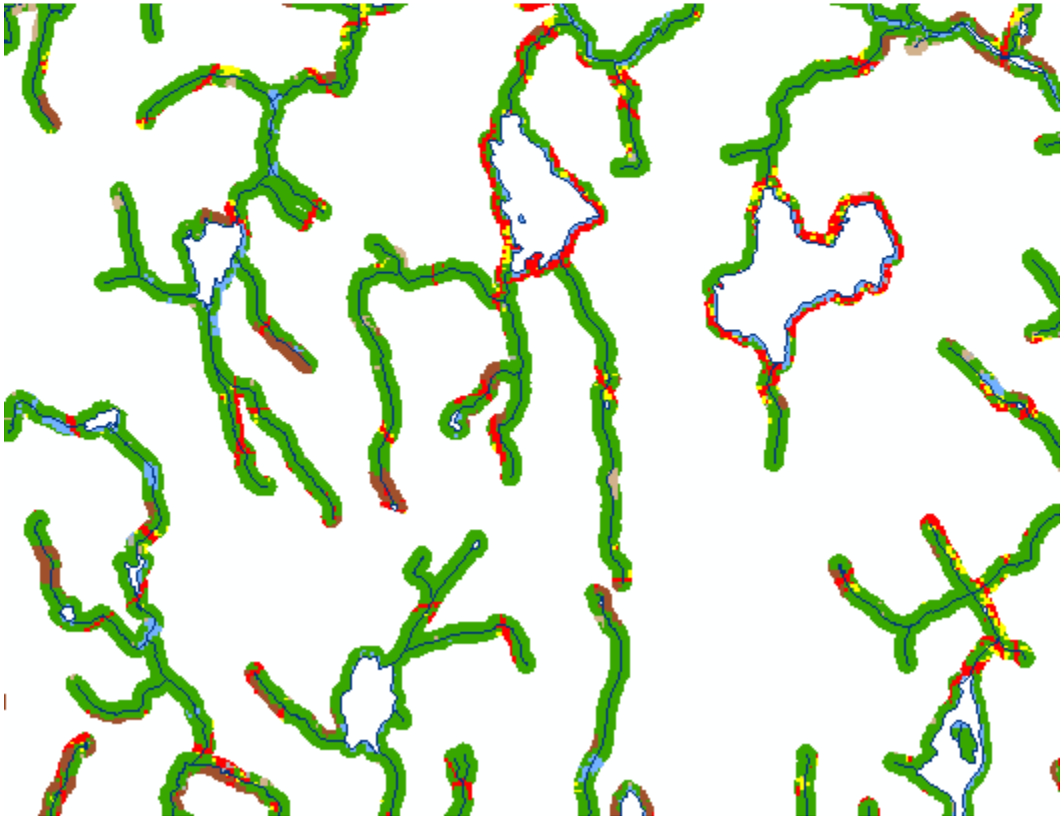


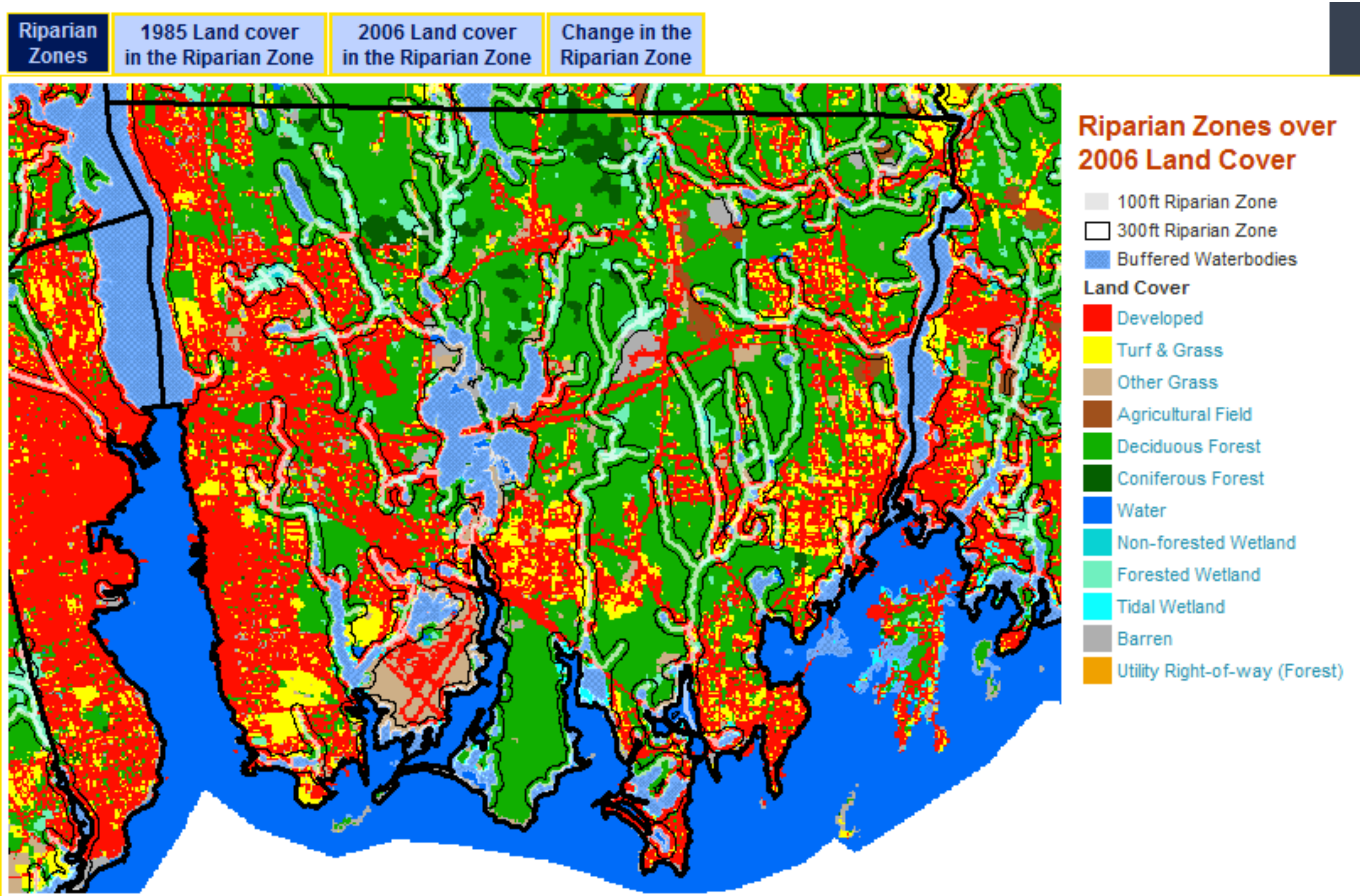


Methods :
Buffer Zones 100 ft and 300 ft

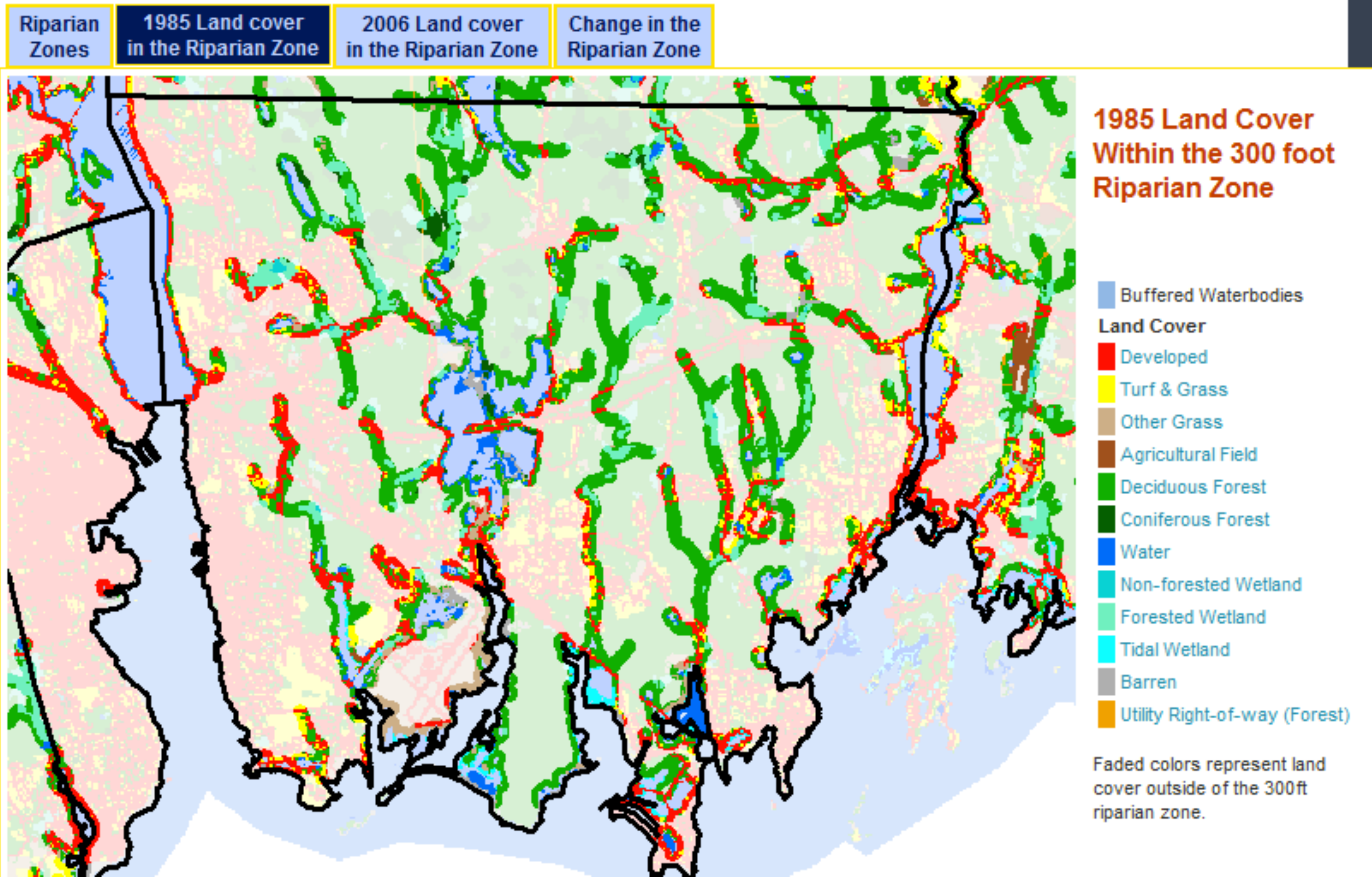
Methods and Results
Land Cover in Buffer Zones



Groton Riparian Corridors

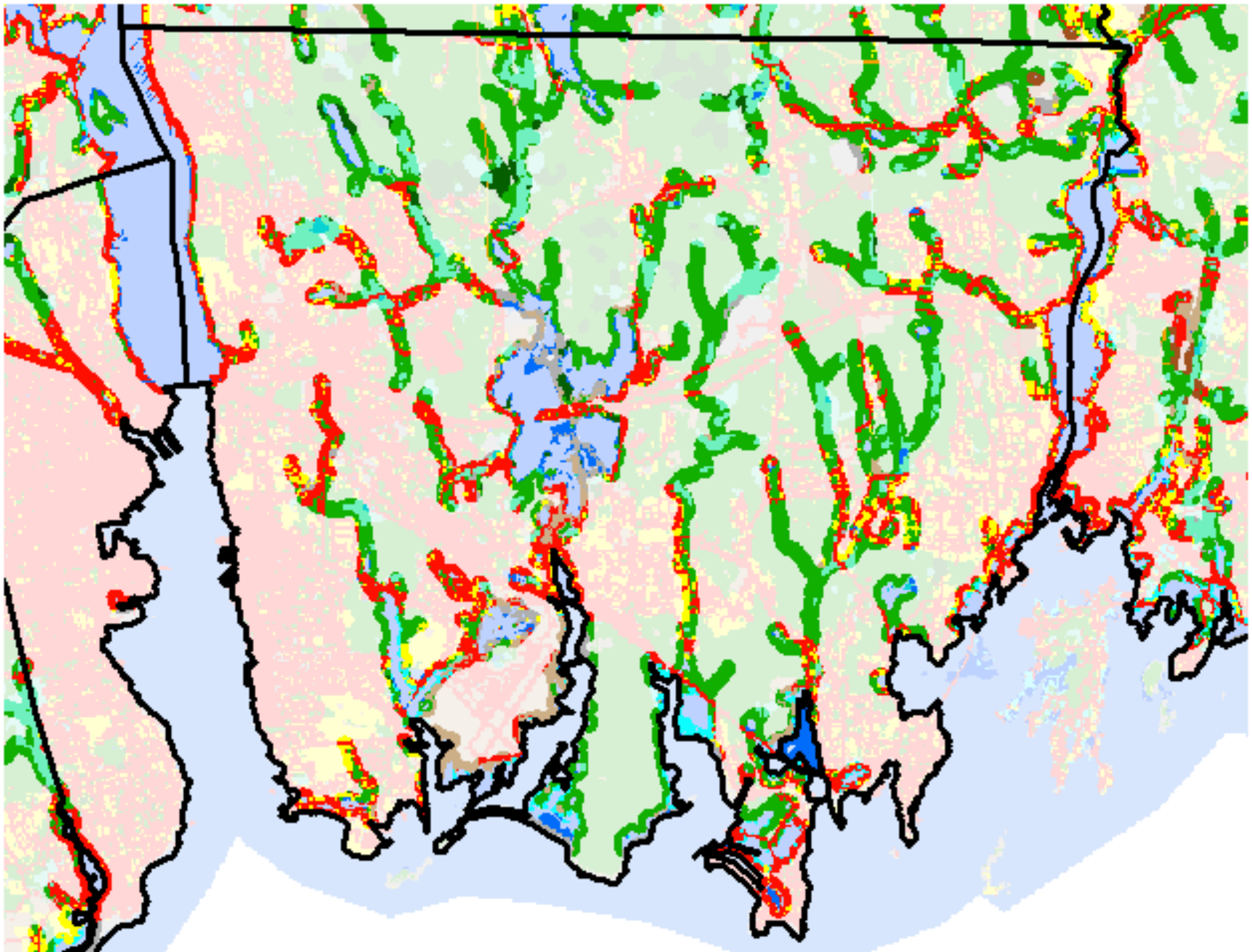


Groton 1985 Land Cover in the Riparian Zone



Groton 2006 Land Cover in the Riparian Zone

Riparian Zones | 1985 Land cover in the Riparian Zone | 2006 Land cover in the Riparian Zone | Change in the Riparian Zone



2006 Land Cover Within the 300 foot Riparian Zone

Printable PDF

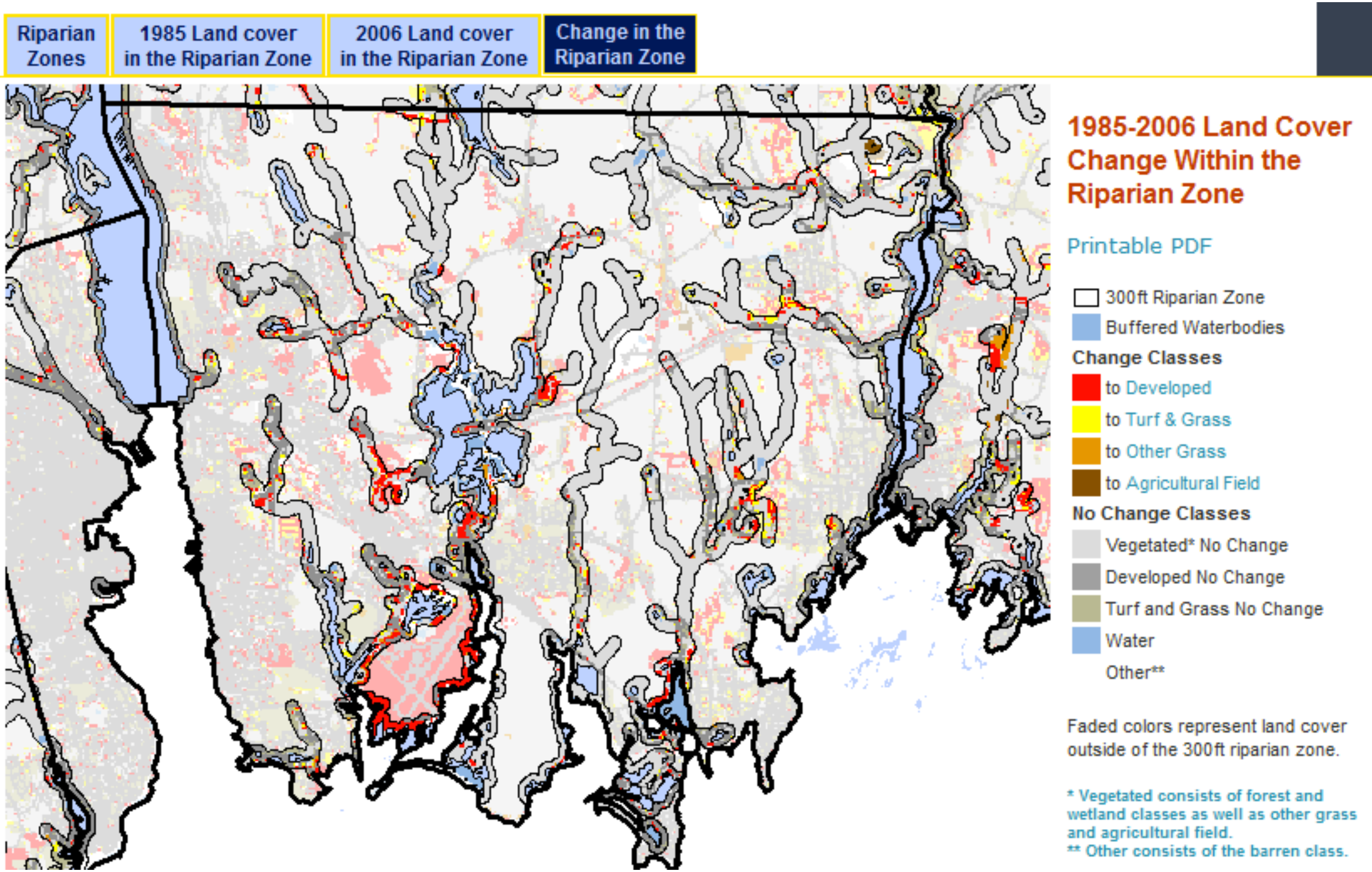
- Buffered Waterbodies

Land Cover

- Developed
- Turf & Grass
- Other Grass
- Agricultural Field
- Deciduous Forest
- Coniferous Forest
- Water
- Non-forested Wetland
- Forested Wetland
- Tidal Wetland
- Barren
- Utility Right-of-way (Forest)

Faded colors represent land cover outside of the 300ft riparian zone.

Groton Land Cover change in the riparian zone



Groton Land Cover In the Riparian Zone

		Developed	Turf & Grass	Other Grass	Ag. Field	Forest*	Water	Wetland**	Barren
Town Wide	1985 Land Cover (acres)	5,487.7	1,412.2	542.8	132.9	11,358.2	1,196.7	315.6	254.3
	1985 Land Cover (%)	26.5%	6.8%	2.6%	0.6%	54.9%	5.8%	1.5%	1.2%
	2006 Land Cover (acres)	6,681.1	1,709.0	591.3	110.2	9,659.1	976.7	348.7	624.4
	2006 Land Cover (%)	32.3%	8.3%	2.9%	0.5%	46.7%	4.7%	1.7%	3.0%
	1985-2006 Change (acres)	1,193.4	296.8	48.5	-22.7	-1,699.1	-220.0	33.1	370.0
	1985-2006 Change (%)	5.8%	1.4%	0.2%	-0.1%	-8.2%	-1.1%	0.2%	1.8%
100 Foot Zone	1985 Land Cover (acres)	349.5	75.8	54.3	0.9	1,140.1	225.3	79.0	41.0
	1985 Land Cover (%)	17.8%	3.9%	2.8%	0.0%	58.0%	11.5%	4.0%	2.1%
	2006 Land Cover (acres)	437.7	96.4	64.1	2.7	1,033.8	151.3	96.3	83.5
	2006 Land Cover (%)	22.3%	4.9%	3.3%	0.1%	52.6%	7.7%	4.9%	4.2%
	1985-2006 Change (acres)	88.1	20.7	9.8	1.8	-106.3	-73.9	17.3	42.4
	1985-2006 Change (%)	4.5%	1.1%	0.5%	0.1%	-5.4%	-3.8%	0.9%	2.2%
300 Foot Zone	1985 Land Cover (acres)	1,129.7	282.4	166.4	9.6	3,315.9	339.1	113.7	113.1
	1985 Land Cover (%)	20.7%	5.2%	3.0%	0.2%	60.6%	6.2%	2.1%	2.1%
	2006 Land Cover (acres)	1,397.7	371.3	197.6	10.4	2,910.6	219.7	143.4	219.3
	2006 Land Cover (%)	25.6%	6.8%	3.6%	0.2%	53.2%	4.0%	2.6%	4.0%
	1985-2006 Change (acres)	268.0	88.9	31.2	0.8	-405.3	-119.4	29.7	106.2
	1985-2006 Change (%)	4.9%	1.6%	0.6%	0.0%	-7.4%	-2.2%	0.5%	1.9

Climate Change in Riparian Ecosystem

Global temperatures are projected to increase by 1.1 to 6.4°C (IPCC 2007)

Riparian ecosystems : air and surface water temps changes

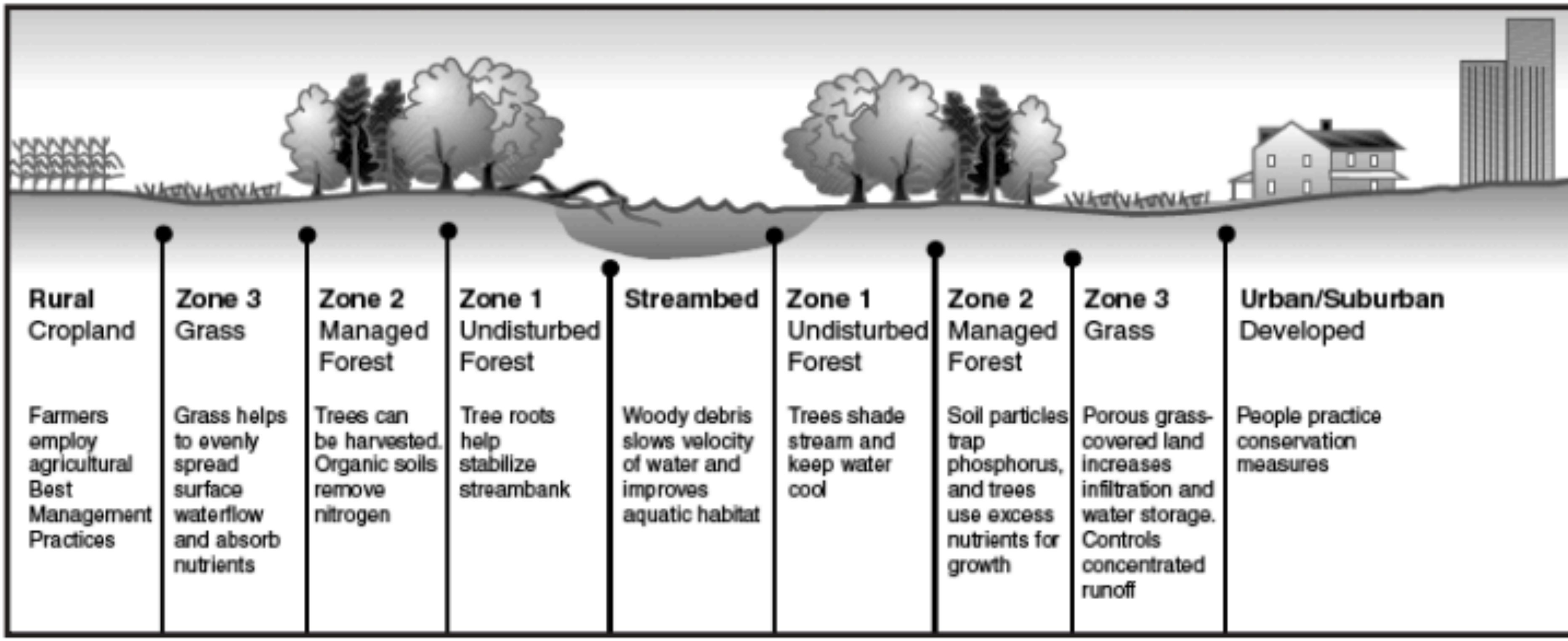
Changes in the magnitude and seasonality of ppt and run-off

Shifts in reproductive phenology and plant and animal distribution

Riparian corridors can help mitigate storm surges and sea level rise.

- Expanding thermal refugia (riparian areas absorb heat) and buffer orgs against extreme temps
- Hydrologic Benefits (cc – increased frequency of extreme flood events, and altered seasonal patterns of ppt and runoff) impacts

Carbon sequestration



From: www.agnr.umd.edu/MCE/Publications/PDFs/FS724.pdf

So what might riparian corridors look like?


LAKE SHORE
RESTORATION
PROJECT
PLEASE
DO NOT DISTURB
(NEW PLANTINGS)

Factors Affecting the Riparian Corridor Width Necessary to Protect the Resource

- Function of Corridor
- Proposed upslope activity
- Stream order and watershed hydrology
- Physical characteristics of the site: slope, soil type, vegetation type

Take home message:

Riparian Corridors can play significant roles in protecting the functions and values of wetlands as well as mitigating impacts of climate change, while having inherent functions and values of their own.

Thank you!

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