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Professor Barrett

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ENVS 3999

Connecticut River Commission Zone 1985-2015 Land Cover Analysis

Introduction

Glossary:

- 1) COG - Continuity of Government
- 2) CT - Connecticut
- 3) GIS - Geographic Information Systems
- 4) ArcPro - Geographic Mapping Software
- 5) CLCC - Connecticut Land Conservation Council

Problem Statement:

The Connecticut River Commission Zone is an area stemming from the Connecticut River in the lower half of Connecticut. It is managed by the CTRiverCOG and CTRiverGateway which are organizations that protect the zone and ensure the land around the river is not compromised by urbanization. Over the last two hundred years forests and open fields all around the state are being converted for human use as technology and human population increase. The job of these organizations is to preserve the land and ensure it carries out its many ecosystem services it provides for the people of CT. With the help of recent GIS data we researchers are better able to understand what type of land previously forested areas are being converted to and which areas are impacted the most.

Goals of the Agreement:

The goal of this project is to provide easy-to-read and useful maps that capture land use changes to the Connecticut River Commission Zone using available GIS data in the last 30 years. A second goal of this project is to quantify the changes in land coverage for the area as percentage of the rest of the state and how many total acres are being altered. Tools readily available in ArcPro will use the CTEco GIS data and provide the numerical amount of land by selecting certain layers of the map.

Objectives of the Agreement/Deliverables:

Task: With the given sets of data, cut down CTEco data to only focus on the towns within the Commission Zone and omit the data from the rest of the state. Decide which land use layers are most important such as forest, developed, agriculture, turf, and open land.

Deliverable: Create 6 distinct maps for the past 30 years of the Connecticut River Commission Zone showing 4-5 different land types layers based on the CTEco data.

Task: Use the data analysis tools in ArcPro to show the amount of land allocated for each type of land use. Compute changes in land coverage for the last 30 years by dividing the current land acreage by a previous land acreage.

Deliverable: Collect numerical data of the Zone coverage and compare to other years coverage to quantify the physical change in acreage.

Administration:

- February 8: Meeting with CT Gateway Commission with the goal of determining the correct amount of deliverables that can be accomplished within the time of the semester
- March 23: Attend CLCC Conference to gain an in-person experience of the legislative conversation around the Connecticut River Commission Zone and other relevant sustainability issues.

Timeline:

February 8- Meeting with Susie at CT Cog, develop updated scope of work

February 13- Combine the two maps to show land change in zone(Email Emily)

February 27- Include any useful map tools such as map titles and orientation to reduce complexity

March 12- Present progress report in class discussion showing finished and unfinished work

March 23- CLCC Conference attendance

March 26- Start working on calculations for changes in land cover

April 2- Finish quantifying land cover changes and begin adding them to maps in the legend

April 16- Touch base with Susie at CT Cog for any comments on progress

April 23- Create finished product presentation for class discussion, adding or omit details based on feedback

Methods & Materials

Procedure:

To complete the first map-making deliverable above, the six shapefiles for Connecticut Land Cover data provided by CTEco were transferred into an ArcPro for the years 1985, 1990, 1995, 2006, 2010, and 2015. A polygon was then created to represent the Commission Zone.

This was done by tracing the zone boundaries based on the map provided on the CT River

Gateway website in the ArcPro base map. The “Clip Raster” geoprocessing tool was used to omit

the excess Connecticut land cover data to only encompass the Commission Zone polygon. This process was repeated for each of the six sets of land cover data for the thirty-year period. Next, the symbology (labeling) of the land types was corrected to reflect the coloring provided on the CTEco map. Finally, each map was exported into a layout file where a scale, orientation, title, and legend were added.

For the second deliverable of quantification, for each attribute table a “Count” field was added to the original attribute data. With this addition, the number of raster grids for each specific land type became available. The attribute data for each year was then exported to an Excel spreadsheet. The total number of raster grids in the Commission Zone was divided by the total number of acres in the zone (21,500 acres) therefore providing land area in acres rather than rasters. Originally, the CTEco data held a total of 12 different types, for the purpose of analysis the groups were combined into 6 categories (Developed, Turf and Grass, Agr. Fields, Forest, Wetland, and Other a.k.a Barren and Utility Forest land). A pie chart was then generated for each year which described the percent coverage of each land type in the Commission Zone. A total of six line graphs were created, four of which show the thirty-year acreage changes for Developed, Turf and Grass, Forest and Wetlands. One line graph to show total land vs. water coverage and the final one a combination of the first four.

Materials:

- Connecticut River Gateway Conservation Zone Map
- CTEco Land Cover Viewer
- ArcPro
- Microsoft Excel Spreadsheets

Calculations:

- Raster Grid to Acre Conversion: $\text{Total Grid Count}(130747)/\text{Total Acres}(21,500) \approx 6.08 \text{ grids/acres}$
- Land Cover %: $\text{Total Acres} - \text{Water Acres} / \text{Total Acres}$

Data and Tables

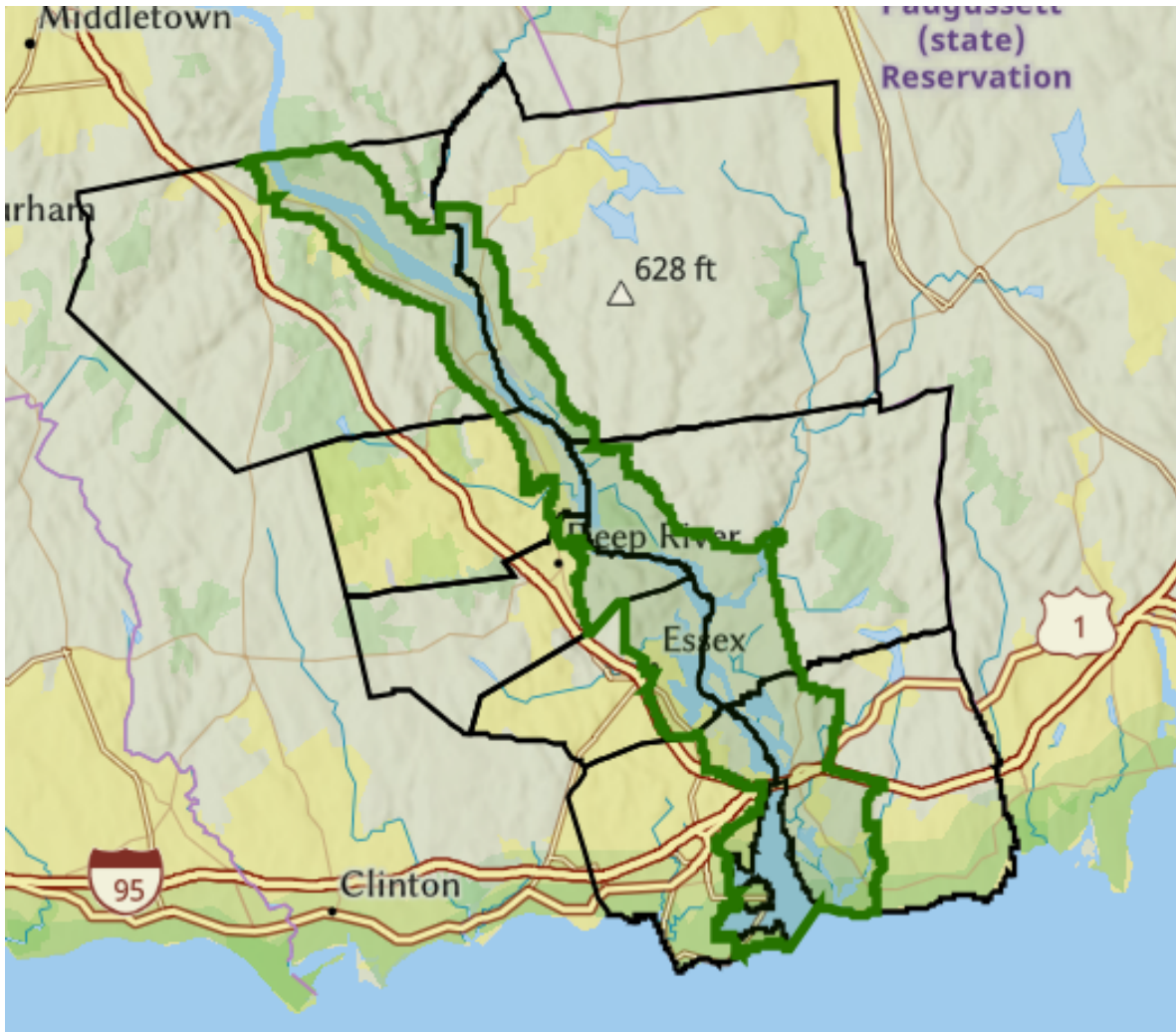


Figure 1. Connecticut River Gateway Commission Zone Boundary(CT River Gateway)

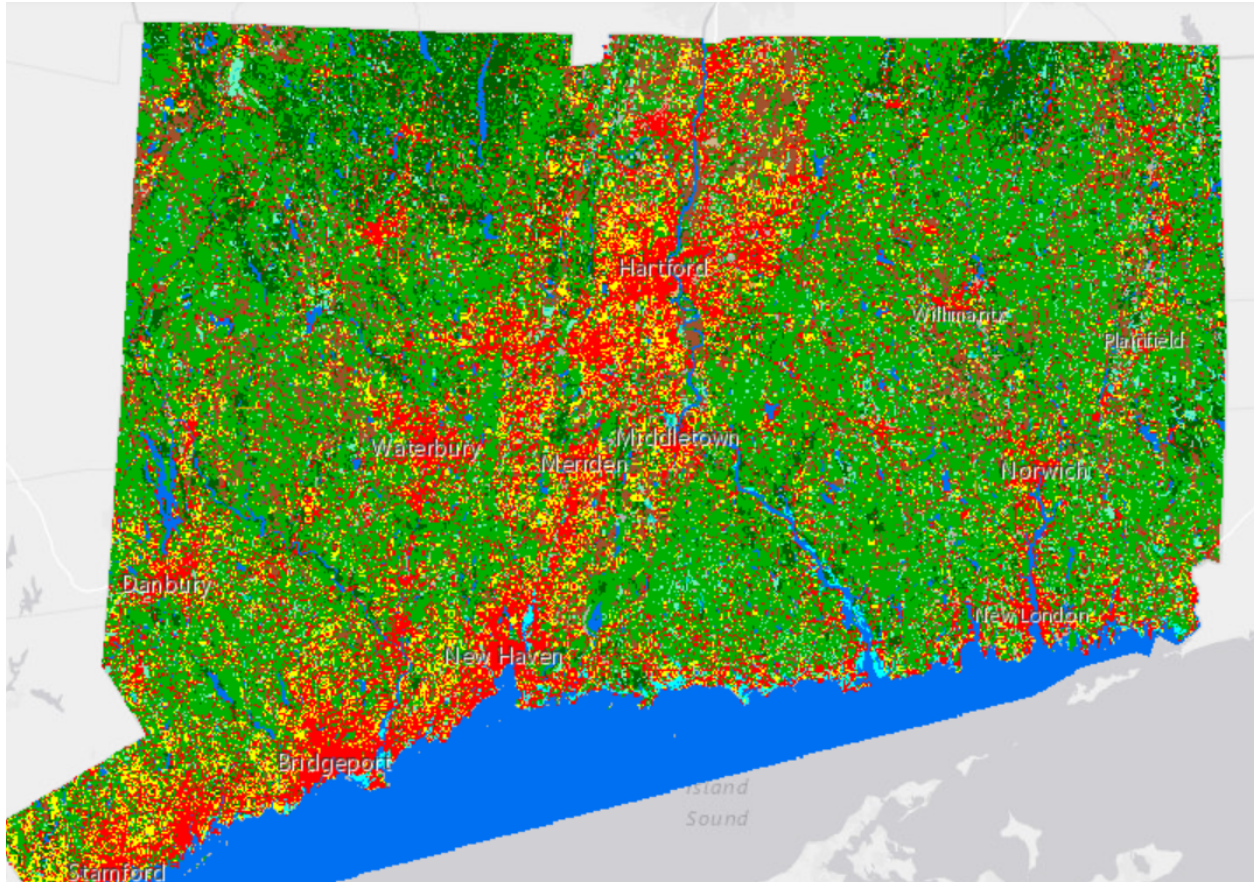
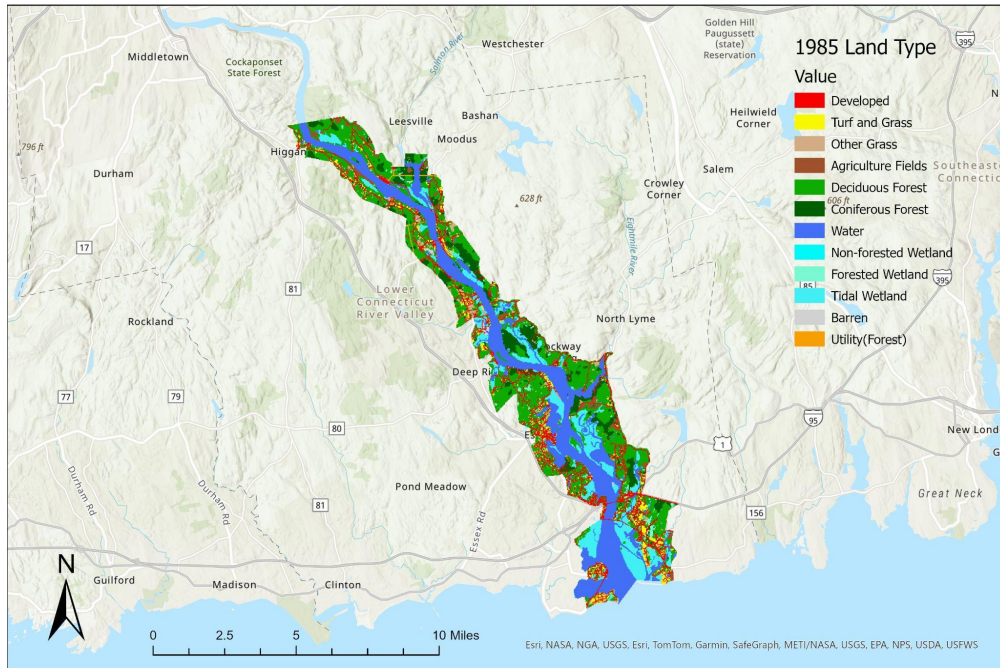


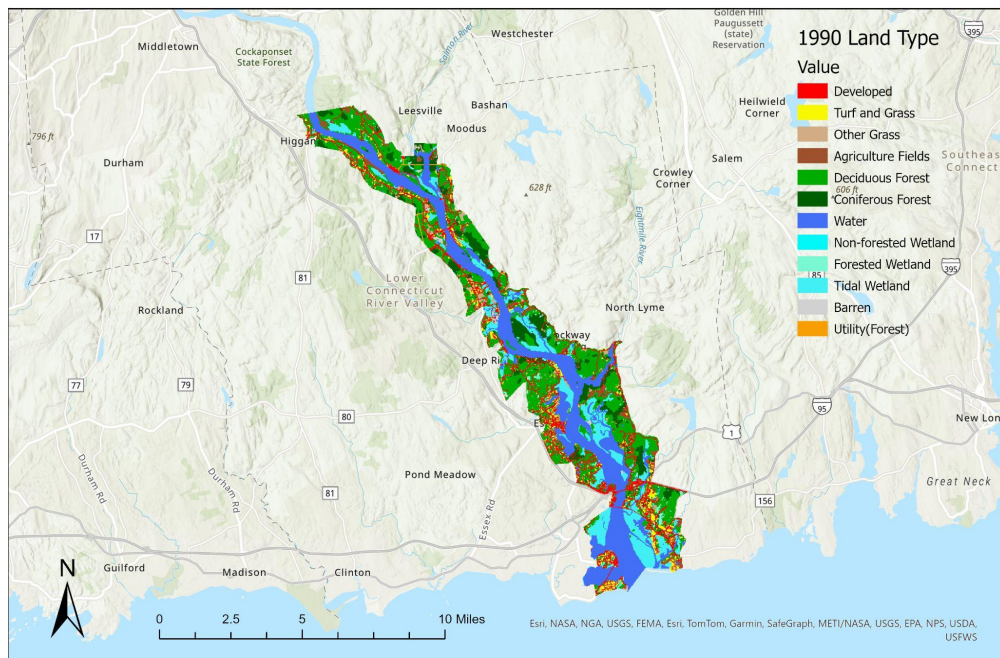
Figure 2. CT Eco Land Cover Map View(CT Eco)

1985 Commission Zone Land Cover



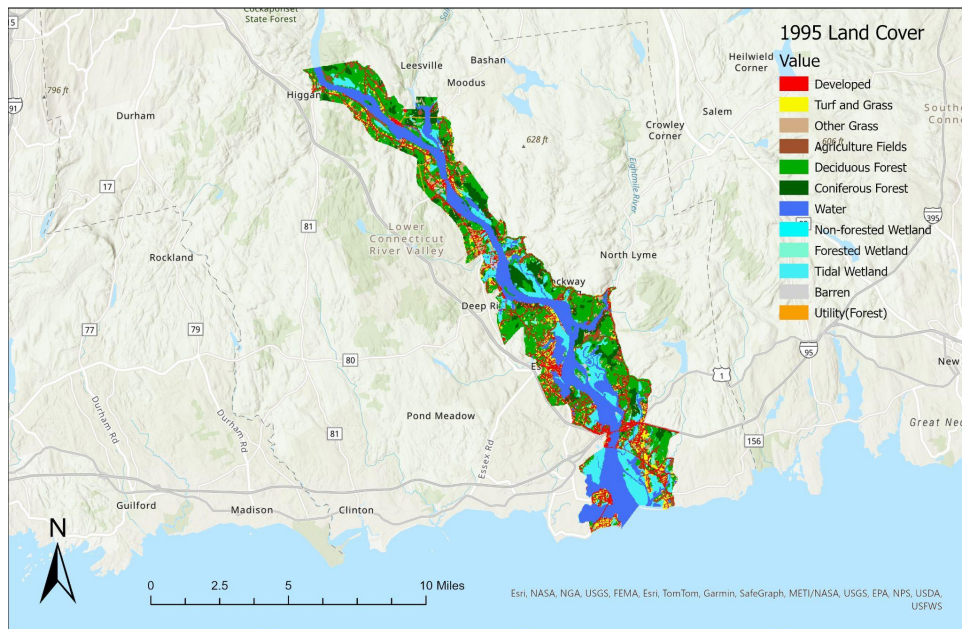
Map 1. 1985 Commission Zone Land Cover

1990 Commission Zone Land Cover



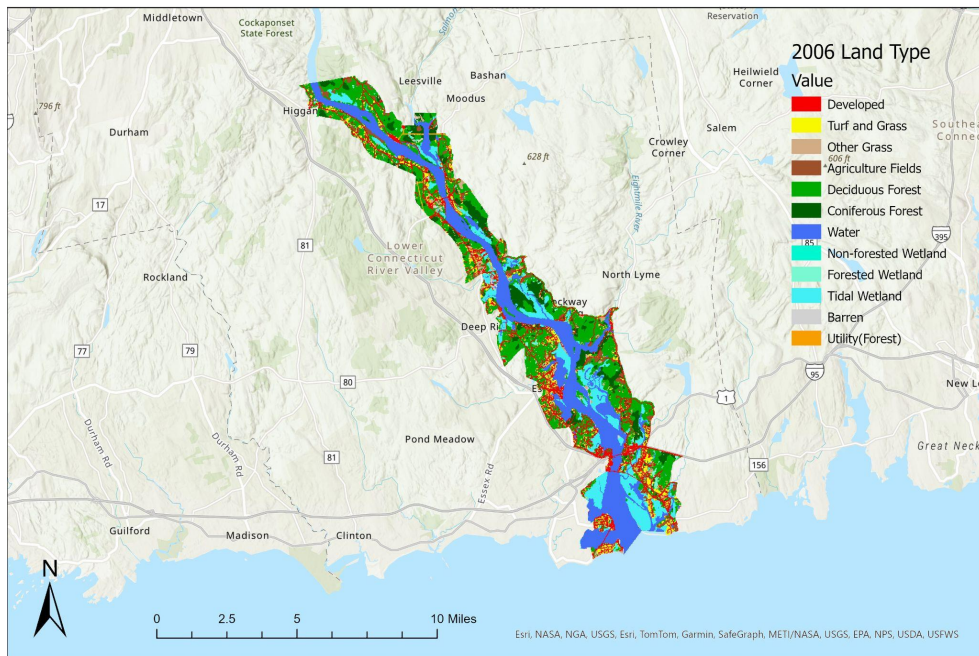
Map 2. 1990 Commission Zone Land Cover

1995 Commission Zone Land Cover



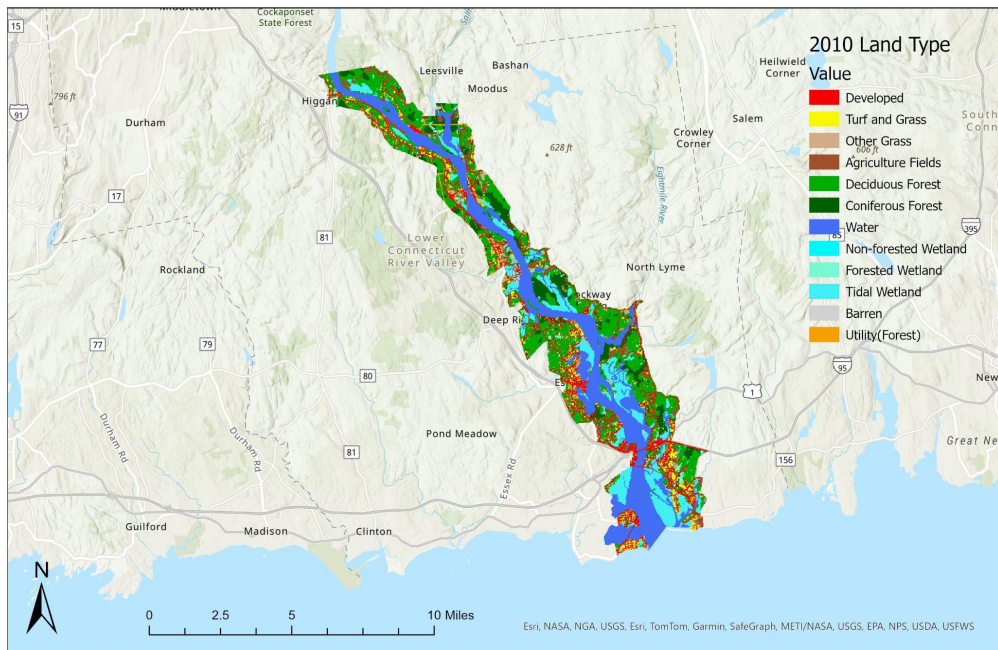
Map 3. 1995 Commission Zone Land Cover

2006 Commission Zone Land Cover



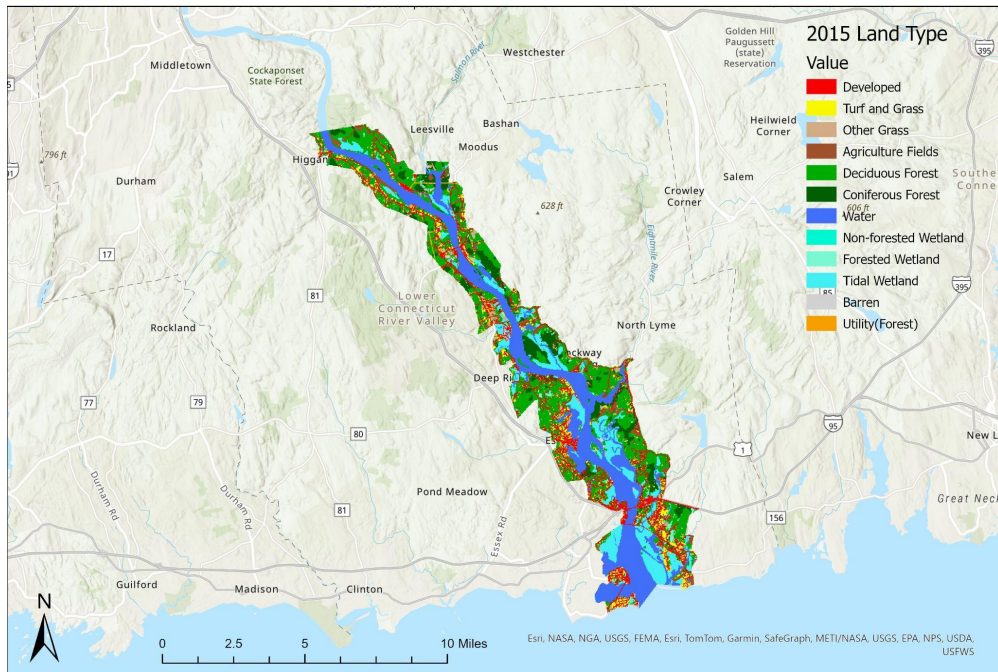
Map 4. 2006 Commission Zone Land Cover

2010 Commission Zone Land Cover



Map 5. 2010 Commission Zone Land Cover

2015 Commission Zone Land Cover



Map 6. 2015 Commission Zone Land Cover

In Acres:						
Land Type	1985	1990	1995	2006	2010	2015
Developed	2521	2682	2876	2895	2899	2912
Turf and Grass	880	927	1090	1145	1142	1143
Other Grass	294	303	396	370	345	330
Agriculture Fields	436	429	413	413	415	413
Deciduous Forest	6592	6438	6129	6099	6126	6125
Coniferous Forest	1839	1814	1749	1752	1756	1760
Water	6071	5964	5856	5869	5873	5852
Non-forested Wetland	10	9	10	11	11	11
Forested Wetland	176	172	170	169	168	168
Tidal Wetland	2550	2603	2617	2586	2587	2594
Barren	71	98	134	133	119	132
Utility Forest	60	60	59	59	59	59
Total Acres	21500	21500	21500	21500	21500	21500
Land Cover Acres	15429	15536	15644	15631	15627	15648

Table 1. 1985-2015 Acreage for Original CT Eco Categories

In Acres:						
Year	1985	1990	1995	2006	2010	2015
Developed	2521	2682	2876	2895	2899	2912
Turf and Grass	1174	1231	1486	1515	1487	1473
Agriculture Fields	436	429	413	413	415	413
Forests	8431	8252	7878	7851	7883	7886
Wetlands	2736	2784	2797	2766	2766	2773
Other	131	158	193	192	178	191
Total Acres	15429	15536	15644	15631	15627	15648

Table 2. 1985-2015 Acreage for Combined Categories

1985 Connecticut Gateway Commission Zone Distribution

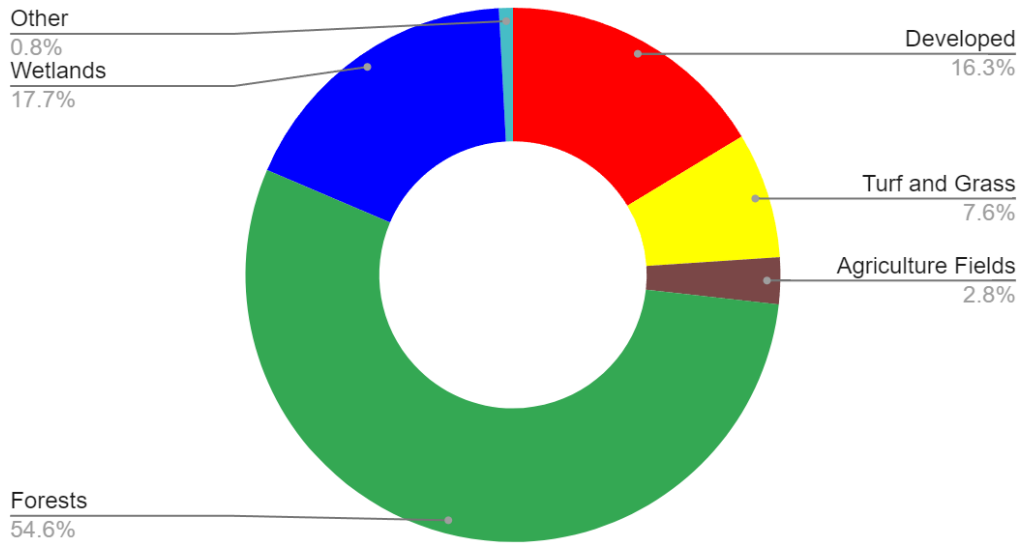


Figure 3. 1985 Commission Zone Land Coverage(%)

2015 Connecticut Gateway Commission Zone Distribution

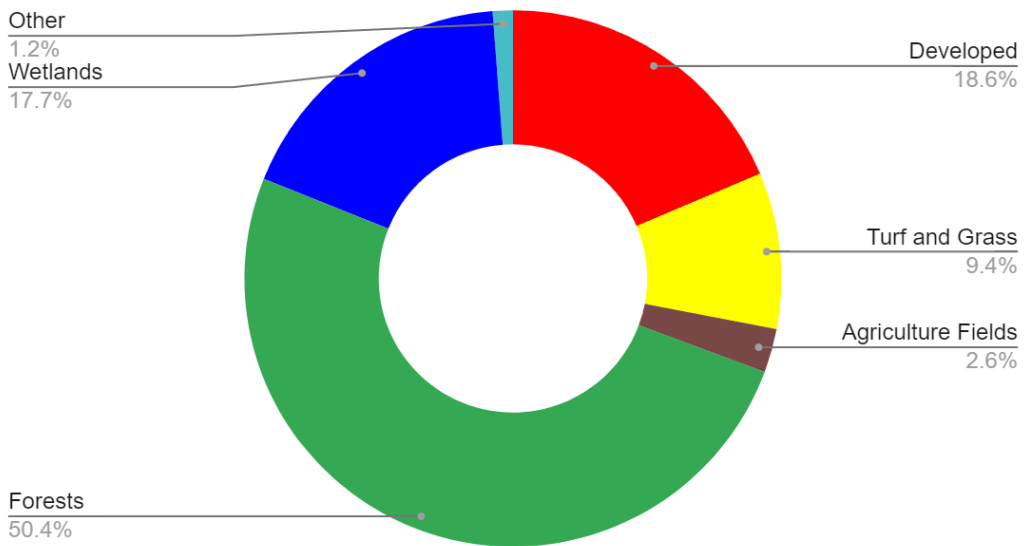


Figure 4. 2015 Commission Zone Land Coverage(%)

Developed Land, Turf and Grass, Forests and Wetlands

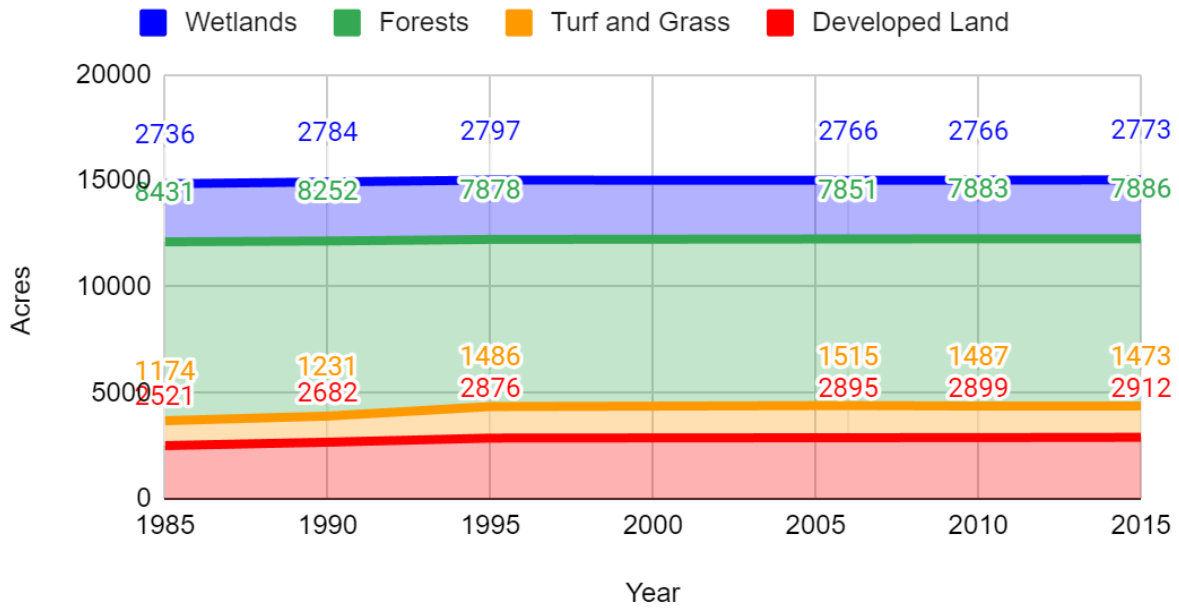


Figure 5. 1985-2015 Commission Zone Land Cover Change(Acres)

Land versus Water Coverage(Acres)

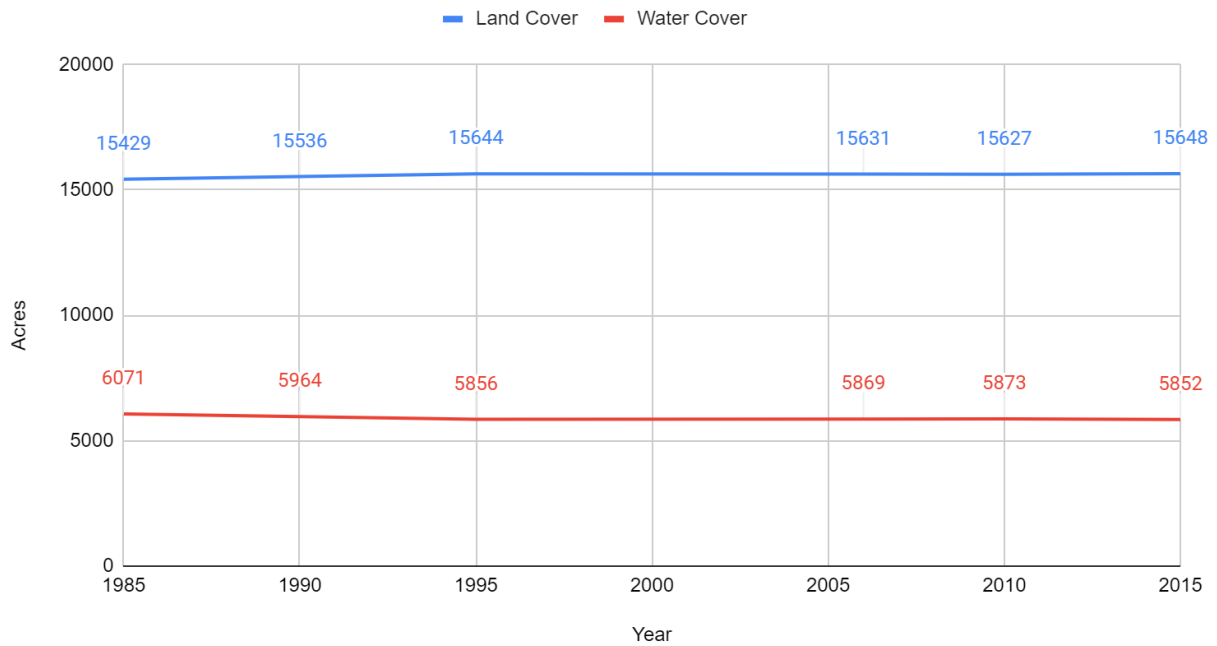


Figure 6. Total Land and Water Coverage(Acres)

Results

From 1985 to 2015, Deciduous and Coniferous forests in the Conservation Zone decreased by 4.2%, a total of 545 acres. Developed land, mainly infrastructure, increased by 2.3% with an additional 391 acres built upon. Turf and Grass areas also rose 1.8% of the zone land coverage for 299 acres. Forested, non-forested, and tidal wetlands coverage showed almost no change over the 30-year period, only gaining about 37 acres. The total land versus water coverage shifted by roughly 1% by adding 198 acres of land that was previously aquatic habitat.

Discussion

Despite there being a clear decrease in forest land and an increase in developed land in the Commission Zone, conservation efforts have clearly been effective. Most forest degradation occurred up until 1995 at which point it still showed a downward trend but at a much slower rate. Conservation in the Gateway Zone is the primary goal of the Commission in protecting the scenic views and biodiversity from infrastructure and home developers. Regardless of a growing Connecticut population and desire to build on the scenic Connecticut River, the conservation zone shows minimal changes to wetlands and forests which function as a habitat for biodiversity and a buffer against sea level rise. The establishment of the zone has proven effective in mitigating anthropogenic effects on wildlife.

References

Bonsack, Kara. "CT Land Cover Viewer." *Center for Land Use Education and Research*, 4 Mar.

2022, clear.uconn.edu/projects/landscape/ct-landcoverviewer/.

"Connecticut River Gateway Commission Zone Map Viewer." *ArcGIS Web Application*,

rivercog.maps.arcgis.com/apps/webappviewer/index.html?id=c874276f8cad4f2b85d5eb3

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