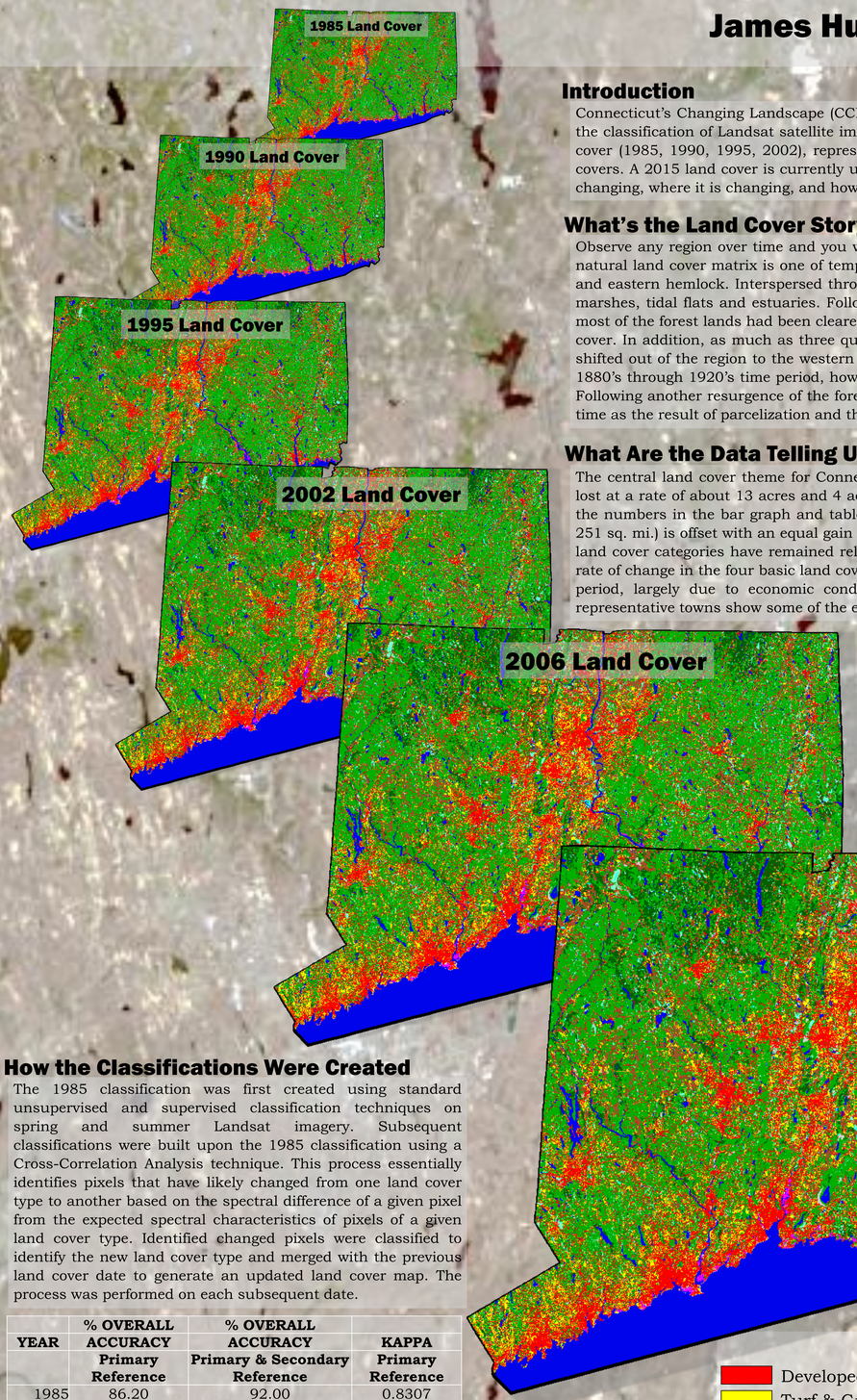
CONNECTICUT'S CHANGING LANDSCAPE

Tracking Land Cover Change in Connecticut

James Hurd, Daniel Civco, Emily Wilson, and Chester Arnold



Introduction

Connecticut's Changing Landscape (CCL) is an ongoing project at the University of Connecticut's Center for Land Use Education and Research (CLEAR) that uses the classification of Landsat satellite imagery to identify and track land cover change in Connecticut. Originally initiated in 2002 with four dates of consistent land cover (1985, 1990, 1995, 2002), representing 12 categories (see map legend) the CCL project has continued over time with the addition of 2006 and 2010 land covers. A 2015 land cover is currently under development. Using this consistent set of land cover data we are better able to look at how Connecticut's landscape is changing, where it is changing, and how fast it is changing.

What's the Land Cover Story in Connecticut?

Observe any region over time and you will notice how dynamic the landscape is. Change is a constant, and Connecticut's landscape is no different. Connecticut's natural land cover matrix is one of temperate forests once dominated by the American chestnut, and now composed largely by oak, hickory and maple, white pine and eastern hemlock. Interspersed throughout the forest is a mix of natural open water surfaces, abundant woody and herbaceous freshwater wetlands, and salt marshes, tidal flats and estuaries. Following the colonization of the region by European settlers, much of the Connecticut landscape has changed. By the 1820's most of the forest lands had been cleared for building materials, and agricultural uses. At this time approximately 25 percent of Connecticut remained in forest land cover. In addition, as much as three quarters of the wetland environments had been lost through filling, ditching and dredging. Over time as agricultural practice shifted out of the region to the western and southern parts of the country, many of the abandoned agricultural fields were left to revert back to forest. During the 1880's through 1920's time period, however, much of Connecticut's forest were again removed for charcoal production to heat homes and manufacturing facilities. Following another resurgence of the forest landscape during the early half of the 20th century, Connecticut is once again experiencing a decline in forest cover, this time as the result of parcelization and the expansion of urbanized areas, in addition to the influx of invasive diseases and pests.

What Are the Data Telling Us?

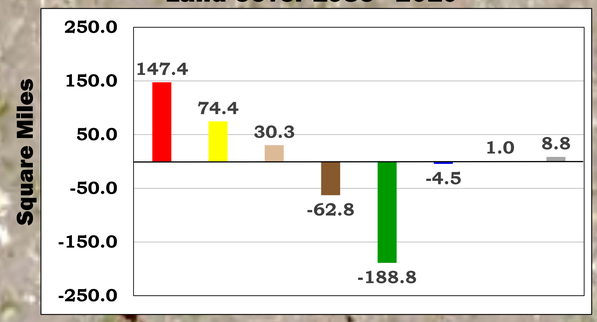
The central land cover theme for Connecticut over the 1985 to 2010 time period is that forest and agricultural land has been lost at a rate of about 13 acres and 4 acres per day and replaced with development and associated grass lands. If you compare the numbers in the bar graph and table to the right, you will see that the loss of forest and agricultural lands (approximately 251 sq. mi.) is offset with an equal gain of development, turf & grass and other grasses (approximately 252 sq. mi.). Other minor land cover categories have remained relatively unchanged. Further, the line graphs in the lower right corner illustrate how the rate of change in the four basic land cover types (development, turf & grass, forest and agriculture) vary from time period to time period, largely due to economic conditions within the state and it's impact on housing construction. The examples of representative towns show some of the extreme cases and the spatial distribution of various land cover changes.

For More Information Visit:

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

http://clear3.uconn.edu/viewers/ctstory/

Change in Connecticut Land Cover 1985 - 2010



	1985		1990		1995		2002		2006		2010		Change		
	Sq. miles	% of State	Sq. miles	% of State	Sq. miles	% of State	Sq. miles	% of State	Sq. miles	% of State	Sq. miles	% of State	Sq. miles	% of Class	% of State
Developed	797.4	16.0%	862.3	17.4%	885.5	17.8%	922.8	18.6%	942.1	19.0%	945.3	19.0%	+147.9	18.5%	+3.4
Turf & Grass	308.9	6.2%	325.9	6.6%	341.7	6.9%	362.5	7.3%	381.7	7.7%	383.3	7.7%	+74.4	24.1%	+1.5
Other Grasses	65.3	1.3%	68.7	1.4%	76.1	1.5%	82.4	1.7%	86.0	1.7%	95.6	1.9%	+30.3	46.4%	+0.6
Agricultural Fields	425.2	8.6%	403.9	8.1%	391.8	7.9%	371.8	7.5%	363.4	7.3%	362.4	7.3%	-62.8	-14.8%	-1.3
Deciduous Forest	2467.0	49.6%	2410.5	48.5%	2379.7	47.9%	2338.2	47.1%	2307.3	46.4%	2303.3	46.4%	-163.7	-6.6%	-3.2
Coniferous Forest	455.9	9.2%	452.4	9.1%	449.5	9.0%	445.2	9.0%	441.1	8.9%	440.2	8.9%	-15.7	-3.4%	-0.3
Water	173.1	3.5%	168.8	3.4%	164.1	3.3%	161.1	3.2%	161.2	3.2%	168.6	3.4%	-4.5	-2.6%	-0.1
Non-forested Wetland	20.2	0.4%	21.2	0.4%	21.2	0.4%	21.7	0.4%	21.1	0.4%	20.7	0.4%	+0.5	2.5%	+0.0
Forested Wetland	183.8	3.7%	177.8	3.6%	174.9	3.5%	173.8	3.5%	173.7	3.5%	174.4	3.5%	-9.4	-5.1%	-0.2
Tidal Wetland	22.6	0.5%	22.9	0.5%	23.0	0.5%	23.2	0.5%	22.9	0.5%	23.1	0.5%	+0.5	2.2%	+0.0
Barren	32.1	0.6%	37.3	0.8%	44.4	0.9%	49.1	1.0%	51.4	1.0%	40.9	0.8%	+8.8	27.4%	+0.2
Utility Corridor	17.6	0.4%	17.3	0.3%	17.3	0.3%	17.0	0.3%	17.1	0.3%	17.1	0.3%	-0.5	-2.8%	-0.1

How the Classifications Were Created

The 1985 classification was first created using standard unsupervised and supervised classification techniques on spring and summer Landsat imagery. Subsequent classifications were built upon the 1985 classification using a Cross-Correlation Analysis technique. This process essentially identifies pixels that have likely changed from one land cover type to another based on the spectral difference of a given pixel from the expected spectral characteristics of pixels of a given land cover type. Identified changed pixels were classified to identify the new land cover type and merged with the previous land cover date to generate an updated land cover map. The process was performed on each subsequent date.

YEAR	% OVERALL ACCURACY Primary Reference	% OVERALL ACCURACY Primary & Secondary Reference	KAPPA Primary Reference
1985	86.20	92.00	0.8307
1990	84.60	90.90	0.8133
1995	83.60	91.00	0.8026
2002	82.70	89.80	0.7936
2006	82.90	89.60	0.7879
2010	82.10	90.30	0.7968

Overall Accuracy Primary Reference: The overall percent accuracy based on just the Primary Reference point. This point identifies the perceived land cover, based on reference imagery, at the center of the Landsat pixel.

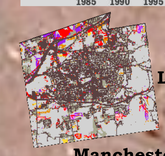
Overall Accuracy Primary & Secondary Reference: The overall percent accuracy based on combining the Primary and, if that is incorrect, the Secondary Reference points. The Secondary Reference is the next likely land cover category based on the land cover features in the immediate surrounding area.

KAPPA Primary Reference: Provides a measure of the observed accuracy with the expected accuracy based on reference imagery, at the center of the Landsat pixel.

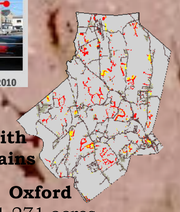
Classification Legend

- Developed
- Turf & Grass
- Other Grasses
- Agricultural Fields
- Deciduous Forest
- Coniferous Forest
- Open Surface Water
- Non-Forested Wetland
- Forested Wetland
- Tidal Wetland
- Barren
- Utility Corridor

Development



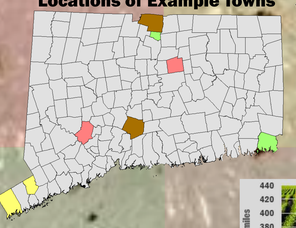
Towns With Largest Gains



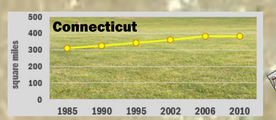
Oxford
+1,271 acres
(67% increase)

Manchester
+1,768 acres
(27% increase)

Locations of Example Towns



Turf & Grass

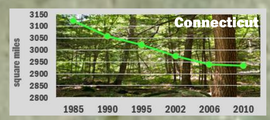


Towns With Largest Gains

New Canaan
+202 acres
(6% increase)

Greenwich
+358 acres
(5% increase)

Forest Cover

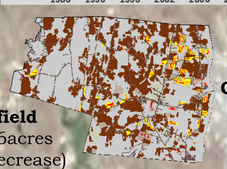


Towns With Greatest Losses

Windsor Locks
-534 acres
(31% decrease)

Stonington
-2,030 acres
(13% decrease)

Agricultural Land



Towns With Greatest Losses

Suffield
-1,936acres
(23% decrease)

Wallingford
-1,558acres
(54% decrease)

CLEAR Center for Land Use Education & Research | Connecticut View | UCONN College of Agriculture, Health, and Natural Resources