



The Status of Connecticut's Riparian Corridors

This paper summarizes an analysis of land cover and land cover change in Connecticut's riparian, or streamside areas. The focus is on statewide information. Information at the town and watershed levels is available on the project website.

About the Project

The University of Connecticut Center for Land Use Education and Research (CLEAR) conducts an ongoing project, "Connecticut's Changing Landscape" (CCL), that uses remote sensing technology to chart changes in our state's major land cover categories over time. The project now includes five dates that span 21 years, from 1985 to 2006. The major categories of interest include developed land, turf and grass, forest, and agricultural fields. This particular Research Summary focuses on 2006 land cover status, and 1985 - 2006 land cover change, in the state's riparian corridors. 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 also sometimes known as "buffer" areas, but are not to be confused with regulatory review zones, which are often also called buffers.

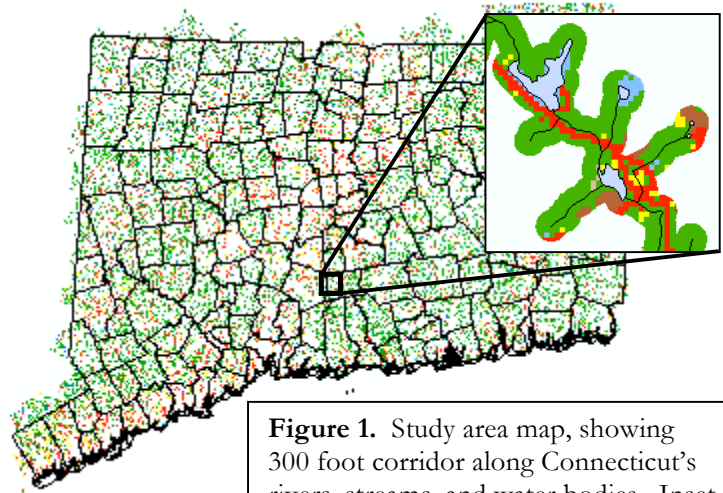


Figure 1. Study area map, showing 300 foot corridor along Connecticut's rivers, streams, and water bodies. Inset shows example close-up of land cover for the 300 ft corridor.

Methods

This study was conducted by analyzing CLEAR multi-date land cover information for areas on either side of Connecticut streams, lakes and other waterbodies. CLEAR researchers created a seamless, continuous GIS data layer of water features that included not only state stream lines, but wetlands and waterbodies contiguous with the stream lines. This provides a more complete picture of development pressures infringing on water resources. Inland wetlands and small waterbodies not directly connected to the stream lines as determined by the state data layers were not included in this study. The study area is based on statewide GIS hydrographic data, which sometimes varies from the actual location of smaller streams. However, the analysis provides a useful overview at the state, town and watershed levels.

Land cover analysis was conducted using medium-resolution satellite-derived land cover data from CLEAR's [Connecticut's Changing Landscape](#) project, which has created land cover datasets for 1985, 1990, 1995, 2002 and 2006. For this study, only 1985 and 2006 were used, creating a record of land cover change over the entire 21-year study period. Definitions of land cover categories can be found on the CCL and Riparian Study websites (see last page). Riparian corridors were characterized for land cover and land cover change for both 100 feet and 300 feet to either side of the stream, or shoreline of a water feature. Since the land cover data is in the form of 100 foot by 100 foot pixels, the 100 foot corridor analysis involves a very small sample size, which CLEAR researchers feel

approaches the limit of appropriate use of medium resolution data; however, since the 100 foot corridor encompasses the regulated review zone in many Connecticut towns, it was included in the study. The 100 foot data seems consistent with, and varies closely with, the 300 ft data, which makes us more confident in the value of that data. This paper, however, concentrates on the 300 foot data (100 foot data can be found on the project website, see last page).

Land cover was measured as area (acres or square miles) and as percent of the unit of interest. Land cover change, as with all CCL projects, was measured in several ways, which are summarized in Table 1. Not all measures were used for all analyses, nor are all the results contained in this paper; complete data tables are posted on the project website (see last page).

Table 1. Ways in which CLEAR land cover change data are measured

Measure of land cover change	Calculation	Significance
Absolute change	(acres T2 – acres T1)	Allows aggregation of total areal change across the same geographic areas (such as towns or basins)
Relative change ("change in percent")	(% area T2 - % area T1)	Allows comparison between areas (such as towns or basins); relates to land cover indicators for watershed health
Relative rate of change ("percent change")	(area T1 - area T2) / area T1	Gives feel for how quickly land cover is changing relative to 1985 baseline, within and between geographic areas

Results

Statewide Riparian Corridor Status 2006

Figure 2 shows the breakdown, by major land cover category, of the statewide 300 foot riparian corridor in 2006. Forest was the predominant land cover category (64.1%), followed by development (16.8%).

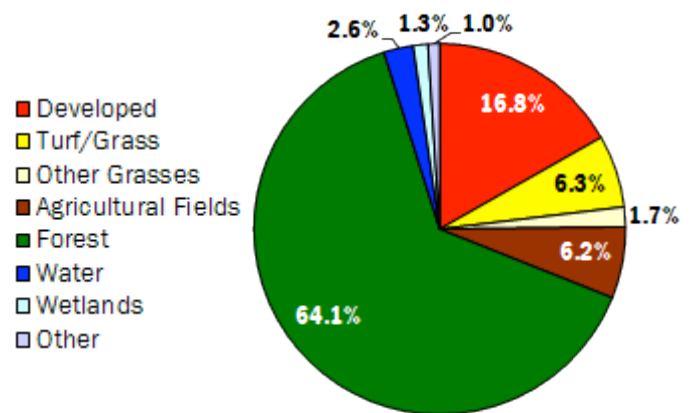


Figure 2. 2006 breakdown of land cover in 300 ft. riparian corridor

Statewide Change in Riparian Corridors 1985 - 2006

Figure 3 shows the percent of each major land cover category in the 300 foot corridor in 1985 and 2006 (thus, the hatched columns are the same data as in Figure 2). Figure 4 shows these changes in terms of acreage. The biggest changes were seen in developed land, which increased by over 19,000 acres, and in forested land, which decreased by over 25,000 acres. As with the overall CCL study, the combined increases in the three land cover categories considered by CLEAR researchers to approximate the “urban footprint” -- developed, turf/grass and “other grasses” (33,028 acres) -- roughly balance the combined losses to the agricultural fields and forest categories (31,975 acres).

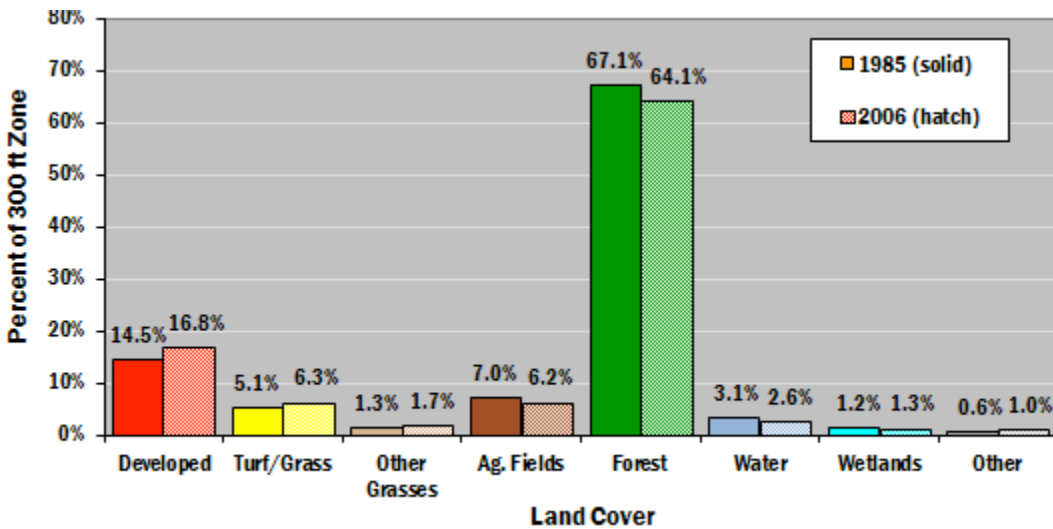


Figure 3. Percent of each major land cover category in the 300 ft corridor in 1985 and 2006.

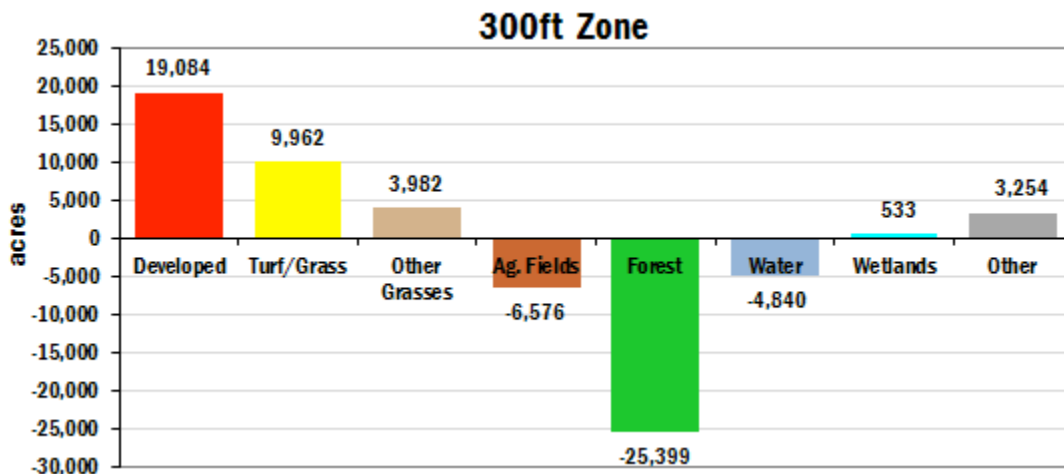


Figure 4. Absolute change 1985 - 2006 (acres) in the 300 ft corridor, by land cover class.

Focusing on development, Table 2 compares the percent of the developed class within the 100 foot and 300 foot corridors with the CCL figure for the entire state. The increase in percentage of developed land (relative change, see Table 1) was 1.7% for the 100 foot corridor, 2.3% for the 300 foot corridor, and 3.0% for the entire area of the state.

Table 2. Change in the percent developed land within the 100 ft and 300 ft corridors, compared to statewide change, 1985-2006.

	1985	2006	Change in %
100 ft corridor	12.7%	14.4%	1.7%
300 ft corridor	14.5%	16.8%	2.3%
entire state	16.0%	19.0%	3.0%

Change in Riparian Corridors 1985 - 2006, by Watershed

Riparian corridor 2006 status and 1985-2006 change were calculated for the 333 “sub-regional” watersheds in Connecticut. Figure 5a shows the level of forest cover, by watershed, in the 300 foot

riparian corridor. Figure 5b shows the degree of relative change (see Table 1) within the 300 foot corridor, by watershed, during the study period. The 25 sub-regional watersheds with the greatest percent loss of forested land during the study period are cross-hatched.

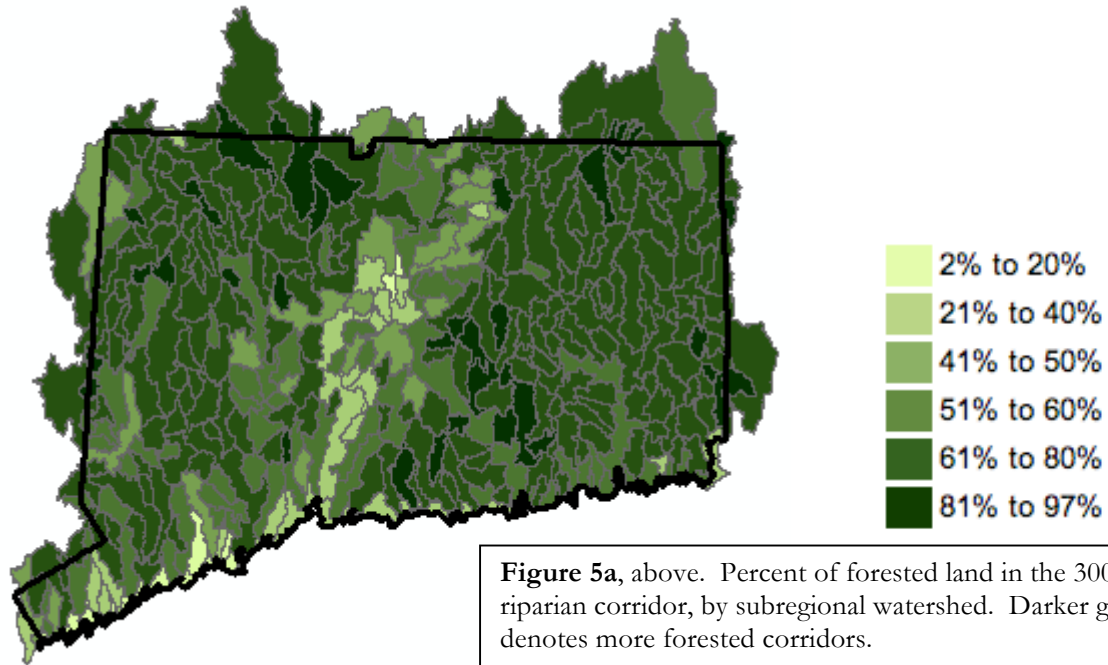


Figure 5a, above. Percent of forested land in the 300 foot riparian corridor, by subregional watershed. Darker green denotes more forested corridors.

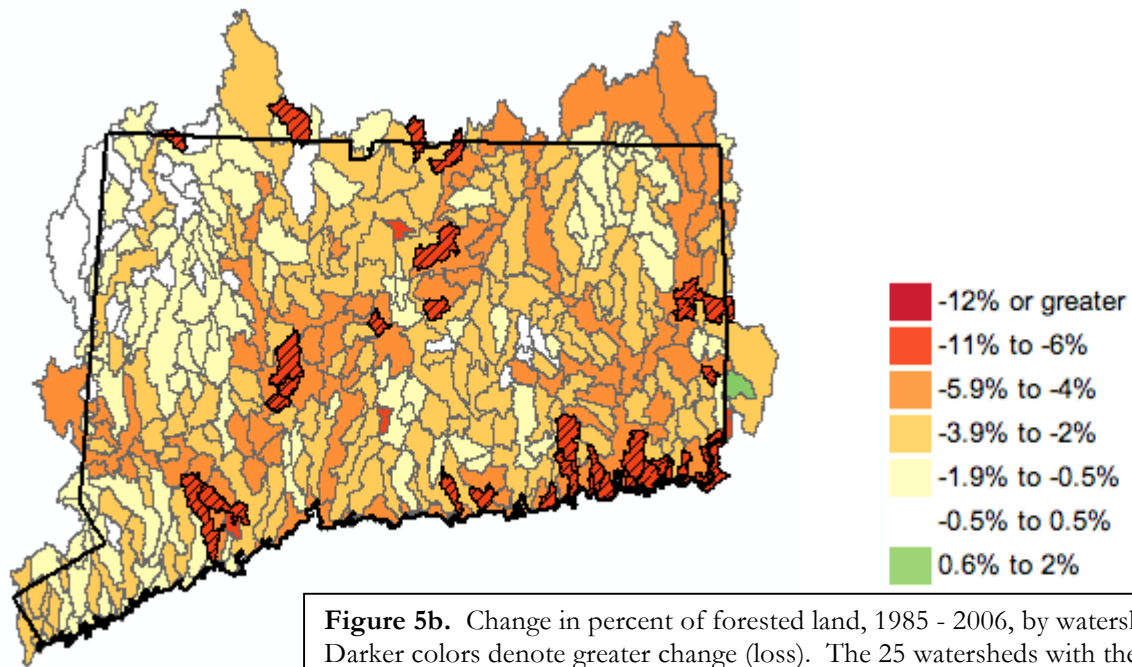


Figure 5b. Change in percent of forested land, 1985 - 2006, by watershed. Darker colors denote greater change (loss). The 25 watersheds with the greatest loss in % forest are cross-hatched. (Stippled portions of watersheds in neighboring states were not included in the study).

Change in Riparian Corridors 1985 - 2006, by Town

While watershed change statistics are more meaningful in terms of estimating ecosystem services and impacts related to riparian vegetation, land use in these areas is determined at the municipal level, so CLEAR looked at the data by town as well.

CLEAR researchers looked at the relationship between new development in the riparian zones, and new development, overall, in each town. Figure 6 shows a land cover change map of Clinton as an example: development added from 1985-2006 in the 300 foot corridor is outlined, with bright colors denoting changed areas; the change map for the rest of the town is in muted colors.

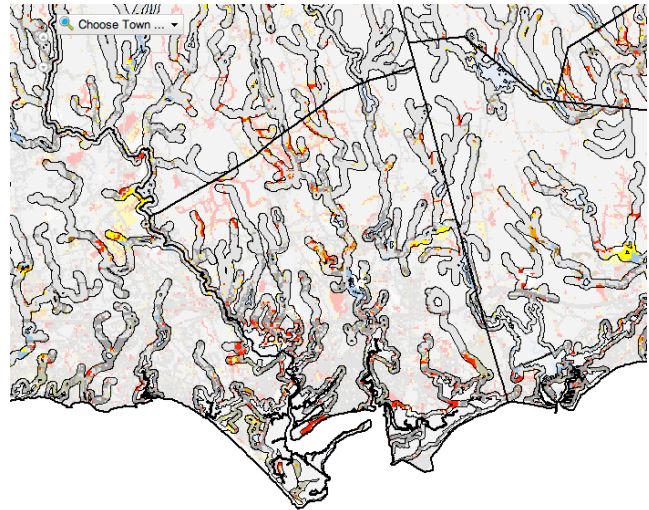
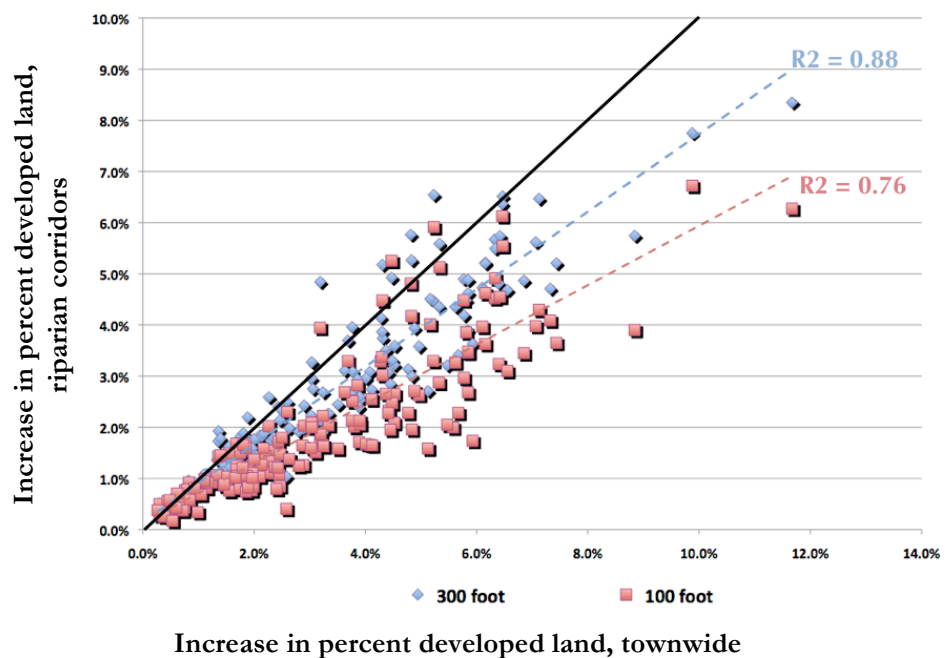


Figure 6. Unmuted colors show areas of new development within the 300 foot riparian zone. These areas were compared to the new development in the town overall (riparian zone plus the muted area).

The percent of each of CT's 169 towns covered by new development in the 1985-2006 period was plotted against the same metric for both the 100 foot (red points) and 300 foot (blue points) corridors. Figure 7 shows the results. The black line represents equality between the town and corridor areas. As might be expected from the data in Table 2, most towns had less new development in the riparian areas than in the town as a whole. Of note, though, is the very strong correlation between the town and the riparian corridor data, with about 76% of the 100 foot corridor data and about 88% of the 300 foot buffer being explained/predicted by the town data.

Figure 7. The relationship of new development in a town to new development in the town's riparian corridors. The linear regression lines for both the 300 ft corridors (blue) and the 100 ft corridors (red) show very strong correlations between the amount of new development in the riparian corridors and the in the town, overall.



Summary and Conclusions

2006 status: The study looked at land cover for the 100 foot corridor (an area of about 298,250 acres) and the 300 foot corridor (about 849,000 acres) for the state of Connecticut. For the 100 foot corridor, forest accounted for over two-thirds of the area (67.1%), with developed land (14.5%) and the closely associated category of turf/grass (5.1%) being the next most prevalent. For the 300 foot corridor, forest was still the most prevalent land cover (64.1%), with developed land (16.8%) and turf/grass (6.3%) again rounding out the top three (Figure 2). These compare with the overall statewide figures from the Connecticut's Changing Landscape project of 58.8% forest, 19.0% developed, and 7.7% turf/grass.

Absolute Change: Statewide, new development added in the 1985-2006 period totaled about 5,100 acres within the 100 foot riparian corridor, and about 19,000 acres within the 300 foot corridor. When the data for the turf/grass and "other grasses" land cover categories are added, the growth in these development-related categories roughly balances the loss of forest and agricultural fields, especially within the 300 foot zone (between 32,000 and 33,000 acres).

Relative Change: During the study period, relatively less new development occurred in the 100 foot corridor (+1.7% of the total corridor area) than in the 300 foot corridor (+2.3%). Both figures are lower than the overall increase in development for the entire state (+3.0%). At the watershed level, "hot spots" of watersheds experiencing the greatest loss in percent riparian forest cover appear in several parts of the state, with a noticeable concentration along the southeast coast (Figure 5b); these areas are similar to "hot spots" of overall growth in development determined by the Connecticut's Changing Landscape project. At the town level, the rate of new development in the riparian corridors was generally lower than the overall town average, but varied closely with the town average (Figure 7).

The amount and rate of development with Connecticut's riparian corridors is likely influenced by a complex combination of development pressure, the local implementation of wetlands and watercourse regulations, and physical factors such as slope, soils and geology. More detailed town-by-town analysis is needed to determine the true nature of these relationships.

This study can be found at:

<http://clear.uconn.edu/projects/riparian>

Connecticut's Changing Landscape project is at:

<http://clear.uconn.edu/projects/landscape>

More on CLEAR research, training and outreach:

<http://clear.uconn.edu>

The Center for Land Use Education and Research is part of the University of Connecticut, and a partnership of the Department of Extension, the Department of Natural Resources and the Environment, and the Connecticut Sea Grant College Program. This report was written by Emily Wilson and Chester Arnold, Department of Extension, February 2011. © 2011 University of Connecticut. The University of Connecticut supports all state and federal laws that promote equal opportunity and prohibit discrimination. CLEAR publication #090925.2.

