



GFC Canopy Assessment Phase 2 Final Report

Georgia Statewide Assessment of Canopy Change Between 2009 and 2019



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June 15, 2021

Disclaimer

The work upon which this publication is based was funded in whole or in part through an Urban and Community Forestry grant awarded by the Southern Region, State and Private Forestry, U.S. Forest Service and administered by the Georgia Forestry Commission.

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Abstract

The objective of the Phase 2 of this canopy assessment project is to analyze canopy change between 2009 and 2019 in the state of Georgia. The Georgia Forestry Commission (GFC) provided 68 counties that are outside developing areas and are mostly timberland or agricultural land with little canopy change. We analyzed the rest 91 counties. As we discussed with the GFC, we used a lumped change analysis without considering spatial distributions of canopy change. The average loss of canopy across the 91 counties was 7.85%.

1. Introduction

Using the canopy datasets we produced for the Phases 1 and 2 of this project, the Institute for Environmental and Spatial Analysis (IESA) at the University of North Georgia (UNG) conducted a canopy change analysis between the two datasets for 2009 and 2019. We created change figures in PDF and polygon datasets in Shapefile that show canopy changes for the 91 studied counties that the Georgia Forestry Commission (GFC) highlighted. At a resolution of 1m and below, NAIP imagery provides high resolution multi-spectral data with which machine learning methods can be applied to extract information. Subsequently, using

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Textron Systems’ Feature Analyst along with the CanoPy Python module that we developed for Phases 1 and 1.5 as part of the project, tree canopy datasets were created for the years 2009 and 2019. The purpose of the canopy change analysis is to analyze how much canopy has been lost or gained in certain counties over the past decade. As we discussed with the GFC, we used a lumped approach instead of a spatially distributed approach. For this reason, the spatial distribution of canopy changes was not considered in our analysis. Instead, spatial changes are visualized in a juxtaposed manner in individual PDF files for the counties. This report explains the methods we used to create the PDF and Shapefiles.

2. Materials and Methods

The 2009 and 2019 canopy datasets span the entire state of Georgia and are designed to enable the temporal analysis of tree canopy within the state. We first clipped these datasets to the 91 counties individually. For each of these counties, clumped statistics were computed to gather the number of acres changed and the percent change in canopy. The analysis was performed within ArcGIS Pro and output figures were subsequently produced.

The percent change in canopy was calculated as the arithmetic difference of two percentages between 2009 and 2019 in percentage points or pp in short as

$$\text{Canopy Change (pp)} = \text{Canopy 2019 (\%)} - \text{Canopy 2009 (\%)}. \quad (1)$$

We presented this percentage point as percent (%) for the purpose of public communication, but it should not be confused as a relative change of two percentages as

$$\text{Canopy Change (\%)} = \frac{\text{Canopy 2019 (\%)} - \text{Canopy 2009 (\%)}}{\text{Canopy 2009 (\%)}} \times 100\%. \quad (2)$$

3. Results

We presented results in separate PDF files and Shapefiles. In this report, the summary of canopy change is shown in Table 1. Within the 91 counties evaluated, there was an average canopy loss of 7.85%. The maximum canopy gained by a county was 12.13% while the highest amount lost was 30.22%. In 2009, there was a total of 14,552,150 acres in the 91 counties while 12,938,694 acres in 2019. Over the decade, there was a total loss of 1,613,456 across the total area of 20,553,345 acres of the 91 counties.

Table 1. Canopy change summary over the 91 counties.

County	Total Acres	2009 Canopy Acres	2019 Canopy Acres	Percent Change
Baker	223,441	95,302	91,327	-1.78%
Baldwin	171,137	138,494	137,384	-0.65%
Banks	149,682	116,630	108,276	-5.58%
Barrow	104,279	73,187	62,501	-10.25%
Bartow	300,862	186,376	199,098	4.23%
Bibb	163,428	113,190	116,255	1.88%
Bryan	290,841	238,833	198,161	-13.98%
Butts	120,342	100,649	91,331	-7.74%

Calhoun	181,483	107,458	103,462	-2.20%
Camden	468,573	295,097	235,156	-12.79%
Carroll	322,443	249,773	210,233	-12.26%
Charlton	500,333	464,056	353,855	-22.03%
Chatham	380,445	146,537	101,573	-11.82%
Chattooga	200,670	182,385	121,747	-30.22%
Cherokee	278,009	224,599	203,368	-7.64%
Clarke	77,460	49,006	52,703	4.77%
Clay	139,026	90,779	89,806	-0.70%
Clayton	92,369	53,736	41,871	-12.84%
Cobb	220,484	149,981	112,964	-16.79%
Colquitt	356,231	178,163	148,283	-8.39%
Columbia	196,860	155,283	138,474	-8.54%
Coweta	285,313	157,578	184,511	9.44%
Dade	111,457	103,354	84,433	-16.98%
Dawson	137,217	117,391	112,945	-3.24%
DeKalb	173,525	104,302	92,141	-7.01%
Decatur	398,806	206,276	163,553	-10.71%
Dougherty	214,157	123,635	116,417	-3.37%
Douglas	128,652	97,028	89,965	-5.49%
Early	330,440	210,058	187,521	-6.82%
Effingham	308,897	272,716	212,607	-19.46%
Elbert	239,399	172,509	171,367	-0.48%
Fayette	127,561	85,148	77,023	-6.37%
Floyd	331,805	214,574	225,573	3.31%
Forsyth	158,181	111,402	86,273	-15.89%
Franklin	170,510	105,867	98,624	-4.25%
Fulton	341,956	222,629	194,555	-8.21%
Glascocock	92,447	81,690	71,516	-11.01%
Glynn	331,651	173,597	140,533	-9.97%
Gordon	229,139	128,766	140,907	5.30%
Grady	294,556	183,606	165,978	-5.98%
Greene	259,961	217,380	193,534	-9.17%
Gwinnett	279,526	164,507	147,094	-6.23%
Habersham	178,566	149,010	126,876	-12.40%
Hall	274,739	200,781	166,935	-12.32%
Hancock	306,345	277,490	253,535	-7.82%
Haralson	181,224	154,613	131,327	-12.85%
Harris	302,680	230,024	234,666	1.53%
Hart	164,162	81,212	89,744	5.20%
Heard	192,693	124,006	147,381	12.13%
Henry	208,982	153,352	128,136	-12.07%
Houston	243,141	162,496	144,948	-7.22%
Jackson	219,576	157,057	138,154	-8.61%
Jasper	239,004	212,133	193,733	-7.70%
Jones	253,058	222,416	216,019	-2.53%
Lee	231,501	154,350	126,711	-11.94%
Liberty	385,603	252,817	218,816	-8.82%
Lincoln	164,663	118,779	111,863	-4.20%
Long	258,431	224,617	183,931	-15.74%
Lowndes	326,754	179,353	189,213	3.02%

Madison	182,770	118,208	116,875	-0.73%
McDuffie	170,482	145,571	125,993	-11.48%
McIntosh	340,596	191,810	150,706	-12.07%
Miller	181,538	67,278	57,607	-5.33%
Mitchell	328,836	171,757	141,095	-9.32%
Monroe	254,590	221,675	204,675	-6.68%
Morgan	226,949	174,411	150,751	-10.43%
Muscogee	141,439	91,924	93,259	0.94%
Newton	178,680	139,301	120,184	-10.70%
Oconee	119,274	80,267	79,912	-0.30%
Oglethorpe	282,895	232,534	214,228	-6.47%
Paulding	201,172	163,183	149,934	-6.59%
Pickens	148,930	128,919	121,573	-4.93%
Polk	199,762	136,155	139,741	1.80%
Putnam	230,831	188,985	177,535	-4.96%
Quitman	102,758	81,045	80,793	-0.25%
Rabun	241,025	224,282	185,937	-15.91%
Randolph	275,744	205,781	191,432	-5.20%
Richmond	210,235	148,079	142,488	-2.66%
Rockdale	84,540	60,853	53,665	-8.50%
Seminole	164,186	70,287	30,966	-23.95%
Spalding	127,733	97,006	83,887	-10.27%
Stephens	117,880	86,384	88,837	2.08%
Taliaferro	125,018	112,790	101,921	-8.69%
Terrell	216,122	159,086	131,056	-12.97%
Thomas	353,366	221,482	185,790	-10.10%
Walker	286,086	263,162	196,159	-23.42%
Walton	211,188	147,722	136,153	-5.48%
Warren	183,474	162,826	144,258	-10.12%
Wheeler	192,165	153,580	117,805	-18.62%
White	155,007	132,587	116,708	-10.24%
Wilkes	303,404	255,188	229,882	-8.34%
Total	20,553,345	14,552,150	12,938,694	-7.85%

4. Conclusions

We analyzed canopy change between 2009 and 2019 across the 91 Georgia counties that are under active development. We produced canopy comparison figures in PDF and canopy polygons in Shapefile for each of the studied counties. Lumped statistics were calculated and canopy change in percentage point was presented as percent for public communication. The overall canopy change across the 91 counties was a loss of 7.85%.