

## Land Cover Trends Project

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# Ridge and Valley

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## Ecoregion Description

The Ridge and Valley is a long, narrow ecoregion that stretches approximately 1,600 km (995 mi) from the southeastern corner of New York to northeastern Alabama, including portions of seven additional states in between: New Jersey, Pennsylvania, Maryland, West Virginia, Virginia, Tennessee, and Georgia (fig. 1). Major cities within this ecoregion are Birmingham, Alabama, and Chattanooga and Knoxville, Tennessee. This northeast to southwest trending area occupies 44,589 km<sup>2</sup> (17,216 mi<sup>2</sup>) and is nestled between generally higher, more rugged mountainous terrain with greater forest cover. The roughly parallel ridges and lowland valleys that comprise this area are the result of extreme folding and faulting events (Omernik, 1987) (fig. 2).

Elevations range from 152 to 1,311 m (500 to 4,300 feet). Three land cover types dominate the ecoregion: forests at about 56 percent, agricultural lands at about 30 percent, and developed areas at about 9 percent. Managed lands comprise more than 13 percent of the area, ranging from State parks to wild and scenic rivers (Conservation Biology Institute, 2001). The Blue Ridge Parkway, a designated parkway administered by the National Park Service, dips into part of the eastern edge of the ecoregion in Virginia, as do small portions of Shenandoah National Park.

## Change from 1973 to 2000

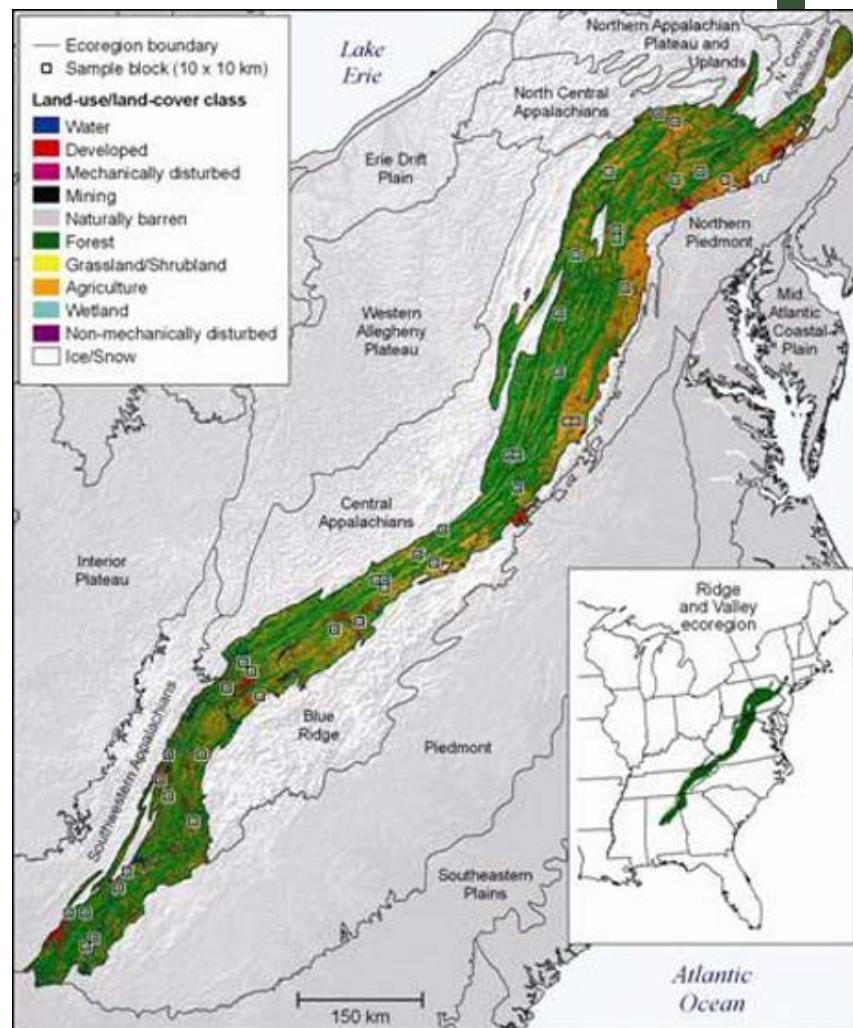


Figure 1. Ridge and Valley ecoregion. The underlying land cover is from the 1992 National Land Cover Database (Vogelmann and others, 2001). Outlines of the thirty-two 10-km x 10-km sample sites for the Land Cover Trends project are shown in black.

The Ridge and Valley ecoregion experienced relatively low change as compared to most Eastern U.S. ecoregions, with 5.5 percent of its land changing during the study period (fig. 3). Of the land that did change, 4.1 percent changed once and 1.4 percent changed two or more times (table 1). In this ecoregion, multiple changes often indicate cyclic disturbances; most of the multiple changes in this ecoregion are accounted for by areas of clear-cuts and forest regrowth (fig. 4).

The overall change per time interval for the Ridge and Valley ecoregion ranges from a low of 1.3 percent from 1980 to 1986 to a high of 2.6 percent from 1992 to 2000. All estimates have an associated margin of error of less than plus or minus one percent, although the margin of error increased with the higher amount of change in the 1992 to 2000 interval (table 2). When normalized to account for varying time period lengths, land cover change showed a gradual increase over the study period, from 0.2 percent to 0.3 percent annual change per time interval (table 2 and fig. 5). The 1992 to 2000 interval was the most active period.

Forest, agriculture, and developed areas account for almost 96 percent of the land cover in this ecoregion. Table 3 shows the percentage of each land cover class for the five respective mapped dates. Forest declined from 57.3 percent in 1973 to 55.8 percent in 2000 (table 3). Mechanically disturbed lands (clear-cut) showed an increase starting in the 1986 to 1992 period. A small decline in agriculture, from 31.2 percent to 30.5 percent, was recorded from 1973 to 2000. This decline was due both to abandoning agricultural fields and to converting agricultural land for developed uses.

Decreases in both forested and agricultural cover were countered by a 1.4 percent net increase in developed areas, from 7.9 percent in 1973 to 9.3 percent in 2000. Figure 6 summarizes these net changes by land cover type for each time period.

The four most common land cover transitions by time interval are reported in table 4. The greatest change over the duration of the study was consistently the conversion of forest to mechanically disturbed lands, followed by mechanically disturbed lands back to forest (forest regrowth). The amount of land that changed from forest to mechanically disturbed lands nearly doubled between the 1986 to 1992 period (535 km<sup>2</sup>) and the 1992 to 2000 period (1,030 km<sup>2</sup>). These changes were due to the clearing of trees. In contrast, only 491 km<sup>2</sup> of mechanically disturbed land grew back to forest cover in the same time period. Other leading conversions were cyclic changes from forest to agriculture and agriculture to forest, along with unidirectional changes from agriculture and forest to development.

The amount of land converting from both forest and agriculture to development doubled in the 1992 to 2000 period as compared to any previous period. This was the same time period when the amount of clear-cutting doubled. Although many clear-cut areas have regrown to forest, mechanically disturbed lands represent a temporary state of transition that can also lead to permanent development. The quantity of clear-cuts, coupled with the increased amount of forested and agricultural lands converting to development, highlights the net loss of forest in this ecoregion over time. These changes also suggest a possible accelerating trend in clearing both forested and agricultural lands for development.

Increases in development and mechanically disturbed lands and decreases in forested and agricultural lands in the Ridge and Valley ecoregion are corroborated by the Southern Forest Resource Assessment from the National Resource Inventory data of the U.S. Department of Agriculture Natural Resources Conservation Service (Wear, 2002). This study shows that for the southern states from 1982 to 1997 strong economic growth led to population growth and increased urbanization at the expense of both agricultural and forested lands. This trend was more noticeable in the southern part of the ecoregion, which also coincides with the largest urban centers in the area, namely Birmingham, Chattanooga, and Knoxville (fig. 7). Forecasts for the northern, central, and southern Ridge and Valley areas show continued and increased forest loss between 1992 and 2020, with higher losses predicted for the southern region. Development pressures are likely to continue driving land use conversions in the Ridge and Valley ecoregion into the foreseeable future (fig. 8).

## References

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Table 1. Amount of overall change detected in the ecoregion and proportion of the ecoregion that experienced change during one or multiple time periods

	Overall spatial change	Number of changes			
		1	2	3	4
Percent of ecoregion	5.5	4.1	1.4	0.0	0.0

Table 2. Raw estimates of percent change in the ecoregion computed for each of the four time periods and associated margin of error at an 85-percent confidence level

[Estimates of change per period normalized to an annual rate of change for each of the four time periods]

	Period			
	1973- 1980	1980- 1986	1986- 1992	1992-2000
Total change (% of ecoregion)	1.5%	1.3%	1.6%	2.6%
Margin of error (85% confidence level)	+/-0.5%	+/-0.4%	+/-0.4%	+/-0.6%
Average annual rate of change (%/year)	0.2%	0.2%	0.3%	0.3%

Table 3. Proportion of the ecoregion covered by each land cover class during each of the five mapped dates

Land-use/land-cover class	1973		1980		1986		1992		2000		Net change 1973-2000	
	km <sup>2</sup>	%	km <sup>2</sup>	%	km <sup>2</sup>	%	km <sup>2</sup>	%	km <sup>2</sup>	%	km <sup>2</sup>	%
Water	2433	2.2	2594	2.3	2704	2.4	2710	2.4	2717	2.4	283	0.3
Developed	8797	7.9	9032	8.1	9292	8.4	9615	8.7	10295	9.3	1498	1.3
Mechanically disturbed	471	0.4	481	0.4	459	0.4	586	0.5	1067	1.0	595	0.5
Mining	222	0.2	223	0.2	253	0.2	264	0.2	278	0.3	56	0.1
Barren	8	0.0	20	0.0	11	0.0	11	0.0	11	0.0	3	0.0
Forest	63618	57.3	63318	57.0	63018	56.8	62848	56.6	61990	55.8	-1628	-1.5
Grassland/Shrubland	93	0.1	94	0.1	125	0.1	113	0.1	113	0.1	21	0.0
Agriculture	34641	31.2	34526	31.1	34424	31.0	34139	30.7	33821	30.5	-820	-0.7
Wetland	760	0.7	756	0.7	756	0.7	756	0.7	750	0.7	-10	0.0

Non-mechanically disturbed      0    0    0    0    0    0.0    0    0.0    0    0.0    0    0.0

Table 4. Leading land cover conversions during each of the four time periods

Period	From class	To class	Area changed (km <sup>2</sup> )	% of all changes
1973-1980	Forest	Mechanically disturbed	416	25
	Mechanically disturbed	Forest	366	22
	Forest	Agriculture	173	10
	Agriculture	Forest	165	10
	Other classes	Other classes	566	34
			1,686	100
1980-1986	Forest	Mechanically disturbed	375	25
	Mechanically disturbed	Forest	339	23
	Forest	Agriculture	174	12
	Agriculture	Developed	145	10
	Other classes	Other classes	462	31
			1,495	100
1986-1992	Forest	Mechanically disturbed	535	30
	Mechanically disturbed	Forest	419	24
	Agriculture	Forest	248	14
	Agriculture	Developed	155	9
	Other classes	Other classes	423	24
			1,780	100
1992-2000	Forest	Mechanically disturbed	1,030	36
	Mechanically disturbed	Forest	491	17
	Agriculture	Developed	331	12
	Forest	Developed	316	11
	Other classes	Other classes	668	24
			2,836	100
<b>Overall:</b>				
1973-2000	Forest	Mechanically disturbed	2,355	30
	Mechanically disturbed	Forest	1,616	21
	Agriculture	Forest	792	10
	Forest	Agriculture	756	10
	Other classes	Other classes	2,278	29
			7,796	100



Figure 2. The Ridge and Valley topography is typified by forests dominating the hills, and development and agriculture occupying the valleys.

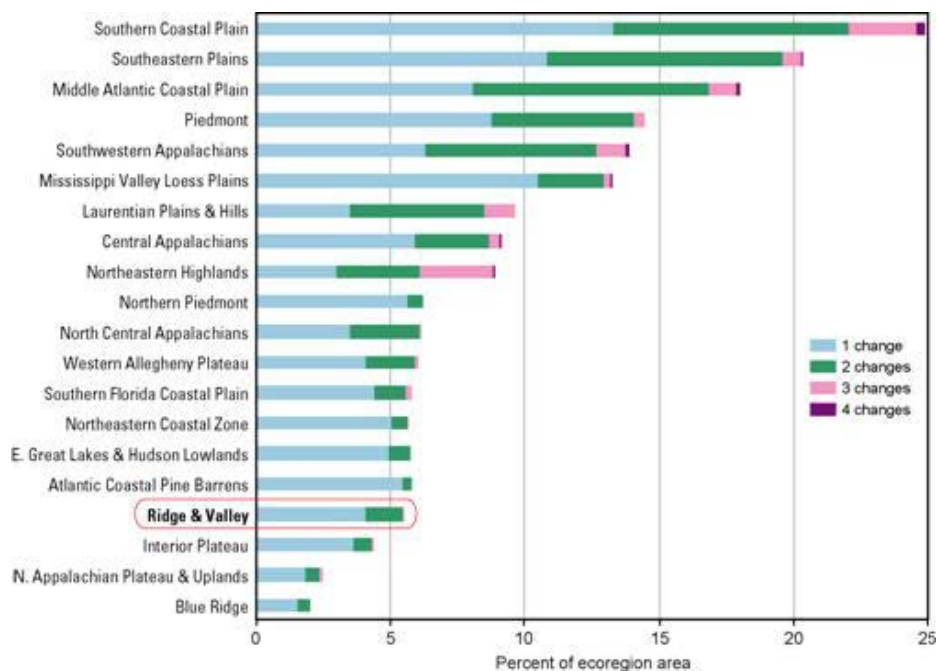


Figure 3. Change in percent of total area of all Eastern U.S. ecoregions. Each bar shows the proportion of the ecoregion that experienced change on 1, 2, 3, or 4 dates.



Figure 4. Regrowth of a clear-cut area in central Alabama.

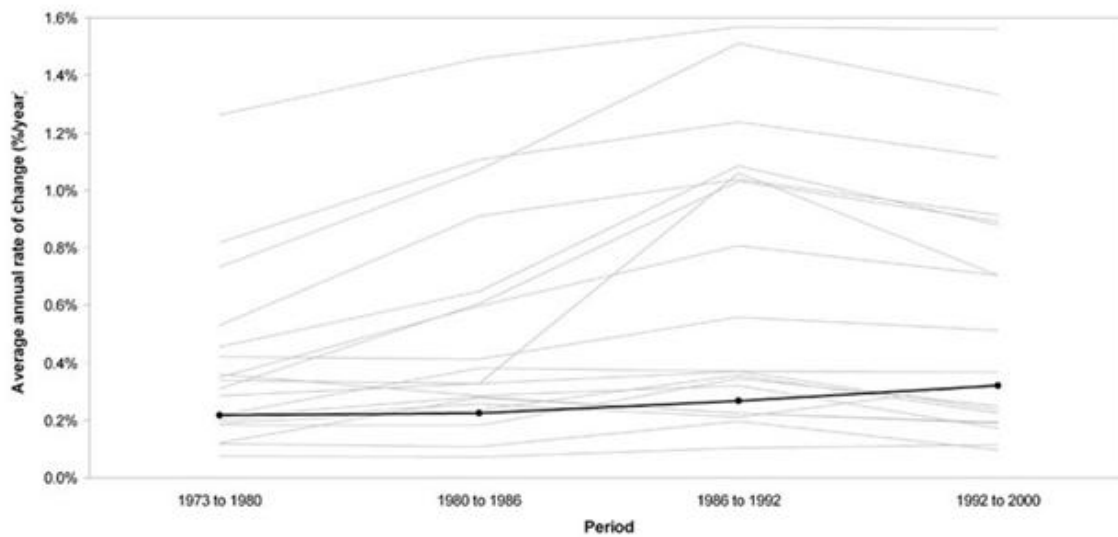


Figure 5. Estimates of change per period normalized to an annual rate of change for each of the four time periods.

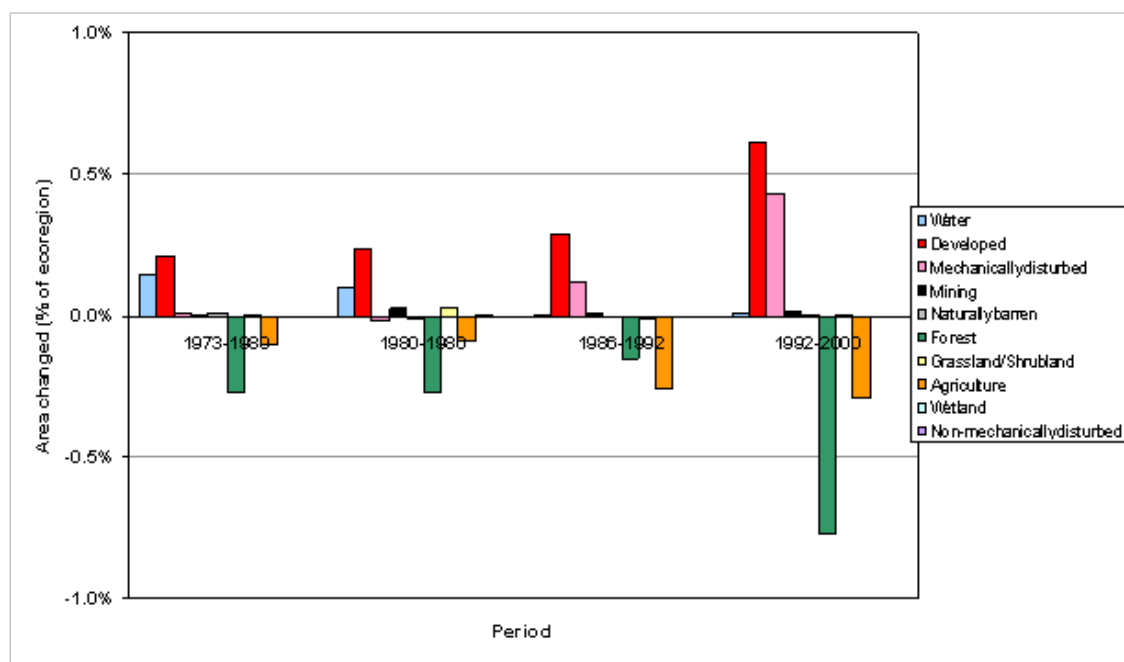
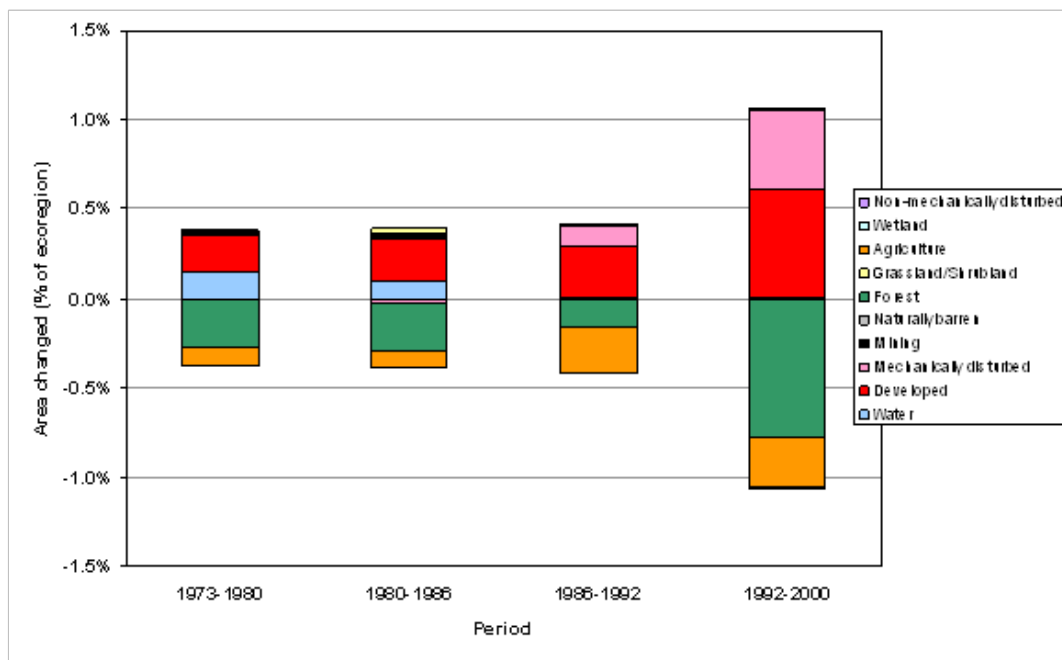


Figure 6. Net change by period for each mapped land cover class. Positive numbers represent a net gain for that land cover, while negative numbers represent a net loss for the land cover.



Figure 7. Industry is fairly common, especially along the interstates and interstate exits in the northern part of the ecoregion in Pennsylvania and Virginia, and in the southern part of the ecoregion around the cities of Birmingham, Chattanooga, and Knoxville.



Figure 8. A new overpass under construction in 2001 near State College, Pennsylvania.

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