

# Land-Use Changes in Southern Virginia Piedmont, 1917 to Present

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## ABSTRACT

We studied the changes in land-use and physiognomy that have taken place near Hampden-Sydney College in Prince Edward County, Virginia and in the Appomattox Court House National Historical Park in Appomattox County, Virginia. Information developed in this study is based on photo interpretation and measurements of aerial photographs supplied by the Soil Conservation Service of the United States Department of Agriculture. These photos were taken in 1937, 1949, 1972, and 1980 (Hampden-Sydney) and 1937, 1949, 1970, and 1984 (Appomattox). Based on the 1937 photographs and a knowledge of successional patterns, we were able to predict confidently the composition of stands in existence in 1917. Land uses have changed significantly. Forested land increased from about 33 to 77, and 28 to 53% coverage for Hampden-Sydney and Appomattox, respectively, between 1917 and the mid-1980's. There were corresponding decreases in open land.

**Key Words:** land-use history, plant succession, vegetation, Virginia Piedmont, landscape

## INTRODUCTION

There is an unfortunate tendency among both lay and professional people to view the landscape as a static and unchanging entity. Primary causative factors of this attitude may be the mobility of our society and the relative shortness of human life with respect to the time required for the appearance of changes in the composition of forest ecosystems. We know, intellectually, that plant communities are dynamic and changing entities but need to remind ourselves continually of this in order to understand their history and project their future development. Oosting's classic work (1942), extended by Odum (1959), described old field succession in the North Carolina Piedmont wherein abandoned field progressed to grass/shrub to young pine, older pine/hardwood mixture and finally to a stable hardwood community. We recognize the 100-150 year time scale associated with this sequence. We can readily accept these ecologists' abstract concepts and can observe the representative seral stages as they exist around us, but we often do not normally integrate the abstract and the concrete into an understanding of our contemporary landscape. Even among descriptive plant ecologists there is a primary emphasis on the contemporary community rather than its antecedents or its descendants (Gemborys, 1974).

But now, in a time of great environmental concern, with strong pressures coming from those who favor changes and pressures just as great coming from those who favor trying to maintain things as they are, it is essential that we recognize that these forests we now think of as "normal" were not even here 50 years ago and what we have now will, even without man's intervention, be quite different in another 50 years' time. We tend to believe, from reading the popular press, that all forests are being converted to housing developments and shopping centers and that soon all trees will have been made into newsprint. These concerns may be valid for some areas, but we don't think they are universally applicable. For example, one general indicator of the increase in woodlands in the Appomattox County/Prince Edward County southern Piedmont area is the increase in the volume of standing sawtimber in these counties between 1959 and 1985. In the years 1959, 1967, 1976, and 1985, there were sawtimber volumes for Appomattox and Prince Edward of 263 and 199; 310 and 231; 349 and 349; and 378 and 457 million board feet, respectively. Most of these increases were due to growth in hardwood volume and not in pine volume (Larson and Bryan, 1959; Knight and McClure, 1967; Sheffield, 1976; Brown, 1985).

The purpose of this work was to document, using evidence from a variety of sources, those changes in landscape appearance of typical southern Virginia Piedmont plant communities that have taken place over the last 50 years. The 2 localities selected for analysis were an 1800 acre tract centered on Hampden-Sydney College in Prince Edward County, and the 1325 acre Appomattox Court House National Historical Park, located in Appomattox County, Virginia. Both of these sites: (1) are believed to be representative of the ecosystems we normally find in the southern Piedmont; (2) have similar founding dates and agricultural histories; (3) demonstrate similar topography, soils, geology, and climate; (4) present a wide variety of habitats ranging from wet bottomlands to dry uplands; and (5) have been included regularly since 1937 in the aerial photography flown by the Soil Conservation Service of the United States Department of Agriculture. Moreover, because of the great historical importance of both sites, there existed the potential to gain access to relevant data and information collected incidentally by others over the years.

#### MATERIALS AND METHODS

We first obtained 22.9 cm square contact prints of aerial photographs of the 2 study areas from the U.S.D.A. Soil Conservation Service. The Appomattox Court House photos were taken in 1937, 1949, 1970, and 1984 and included prints numbered Sept 20 1937 FG 150 105 to 107 and 149 to 151; 9-9-49 DHD-4F-70 to 74; 9-9-49 DHD-3F-89 to 91; 10-4-70 DHD-2LL 43, 44, 72, and 73; and 4-11-84 513-66 377810 HAP 83 F. The Hampden-Sydney photos were taken in 1937, 1949, 1972, 1980 and included prints numbered JUL 24 1937 FG 139-34; 7-22-49 DHM-2F-77; 9-11-72 51147 272-88 and 89; and, 11-2-80 40 51147 279-5.

Next, through study and interpretation of the images presented on these photographs and by making checks of our categorizations in the field, we transferred information regarding several categories of vegetation type onto a series of base maps. Natural regeneration of pine included both Shortleaf Pine (*Pinus echinata* Mill.) and Virginia Pine (*Pinus virginiana* Mill.) but recently a few sites have been planted with Loblolly Pine (*Pinus taeda* L.). Our data do not differen-

tiates between these types. The "Hardwoods" category includes both upland and bottomland communities. White Oak (*Quercus alba* L.), Post Oak (*Quercus stellata* Wangenh.), Southern Red Oak (*Quercus falcata* Michx.) and Hickories (*Carya* spp.) dominate the upland forests. Yellow Poplar (*Liriodendron tulipifera* L.), Red Maple (*Acer rubrum* L.), Sycamore (*Platanus occidentalis* L.) and Blackgum (*Nyssa sylvatica* Marsh.) are commonly found in the bottomland forests. The Appomattox base map was developed from a map constructed by Hamilton (1985) and the Hampden-Sydney map was based on a recent Prince Edward County Tax Map. The major categories included, simply, "Open Land", "Young Pine", "Old Pine", "Hardwoods", and in the case of Hampden-Sydney, a category called "Campus". Then, using a Lasico Polar Compensating Planimeter, we determined the area and percentages for the various land-uses and vegetation types between 1937 and nearly contemporary times.

Given our familiarity with the concept of plant succession and the path it follows in the Piedmont, it seemed valid to carry our vegetation maps at least 20 years back in time, from 1937 to 1917. For, we know with fair certainty that a pine stand that appeared to be 20 years old in 1937 was probably an old field, recently abandoned, in 1917; that a pine stand that was 40 years old in 1937 was 20 years old in 1917; and that a mixed pine/hardwood stand that was present in our 1937 photograph would probably have been a 40 year old pine stand in 1917. We do recognize the small possibility that some forests may have been converted to agricultural use during the 1917 to 1937 period leading to an underrepresentation of the area of forested land in 1917.

## RESULTS

Figures 1 through 5 are the land-use maps developed for the 1800 acre Hampden-Sydney area for the period 1917 to 1980. In Figures 1 and 2 there is an area in the upper right corner of the map where no forest land is indicated. Unfortunately the 1937 photo does not have complete coverage, so this map, together with the 1917 map derived from it, presents no information regarding land-use of this area. This area was excluded when percentages of the various land-use coverages were calculated. Similar maps were developed for Appomattox Court House but are not represented here. Tables 1 and 2 and Figures 6 and 7 represent numerically and graphically the results derived from measurements made of the maps.

In the case of Hampden-Sydney there are 4 important trends apparent. First, is the continuous and steady decline in the percentage of open, agricultural land, from a maximum of 61% in 1917 to a low of 12% in 1980. Second, is the expansion followed by a decline in the percentage of young pine forest less than 20 years old during the study period. Young pine started at 7% in 1917, increased to a high of 25% in 1949, and then decreased to 1% in 1980. Third, is the recent expansion in the percentage of land covered by older pine forest. This category has shown a slow steady increase from 0 in 1917 to 20% in 1980. Fourth, is the steady increase in area occupied by hardwood stands during the period of study, from 26% in 1917 to 56% in 1980. These results are essentially consistent with Oosting's successional model, that of replacement of one community by another, especially in an area in which agriculture is declining in importance.



FIGURE 1. Map of probable land-use patterns in the Hampden-Sydney area, 1917. White, Campus and Local Settlements (except for upper right corner for which aerial photography was unavailable); black, Agricultural Lands; vertical lines, Pine Stands less than 20 years old; horizontal lines, Pine Stands greater than 20 years old; and, gridded lines, Hardwood Stands.

Land-use at Appomattox Court House, on the other hand, shows a quite different developmental pattern. First, the amount of open land showed a decline, from 72% in 1917 to around 50 in 1937, a figure near where it stands today. Second, young pine stands originally stood around 21% in 1917 but decreased to 5% percent in 1984. These young stands, evident in the 1984 photographs, represent planta-



FIGURE 2. Map of land-use patterns in the Hampden-Sydney area, 1937. White, Campus and Local Settlements (except for upper right corner for which aerial photography was unavailable); black, Agricultural Lands; vertical lines, Pine Stands less than 20 years old; horizontal lines, Pine Stands greater than 20 years old; and, gridded lines, Hardwood Stands.

tions, and not natural reproduction (Anonymous, 1977; Hamilton, 1985). Third, older pine stands showed an increase from none in 1917 and 1937 to 20% in 1984. Fourth, hardwood stands have remained steady at about 28%.

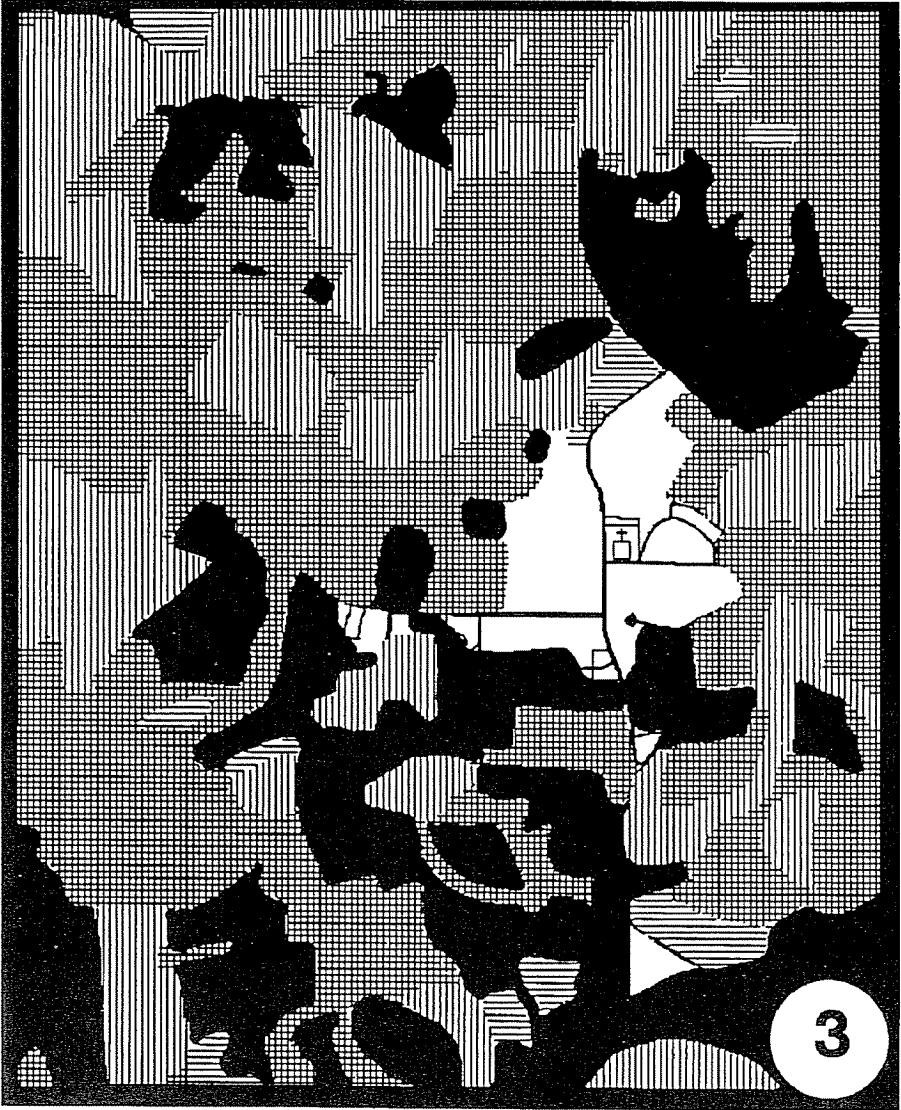


FIGURE 3. Map of land-use patterns in the Hampden-Sydney area, 1949. White, Campus and Local Settlements; black, Agricultural Lands; vertical lines, Pine Stands less than 20 years old; horizontal lines, Pine Stands greater than 20 years old; and, gridded lines, Hardwood Stands.

The primary differences between these 2 areas, Hampden-Sydney and Appomattox Court House, are that at Hampden-Sydney the percentages of open, agricultural land have decreased and hardwoods have increased, while at Appomattox both have remained relatively stable over the study period. We now know that the relative stability of the Appomattox site is the result of a conscious effort

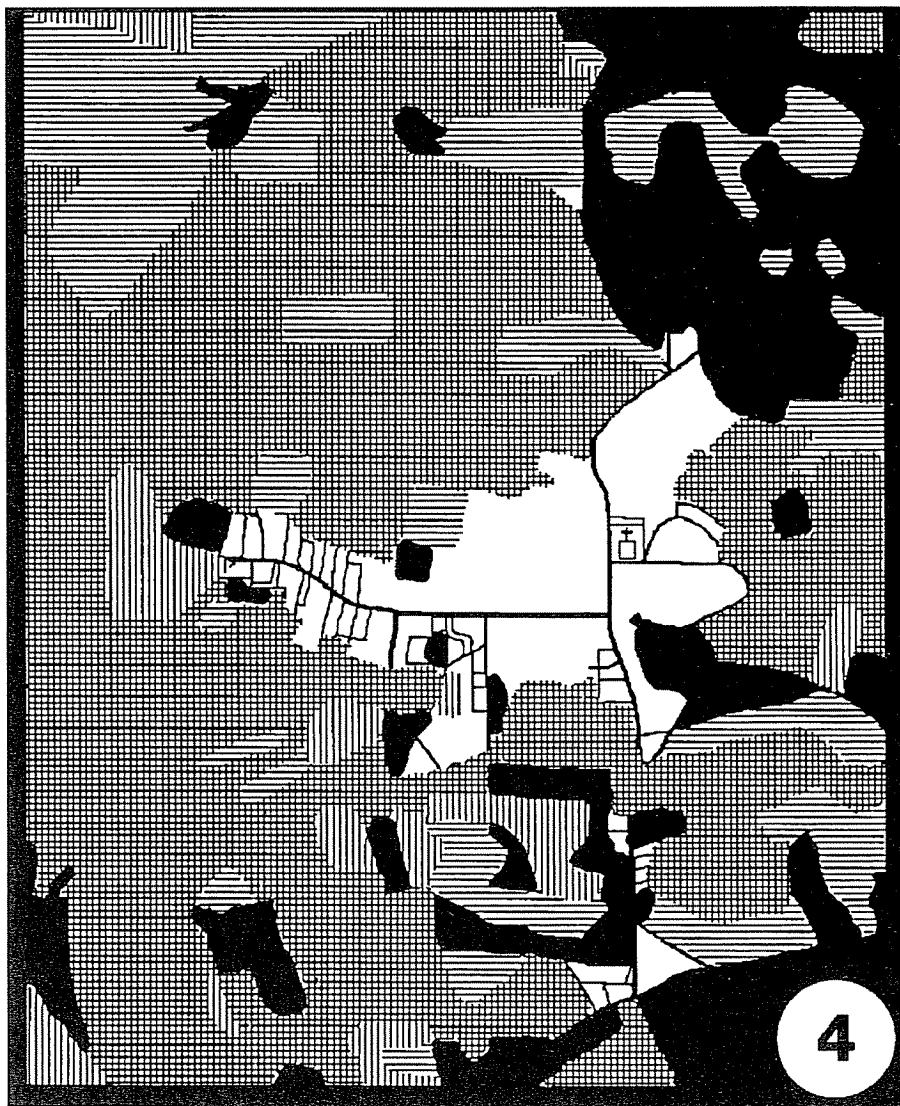


FIGURE 4. Map of land-use patterns in the Hampden-Sydney area, 1972. White, Campus and Local Settlements; black, Agricultural Lands; vertical lines, Pine Stands less than 20 years old; horizontal lines, Pine Stands greater than 20 years old; and, gridded lines, Hardwood Stands.

by the park staff to maintain the site's appearance "as it was at the time of the war", combined with a major effort to create a visual barrier around the boundaries of the park in order to prevent the intrusion of modern distractions (Anonymous, 1977; Montgomery, personal communication).

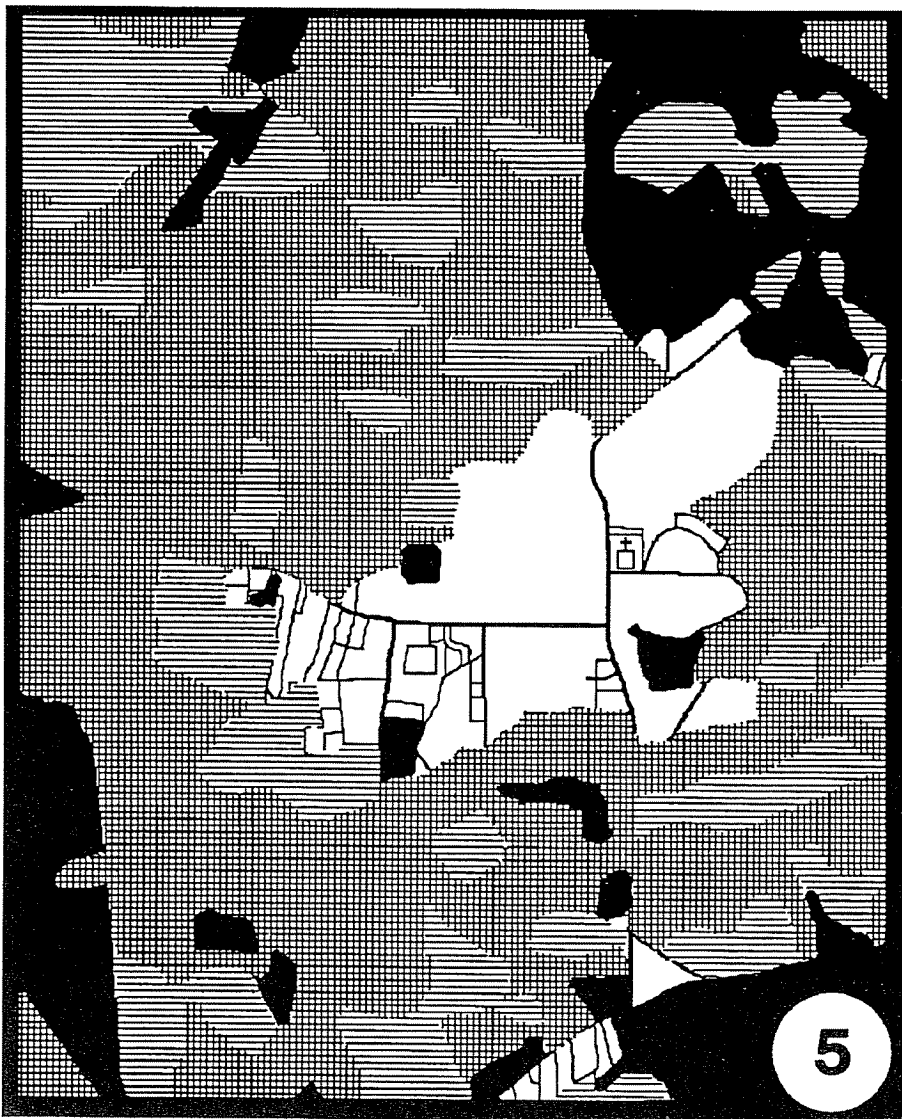


FIGURE 5. Map of land-use patterns in the Hampden-Sydney area, 1980. White, Campus and Local Settlements; black, Agricultural Lands; vertical lines, Pine Stands less than 20 years old; horizontal lines, Pine Stands greater than 20 years old; and, gridded lines, Hardwood Stands.

#### DISCUSSION

Our work has demonstrated that major changes in the landscape have occurred in at least the last 70 years in the southern Virginia Piedmont. We expect that, unless active efforts are made to preserve the current mix of plant communities, as currently is being done aggressively at Appomattox, changes will inevitably con-



TABLE 1. Percent of area covered by Campus or Local Settlements, Open Land, Pine Stands less than 20 years old, Pine Stands more than 20 years old, and Hardwood Stands in a 2.8 square mile area centered on Hampden-Sydney College, Prince Edward County, Virginia for the years 1917, 1937, 1949, 1972, and 1980. The apportionment of percentage during the latter 4 years is based on an interpretation of photographs supplied by the United States Department of Agriculture Soil Conservation Service. The percentages given for the 1917 time period represent an extrapolation based on the 1937 data.

LAND USE	YEAR				
	1917	1937	1949	1972	1980
Campus, Local Settlements	6	6	7	12	12
Open Land	61	35	24	12	12
Pine Stands less than 20 Years Old	7	24	25	5	1
Pine Stands more than 20 Years Old	0	7	3	17	20
Hardwood Stands	26	28	43	53	56

TABLE 2. Percent of area covered by Open Land, Pine Stands less than 30 years old, Pine Stands more than 30 years old, and Hardwood Stands in the 1325 acre Appomattox Court House National Historical Park, Appomattox County, Virginia for the years 1917, 1937, 1949, 1970 and 1984. The apportionment of percentage during the latter 4 years is based on an interpretation of photographs supplied by the United States Department of Agriculture Soil Conservation Service. The percentages given for the 1917 time period represent an extrapolation based on the 1937 data.

LAND USE	YEAR				
	1917	1937	1949	1970	1984
Open Land	72	50	50	46	47
Pine Stands less than 30 years old	21	23	18	7	5
Pine Stands more than 30 years old	0	0	6	19	20
Hardwood Stands	7	26	26	29	28

tinue, with predicted increases in hardwood forests and decreases in open land and pine stands. It is even questionable whether the conversion of hardwood forests to commercial pine monocultures can reverse this trend.

It is also important to recognize that the ecosystems of our 1917 starting point, which were essentially dominated by open fields, were vastly different from those encountered by the early white settlers and that our contemporary forest ecosystems are perhaps more like those of the primeval forest than at any time since the settlers' arrival. We speculate that the Piedmont may be regaining its original appearance (albeit with species changes) while other areas of the state, such as Tidewater and Northern Virginia, are undergoing community destruction on a major scale.

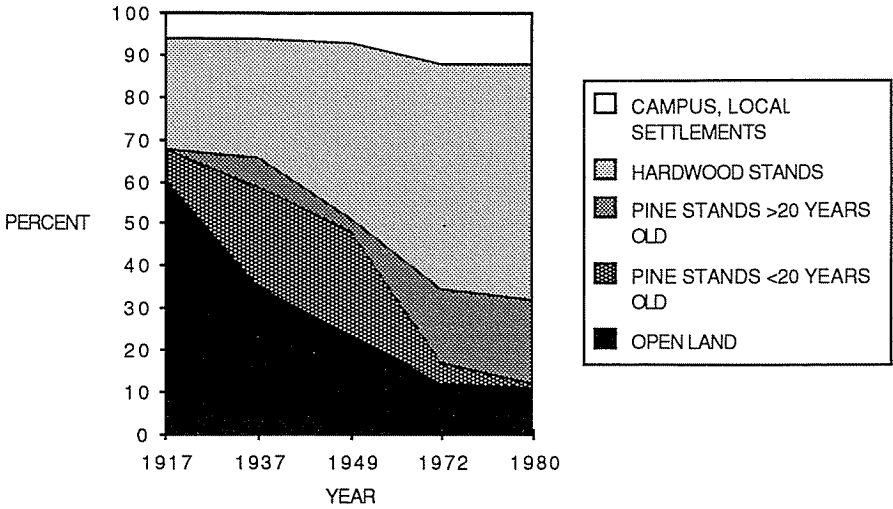


FIGURE 6. Percent of area representing different land-uses, 1917 through 1980, Hampden-Sydney.

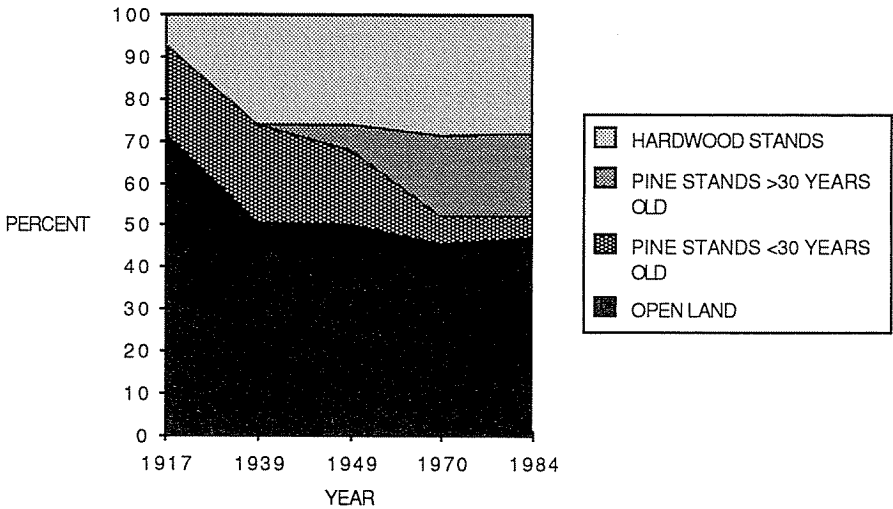


FIGURE 7. Percent of area representing different land-uses, 1917 through 1984, Appomattox Court House National Historical Park.

Certainly our work demonstrates, in a small way, that deciduous forest ecosystems are tremendously resilient, at least in terms of gross appearance, and can reestablish themselves in a relatively short period of time. But, the short time span over which these hardwood communities, in particular, have been reassembled brings into question the degree of stability that they may have attained. Many are concerned with the extent of the development of commercial pine monocultures. We wonder if our concern with the monocultures is overstated when we reflect on the history of the areas we studied and take into consideration the historical development of natural pine stands and the great increase in hardwoods. We emphasize that our results are representative of conditions in a relatively small area of the state and may not apply in zones more urban or more agriculturally prosperous.

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