Forestland Parcelization in Upstate New York Despite Economic Stagnation and a Declining Population

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Abstract

Nonindustrial private forestlands (NIPF) account for a majority of the forested working landscape in the eastern United States. Throughout the United States, NIPF average ownership sizes continue to decline. Smaller parcel sizes create declining economies of scale for forest managers and timber harvesters, threatening the viability of the forested working landscape and in turn wood supply. This study documents the parcelization of NIPF holdings in a central New York State county during the last twenty-five years of the twentieth century. The findings indicate the average parcel size of NIPFs decreased from 36 to 24 acres over the study period, despite a decline in population in the county. Although average parcel size is declining, a large percentage of the rural forestland remains in acreage classes suitable for forest management as long as the forest products industry can adapt to changes on the landscape.

Introduction

Parcelization – the division of large land holdings into smaller ones – is among the biggest issues facing the nation's 393 million acres of private forestland (Dennis 1992; Sampson and DeCoster 2000; Butler and Leatherberry 2004). Of particular importance are the estimated 10.3 million nonindustrial private forestland (NIPF) owners who collectively control 262 million acres (42%) of the nation's forests and 94 million acres (55%) in the Northeast United States (Butler and Leatherberry 2004). National trends indicate that NIPF parcel sizes continue to decline. In 1953, nationwide, the average NIPF owner's forest holding was 44 acres; by 1978 it was 30 acres, further declining to 24 acres in 1994 then maintaining this level through the 2003 National Woodland Owner Survey. In 1978, the average NIPF holding in the Northeast United States (New England, Lake, Central and MidAtlantic States) was 35 acres, declining slightly to 33 acres in 1994 then dropping dramatically to 20 acres in 2003 (Wall 1981; Birch et al 1982; Birch 1996; Butler and Leatherberry 2004).

Unlike fragmentation, which causes a disruption in continuity of the natural landscape, parcelization describes changes in ownership patterns when larger forested tracts are divided into smaller parcels owned by several owners with potentially varying management objectives. Forestland parcelization directly affects the potential for forest management by reducing the size of the management unit (Zipperer and Birch 1993). Parcelization is arguably the strongest driver of forest fragmentation as well as a pre-cursor to urban development (Zipperer and Birch 1993; Sampson and DeCoster 2000; Thorne and Sundquist 2001). Forestland was the largest source of rural land converted to urban-developed uses in the 1990s, providing more than one-third of the total land converted (USDA 1999). According to the USDA's 1997 Natural Resources Inventory, 10 million acres of private forests were converted to developed lands between 1982 and 1997 (USDA 1999). The last five years of that inventory period (1992-1997) indicated that 70% more forest was developed than in the entire preceding decade – nearly 1 million acres of forest converted to development per year (Best 2002). Current NIPF owners are expecting to subdivide over 5 million acres of forestland in the next few years. Overall, trends reported in national and regional studies indicate that forestland ownerships are diversifying – in terms of numbers of

owners and socio-economic backgrounds of those owners – and shrinking in size as time passes and generational shifts occur (Butler and Leatherberry 2004). Smaller parcel sizes create declining economies of scale for forest managers and timber harvesters, threatening the viability of the forested working landscape and in turn the region's wood supply. We suspect the trends are similar in New York State (NYS) where NIPF owners control over three-quarters of the state's forests.

Forestry in New York State

The NYS forests extend across 18.6 million acres of land – 62% of the state's terrain – representing more forestland than any of its northeastern neighbors. Of the total forested acres, 15.4 million (83%) are classified as timberland by the USDA Forest Service, defined as fertile and accessible enough to produce wood crops and not withdrawn from timber harvesting by statute or regulation. Consequently, 51% of the state's land mass is classified as timberland. The majority of the timberland (14.2 million acres) is privately held in either industrial or nonindustrial ownerships. The forest products industry owns approximately 1.2 million acres, while an estimated half million NIPF owners control the remaining 13 million acres of timberland in the state (NEFA 2001). NYS has a vibrant forest products industry. Forest-based manufacturing provided $7.7 billion in value of shipments to the state's economy in 1997. NIPF owners supply 90% of the roundwood used by the state's two pulp and paper operations and 450 sawmills (Canham and King 1998, Germain 1998). The forest products industry ranks sixth in the state for manufacturing jobs, employing at least 65,000 people (Canham and King 1998).

Aerial photographs and satellite imagery of the state depict a landmass rich in forests. Furthermore, historical statistics indicate forest cover has increased from 20 to 62 percent over the past century (Canham and King 1998). While the reforestation of the Northeast has been cited as a great triumph of the regenerative power of these forests (Irland 1999), in regards to the future of the forest products industry, the working forested landscape in NYS is threatened by forestland parcelization. Changing ownership patterns have the potential to remove significant acreages of forestland from the timberland category by changing ownership objectives and reducing the economic viability of management for timber. Availability of forest resources for wood products, water quality, recreation, and management depends on the priorities and decisions made by the half million landowners in the state. Both of these factors contribute to what has been referred to as the "forest cover complacency syndrome" (Lapierre and Germain 2005), or the tendency for people to assume that all forest cover is functionally equivalent in terms of land use. In reality, a variety of social and economic forces can impact forestland use without resulting in widespread losses in forest cover. This study provides insight on the parcelization of NIPF in NYS by rigorously quantifying how NIPF parcel sizes have changed between 1975 and 2000 in Oneida County, New York.

Oneida County, New York

Oneida County (Figure 1) was selected to document NIPF parcelization in NYS because of the amount of forest cover, variety of forest cover and soil types, percentage of NIPF to total forestland, employment in the forest products industry, a declining population and an anemic economy. Located between Albany and Syracuse on the eastern shore of Oneida Lake and the southwestern corner of the Adirondack Park, Oneida County has the "greatest range of soil types and complexity of distribution of soils in any county in New York State" (Pearson et al. 1960). Species composition of the forest cover and land use history also vary spatially within the

county. Oneida County ranks 14th in total forest area out of the 62 New York Counties with 455,000 acres of forestland (59% of its total landmass), of which 436,000 acres (96%) is classified as timberland (USDA Forest Service 2005). The four percent of forestland that does not qualify as timberland is controlled by the state and managed as forest preserve or park land. Of the 436,000 acres of timberland, NIPF owners control over 385,000 acres (82%) (USDA Forest Service 2005). The county and the state manage the bulk of the remaining timberland acreage. Although the forest products industry does not own any timberland in the county (USDA Forest Service 2005), Oneida county has "high employment" in the forest products industry, supporting 13 solid wood mills (sawmills) and over 1500 workers (Canham and King 1998, US Bureau of the Census 2000).

The relative positive impact of the forest products industry is among the few economic bright spots in the county. During the 1970s and 1980s, the once vibrant manufacturing sector declined precipitously. The 1990s brought more bad news with the closing of the biggest employer, the U.S. Air Force base. Consequently, during the 1990s the city of Utica lost proportionally more inhabitants than any city in NYS (Thomas 2003). The Utica-Rome metropolitan area in Oneida County ranked 17th out of 281 cities on the list of "Metropolitan Areas with Greatest Population Density Loss in the United States: 1982-1997" with a net density loss of 35%. Overall, the county population declined by 9% over the same period (Fulton et al. 2001). Oneida County thus presents an opportunity to examine parcelization in a rural forested county with a depressed economy and shrinking population base.

Methods

The study was designed to yield rigorous parcelization results for the entire county. The sampling design was stratified with one-stage cluster sampling implemented in each stratum. A stratum was an individual township and the cluster was a tax map sheet within that township. The secondary sampling units making up the clusters were the individual parcels found on each tax map sheet. The design is a one-stage cluster sampling scheme because all of the parcels on each sampled tax map sheet were included in the sample.

There are 28 townships in the county. In total, Oneida County has 1,120 tax map sheets. For each township, a collection of tax map sheets – drawn by different land assessors – exists digitally in AutoCAD and physically on Vellum pages at the county clerk's office. The 169 tax map sheets in the Utica Township and 83 other tax map sheets in the remainder of the county were eliminated from the potential sample because their population densities were categorized as "urban places" by the Oneida County Department of Planning with little or no forest management opportunities. Urban areas are defined as continuously built up areas with populations equal or greater than 50,000 or an incorporated place or Census-designated place with at least 2,500 inhabitants (U.S. Bureau of the Census 2000). Upon removal of the urban tax map sheets (1:100 scale) from the sample, a total of 868 tax map sheets were available representing rural lands (1:400 scale) in the county. The number of tax map sheets within each township ranged from 11 to 86. A simple random sample of two tax map sheets was selected from a list frame of all sheets in each of the 27 townships (strata) to yield a sample of 54 tax map sheets. If a sampled sheet contained industrial, commercial, or government-owned land, those parcels were eliminated. Recall that 59% of the county's total landmass is forest cover (USDA Forest Service 2004). When you remove that portion of Oneida County not included in our sample (urban areas), the forest cover is estimated to be approximately 70% (based on early 1990s satellite imagery). Because 96% of the county's forestlands are classified as timberland,

and NIPF owners control over 80% of the timberland and parcels under industrial, commercial or government ownership were eliminated , the results of the study reflect activity on NIPF.

From each tax map sheet, the owner name, deed book and page references, dates of parcel sales, original size of parcels, and parcel size changes from 1975 to 2000 for every parcel included on the sheet were collected. Using modern and historic tax rolls, deed books, and grantee books to analyze the chain of transactions, the extent of parcelization of each tax map at four points in time (1975, 1980, 1990, and 2000) was determined. To illustrate the methodology used for tracking parcelization, Figure 2 offers a graphic demonstration of how parcel #7.0 on tax map #095 from Annsville was parcelized from 1975 to 2000. Starting with the most recent data available (2000), we created a database of all parcels greater than 1 acre within map #095. Then, using individual tax map numbers as starting points, we traced histories of those parcels liber and page information available in print in the Oneida County Clerk's Office in Utica, New York.

The following six acreage classes were used to depict the shifts in parcel sizes and examine how the distribution of parcel sizes changed between 1975 and 2000: 1 – 4.99; 5 – 9.99; 10 – 24.99; 25 – 49.99; 50 – 99.99; 100 and greater. The acreage classifications were developed based on national and state forest management thresholds such as the USDA Forest Service National Woodland Owner Survey, American Tree Farm System and the NYS Forest Tax Law. Table 1 illustrates the number of parcels and acres by acreage classification for a single sampled township (stratum). To estimate the number of parcels in a township (stratum) within an acreage class, the number of parcels in that acreage class was averaged for the two sampled tax sheets. This average was then multiplied by the total number of tax sheets in the township. The estimated total number of parcels in the county was obtained by summing the estimated totals for the 27 townships. Total acreage of the parcels within each acreage class was estimated in a similar fashion. The number of acres in the acreage class for the two sampled tax sheets in a township was averaged. This average was then multiplied by the number of tax sheets in the township to obtain the estimated number of acres for that acreage class in the township. Finally, the estimated acreages were summed over the 27 townships to obtain the estimated total number of acres in the acreage class for the county.

Human population changes – based on U.S. Census Data (U.S. Bureau of the Census 2000) -- were collected for 1980, 1990, and 2000 to identify population shifts at the township level. We used the population data to examine the relationship between parcelization and population decline at the county level.

Results and Discussion

The number of NIPF parcels in Oneida County greater than one acre increased from approximately 14,000 parcels in 1975 to 20,000 parcels in 2000 (Tables 2 & 3). The average parcel size of NIPF dropped from 36 to 24 acres during the 25-year period (Table 3), similar to the current national average and slightly above the 20-acre average for the Northeast (Butler and Leatherberry 2004).

The number of parcels in the smaller acreage classes is increasing, while the 50- 99.99 and 100 acres and greater are declining. The increase in the number of parcels in the 1-4.99, 5-9.99 and 10-24.99 acreage classes was 61%, 84%, and 72%, respectively. The increase in the 25-49.99 acre class was less dramatic at 24%. The decline in the number of parcels in the 50-99.99 and 100 acres and greater classes was 7% and 23%, respectively (Figure 3).

The parcelization of NIPF in Oneida County is taking place despite a 9% decrease in population during the study period. Recent studies reported dramatic NIPF parcelization in population growth regions of New England and the Catskill Mountains of New York where there is significant development pressure from adjacent vibrant urban centers (LaPierre and Germain 2005; National Forestry Community Center 2004; Thorne and Sundquist 2001; Kittredge et al 1996). In contrast, this study documents forestland parcelization in a county with a depressed economy and shrinking population base. In this case, the primary driver of parcelization is per capita land use rather than population. Private forests in the United States have been dividing into smaller ownership parcels at rates well above those attributable to more people needing more space – about 1.6 times faster than population growth (DeCoster 1998). Between 1982 and 1997, the amount of urbanized land in the United States increased by 47%, from approximately 51 million acres in 1982 to approximately 76 million acres in 1997. During this same time period, the nation's population grew by only 17% (Fulton et al. 2001).

Although beyond the scope of this study, we suspect that land use and consumption decisions are driving parcelization in Oneida county. Brown et al (1997) reported that 45% of Americans prefer to live in a rural or small town setting 30 or more miles from a city. In addition to the rural lifestyle, many cite lower land costs as a motivating factor for emigrating to rural areas. Rather than the typical ¼-acre house lots of the suburbs, these rural homesteaders beyond the urban fringe favor large lots of up to 50 acres. Due to its proximity to the Adirondack Park and Oneida Lake, Oneida County is a popular location for vacation homes. These scattered single-family residences and vacation homes often become private "green spaces" for their owners. The timberland remains intact, but the opportunity for forest management is largely lost. In terms of average parcel size and the distribution of parcels by acreage class, the glass appears to be half empty; however, when we examine the actual acreage distribution by diameter class we are more hopeful about the forested working landscape.

Maintaining a Viable Forested Working Landscape

Critical to the question of available forested working landscape is the area distribution of the acreage classes. The decrease in average parcel size is an important trend to follow, but it does not tell the whole story. It is also important to examine the amount of area shifting from the larger to the lower acreage classes. During the 25-year period the area within the 1-4.99, 5-9.99 and 10-24.99 classes increased by 40%, 32% and 34%, respectively (Figure 4). In addition, just over 45,000 acres shifted below the 1-acre class (as indicated by the decline in total acres over the period). This result reinforces the fact that parcels are getting smaller and an increasing area is shifting to these smaller acreage classes. Correspondingly, the number of acres in the 25-49.99 acreage class remained relatively stable, increasing by only 6%, while the area in the 50-99.99 and greater than 100 acreage classes declined by 16% and 28%, respectively (Figure 4). Even with this decline in the total acreage found within the larger acreage size classes, 42% of the NIPF area is still in the 100-plus acre size class, compared to 50% in 1975. An estimated 69% of the NIPF area is 50 acres or greater, down from 78% in 1975. Consequently, two thirds of the county's NIPF consist of parcels large enough to provide economies of scale for forest management according to the NYS Forest Tax Law which requires 50 acres of contiguous forestland to enroll in the tax abatement program (NYS Forest Tax Law 2005). This is a common threshold for viable forest management (Sampson 2004; Thorne and Sundquist 2001). If the American Tree Farm System threshold for viable forest management of 10 acres and above is adopted, the opportunity for forest management in the county was nearly unchanged from 1975

to 2000. The 10-plus acres category remained stable during the study period, decreasing by only 4%, from 95% to 91%. However, many resource managers would argue that 10 acres is too small to support timber management activities, preferring a minimum acreage threshold above 25 acres – incidentally the proposed new minimum acreage threshold for the NYS Forest Tax Law (Williamson 2002). In 2000, an estimated 83% of the NIPF area was above this threshold, down from 90% in 1975.

In a study conducted in Virginia, Wear et al. (1999) determined that the probability of forest management approaches zero when forest population densities reach a level of 150 people per square mile. Using Wear's density threshold for forest management, Oneida County (excluding the Town of Utica which was not included in our sample due to the Utica-Rome metropolitan area) averages 125 people per square mile across all lands (U.S. Bureau of the Census 2000). Although we do not know the exact forest population density, this average population density across all NIPF in the county is within a population density that will support a viable working forested landscape. This is consistent with our finding that over 80% of NIPF are still in the viable forest management category of greater than 25 acres. Although parcelization is chipping away at the working forested landscape, opportunities for forest management remain viable as long as resource managers can adapt to smaller woodlots.

Conclusions

This study rigorously quantified NIPF parcelization in Oneida County, New York, a county that may be symbolic of what is happening to NIPF in other counties across the state, and perhaps throughout the Northeast United States. Unique to this study is that we documented NIPF parcelization in an economically depressed county that lost population during the study period. Oneida County is likely representative of rural counties which are facing parcelization due to increased per capita land consumption, simply stated – fewer people using more land. Rural counties dominated by NIPF (such as Oneida) represent an important source of wood fiber for the state's primary wood products manufacturers – primarily the sawmill sector. The general decline in parcel size, and more importantly the shift in ownership to smaller acreage classes, suggests that declining economies of scale attributable to more landowners holding smaller parcels is a legitimate concern for forest management and future timber supply. Given the importance of NIPF to the regional wood supply, the forest products industry will need to monitor and adapt to this transformation of the forested working landscape. The sawmills are particularly susceptible because they are less invested in forestland, generally relying on fee simple lands for only about 10% of log volume (Germain 1998; Lones and Hoffman 1990). Because the majority of this sector's log volume originates from stumpage and log purchases from individuals and brokers, sawmills are significantly impacted by ownership decisions on private forestlands. The forest cover remains, but the owners' focus may be on values other than timber.

This study provides a methodology that is readily extended to a state or regional scale for establishing a baseline and subsequently monitoring parcelization. Additional research is required to obtain empirical evidence on the nature of land use changes resulting from parcelization. In order to predict the impact of forestland parcelization on regional wood supply, comprehensive landowner surveys combined with field inventories are needed to assess what actually occurs to forests when NIPF parcels are subdivided. To plan for the future, the forest products industry will require projections on the percentage of parcelized lands converted to

other uses, high-graded to the extent of low productivity or taken out of timber production due to a change in landowner objectives.

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Figure 1: The counties of New York State.

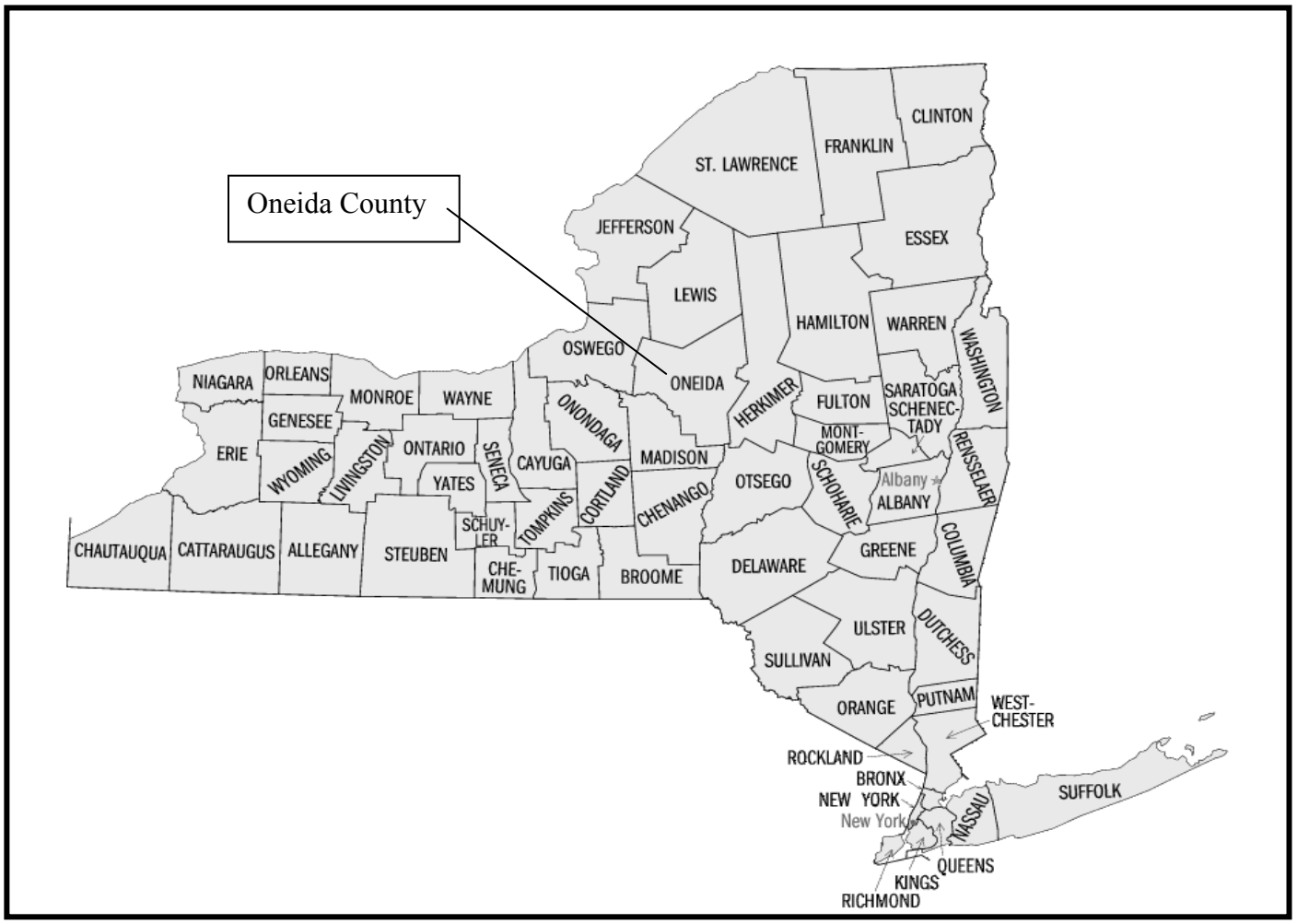

Figure 2. The parcelization of Lot #7 of Tax Map #095000 in the Town of Annsville from 1975 to 2000.

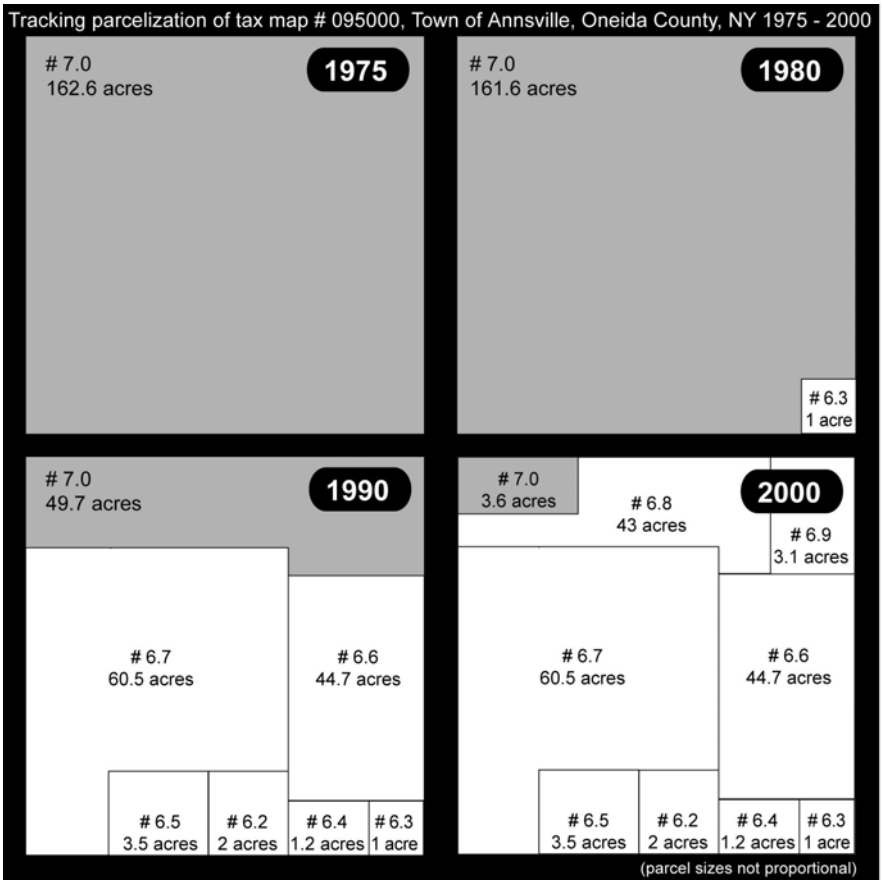

Table 1. Sample totals and township estimates by year for number of parcels and acreage within each acreage classification from the two clusters (tax sheets) sampled out of 29 available for the Town of Annsville, Oneida County.

	Number of Parcels by Year							
Acreage Classification	2000 Sample Total	2000 Township Estimate	1990 Sample Total	1990 Township Estimate	1980 Sample Total	1980 Township Estimate	1975 Sample Total	1975 Township Estimate
1 to 4.99	36	522	22	319	19	276	18	261
5 to 9.99	10	145	11	160	10	145	7	102
10 to 24.99	8	116	8	116	8	116	7	102
25 to 49.99	8	116	8	116	6	87	6	87
50 to 99.99	6	87	6	87	5	73	4	58
≥ 100	4	58	4	58	5	73	6	87
	Number of Acres by Year							
Acreage Classification	2000 Sample Total	2000 Township Estimate	1990 Sample Total	1990 Township Estimate	1980 Sample Total	1980 Township Estimate	1975 Sample Total	1975 Township Estimate
1 to .4.99	49	704	35	506	28	409	27	395
5 to 9.99	84	1219	94	1363	86	1247	68	991
10 to 24.99	115	1667	117	1690	117	1690	90	1298
25 to 49.99	263	3820	270	3917	184	2664	188	2726
50 to 99.99	454	6582	548	7945	393	5705	403	5844
≥ 100	466	6759	537	7792	629	9120	694	10063

Table 2. The estimated net change in number of parcels and acreage in Oneida County from 1975 to 2000.

Acreage Class	Estimated Net Change in Number of Parcels 1975 – 2000*	Standard Error of Estimated Change	Estimated Net Change in Acreage of Parcels 1975 – 2000*	Standard Error of Estimated Change
1 – 4.99	3918	678	10190	1829
5 – 9.99	1191	270	8164	1704
10 – 24.99	978	267	16049	4330
25 – 49.99	367	140	11816	4992
50 – 99.99	-129	106	-11645	7422
100 +	-302	115	-57702	16919

* A positive value indicates that the number of parcels (or acreage) increased in that acreage class from 1975 to 2000. A negative value indicates loss of parcels or acreage from 1975 to 2000. A 95% confidence interval for the population net change in number of parcels or population net change in acreage may be obtained by taking each estimate and adding and subtracting 2.05 times the standard error (two-sided confidence interval based on a t-distribution with 27 degrees of freedom). If the confidence interval does not contain the value 0, the null hypothesis that the population (true) net change is 0 would be rejected at an alpha level of 0.05.

Table 3. Estimated number of NIPF parcels greater than one acre and average NIPF parcel sizes in Oneida County in 1975, 1980, 1990 and 2000.

Year	Estimated Number of Parcels	Average Parcel Size (acres)
1975	13,995	36
1980	14,379	35
1990	17,031	30
2000	20,018	24

Figure 3. Estimated number of NIPF parcels greater than one acre in Oneida County by acreage size class in 1975, 1980, 1990 and 2000.

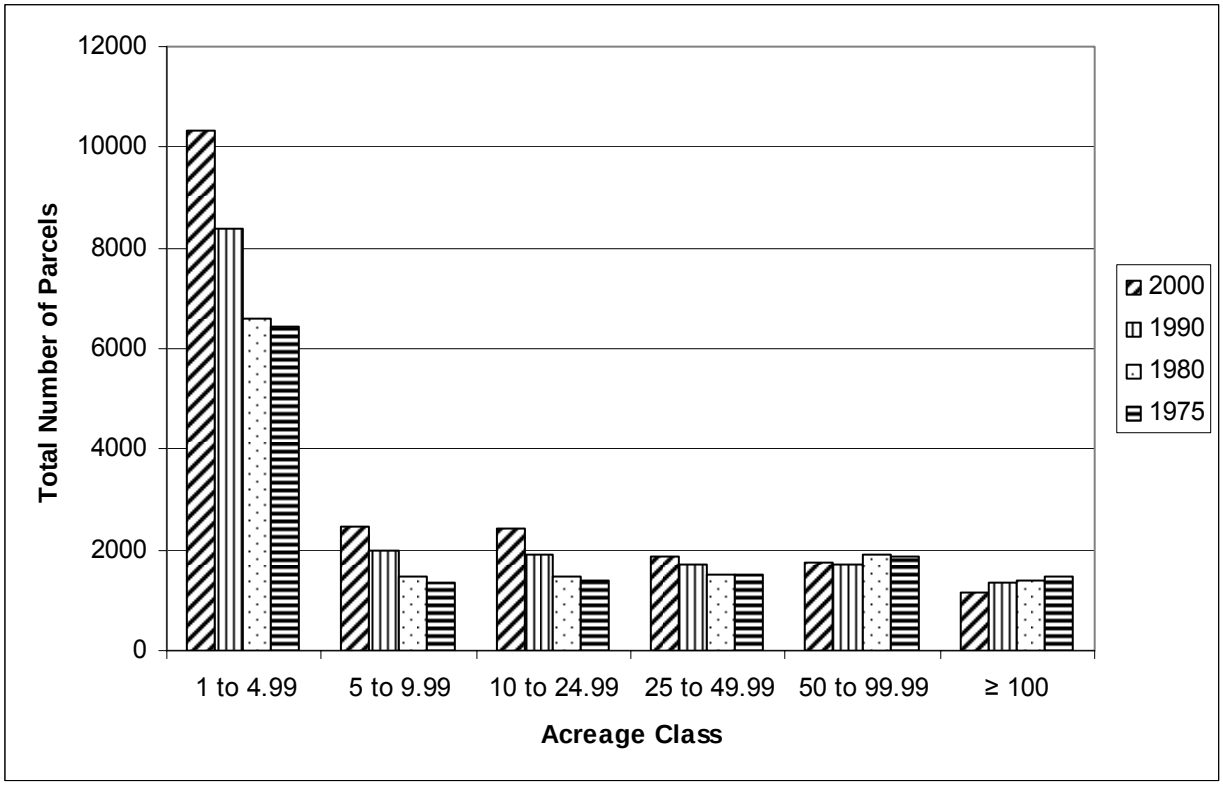

Figure 4. Estimated number of NIPF acres greater than one acre in Oneida County by acreage size class in 1975, 1980, 1990 and 2000.