




### INDICATOR 3

#### **Extent of forestland conversion, fragmentation, and parcelization**

*While it is important to study the amount of forestland within a state or region, it is also necessary to understand the rate at which forests are lost through conversion to other land uses, namely agriculture, which may be temporary, or development, which is almost always permanent. Also important is the degree to which the remaining forest is fragmented or broken into smaller contiguous blocks. Forest fragmentation leads to additional challenges that degrade forest health and sustainability. Invasive plant species that displace native plants often become established around forest edges and reduced forest parcel size results in less interior forest for plants and animals that require this specific habitat. A third concern is the reduction in the average forest ownership size (parcelization) as large parcels are subdivided into multiple ownerships. The resulting increase in the number of forest landowners requires more technical forestry assistance to manage the same forested acreage and makes large-scale forest management more difficult.*



#### Forest conversion

Delaware's forestland acreage has remained relatively constant over the last century. And although the current acreage is slightly higher than in 1907, there has been a steady decline since the 1950s peak of 454,000 acres. Conversion of forestland to agricultural land in the 1960s and 1970s was the primary reason for this decline. But this conversion rate slowed dramatically with the advent of the Conservation Reserve Enhancement Program (CREP). The loss of forestland through the conversion of cropland has virtually stopped with the planting of nearly 3,000 acres of cropland to trees through CREP. However, while the loss of forestland to agriculture has nearly ceased, the conversion to non-forested developed land rapidly increased over the last three decades.

Land values in Delaware have increased significantly since the late 1980s and in some cases this increase has been 20- to 30-fold. The development boom that began around 2000 and peaked in 2007 was driven by the housing market. And although the following ten years saw a sharp decline in this market, development has increased again in recent years. If the next housing expansion mirrors the last, the expectation is a loss of another 10,000+ acres to development. The DFS completed a study that revealed nearly 16,000 acres of forestland were contained in areas approved for development between 2002 and 2009, which equaled 7.3% of the remaining unprotected forestland (217,000 acres)—privately-owned land without a permanent conservation easement. It only seems inevitable that similar future losses will occur as Delaware's population grows and this is a concern. Unlike a change from forest to agriculture where the area may return to forest in the future, development represents a permanent reduction in the forestland base.

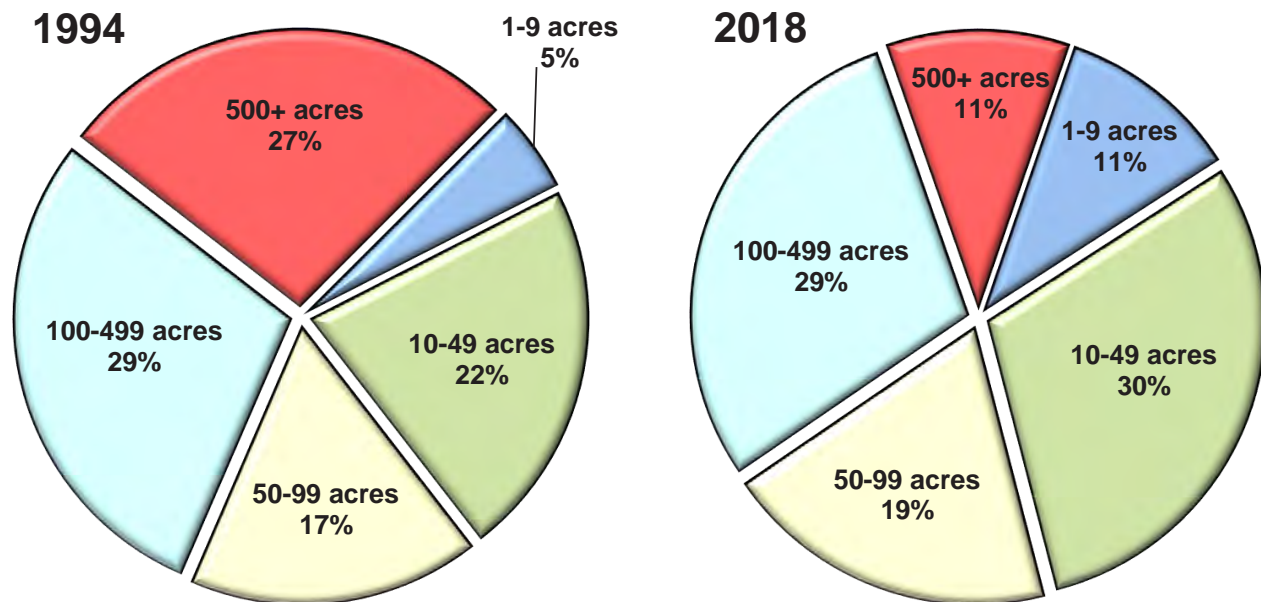
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## Forest fragmentation

Over the last 70 years as the amount of forestland has decreased, there has been a corresponding increase in forest fragmentation (smaller areas of contiguous forests). In 2009, the DFS identified 343 contiguous forest blocks larger than 250 acres. The mean size was 515 acres and the total area within contiguous blocks summed to 176,711 acres. An analysis based on 2017 aerial imagery revealed that 112 of those forest blocks had been reduced in size. Of those, 14 were removed because they fell below the 250-acre threshold. In a single case, a block was split, but both halves remained over 250 acres (resulting in one new block). The final result is 330 large forest blocks over 250 acres (14 blocks from 2009 lost) and the total forest within contiguous blocks is 170,105 acres (a loss of 6,600 acres). The primary observed causes reducing the size of forest blocks was development and conversion to agriculture.

Figure 15. Privately owned forest parcel acreage in Delaware in 1994 and 2018.



Source: U.S. Forest Service Forest Inventory and Analysis, National Woodland Owners Survey

## Forest parcelization

Privately-owned forest parcel acreage has changed dramatically (Figure 15). Based on FIA data from the National Woodlands Owners survey, in 1994 nearly three-quarters of private forestland was held in parcels greater than 50 acres. By 2018 that percentage dropped to under 60%. Forest parcels less than 50 acres increased from 27% to 41% during that same time period. Much of this increase can be attributed to the decrease in very large parcels ( $\geq 500$  acres) that are privately-owned. Some of these parcels were developed, others were purchased by the state and added to the land holding inventories of the DFS and DNREC's Divisions of Fish & Wildlife and Parks & Recreation.

Two-thirds of Delaware forests are located in areas with population densities between zero and 100 people/square mile and nearly 90% are located in areas of less than 250/square mile (Figure 16). Delaware's population continues growing with an 11% increase over the last nine years. The current total population of 995,764 equates to an average of 510 people/square mile. In 2000, that average was under 400. Not only is the population increasing, but it is also becoming less concentrated within municipalities and spreading across the landscape. In 1920, about half of the state's population lived in Wilmington, Delaware's largest city, however, today less than 8% lives there.

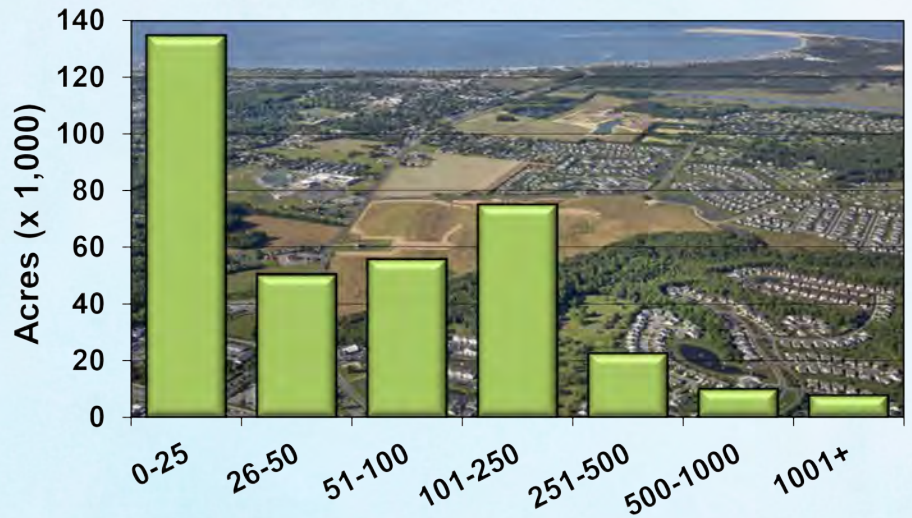
Between 1950 and 2005, Delaware lost 384,000 acres of farmland, an average of nearly 7,000 acres/year (and a simultaneous average yearly loss of about 1,700 acres of forestland). The American Farmland Trust (AFT) published a study that found that between 1984 and 2002, 118,000 acres of farms and forests were consumed by 96,000 residential housing units (1.23 acres/house). This total is nearly equal to all the acres consumed in the previous 300 years. Prior to 1984, 260,000 housing units consumed 125,000 acres of land (0.48 acres/house). Delaware's population is not only increasing, but that population is also using more land for each new home. If this unsustainable trend continues, even more farmland and forestland will be lost to housing development.





**The loss of forestland has increased significantly in the past 30 years. This can primarily be attributed to development.**

**Figure 16. Forestland by population density (people/sq. mile) in 2017.**



Source: U.S. Forest Service Forest Inventory and Analysis

Urban areas have displaced about 15% of Delaware’s forests. A 2010 U.S. Forest Service study (General Technical Report NRS-62) estimated that by 2050, 32.5% of Delaware’s forestland will have been subsumed by urban growth. This means that by 2050 almost one-third of Delaware’s former forests will lie within the limits of new urban areas. Only four other states are expected to experience a greater degree of absorption of forests into expanding urban areas: Connecticut (36%), Massachusetts (37%), New Jersey (40%) and Rhode Island (48%).

**Urban forests**

As the amount of rural forestland decreases and fragments, and as urban areas expand, it is expected that Delaware’s forested urban areas will increase. A 2010 GIS analysis of aerial photographs indicated that nearly 40,000 acres of urban forests were located within Delaware’s 57 incorporated municipalities and other urbanized areas designated by the 2000 Census. The total land area within these urbanized areas totaled approximately 234,000 acres, thus Delaware’s urban forest canopy coverage was just under 17% ten years ago. In 2019, an analysis using LIDAR-derived canopy data revealed 81,126 acres of urban forests in a total urbanized area of 262,244 acres which translates into 31% of forest canopy coverage currently. At first glance this appears to be a large increase (a doubling of acreage), but the methodologies used are different, so it is not practical to make direct comparisons. A LIDAR analysis in 2010 may very well have resulted in more than 40,000 acres of urban forests. Nevertheless, the new measurement using the latest technology is reliable and above the national average of 27%.

**Conclusions**

Delaware has more forested acres now than it did more than a century ago. However, the loss of forestland has increased significantly in the past 30 years and this change is due primarily to development. Along with outright loss of forestland, there is an accompanying increase in fragmentation and an increase in the urban forest component. New houses are using an increasing amount of land and there is currently another housing boom in Delaware. The real estate market continues to improve, especially in coastal Sussex County where there is an associated loss of forestland. The trends in population increase and loss of forestland present both environmental and economic challenges to all future Delawareans.



## **INDICATOR 4**

### **Status of forest/woodland communities and associated species of concern**

*Forests provide habitat (shelter, food, nesting sites, etc.) for numerous animal species and are home to a wide variety of plant species. Some rare plants are found only in specific types of forest and some rare animals require certain forest habitat for their survival. Protecting and conserving the wide range of forests native to Delaware is critical to the survival of many plant and animal species—both rare and common. Recognizing and understanding the rare, threatened, and endangered species of plants and animals found in our forests is the first step in their conservation.*

### **Delaware Wildlife Action Plan**

The Delaware Wildlife Action Plan (DEWAP) 2015-2025 is the state's updated version of a comprehensive strategy for conserving the full array of native wildlife and habitats—common and uncommon—as vital components of the state's natural resources. The first DEWAP was completed in 2006. The updated DEWAP not only considers species and habitats, but it is also comprehensive in terms of those responsible for its implementation. Though DNREC's Division of Fish & Wildlife (F&W) is the lead agency that is coordinating implementation, the DEWAP is intended for all agencies, nonprofits, and individuals who are actively engaged in conservation efforts, including the Delaware Forest Service. Together with all conservation partners, the aim is to maintain existing populations and prevent species from becoming threatened or endangered.

Delaware is the second smallest state in the U.S. and yet it harbors a surprising diversity of wildlife species and habitats within its borders. Over 2,800 species are documented to occur in the state and more than 125 specific types of habitat are found in the state including coastal marine waters and brackish marshes, tidal and non-tidal freshwater streams and wetlands, and upland forests and meadows. Of these, the DEWAP identifies 688 Species of Greatest Conservation Need (SGCN) and nearly all of Delaware's habitats are used to some extent by at least one SGCN. Because the DEWAP is a comprehensive plan for all species, large blocks of forest and wetland habitats (≥250 acres) that support many common species are also identified. Maps depicting habitat for a full array of wildlife species were created to show areas of the state to focus conservation efforts. The maps are also intended to help guide more site-specific conservation planning efforts. One successful example cited as a site-specific community-based planning effort was the Blackbird-Millington Corridor Conservation Area Plan where F&W partnered with The Nature Conservancy.

Recognizing all possible issues that affect habitats and species of conservation concern, whether the impacts are fully understood or not, is an important step in building a comprehensive plan. For 12 habitat groups (including forested non-tidal wetlands and natural forested uplands), 289 issues were identified along with 755 corresponding actions. For five taxa groups (birds, fish, herpetofauna, invertebrates, and mammals), 419 issues and 651 actions were identified. From this extensive list of issues and actions, a clear picture of priorities emerged. Among these were addressing habitat loss and degradation, including loss and conversion of forest habitat to other non-ecological land uses.

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