Currently, there are more than 567 miles of trails open to the public, a slight increase compared to 2010. In addition, approximately 155 of these trail miles are open to horseback riding and 483 miles to mountain biking.

Delawareans often use public lands for recreation and many of these activities occur within forested areas. Publicly protected lands have grown from about 125,000 total acres in 2002 to over 140,000 acres in 2019. The majority of these lands are within State Parks, State Wildlife Areas, State Forests, and Delaware's two National Wildlife Refuges. Forest covers approximately 45% of these State and Federal lands, all of which are open for public recreation. Maintenance and enhancement of these facilities is necessary to accommodate Delaware's growing population.

Conclusions

Data indicate that recreation in forests is a widely enjoyed activity in Delaware. A well-developed recreational infrastructure, including campsites, trails, and more than 55,000 acres of forest on state and federal lands, is available to the public.

INDICATOR 14

Investments in forest health, management, research, and wood processing

Maintenance of healthy forests requires funding. Surveys for insects and diseases, monitoring of forest conditions, tree planting, and research in forestry all require time and money. Furthermore, landowners and communities require technical forestry assistance to maintain and manage their forest resources. Likewise, forest industries must invest in their operations if they are to remain competitive and continue to provide employment opportunities. Tracking the public and private funds invested in these various operations (forest health, management, research, and wood processing) is a good indicator of the likely success and long-term sustainability of forests and forestry in the state.

U.S. Forest Service Eastern Region S&PF Funding

The Delaware Forest Service (DFS) receives core program funding each year from the U.S. Forest Service Eastern Region State and Private Forestry (S&PF) program budget. The four core program areas are forest health, forest stewardship, fire, and urban and community forestry. Over the past three fiscal years, total federal funding has averaged about \$482,500/year (Table 14). These essential funds help the DFS provide forest health monitoring and pest diagnosis, forest landowner assistance, wildfire mitigation and suppression, and community forestry assistance. Funding for three positions and related operating expenses is included in these annual core grants. The DFS has also received Eastern Region S&PF funding in the past for land acquisition through the U.S. Forest Service Forest Legacy Program (FLP). Through a series of six acquisition grants from 2004 to 2010, Delaware received \$14,950,000 for legacy projects in the state. Additionally, Chesapeake Bay watershed funding is often available to Delaware in an effort to increase tree canopy coverage in Delaware communities within this priority watershed.



Table 14. Core forestry funding by U.S. Forest Service Eastern Region State and Private Forestry				
Program	FY18	FY19	FY20	
Forest Health	73,000	73,000	83,000	
Forest Stewardship	62,782	61,520	64,900	
State Fire Assistance	113,277	113,277	115,448	
Volunteer Fire Assistance	27,928	28,963	30,505	
Urban & Community Forestry	200,000	200,000	200,000	
Total	476,987	476,760	493,853	

Source: Delaware Forest Service



State funding

The majority of public funds invested in forest health and management is provided through the DFS within the Delaware Department of Agriculture (DDA). Each year, the DFS receives approximately \$1,210,000 in state (general) funds—most (95%) of these funds support 16.5 staff positions within the DFS (Table 15). These positions include foresters who provide technical forestry assistance to landowners and communities, assist with wildfire suppression, and manage and maintain the three State Forests. These funds have remained fairly stable throughout the past decade, with a slight increase, although a past economic downturn resulted in the loss of three positions and some operational funds.

Table 15. Delaware Forest Service positions and budget.

Fiscal	Total	General	Budget (\$ thousands)		
Year	Positions	Fund Positions	Total	General Fund	
2009	25	17.5	2,578	1,213	
2010	24	17.5	2,155	1,082	
2011	23	16.5	2,008	1,067	
2012	23	16.5	2,170	1,168	
2013	23	16.5	2,053	1,157	
2014	23	16.5	2,043	1,155	
2015	23	16.5	2,079	1,135	
2016	23	16.5	2,002	1,125	
2017	23	16.5	2,135	1,217	
2018	22	16.5	2,126	1,245	
2019	22	16.5	2,209	1,213	
2020	22	16.5	2,203	1,246	

Source: Delaware Forest Service

The DFS also generates income from its three State Forests, primarily through timber sales and cropland leases. These appropriated special funds (ASF) allow annual spending authority of \$660,500 and support 2.5 staff positions within the DFS. However, over the last ten years, the average revenue generated was only \$386,000. This revenue reduction is primarily due to the drop in timber value over that time period. Starting in FY20 all cropland leases were restructured and rebid resulting in a 30% increase in projected revenue. This will help replace the lost revenue in timber sales.

Delaware provides funds each year to landowners to cost share forest management expenses (tree planting, timber stand improvement, etc.) and to communities for tree planting and tree management (pruning, hazard tree removal, etc.) on publicly-owned lands. Available funds for both landowner and urban forestry projects total \$75,000. The state of Delaware provides \$37,500 for each program through proceeds from State Forest timber sales and cropland leases (ASF funds), while approximately \$40,000 is available through federal grants. The federal funds for urban forestry projects are provided through the Urban and Community Forestry (U&CF) program within the Eastern Region S&PF budget.

Since its inception in 1991, the U&CF grant program has provided over \$1.75 million through 577 grants to over 200 organizations for tree planting and tree management projects on publicly-owned land throughout Delaware. These grants, matched by communities with either nonfederal funds or in-kind services, have resulted in the planting of over 13,000 trees. Funds are also used to complete street-tree inventories and community forest management plans. These activities help to sustain our state's urban forest resource.

Nearly all of the forest health investments within Delaware are included in the state and federal funds previously discussed. For the last ten years, the DFS has consistently received \$73,000 of base S&PF funding for forest health-much of this funding supports one-half of a senior forester position dedicated to forest health issues (state funds support the remaining half of the position). The DFS annually monitors for various forest pests and has established multiple, long-term forest health monitoring projects, such as annual sampling for southern pine beetles as part of a southern regional effort to detect population trends. The forest health specialist also completes an annual aerial defoliation survey to monitor for any significant damage from forest insects. The DFS often receives additional federal funds (typically \$5,000 to \$10,000) for specific forest health projects-such as monitoring for thousand cankers disease, emerald ash borer, sirex woodwasp, and Asian longhorned beetle. The base forest health funding has remained stable over the past decade while the availability of federal funds for monitoring for specific forest pests has actually increased.

The DFS works in partnership with the DDA Plant Industries section which handles forest pest issues related to the horticultural and agricultural industries and has the authority to impose quarantines within the state for various agricultural and forest pests. The Plant Industries section is also responsible for monitoring the state's gypsy moth population and inspecting the state's horticultural industry for any quarantined forest pests. The urban and community forestry grant program has provided over \$1.75 million through 577 grants to over 200 organizations for tree planting and tree management projects.







Forest research

Forestry research opportunities are limited in Delaware because no university offers an accredited forestry program and there are no National Forests or U.S. Forest Service Research Stations in the state. Furthermore, with its small staff (22 positions including only 10 forester positions), the DFS does not have sufficient capacity to implement significant forestry research. The DFS conducts small scale research projects, but they are limited in scope and budget. This situation is unlikely to change with current state budgets.

There is limited federal funding provided for forestry research at Delaware's two land grant universities—Delaware State University (DSU) and the University of Delaware (UD). From 1995 to 2008, Delaware received between \$60,000 and \$92,000 annually for forestry research through the McIntire-Stennis budget, and all of these funds were awarded to UD. However, the McIntire-Stennis law was changed in 2008 such that 1890 Land Grant colleges became eligible for this forestry funding. Therefore, beginning in FY10, DSU began receiving a portion (10%) of the funds (Table 16). This amount was increased by an additional 10% for each of the following three years to 40% of the total amount. The split in funds currently remains at 60% for UD and 40% for DSU.

Fiscal Year	University of Delaware	Delaware State University	Total Funding
2009	92,876	0	92,876
2010	100,923	11,214	112,137
2011	99,038	24,709	123,747
2012	114,712	49,162	163,874
2013	113,883	75,922	189,805
2014	113,502	75,668	189,170
2015	102,411	68,274	170,685
2016	113,162	75,441	188,603
2017	137,345	91,564	228,909
2018	137,666	91,777	229,443
2019	133,095	88,730	221,825

Table 16. McIntire-Stennis funding (dollars) for Delaware.

Source: Delaware Forest Service

Wood processing

There is virtually no new investment in (primary) wood processing industries in Delaware as there are only a handful of small sawmills with no paper mills or other solid wood product industries. The existing sawmills are small, use primarily low-grade hardwood logs, and are family-operated. The largest hardwood sawmill in Delaware closed more than ten years ago. With the current depressed lumber market, additional investment in either the existing sawmills or new ones is unlikely unless markets improve. Furthermore, the number of sawmills in surrounding states that purchase Delaware timber continues to shrink, particularly pine sawmills. In the last ten years, another two pine sawmills closed on the Delmarva Peninsula making that six closures in 20 years. This, combined with the recently depressed economy and real estate market, produced a dramatic decrease in timber demand in Delaware. Recently, however, the national and local economies have improved, and housing starts are increasing again, thus creating an opportunity for a new pine sawmill in Delaware (or elsewhere on the Peninsula). FIA data clearly show there is an ample supply of pine timber available for a revitalization of the timber industry in Delaware.

Additionally, while this is not considered wood processing, there are potential new markets for forest products on the horizon. Delaware is a member of the Regional Greenhouse Gas Initiative (RGGI) and forest management, urban forestry, and avoided deforestation are now approved forestry offsets for RGGI. Furthermore, markets for other non-wood services, such as wetland mitigation banking and endangered species banks—collectively referred to as ecosystem services—have potential to expand in Delaware.

Conclusions

Delaware does not have a forest research station or any universities that have an accredited forestry program. Nonetheless, the state receives significant state and federal funding for forest health and forest management. These funds have remained relatively stable over the past decade. Delaware also provides funding to communities and landowners for tree planting and other forestry activities, and these funds have also remained relatively constant. There is little investment or research in wood processing industries, primarily because Delaware has few primary wood processors (sawmills) and no papermills. There may be an opportunity to site a sawmill in Delaware in the future, but this will not occur until lumber prices substantially improve.

INDICATOR 15

Forest ownership, land use, and specially designated areas

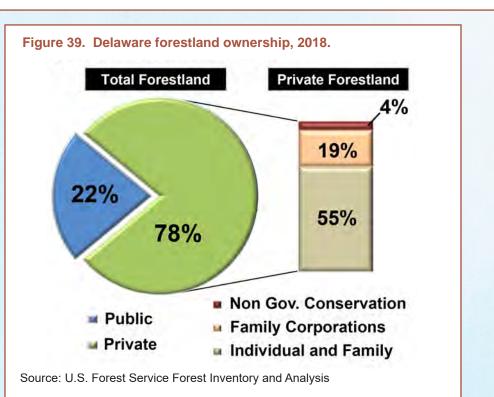
The percentages of public and private sector forestland ownership give an indication of the amount of forestland that is protected from conversion to other uses. Further analysis of private forests, such as the amounts under conservation easements and property tax reduction programs, provides a further understanding of the long-term sustainability of a state's forest resources.

Forestland ownership

Since the 2010 forest resource assessment, publicly-owned forestland in Delaware has increased by about 2% (from 20% to 22% or about 7,000 acres). Most of this gain can be attributed to fee simple purchases of land made through the federal Forest Legacy Program and the state's Open Space Program. Public land is mostly state owned (18%) with some county/ municipality (2%) and federal (2%) ownership, but the majority of forestland in the state is still privately owned (Figure 39). Of the nearly 282,000 acres of private forest, individuals and families own more than two-thirds. Family corporations account for about one-quarter and the remainder is held by private conservation groups such as The Nature Conservancy. Glatfelter Pulp Wood Company is Delaware's sole remaining industrial forest landowner and they have divested well over half of their holdings since 1999. Their remaining lands are for sale on the open market and will likely be sold within the next decade. The only timber management organization (TIMO) that owns forestland in Delaware is the Forestland Group that purchased 1,358 acres of former Glatfelter properties. All of these lands have a permanent conservation easement held by the Delaware Forest Service (DFS).

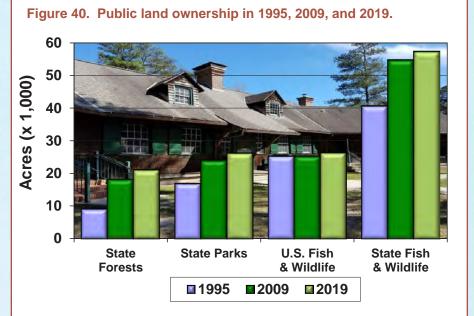
FIA data clearly show there is an ample supply of pine timber available for a revitalization of the timber industry in Delaware. Since 1995, State Forest acreage has more than doubled from 9,100 acres to 21,126 acres including 2,428 acres through the Forest Legacy Program.





State lands

State ownership has increased considerably (57% overall) in the last 24 years as private lands have been purchased or donated to the State Forest system, State Parks, and Fish & Wildlife (Figure 40). Many of these purchases were made possible through Delaware's Open Space Program. Additional purchases of forestland by the DFS since 2004 included 2,428 acres through the Forest Legacy Program. Since 1995, State Forest acreage has more than doubled from 9,100 acres to 21,126 acres. This equates to a 132% increase in land holdings that are managed for multiple public uses and for timber production.



Sources: Delaware Forest Service, Delaware Department of Natural Resources and Environmental Control, and U.S. Fish & Wildlife Service

Protected land

Public ownership includes federal lands managed by the U.S. Fish & Wildlife Service (Bombay Hook and Prime Hook National Wildlife Refuges) and state lands managed by several agencies, primarily State Forests, State Parks, and State Wildlife Areas (Figure 41). Additional public lands are owned by other state agencies, counties, and municipalities. Portions of these protected land holdings include forestland and marshland.

Figure 41. Public ownership (all lands), 2017.



ENTERING

Bombay Hook

NATIONAL WILDLIFE REFUGE

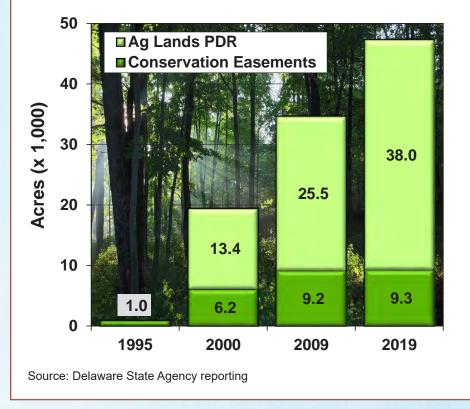
Private land with public conservation easements

The State of Delaware holds conservation easements on private lands through a variety of programs. The Delaware Agricultural Lands Preservation Foundation (DALPF) has the most easements with over 139,000 acres in permanent protection (a 42% increase in the last ten years). Of this total, approximately 38,000 acres are forested. While these easements are permanent, they do not prohibit the future conversion of forestland to cropland (as long as all federal and state laws are satisfied). However, most of these areas are wetland forests unsuitable for agricultural uses. An additional 1,200 acres of forestland easements are held by the DALPF through a separate Forestland Preservation Program in which it is prohibited to convert the protected forestland to non-forest uses.

The DFS holds permanent easements on nearly 8,000 acres of forestland—a 14% increase in the last ten years. These easements require owners to maintain the land as forests and follow a forest stewardship (management) plan. Most of these easements are located on working forestlands (loblolly pine plantations) formerly owned by the Chesapeake Forest Products Company. Another easement totaling 908 acres was purchased through the Forest Legacy Program. The remaining easements, 1,200 acres, were purchased through Delaware's Forestland Preservation Program. The Department of Natural Resources and Environmental Control, Division of Parks & Recreation, also holds conservation easements on forestland totaling over 1,000 acres. Most of these easements are designed to protect biodiversity and unique habitat. Total acreage of conservation easements on forestlands held by the state has increased nearly ten-fold since 1995. And since 2000, the number of forestland acres under easement with DALPF has nearly tripled (Figure 42).

The DFS holds permanent easements on nearly 8,000 acres of forestland—a 14% increase in the last ten years.

Figure 42. State-owned forested conservation easements, 1995–2019.





The Forest Legacy Program (FLP) provides U.S. Forest Service funding for protection of working forestlands through outright purchase or through the creation of conservation easements. Funds may only be used in certain geographic areas known as Forest Legacy Areas (FLAs) (Figure 43). As of 2019, 3,336 acres of forests are protected under the Forest Legacy Program. This is an increase of 1,304 acres over the last ten years. Fifteen parcels totaling 2,428 acres were purchased for Redden State Forest, and one 908-acre conservation easement was established. (These totals were included in the discussion above.)

The Delaware FLP is implemented according to the Delaware FLP Assessment of Need (AON), which was originally approved by the Governor's office on December 22, 1998. An updated AON is included in this assessment with five proposed new FLAs and two small expansions (see Appendix 3). The AON includes approved eligibility criteria for the FLAs, approved FLAs, specific goals and objectives to be accomplished by the Delaware FLP, and the process by which the Delaware Forest Service evaluates and prioritizes projects to be considered for inclusion in the FLP. The Redden/Ellendale FLA was approved for expansion on August 18, 2003. The Blackbird/Blackiston and Cypress Swamp FLAs were approved for expansion on June 7, 2006.

Additional forestlands are protected in Delaware through ownership by nongovernmental organizations (NGOs) with environmental protection missions. While many of these lands are not permanently restricted from land-use conversion through conservation easements, it is very likely that these forests will remain permanently protected. NGOs own over 16,000 acres of forestland. Two organizations own the bulk of these lands—Delaware Wild Lands, Inc. (over 11,000 acres) and The Nature Conservancy (over 4,000 acres).

Forestland in tax reduction programs

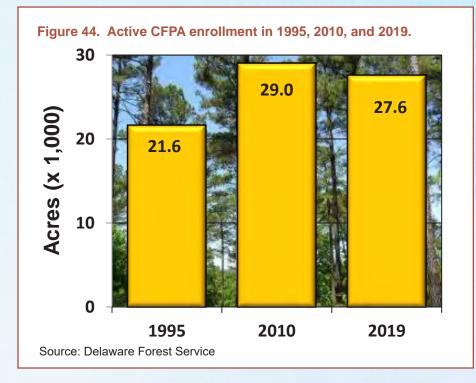
Much of Delaware enjoys extremely low property taxes—some of the lowest tax per assessed value in the eastern United States. Nonetheless, Delaware's Commercial Forest Plantation Act (CFPA) offers a 30-year county tax exemption to landowners with at least 10 acres of forestland and who follow a forest stewardship plan. In 2019, 27,569 acres of private forests were enrolled in CFPA. This is a slight drop (4.9%) since 2010 but still amounts to about 10% of Delaware's privately-owned forestland (Figure 44).

Additional forestland is enrolled in the state's Farmland Assessment Program that provides a significant property tax reduction (often a complete exemption from property taxes) for agricultural land that generates a minimum amount of gross receipts averaged over a two-year period. Many woodlots that are associated with cropland are included in this property tax program. Currently, the DFS estimates there are approximately 63,342 acres of forestland enrolled in the Farmland Assessment Program. As of November 2019, New Castle County reported 7,242 acres and Kent County reported 21,350 acres of forestland enrolled. Sussex County only tracks total acreage (173,833); therefore, assuming 20% of these lands are forested— believed to be a reasonable estimate of the forested percentage of farms yields an estimated 34,750 acres enrolled in Sussex County. There is no additional requirement, such as a forest management plan, for landowners with forestland within the Farmland Assessment Program.

Figure 43. Current and Proposed Forest Legacy Areas.



Source: Delaware Forest Service





Forest certification

The Sustainable Forestry Initiative (SFI), a program developed by the American Forest and Paper Association, provides certification for forestlands with management plans that meet certain sustainability criteria. The Glatfelter Pulp Wood Company, a private landowner, still owns and manages over 6,000 SFI-certified acres in Delaware. Also, the 1,350 acres of forestland owned by the Forestland Group are certified through the Forest Stewardship Council (FSC). Lastly, Delaware Wild Lands, Inc., owns and manages over 21,000 acres of agricultural lands, marshlands, and forests. Their Great Cypress Swamp property in southern Sussex County consists of 10,600 acres of forestland with approximately 4,000 currently under active ecological forest management. The Delaware Forest Service considered third-party certification of State Forest forestlands, but the high cost was prohibitive and currently there is no state law requiring such certification.

Conclusions

Over 75% of Delaware's forests are privately owned. The remaining publicly-owned forests are in state ownership with some federal and county/local ownership. Therefore, programs designed for private non-industrial forest landowners will continue as the most common method to protect forests from conversion to other uses. There are a variety of conservation easement programs that have protected over 38,000 acres of forestland in Delaware. The Forestland Preservation Program has now been funded with \$1 million for each the last two years with plans to continue funding so long as the state's budget allows. Nongovernmental organizations also have protected significant forested acreage. While Delaware's county property taxes are quite low, the Commercial Forest Plantation Act and Farmland Assessment Act provide property tax exemptions for most of Delaware's forestland. One opportunity to consider is a way to work more closely with landowners with forestland in the Farmland Assessment Program.

INDICATOR 16

Employment and wages in forest-related sectors

Sustainable forest management requires an economic infrastructure for the production of end-use products from timber. While there are only a few relatively small primary wood processing facilities in the state, Delaware's working forests sustain a number of industries and employ thousands of citizens. Wages must stay competitive to ensure the long-term viability of these industries.

Wood-related products manufacturing employees

In 2018 there were approximately 1,170 people employed in the forest products manufacturing industry in Delaware. This represents about 2.25 people/1,000 between the ages of 18 and 65. This is less than half the number of people employed in this industry just 20 years ago. The average rate of pay for these individuals was about \$27/hour, and they had a total payroll of \$63.36 million. Most of these jobs are located in secondary wood processing industries. Establishments producing a variety of products including furniture, custom millwork, cabinets, and other wood products employed these citizens. Employment in wood-based industries increased from 1954, when there were 1,800 people employed in these industries, to 2000, but over the last 20 years there has been a steady decline (Table 17).

There are nine sawmills located in Delaware, excluding portable mills, and two concentration yards. The DFS also lists 14 Delaware loggers in its primary and secondary wood processors directory. Additionally, 27 Maryland (Eastern Shore) and five Pennsylvania loggers service areas in Delaware.



Table 17. Timber-related industry
employment, 1954–2018.

Year	Number Employed
1954	1,800
1967	2,200
2000	2,750
2005	1,500
2010	1,200
2015	1,100
2018	1,170

Source: United States Census Bureau Economic Census

State forestry employees

Nearly all of the foresters in Delaware work for the DFS. There are a handful of individuals working as procurement foresters and there are no full-time forestry consultants in the state. This situation may be partly explained by the fact that the DFS provides most professional forestry services at no cost (although others from surrounding states work within Delaware). The DFS currently employs 10 foresters as part of its contingent of 22 full-time personnel and one seasonal position. By comparison, in 1984 the DFS employed 13 full-time, permanent staff. Staffing increased steadily over the subsequent 20 years, although the DFS lost three full-time positions since 2008.

The number of certified arborists recognized by the International Society of Arboriculture (ISA) in Delaware grew from 10 in 1995 to 81 in 2009. However, since then, that figure has dropped to a current number of 43 in 2019. The number of tree care companies also continues to grow with over 60 now located in Delaware. (Please note that not all of these companies have a certified arborist on staff.)

Additionally, the Census of Agriculture tracks farms that grow nursery stock. In 2002, 55 farms produced nursery stock on 1,190 acres. Five years later, the number of farms producing dropped to 47 on only about half the acreage in 2002. Estimated sales in 2007 totaled \$47.5 million. The downward trend in number of farms, acres, and sales continued through the most recent survey in 2017 (Table 18).

Table 18.	Nurserv	stock	crops	produced	on De	laware farms.
	i tai ooi y	01001	or opo	produced	011 00	

Year	Number of Farms	Acres in the Open	Sales (millions)
2002	55	1,190	NA
2007	47	541	47.5
2012	23	483	47.1
2017	16	447	13.5

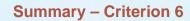
Source: USDA, National Agricultural Statisics Service, Census of Agriculture

Conclusions

Forest products industries, particularly secondary wood processors, employ less than 1,200 Delawareans and constitute an important but shrinking sector of the economy. There are limited opportunities for professional foresters—most are employed with the Delaware Forest Service. Delaware has no full-time forestry consultants. The number of urban forestry jobs, such as tree care professionals, and forest nursery positions has grown, but the number of certified arborists has sharply declined in the last ten years.



Delaware has invested significant funding to purchase forestland outright and purchase conservation easements—over 55,000 acres of forestland are now publicly owned.



Forests in Delaware contribute significantly not only to the state's environmental quality but also its economic viability. Despite the fact that nearly all of Delaware's timber is processed out-of-state, these harvests produce a significant return to Delaware's landowners, although the forest industry has been in decline over the last ten years. One of the consequences of this decline has been a decrease in annual harvests of hardwoods and softwoods. This has resulted in annual growth far exceeding annual removals for both groups during that time period, but hardwood growth had consistently exceeded removals at least since 1959. Hardwood harvests have increased in recent years with additional demand for low quality timber (pulp and wood energy) although ample supplies remain.

Recreational opportunities abound in Delaware and have increased with the significant additions to state-owned parks, forests, and wildlife areas—38,070 acres (+57%) since 1995 (this includes a 7,890-acre increase [8%] since 2009). A well-developed recreational infrastructure, including campsites, trails, and more than 55,000 acres of forest on state and federal lands, is available to the public.

Public investment in forest health and management has remained relatively constant with a gradual increase in some cases despite the fact that Delaware does not have a forest research station or any universities that have an accredited forestry program. The DFS offers a full range of technical forestry assistance to communities and landowners and some financial assistance for tree planting and other management activities. These funds, a mixture of state and federal sources, have also remained relatively constant although their sources have changed. Such investments help achieve one of the S&PF national priorities, namely to *Conserve and manage working forest landscapes for multiple values and uses*. There is little investment or research in wood processing industries, primarily because Delaware has very few primary wood processors (sawmills) and no papermills, but this could change in the near future because of the improvement in the national (and local) economy in the last few years.

Delaware has invested significant funding to purchase forestland outright and purchase conservation easements. Over 55,000 acres of forestland are now publicly owned (over 95% state owned) which represents approximately 15% of Delaware's forest base. An additional 45,000 acres are in permanent conservation easements. Many of these purchases have occurred in the last 20 years. Most of the privately-owned forestland is enrolled in one of two property tax reduction/exemption programs although one of the programs (Farmland Assessment) does not require any forest management by landowners.

Delaware's forest-based industry, while relatively small, significantly contributes to the economy—the secondary wood processors employ the most citizens. Opportunities for professional foresters are limited and the Delaware Forest Service is the largest employer. The number of urban forestry professionals is declining at a time when Delaware's expanding population requires additional arborists and tree nursery professionals.

All of these indicators help ensure that our citizens will continue enjoying the many natural benefits and services provided by our forests. Continuing these investments, in a cohesive and strategic manner, will help maintain and *Enhance public benefits from trees and forests*—one of the S&PF national priorities.