

# 4.0 Conservation and Maintenance of Soil and Water Resources

Soil and water are the foundation for all other forest resources. Soil, which has both living and nonliving elements, holds water between rainstorms and stores nutrients for plants and animals; it also acts as an anchor for vegetation and a seasonal or permanent home for a variety of burrowing animals, insects, and microscopic creatures. Soil conservation means maintaining site productivity and soil resource functions. Even though it can be formulated and restructured to support plant growth, soil is not considered a renewable resource because it takes thousands or even millions of years to develop.

Water resources include the physical features, habitat, and inhabitants of lakes, streams, and wetlands, as well as water itself. Forests and trees, whether urban or rural, help reduce storm water runoff, filter pollutants, store water and nutrients, clean and cool water, protect municipal water supplies, reduce flooding, replenish groundwater and provide fish habitat. Water quality depends upon the extent to which the watershed from which it comes is disturbed by pollution, bacteria and other factors.

The quality of Iowa's water is only as good as the quality of the soil that filters it. The topsoil that once grew prairies, forests and wetlands and which once purified water across the state has been eroding away since the time the state was first settled; in fact, half of the topsoil that existed prior to statehood has been lost in most of the state's sloping cropland. This productive soil has been washed into streams and blown across fields and ditches; as a result of this, aquatic systems have been choked and fertilizers and pesticides have damaged water sources and other natural areas.<sup>41</sup>

## 4.1 Iowa's Water

Programs and efforts designed to improve water quality are crucial for maintaining safe, healthy drinking water. Forest riparian buffer and bottomland hardwood tree planting practices, funded through the Conservation Reserve Program, are one way of using sound forest management practices to promote and improve water quality. In Iowa, however, the importance of tree planting and forest management practices to improve water quality is often overlooked. Emphasizing efforts in watersheds that provide domestic water supplies and watersheds containing impaired waters are good places to prioritize reforestation activities.

While certainly not pristine, Iowa lakes and streams may be cleaner than in the early 1900's, when they were polluted with sewage and industrial wastes. Federal studies of Iowa's surface waters in recent years have noted contaminants such as fertilizer, agricultural chemicals, industrial wastes, sewage and livestock manure. The need to remove excess water as quickly as possible to promote high yielding food crops has led to the tiling of millions of acres of agricultural crop land; there are currently over 800,000 miles of drainage tile lines, which is 7 times the length of Iowa's current road system.<sup>42</sup>

<sup>41</sup>Stone.

<sup>42</sup>Stone.

The removal of natural systems along water corridors leads to negative long-term consequences. The channelization of streams to increase cropland has reduced the water holding basin of most streams in Iowa and increased the likelihood of flooding in many areas across the state. This has led to a decrease in the amount of stream length available for water holding during rain events. During periods of heavy rainfall, areas with reduced storage capacity overflow, causing flood damage to agricultural fields and property. Remedies for such problems include wetland restoration and establishment of riparian buffer strips, which can increase water holding capacity during heavy rain events.



Photo by Photographic Services, University of Iowa.

Another consequence of stream channelization is increased water velocity, which accelerates the process of stream bank cutting. When these channelized streams meet natural, meandering streams, the increased energy is dissipated, but not before damaging the interface with the natural system. Over time, damage to the natural system results in decreased habitat for both terrestrial and aquatic creatures.

More time and money are required if monitoring of livestock wastes, urban runoff, pesticides, sewage facilities and non-point pollution is to be effective. River and lake protection can be achieved through watershed safeguarding, wetland restoration, and channelization prevention. The most economical way to address the problems created by improper land and water use is



Photo by Gary Hightshoe, Iowa State University.

to teach landowners about the ways that their habits can affect the functioning of natural systems, and how damage to such systems can come back to harm them in the future.

According to NOAA, Iowa receives an average of 34 inches of rainfall each year; about two inches of this evaporates from trees and plants and returns to the atmosphere, four inches runs directly into rivers and lakes and another two inches soaks into the groundwater system. The rest is available for plants, trees and

agricultural crops that produce valuable crops for the landowners that own them.<sup>43</sup>

Before Iowa's permanent vegetation was removed, water was usually slowly filtered and absorbed by soil structure that was seldom disturbed. Some of the water moved through the soil profile to underground aquifers providing clean drinking water that citizens still benefit from today. This clean source of water has become more important as the difficulty and costs of cleaning surface water increases. Now surface water carries fertilizers, chemicals, soil, and other pollutants due to the over 60% of the land under agricultural production and 700 communities not having adequate sewage systems.<sup>44</sup> The costs to correct and prevent problems with water quality as a result of land use decisions will continue to follow each generation that lives in Iowa.

<sup>43</sup>Stone.

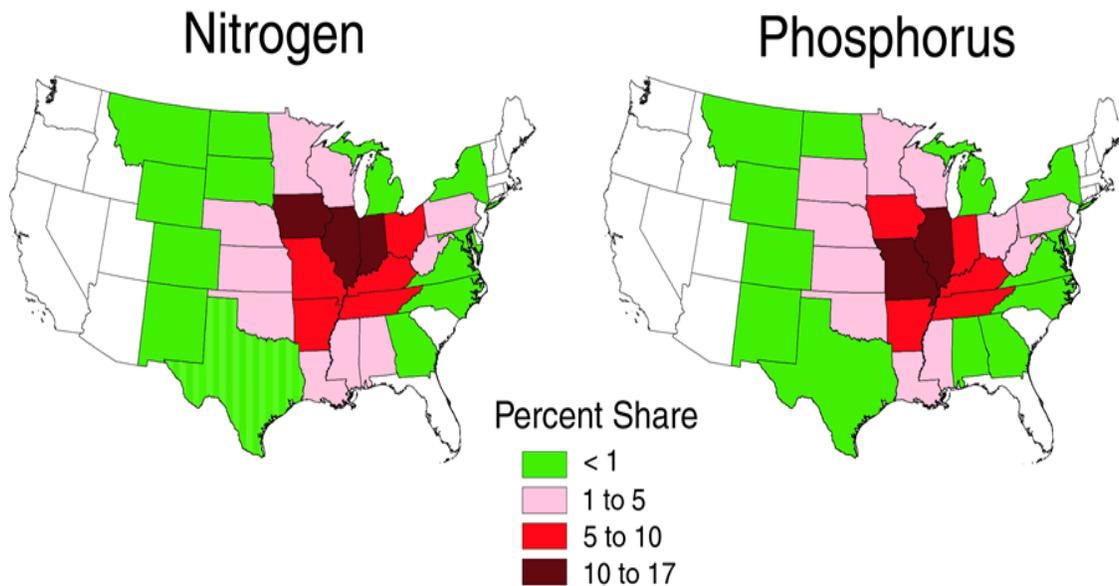
<sup>44</sup> <[www.water.iastate.edu/Documents/SWCC\\_Soil\\_Water.pdf](http://www.water.iastate.edu/Documents/SWCC_Soil_Water.pdf)>. April 15 2010.

There are two sources of water pollution: point source pollution, which is poured directly into a water source from a pipe or other device, and nonpoint source pollution, such as sediment, nutrients, and bacteria, which washes into water sources from fields and other areas. While point source pollution can be a problem, most water quality problems in Iowa are caused by nonpoint source pollution. Such pollution comes from watersheds, which are areas of land that drain into lakes or streams. To improve Iowa’s water quality, watersheds need to be stabilized with permanent native vegetation to keep sediment, nutrients and bacteria from washing into streams and lakes.

Iowa farmers annually apply more than 3 billion pounds of chemical fertilizers and 45 million pounds of pesticides to agricultural fields. It is therefore no surprise that agricultural pesticides are detected in nearly every sample of rainfall taken during the growing season, in 26 percent of groundwater samples and in 78 percent of surface waters samples.<sup>45</sup> There have been a lot of studies reviewing the impact of agricultural chemicals on human health and the environment. Although the results vary, there are few who dispute that dispersal of these chemicals is widespread.

A computer modeling software program called SPARROW gives regional interpretations of water-quality monitoring data. The model relates in-stream water-quality measurements to spatially referenced characteristics of watersheds, including contaminant sources and factors that influence terrestrial and aquatic transport. SPARROW empirically estimates the origin and fate of contaminants in river networks and quantifies uncertainties in model predictions. Figure 4.1 shows which states contribute the greatest amount of nitrogen and phosphorus to the Gulf of Mexico.

Figure 4.1 Estimates of Nitrogen & Phosphorus Contributions to the “Dead Zone” in the Gulf of Mexico.



Source: USGS, [water.usgs.gov/nawqa/sparrow/gulf\\_findings/by\\_state.htm](http://water.usgs.gov/nawqa/sparrow/gulf_findings/by_state.htm).

Nitrogen from farm and lawn fertilizers, livestock manure and municipal and industrial wastes are expelled into Iowa’s rivers and eventually travel down the Mississippi River system. The accumulated discharges of these pollutants into the Gulf of Mexico have reduced the amount of oxygen there, which has led to the development of the hypoxic zone or “Dead Zone”. Roughly the size of New Jersey, this area gets its name from the near-complete lack of shrimp, fish and other marine life found there during the spring and summer months.<sup>46</sup>

<sup>45</sup>Stone.

<sup>46</sup>Roach, John. “Gulf of Mexico ‘Dead Zone’ Is Size of New Jersey.” National Geographic News. May 25 2005. <[news.nationalgeographic.com/news/2005/05/0525\\_050525\\_deadzone.html](http://news.nationalgeographic.com/news/2005/05/0525_050525_deadzone.html)>.





**Sediment deposition on an agricultural field located in a flood plain.** Photo by Bruce Blair.

agricultural fields are adjacent and uphill to them. The agricultural fields do not have adequate soil structure because of tillage practices, causing water to runoff and down hill shortly after it begins raining.



**Toxic byproducts from human activity and excess silt take their toll in the form of fish kills.** Photo by Ron Johnson.

Forest and wetland ecosystems have the ability to filter, trap and recycle sediment and other forms of pollution. However, having fewer of these systems in place has several consequences. One, there are not enough forests and wetlands to filter polluted water into a cleaner state. Second the forests and wetlands that remain are often damaged by being overwhelmed by the quantity of water being directed their way. For example, gullies develop within forests, when

## The Influence of Pasturing on Water Quality

Streams that pass through pastures are often regarded as free water sources for livestock. Access to streams is usually unrestricted, which allows livestock to not only drink stream water but to walk and cool down within it as well. This activity accelerates erosion on soil-exposed stream banks and leads to the detriment of aquatic life and the plants that grow within or along the adjacent riparian corridors. These disruptions are often carried downstream, which leads to destruction of aquatic and plant life away from the initial source. An effective way to guard streams from livestock pollution and physical damage is to fence them off. Shade from tree plantings along these fences could provide an alternative to standing in the stream during the hotter summer months.

## Establishing Buffers to Improve Water Quality

Buffers provide many benefits, including soil erosion control, improved water quality through removal of sediment, fertilizers, pesticides and other runoff pollutants, improved air quality, enhanced fish and wildlife habitat, flood control, energy conservation, beautification, improved farm safety and protection of buildings, roads and livestock.

The National Hydrologic Dataset provides the most detailed water layer available for Iowa. Since floodplain information isn't available in digital format for most Iowa counties, stream order is the best indicator of riparian habitat potential. The higher the stream order, the greater the potential

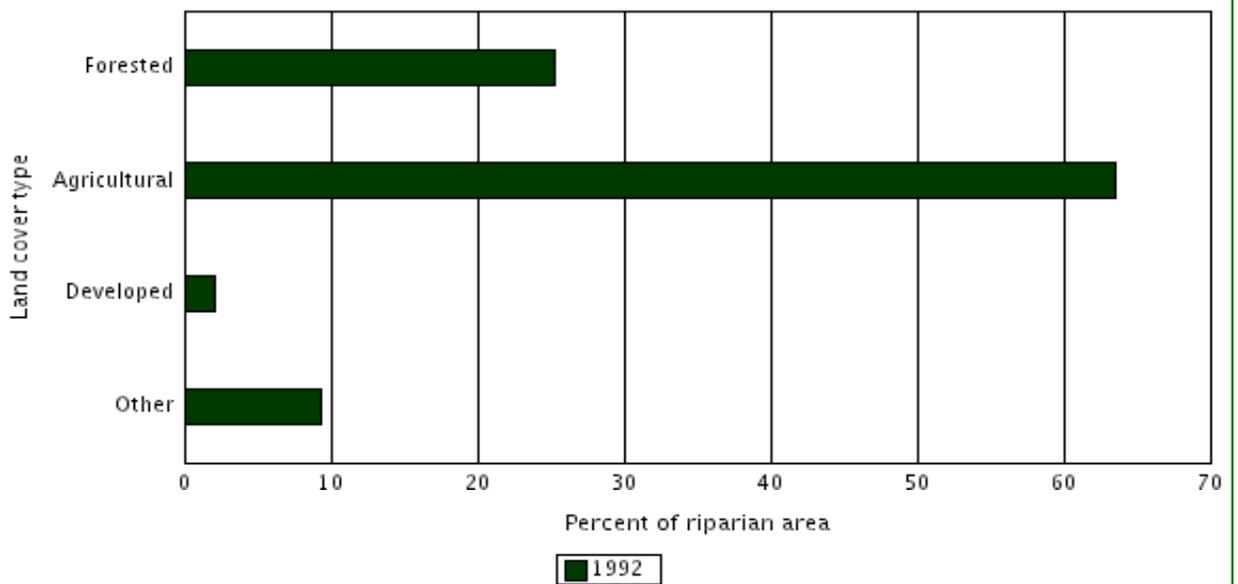
for that floodplain to support larger stands of bottomland forest. First order streams were excluded from Figure 4.3, which shows existing riparian corridors in Iowa. As of 2002, there were 435,000 acres of riparian forest, and historical data has shown that more than 100,000 of such acres have been lost since Iowa was first settled. If all the streams in the state had buffers of 25 meters, there would be 1,555,498 acres of riparian corridors.

**Figure 4.3 Existing Riparian Corridors in Iowa, 2002.**



Source: Kathryn Clark using National Hydrologic dataset.

**Figure 4.4 Percentage of Forest and Other Land Cover Types in Iowa Riparian Areas.**



Source: U.S. Department of Agriculture, Forest Service - Forest Sustainability Indicators Information System. [Database].

As Figure 4.4 indicates, agriculture was the land use in over 60% of the riparian area in the state in 1992. Tile lines are often used to improve crop yield through the removal of excess water, which keeps the roots of crops out of standing water. Channelization puts pressure on existing streams to hold water that is being removed from cropland at a faster rate than would occur within a natural system. Increased flooding has resulted from the alterations made to hydrological drainage systems that existed prior to agricultural development. Due to the removal of permanent vegetation for the sake of agriculture, there is a large number of impaired waterways in the state.

If every stream with a defined channel in Iowa had a 25 meter buffer, there would be 1,555,498 acres of water quality protection and aquatic habitat for a variety of species. This would not only provide long-term water quality benefits but would also cut down on nitrogen runoff. There would be less strain on water treatment plants because agricultural runoff could be intercepted within the buffers. Using trees in buffers deters landowners from converting the land to other uses while providing important aesthetic views and wildlife corridors. Reforestation of riparian areas could reduce flood damage to private property so long as houses and business were not allowed to be constructed within these zones.

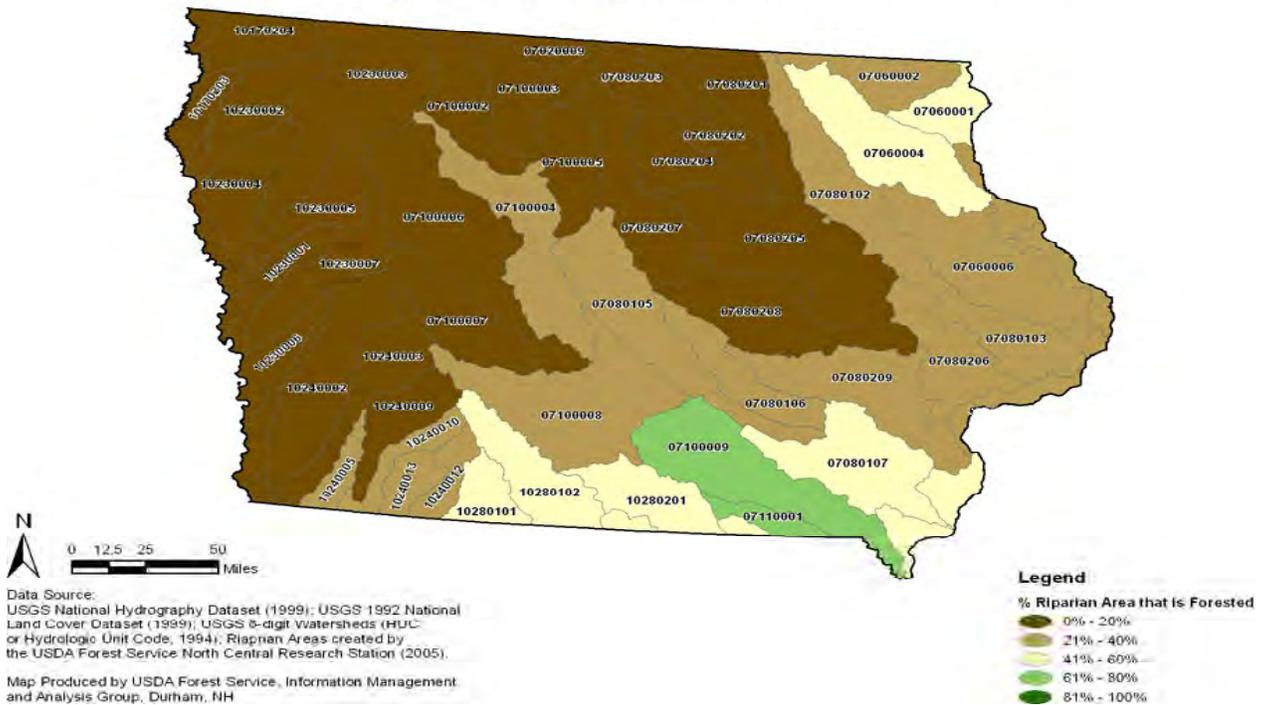
Buffers can cut sediment in surface runoff by as much as 90%, cut nitrogen and phosphorous runoff by 80%, and support five times the number of bird species as cropped or heavily grazed land. Additionally, buffers remove nitrates from the groundwater, reduce streambank erosion and increase soil organic matter.<sup>47</sup>

Streamside forests support healthy fish by supplying essential woody debris and adequate organic food. The loss of trees along streams results in fluctuating water temperature, as water heats up from the sun during the day and then cools off significantly at night; such fluctuations make it difficult for fish to breed successfully, and can therefore adversely affect populations. Trees also provide debris critical for the successful maintenance of cold-water fish such as trout and serve as habitat for insects, which are an essential part of the food chain in aquatic systems.

The watershed map in Figure 4.5 shows that most of Iowa's riparian areas are not forested; the most heavily forested riparian areas are in southeast Iowa, while the least-heavily forested areas are in northern and western Iowa.

<sup>47</sup><[www.buffer.forestry.iastate.edu/Assets/10\\_things.pdf](http://www.buffer.forestry.iastate.edu/Assets/10_things.pdf)>. April 15 2010.

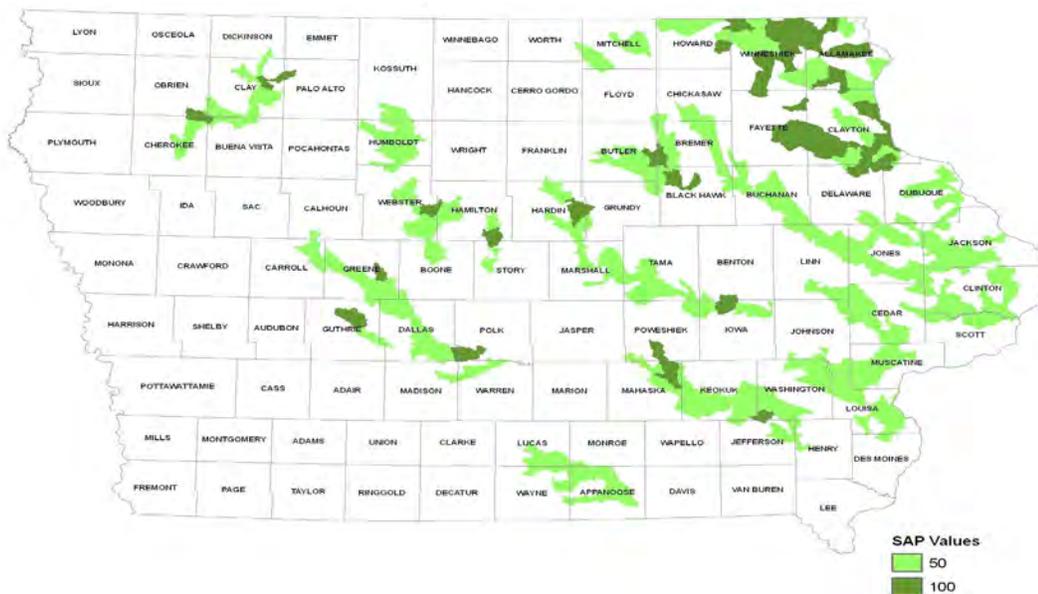
**Figure 4.5 Percent of Riparian Area that is Forested by 8-digit Watershed.**



Source: U.S. Department of Agriculture, Forest Service - Forest Sustainability Indicators Information System. [Database].

Water quality depends on the way that land within watersheds is used, and surface water quality is one of the most serious and pervasive environmental issue facing Iowa. Figure 4.6 shows watersheds in the state that contain high quality resources, have significant public-owned lakes, supply drinking water to communities and are impaired because of excess sediment. It is difficult to prioritize watersheds because of changing environmental and land use factors from one year to the next.

**Figure 4.6 Priority Watersheds in Iowa.**



Source: Kathyne Clark using impaired streams classified under 303d from 2002, significant public lakes in Iowa, impaired streams from 2002, and water use for surface water intakes.

Lack of permanent vegetation for Iowa’s waterways, rivers, and soil makes water more expensive. As Figure 4.7 shows, water treatment plant costs increase by about 25% for every 10% of forest that is removed from the watershed that supplies the drinking water for a particular community.<sup>48</sup>

**Figure 4.7 Water Treatment Cost based on Percentage of Watershed that is Forested.**

Percentage of Watershed Forested	Chemicals and Treatment Costs	Average Treatment Costs/day	Percentage Increase in Cost
10%	\$115	\$2,530	24%
20%	\$93	\$2,046	27%
30%	\$78	\$1,606	26%
40%	\$58	\$1,276	26%
50%	\$46	\$1,012	24%
60%	\$37	\$814	

Source: Trust for Public Lands & The American Water Works Association.

## Community Stormwater

Stormwater is created when rain falls on roads, driveways, parking lots, rooftops and other impervious surfaces that do not soak up moisture. When dealing with stormwater, communities are faced with the challenge of moving water away from existing infrastructure quickly in order to avoid damage without flooding and polluting already degraded lakes and streams; untreated stormwater that is not filtered before it enters streams causes damage to aquatic habitat and wildlife that depend on safe water for survival.

Each time it rains the water within a community collects and transports pollutants to community wastewater receptacles that eventually drain into man-made ditches or natural water systems. Many different pollutants, including sediment, nitrogen, phosphorus, bacteria, oil, grease, trash, pesticides and metals, are found on impervious surfaces. Research has shown that there is a direct correlation between the amount of pollution and the amount of impervious cover within a community.<sup>49</sup>

Encouraging new developments to create better filters for stormwater runoff is one approach to dealing with this problem. Using green infrastructure such as trees, forests and other vegetation and their associated soils to absorb and filter stormwater is the best alternative to “hard infrastructure” like pipes, pumps and storage chambers. It is also economical, as it spares communities from having to continuously spend money updating exhausted infrastructure. In addition to its benefits for stormwater runoff, green infrastructure also provides public places for recreational activities and can improve community aesthetics. Finally, trees improve air quality, provide shade to impervious barriers that reduce air temperatures, reduce heating and cooling costs nearly 30% for businesses and residents, increase property values by as much as 15%, provide habitat for wildlife and hide water treatment plants and other unsightly objects.<sup>50</sup>

Despite the numerous low-cost benefits that trees provide, most communities are too focused on the short-term goal of regulating pollution levels from water treatment plants to consider the long-term strategy of using trees to prevent such pollution. Unfortunately, leaving green infrastructure in tact to address stormwater runoff is not a top priority for developers either, who are more concerned with trying to maximize the number of housing units they can build in a parcel of land.

<sup>48</sup>Trust for Public Lands. <[www.tpl.org/tier3\\_cd.cfm?content\\_item\\_id=21899&folder\\_id=1885](http://www.tpl.org/tier3_cd.cfm?content_item_id=21899&folder_id=1885)>. March 4 2010.

<sup>49</sup>“Watershed Forestry Resource Guide - 2008.” <[www.forestsforwatersheds.org/reduce-stormwater/](http://www.forestsforwatersheds.org/reduce-stormwater/)>. March 9 2009.

<sup>50</sup>Stone.

## 4.2 Soil Quality

Soil quality refers to the capacity of a soil to function within ecosystem and land use boundaries, to sustain biological productivity, to maintain environmental quality, and to promote plant and animal health. To grow crops, support plants and animals, and process water and air, soil must be a dynamic resource, filled with essential living organisms. There are ways to protect soil health from the ailments of erosion, chemical overuse, weed infestations, and loss of organic matter. Like a person's skin, topsoil is a fragile layer that defends the integrity of a complex, living organism, and future generations depend upon its condition.<sup>51</sup>

As with crops, the quality and quantity of trees in a particular area are directly proportional to the quality and quantity of the soil in which they grow. Trees growing on sites with deep, fertile, well-drained soils grow taller and broader than trees growing on sites with shallow or compacted soils and eroded areas. There are over 18 million acres of land in Iowa with soils suitable for growing more than 200 board feet and over 28 million acres capable of growing more than 150 board feet of wood per acre per year. Trees also grow better in areas with little competition from grass, weeds and other vegetation, as such areas allow them to access light and moisture easily and early in their development. This is valuable from an economic standpoint because it allows a tree to put on diameter growth sooner and more quickly, which in turn shortens the time it takes for it to reach a merchantable size. Despite all of this, convincing landowners that they can improve their stocking levels through better management continues to be a challenge in the state.

Soil productivity has influenced the vegetation grown on almost every acre of Iowa's soils since 1850, and the issues of erosion, degraded water quality and wildlife habitat have faced every landowner since. It has been determined



**Corn stubble left on fields during the winter holds soil and moisture in place, helps prevent wind erosion, benefits wintering wildlife, and adds nutrient material to the soil in spring.** Photo by Photographic Services, University of Iowa.



**Aerial view of cropland interrupted by a stream, a drainage ditch, and a fence line. Iowa's land is working land - most of it is used, not idled, and it is focused on nurturing cultivated plants from extraordinarily productive soils.** Photo by Drake Hokanson.

<sup>51</sup>Stone.

**There are almost 29 million acres of soil suitable for growing trees in the state.**

that by 1936, 87% of Iowa’s land showed signs of erosion resulting from land cover conversion; it was also predicted that 35% of the original surface soil had already been washed or blown away.<sup>52</sup>

History and research has shown that maintaining permanent vegetation like trees and native prairie grasses on highly erodible soils benefits the fish that live downstream and the wildlife living in the area; it also leads to better water absorption, provides wood materials for lumber and firewood and protects against wind. Unlike agriculture, which requires high input costs and favorable weather conditions, relies on monoculture, alters habitat and soil and often fails to produce a profit, maintenance of healthy forest land can provide numerous resources for human consumption, habitat for wildlife, and maintenance and improvement of highly erodible soils.

There are almost 29 million acres of soil suitable for growing trees in the state. Figure 4.8 shows the number of acres in the state for each of 10 woodland suitability units (WSU), a measure that groups various soil types together based on their ability to grow a certain volume of wood during a year. Iowa’s productive soils could provide benefits to the forest products industry and to landowners wishing to grow trees because, as the figure shows, the most productive WSU category contains the greatest number of acres of land of any category for the state.

If all of the soils listed in Figure 4.8 had trees established and growing on them, they could yield over \$2 billion worth of timber annually (assuming a value of \$0.30 per board foot); even more impressive is that this number doesn’t take into account ecosystem services such as improved air and water quality, increased carbon sequestration, improved wildlife habitat and greater recreational opportunities. Unfortunately, people still fail to see the benefits, including monetary ones, provided by such services in addition to the better-understood monetary benefits of timber itself, which is one reason that trees continue to lose out to crops in Iowa.

**Figure 4.8 Number of Acres for Growing Trees in Iowa by Soil Suitability Rating.**

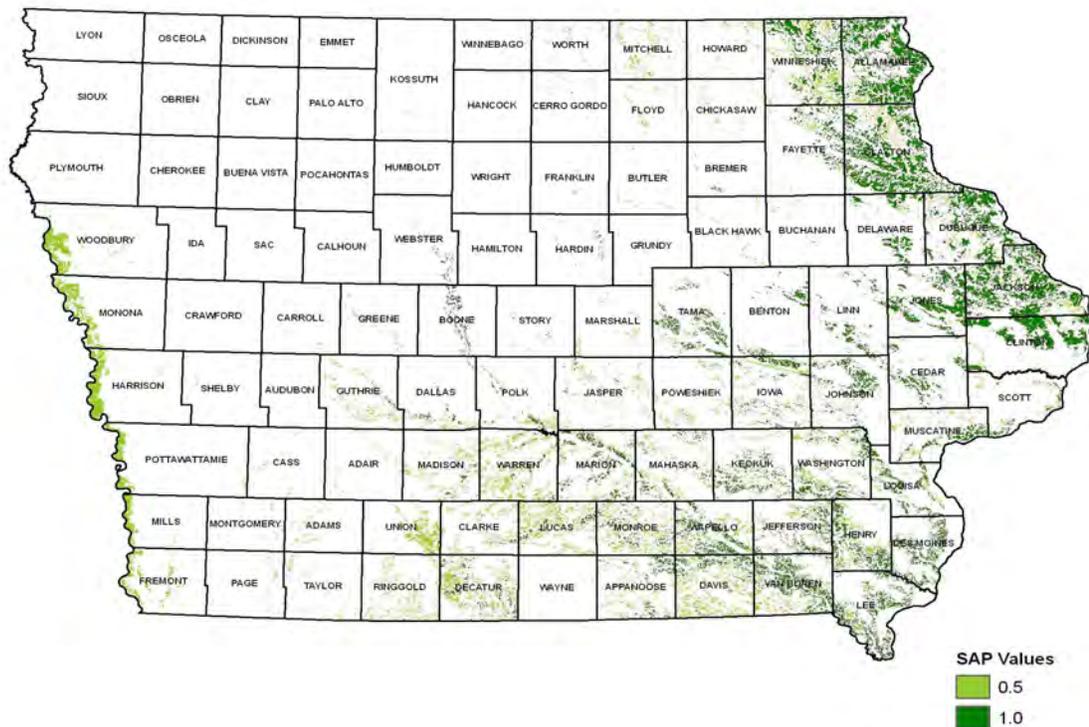
WSU	Acres	Annual Growth bdft/year	Value at \$0.3 per bdft	Production (bdft/ac/yr)
1	8,259,349	1,445,386,075	433,615,823	150-199
2	9,058,360			
3	15,820,675	4,350,685,625	1,305,205,688	250-300
4	2,515,764	566,046,900	169,814,070	200-249
5	1,200,503	210,088,025	63,026,408	150-199
6	437,545	98,447,625	29,534,288	200-249
7	565,704	70,713,000	21,213,900	100-149
8	1,882,026			
9	2,385			
10	684,167			
<b>Total</b>			<b>\$2,022,410,177</b>	

Source: Kathyne Clark using Iowa cooperative soil survey and Iowa DNR geological survey data.

<sup>52</sup>Walker, R.H., and Brown. P.E. “1936 Soil Erosion in Iowa.” *Journal of Geography* 36 (1937): pp. 118-120.

Knowing where soils that were developed under forest conditions are located is a good historical reference when deciding where to prioritize returning areas lost to other land uses back to forests. The forest soils map in Figure 4.9 uses the SSURGO soils data revised by the Natural Resources Conservation Service to show areas of the state where soils were developed by forests; based on this information, a total of 8,883,857 acres were developed in this way. Transitional soils, shown on the legend by the value 0.5, represent 4,888,604 acres while forested soils, shown by the value 1.0, represent 3,995,253 acres.

**Figure 4.9 Soils Developed by Forests in Iowa.**

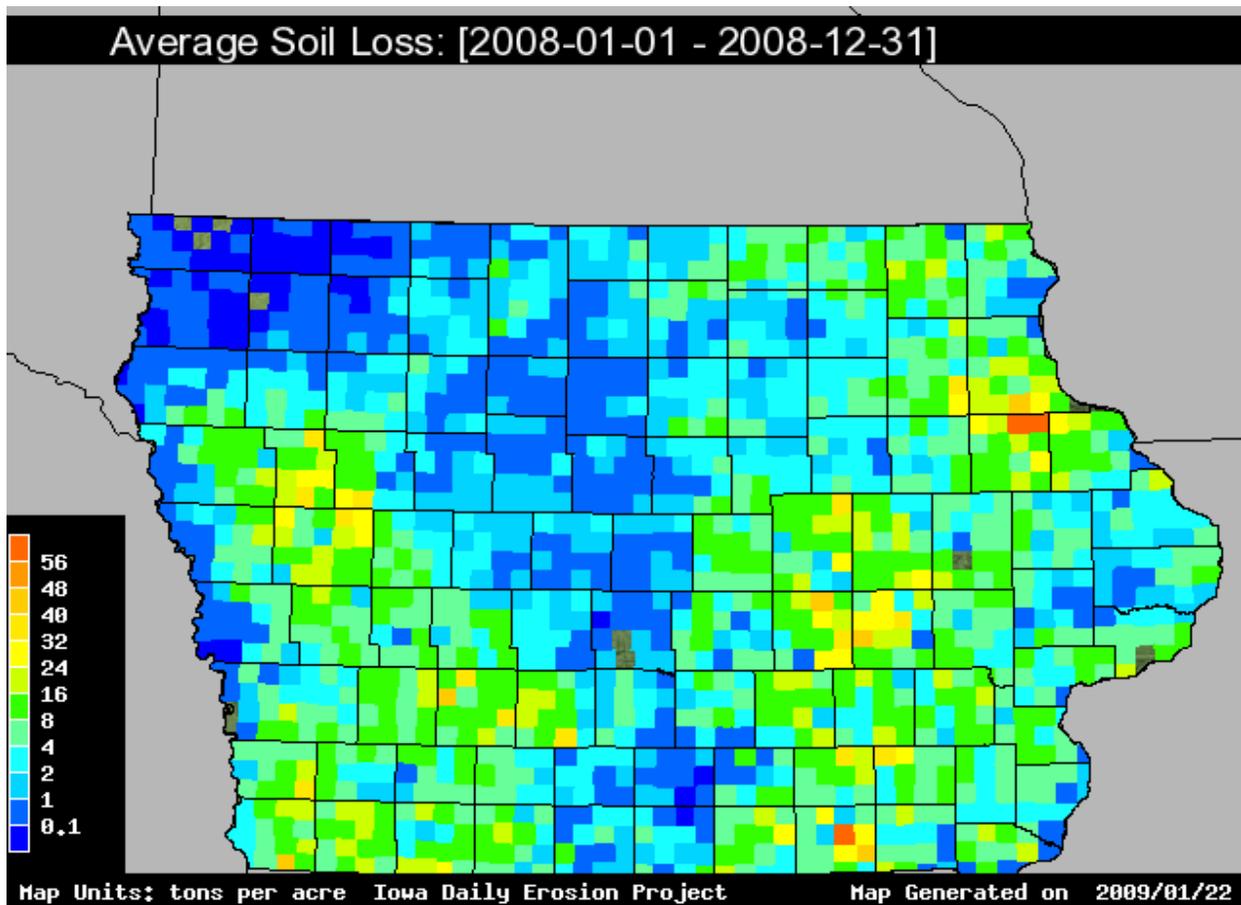


Source: Kathyne Clark using Iowa cooperative soil survey and Iowa DNR geological survey data.

## 4.3 Soil Erosion

Soil erosion occurs when the rate of soil loss is greater than the rate of soil formation for a particular site. Reductions in productivity from erosion reduce the value of that land as well as limit the vegetation that can grow on it. Figure 4.10 shows the estimated amount of soil loss for Iowa in 2008 in tons per acre. The map is generated from rainfall and climate information, characteristics about the land and information about land-use management practices. As the legend shows, the southwest and southeast quarters of the state had the most erosion in 2008. Looking at the state as a whole, there was an average of at least one ton of soil erosion per acre of land during this time period. Clearly this is not a sustainable loss that will allow Iowa to remain a leader in agricultural production.

Figure 4.10 Average Soil Loss in Iowa for 2008.



Source: Iowa State University, [wepp.mesonet.agron.iastate.edu/GIS/erosion.phtml?pvar=avg\\_loss\\_ace&dstr=03/04/2008](http://wepp.mesonet.agron.iastate.edu/GIS/erosion.phtml?pvar=avg_loss_ace&dstr=03/04/2008).

Soils represent the basic support system for terrestrial ecosystems because of their role in providing nutrients, water, oxygen, heat, and mechanical support to vegetation. Any environmental stressor that alters the natural function of the soil has the potential to influence the productivity, species composition, and hydrology of forest systems.

Soil in the state is so rich, productive and plentiful that it is often taken for granted that it will always be there for future generations. Unfortunately, the desire of farmers to derive as much income from agriculture as possible each year usually conflicts with practices that conserve the environment, and put the state's soil at risk to erosion and degradation. Growing permanent vegetation like trees on sensitive soils is one way to permanently conserve soils that are prone to erosion problems; it also makes agricultural production less attractive because it requires such a significant investment of time and money for land conversion. Furthermore, cost-share opportunities can provide landowners with monetary incentives to grow trees on their property, which makes the farming less attractive as well. On the other hand, if grasses are planted rather than trees, plowing becomes much easier and it is more likely that such land will simply revert back to farmland.

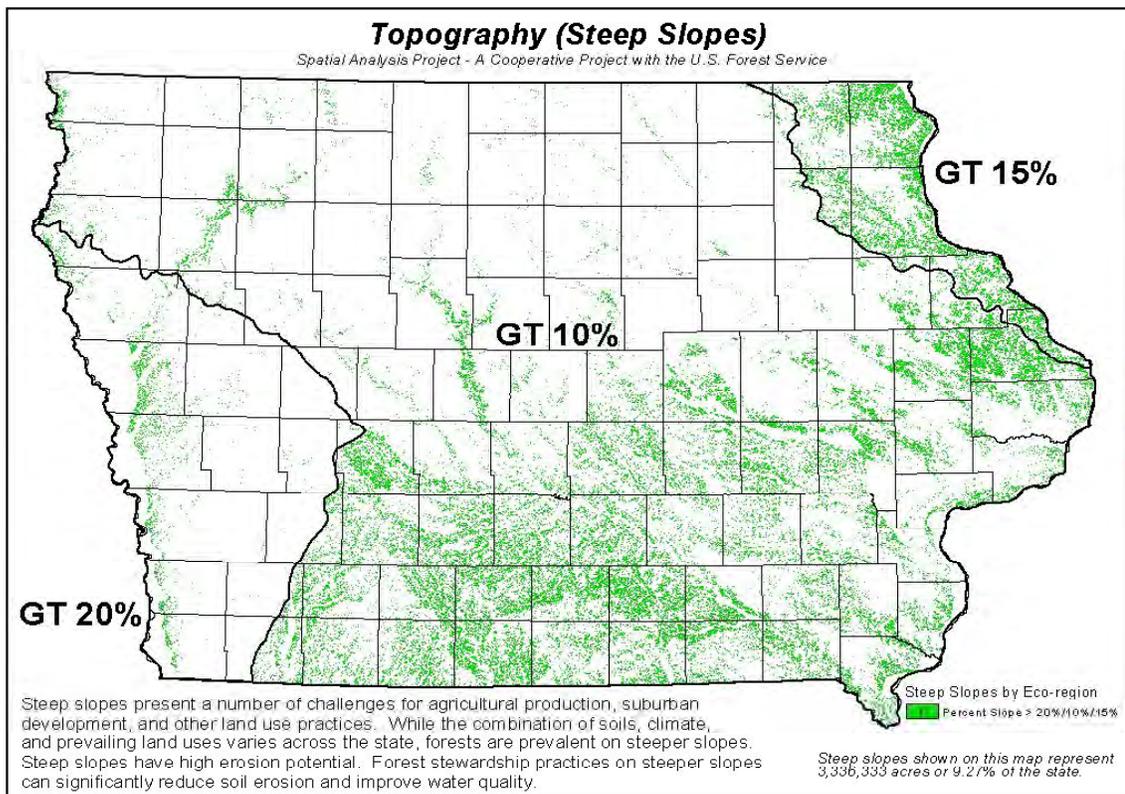
Forests on sensitive soils, or soils comprised of more than 10% sloping land, benefit from having all of the water on their upper slopes intercepted and diverted by buffers or terraces. Forests on highly erodible soils require buffers between them and adjacent agricultural fields in order to prevent gullying and scouring of their soils. With proper buffering, forests can hold onto these thin soils, which are sometimes located on very steep terrain, while providing valuable wildlife habitat and improving water quality.

Figure 4.11 shows the slopes estimated from the National Elevation Dataset (NOTE: GT stands for “Greater Than”). Slope is a major determinant of land use and susceptibility to erosion. Soils and general terrain relief of a region largely determine land uses and the amount of erosion that is thereby produced. The colored areas on the map show where there are slopes greater than the number associated with each of the three sub-regions displayed. According to these slope criteria, more than 3.3 million acres of land in Iowa are considered to have steep slopes.



Trees growing on productive soils experience healthy levels of growth. Photo by Bruce Blair.

Figure 4.11 Slope Land Percentage in Iowa.



Source: Kathryn Clark using USGS National Elevation dataset.

Air is critical for plant root respiration and nutrient absorption, and soils should ideally be comprised of roughly 50% air by volume. Encouraging loggers to harvest only when the ground is frozen and to follow other sound management practices is necessary to prevent forest soils from becoming compacted, which causes them to lose the air so crucial for healthy plant growth. Though soils do rebound from the negative effects of compaction, this usually takes quite a while.

Figure 4.12 shows that between 1850 and 2002, most forests growing on soils with very little slope

were lost in Iowa. Such soils tend to be highly agriculturally productive, while steeper slopes are more likely to remain forested because they are not suitable for growing crops. As this figure shows, Iowa has lost at least 9% of its forest for each slope category since 1850.

**Figure 4.12 Number of Acres of Forest Land on Different Slopes in Iowa, 1850 and 2002.**

Slope	Forest Acres in 2002	Percentage Found on Each Slope 2002	Forest Acres in 1850	Forest Acres Lost 1850-2002
A (0-2%)	877,829	30.7	1,961,756	-1,083,927
B (2-5%)	333,050	11.7	974,850	-641,800
C (5-9%)	274,927	9.6	1,082,614	-807,687
D (9-14%)	367,044	12.9	1,063,993	-696,949
E (14-18%)	298,744	10.5	556,837	-258,093
F (18-24%)	382,434	13.4	506,287	-123,853
G (24% +)	321,205	11.2	334,779	-13,574

Source: Kathyne Clark using Iowa Cooperative Soil Survey, Iowa DNR Geological survey data and General Land Office (GLO) maps as surveyed from 1836-59.

Figure 4.13 shows that more than 25% of forests growing on slopes of 18% or greater have been lost in Iowa since 1850. Not only does such forest loss lead to a reduction in wildlife habitat, but removal permanent vegetation on such steep slopes negatively impacts water quality, which leads to a reduction in suitable habitat for aquatic organisms. Furthermore, the more sedimentation, nitrogen and chemical runoff that enters into Iowa's rivers, the greater the cost to taxpayers who must bear the financial burden of the larger and more sophisticated water treatment plants required to make their drinking water safe.

**Figure 4.13 Percentage of Forest Land on Different Slopes in Iowa, 1850 & 2002.**

Slope	Forest Acres in 2002	Percentage Found on Each Slope 2002	Percentage of Forest lost 1850-2002
A (0-2%)	877,829	30.7	55.3
B (2-5%)	333,050	11.7	65.8
C (5-9%)	274,927	9.6	74.6
D (9-14%)	367,044	12.9	65.5
E (14-18%)	298,744	10.5	46.3
F (18-24%)	382,434	13.4	25.5
G (24+)	321,205	11.2	4.1

Source: Kathyne Clark using Iowa Cooperative Soil Survey, Iowa DNR Geological survey data and General Land Office (GLO) maps as surveyed from 1836-59.

According to Figure 4.14, slightly more than 667,000 acres of land with a slope greater than 14% and over 2.6 million acres with a slope greater than 9% were farmed in 2008. These are areas where permanent vegetation could have the most positive impact on wildlife habitat, soil erosion and water quality.

**Figure 4.14 Percentage of Agricultural Land in Production on Various Slopes.**

Slope	Agriculture Acres 2002	Percentage found on each slope 2002
<b>A (0-2%)</b>	10,112,056	45.0
<b>B (2-5%)</b>	6,286,462	28.0
<b>C (5-9%)</b>	3,354,199	14.9
<b>D (9-14%)</b>	2,056,826	9.2
<b>E (14-18%)</b>	526,436	2.3
<b>F (18-24%)</b>	118,814	0.5
<b>G (24+)</b>	22,543	1.0

Source: Kathyne Clark using Iowa Cooperative Soil Survey and Iowa DNR Geological survey.

Pasture land is another example of land that would benefit from establishment of permanent vegetation. Compaction by livestock leads to trails, which can turn to depressions and then become gullies if land usage and soil are conducive to such an outcome. Over the years these gullies will cut deeper and deeper, degrading the quality of the pasture and the water due to soil loss. Tree root systems are deeper and therefore hold soil in place better than the cool season grasses and alfalfa typically found in pastures. As Figure 4.15 indicates, there are over one million acres of pasture land on slopes greater than 9% in Iowa.

**Figure 4.15 Percentage of Pasture Land in Production on Various Slopes.**

Slope	Pasture Acres 2002	Percentage found on each slope 2002
<b>A (0-2%)</b>	465,776	18.4
<b>B (2-5%)</b>	444,643	17.6
<b>C (5-9%)</b>	529,407	20.9
<b>D (9-14%)</b>	571,112	22.6
<b>E (14-18%)</b>	306,402	12.1
<b>F (18-24%)</b>	158,875	6.3
<b>G (24+)</b>	54,856	2.1

Source: Kathyne Clark using Iowa Cooperative Soil Survey and Iowa DNR Geological survey.

Planting permanent vegetation on slopes greater than 9% across the state is a great way to stabilize sensitive soils and allow for the development of a soil structure that is better able to absorb rainfall and reduce sediment and nutrient runoff; this would in turn improve water quality, which is not only important for wildlife and aquatic habitat but important for human consumption as well.

A piece of land is only as valuable as the soil that it contains. Landowners who work to conserve and enhance the quality of their soil will be able to derive more long-term income from their land than those who sacrifice long-term soil quality for short-term financial gain. The harsh reality is that Iowa will probably never again have as much permanent native vegetation as it had 160 years ago; however, prioritizing land use based on soil quality, slope and position in respect to rivers and other bodies of water is one way to ensure the regeneration of sensitive soils for the future. Financially speaking, soil conservation would help landowners maintain their land values, reduce water treatment costs and reduce damage to personal property from flooding. If you add these benefits to the aforementioned environmental ones, it becomes evident that soil conservation is a win-win situation for both people and the earth.

## 4.4 Highlights of Issues Affecting Conservation and Maintenance of Soil and Water Resources

It is necessary to develop programs that provide landowners with monetary incentives for good conservation practices.

Forest cover is generally not recognized as a viable option for improving water quality.

High levels of pollution such as coliform bacteria, pesticides and excess nitrates have taken time to build up in Iowa's water, and improving the state's water resources for this and future generations is a long-term, on-going process.

If all streams in Iowa of an order greater than 1 contained a 25 meter buffer, there would be over 1.5 million acres of riparian buffers, or more than three times as many acres as currently exist.

Because Iowa has lost more than 56% of its forest cover since 1850, Iowans are forced to pay an average of 125 -150% more for their clean water than they would have to pay if these forests still existed.

Green infrastructure is not well incorporated into community storm water management plans.

In 2008, Iowa lost at least one ton of soil per acre statewide to wind and rain erosion.

Due to long payback periods and lack of incentives for tree growth, most landowners choose to devote their land to growing crops instead of healthy forests.

Encouraging loggers to harvest only when the ground is frozen and to follow other sound management practices is necessary to prevent soil compaction.

From 1850 to 2002, Iowa lost more than one million acres of forest to agriculture on land with slopes greater than 9%.

Since 1850 Iowa has lost more than 25% of its forest on slopes 18% or greater.

Over one million acres of land is currently being used for pasture on slopes greater than 9%.

# 5.0 Maintenance of Forest Contribution to Carbon Cycles

Carbon dioxide, methane and nitrous oxide, the so-called “greenhouse” gases, have changed the composition of the earth’s atmosphere and are strongly implicated as potential sources of climate change. The concentration of carbon dioxide has been increasing since the 18th century, and greenhouse gases warm the earth by allowing sunlight to reach the earth’s surface while simultaneously blocking heat from escaping; some of the gases also thin the ozone layer that shields the earth from harmful solar radiation.

Growing forests store carbon naturally in both the wood and soil in a process called carbon sequestration. Trees are about 50 percent carbon, and wood products from harvested trees continue to store carbon throughout their lives as well. In general, forest activities such as tree planting increase carbon sequestration, while activities such as prescribed burning release carbon into the atmosphere. Increasing carbon stored in urban and rural trees and forests is usually an inexpensive way to mitigate increasing atmospheric greenhouse gases (GHG). In addition to sequestration, planting and maintaining trees in communities, especially around buildings, to provide shade or block prevailing winds can moderate temperatures and substantially reduce energy demands and related greenhouse gas emissions.

In 2007, Iowa conducted an inventory of the greenhouse gases that were being emitted within the state using different criteria than had been used in previous surveys. Details from this survey, called the 2008 Greenhouse Gas Emissions from Selected Iowa Source Categories, can be found at: [www.iowadnr.gov/air/prof/ghg/files/2008\\_Greenhouse\\_Gas\\_Inventory.pdf](http://www.iowadnr.gov/air/prof/ghg/files/2008_Greenhouse_Gas_Inventory.pdf) The EPA’s Greenhouse Gas Equivalencies Calculator estimates that the total greenhouse gas emissions from major sources’ fossil fuel combustion in 2007 for Iowa was 55.48 MMtCO<sub>2</sub>e, or the equivalent of carbon sequestered by 1,422,564,103 tree seedlings grown for 10 years.<sup>53</sup>

## Forecasting

The DNR’s 2008 inventory does not include any direct forecasting. However, the Center for Climate Strategies (CCS) forecasted Iowa’s anthropogenic greenhouse gas emissions and carbon sinks to 2025 in their comprehensive Iowa Greenhouse Gas Inventory and Reference Case Projections 1990- 2005, which was prepared for the Iowa Climate Change Advisory Council (ICCAC). The DNR chose to use CCS’s forecast because it was the most comprehensive, accurate forecast that was readily available. The CCS report shows that Iowa’s gross GHG emissions increased by 20% from 1990 to 2005 to 119.5 MMtCO<sub>2</sub>e. Assuming that nothing changes in the way of policy and human attitude, CCS projects that by 2025 Iowa’s gross GHG emissions will grow to more than 50% of 1990 levels.<sup>54</sup>

<sup>53</sup><[www.epa.gov/cleanenergy/energy-resources/calculator.html](http://www.epa.gov/cleanenergy/energy-resources/calculator.html)>. February 27 2009.

<sup>54</sup><[www.iaclimatechange.us/ewebeditpro/items/O90F20675.pdf](http://www.iaclimatechange.us/ewebeditpro/items/O90F20675.pdf)> . April 15 2009.

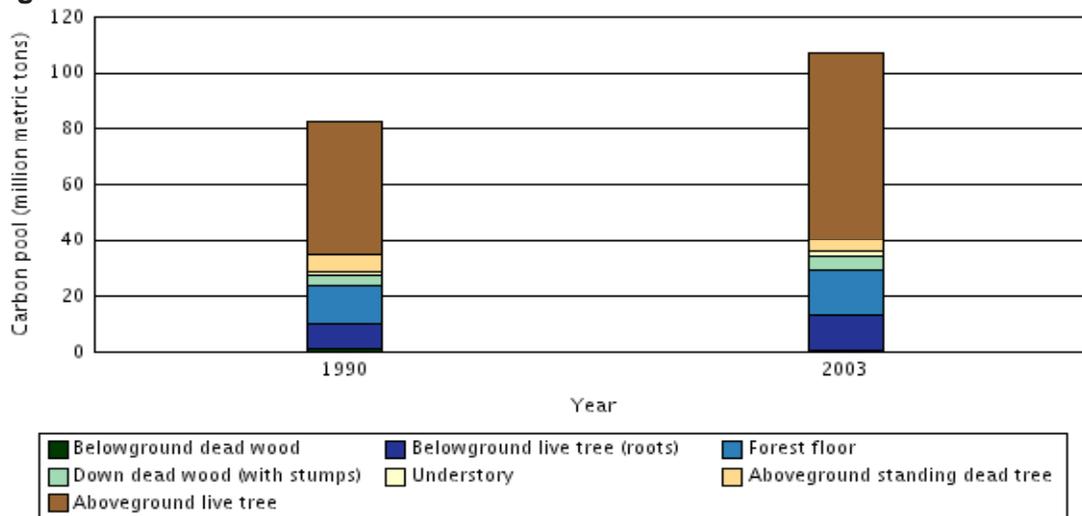
# 5.1 Forest Ecosystem Biomass and Forest Carbon Pools

According to 2007 USDA-FS-FIA data, Iowa had more than 114 million metric dry weight tons of carbon stored within 3 million acres of forest. Figure 5.1 compares stored carbon quantities for 1990 and 2003; it also gives a breakdown of the amounts of carbon stored in each part of a forest. The figure shows that the overall amount of carbon stored in forests in Iowa increased by more than 39% over this time period.

Total forest ecosystem biomass includes all tree parts, dead trees and saplings growing in an area. As Iowa’s trees continue to grow larger in size, the above ground storage of carbon increases the most of any type of storage; other storage areas generally increase as a result of expanding forest area rather than increased tree size. Forest carbon storage is influenced by the rates of forest growth, harvest activity, loss of forest land due to conversion to other land uses and loss of forest cover due to fire or other natural disturbances. The amount of carbon Iowa forests store is greatly dependent on private forest landowners, since they own over 90% of the state’s forest resources. Forest landowners would likely take more interest in managing their forests if they were rewarded for the positive benefits, such as clean oxygen and carbon storage, that their forests provided.

The average person produces 9.41205 metric tons of carbon dioxide each year according to EPA estimates. With a population of nearly 3 million people, this means that Iowa is responsible for producing more than 28 million metric tons of carbon dioxide each year, a number that doesn’t even take into account the output of carbon dioxide from businesses. Only 32 million additional metric tons of carbon dioxide were stored in Iowa’s forests between 1990 and 2007, meaning that only a little more than a year’s worth of carbon dioxide emissions were offset through carbon sequestration over a seventeen year period. Clearly Iowa has a long way to go to becoming a net carbon sink, an area where more carbon is stored than is produced; in order for this to be achieved, there will need to be a dramatic decrease in carbon dioxide emissions, a significant increase in stocking levels on Iowa forests or some combination of these two things.<sup>55</sup>

**Figure 5.1 Forest Carbon Pools in Iowa.**



Source: U.S. Department of Agriculture, Forest Service - Forest Sustainability Indicators Information System. [Database].

<sup>55</sup><[www.epa.gov/cleanenergy/energy-resources/calculator.html](http://www.epa.gov/cleanenergy/energy-resources/calculator.html)>. February 27 2009.

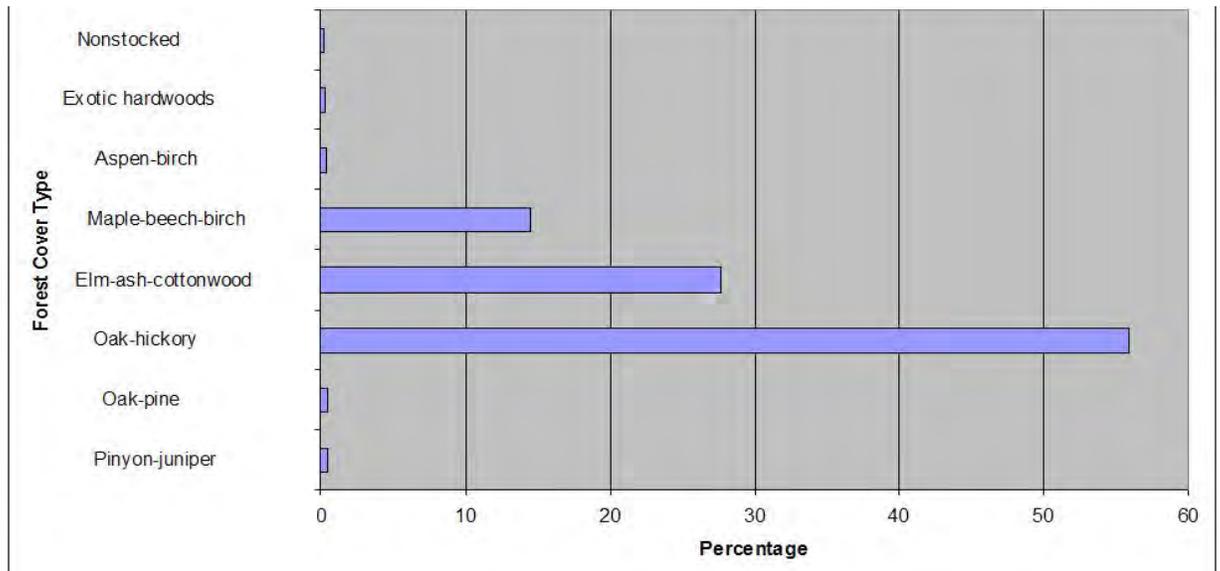
Factors that influence carbon storage in Iowa forests include land-use changes, timber harvesting, natural disturbances, increasing atmospheric carbon dioxide, climate change, nitrogen deposition and ozone in the lower atmosphere.<sup>56</sup> Sound forest management activities can improve the carbon sink within existing forest land by allowing for increased stocking levels in existing forests. Many forests continue sequestering significant amounts of carbon for 125 years or more after being established; as they mature, sequestration levels off to a state where carbon uptake is nearly equal to release.<sup>57</sup>

Carbon from forests can remain stored in forest products long after forests are harvested and the wood is processed. For instance, carbon stored in trees harvested to build houses in the early 1900's is still stored in these houses. Harvested carbon can be tracked in four general categories: wood products, landfills, wood burned for energy (which substitutes for fossil fuel), and carbon emitted from wood not used as an energy source.

## 5.2 Forest Carbon by Forest Type

Figure 5.2 reflects the fact that most carbon in Iowa is stored in the oak-hickory forest type. Some of the oaks in this forest type are the oldest and longest-living trees in the state, which means their value as carbon sinks is relatively high. It is also important to note that the long life cycle of trees minimizes their ability to adapt to quickly changing conditions in the local climates in which they grow.

**Figure 5.2 Carbon Stored in Iowa by Forest Cover Type, 2003.**



Source: U.S. Department of Agriculture, Forest Service - Forest Sustainability Indicators Information System. [Database].

<sup>56</sup>Birdsey, Richard A. et al. "North American Forests." The First State of the Carbon Cycle Report (SOCCR). November 2007. p. 117. <[www.climate-science.gov/Library/sap/sap2-2/final-report/sap2-2-final-all.pdf](http://www.climate-science.gov/Library/sap/sap2-2/final-report/sap2-2-final-all.pdf)>.

<sup>57</sup>Birdsey, Richard A et al. p. 119.

## 5.3 Iowa Forest Contributions to Carbon Sequestration

Maintaining the number of acres of existing forest in Iowa is a simple way of keeping the state's stored carbon from being released. Increasing the productivity within existing forest lands can actually increase Iowa's capacity to store carbon without adding more forested land; for oak trees, this benefit is even greater because oaks longer life cycles than other trees in Iowa.

Substituting bio-fuels, particularly cellulosic ethanol from wood fibers, for fossil fuels would help local economies by creating markets for under utilized wood products, and would allow for better, more productive management of the state's existing forests. If it were logistically feasible to remove all trees except crop trees from forested lands, material for cellulosic ethanol could be supplied from smaller trees while wood production could still be maximized on the best crop trees.

## 5.4 Urban Community Role in Carbon Sequestration

It is important to plant trees within urban corridors in order to ensure that there are adequate replacements for older trees; this is especially important in communities with growing populations or those expanding into existing forests. Benefits from urban trees are well documented and include pollution control, noise barriers, crime reduction through aesthetic enhancement, shade from hot summer days and wind protection during the winter.

One way to determine the value of carbon storage and sequestration is to run an analysis through I-Tree, a state-of-the-art, peer-reviewed software suite from the USDA Forest Service that quantifies the environmental values tree provide to people. Figure 5.3 gives a ranking by species of the trees best adapted to carbon storage. Attributes selected for comparison for I-Tree analysis include the following: land use= single family residential; site location= front yard; DBH= 18-24"; maintenance record= mature trees with routine maintenance; priority task= no maintenance needed; sidewalk damage= none; wire conflict= none; wood condition= no apparent problems; and leaf conditions= no apparent problems. Figure 5.3 indicates that the species best suited for carbon storage in urban areas are generally shade intolerant, which has implications for forest setting situations as well.

**Figure 5.3 Best Tree Species for Carbon Storage in Urban Areas, 18-24" Size Category.**

Species	Carbon Stored (lbs)
Black walnut	16,915
Honey locust	13,485
White ash	8,458
Bur oak	8,458
White oak	8,458
Eastern cottonwood	8,458
American sycamore	8,458
Kentucky coffeetree	8,458
Green ash	8,458
Hickory	8,458

Source: USDA Forest Service, I-Tree Version 1.0.

## 5.5 The Role of Nurseries

As providers of growing stock for community tree plantings, nurseries play a large role in the long-term biodiversity of communities. Most Iowa nurseries bring in nursery stock from out-of-state and then finish growing the trees for a year at most. Many of these trees are cultivars, which are propagated from a single genotype for aesthetics and fast growth. By reducing the genetic variation of a species, the ability for that cultivar to adapt to fluctuations in the weather is limited; this is especially troubling when the same cultivar is planted in each lot of an entire subdivision. This lack of genetic and species diversity places such an area at a greater risk to destructive insects, diseases or devastating climatic changes resulting from global warming. Reducing genetic diversity decreases the chance for a cultivar to adapt to change.

Converting non-forested land to forest land is one way of increasing Iowa's carbon storage capacity. Iowans have planted over 150 million trees since 1940, which has helped to compensate for some of the 3,627,874 acres of forest land cleared for agriculture. Converting land on sensitive soils and steeper terrain to forest can help Iowa increase its net carbon sequestration, protect soils, improve water quality, create wildlife habitat and add more aesthetics to the countryside. While increasing forest acres takes away from land being used for pasture or crop production, the reduction could help reduce overproduction of food crops and would provide the multiple benefits mentioned above.

## 5.6 Highlights of Forest Contribution to Global Carbon Cycles

Iowa is a net producer of carbon.

Increasing stocking levels within existing forests would increase Iowa's capacity to store carbon without adding more forested land.

Increased tree planting within urban and rural areas would increase carbon sequestration potential.

Reducing genetic diversity within landscape nursery stock decreases the chance for a cultivar to adapt to a change.

Converting the less productive agricultural land located on sensitive soils to forests can help increase net carbon sequestration.

# 6.0 Maintenance and Enhancement of Long-term Socioeconomic Benefits of Forests

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Many people depend on forests for their livelihood or for their physical and mental well-being, and forests in urban and rural areas contribute significantly to the economic base of many communities; additionally, urban and community trees and forests provide cooling, storm water reduction and other benefits. Tracking these values, as well as monitoring shifts in demand for products and services, provides useful insights for the future; changes can indicate potential drains on the forest resource or highlight management opportunities.

Iowa's forests produce a multitude of goods and services—everything from timber and mushrooms to recreation and water. Sustainable forestry requires diverse, strong markets for a wide variety of products. Market forces are often the dominant influence on resource-based goods and services, but nonmarket forces—such as the desire to sustain biological diversity or the opportunity to dwell in or visit a natural place—are also important factors influencing investments in goods and services. Most forests can provide multiple goods and services simultaneously; however, there will always be situations where multiple activities and desired uses are incompatible.

Forest products in the state include wood products such as sawlogs, veneer, pulpwood and fuelwood and non-wood products such as pine cones, berries, mushrooms and ginseng. Iowa has the enviable distinction of possessing the soil and climate necessary for growing some of the finest hardwoods in the world; black walnut, for example, attracts buyers from around the globe.

## 6.1 Wood Product Production, Consumption and Trade

Wood products make a significant contribution to the Iowa economy. Iowa forests provide veneer and quality lumber to sawmills, which provide secondary processors that create value-added finished products for many different industries located throughout the state. Furniture, crafts, cabinets, novelties, carvings, pallets and cooperage are some examples of useful wood products in addition to firewood.

Forest crops are a long-term investment, as many species are 80 to 120 years old before they reach a merchantable size. Most trees will have some lumber volume and value as they reach 16 inches in diameter but will attain even greater volume and value as they get even larger. The value of a tree is affected by its species, its quality, the ease with which it can be logged, and the size and restrictions of the timber sale at which it is sold.

Forests also provide environments for medicinal plants and other non-wood products. Maintenance of biological diversity or scenery are goals for many forest landowners that keep some forest products from going to market. But those forests are still providing important functions and potential income for non-traditional wood products.

Industrial roundwood products include saw logs, pulpwood, veneer logs, poles, commercial posts, pilings, cooperage logs, particleboard bolts, shaving bolts, lath bolts, charcoal bolts, and chips. All roundwood in Iowa comes from hardwood species, as there are no markets for the relatively few types of softwood that grow in the state. According to a survey conducted in 2005, Iowa had 29 sawmills that produced 16 million cubic feet of industrial roundwood; comparatively, there were 59 sawmills that produced 17.6 million cubic feet of roundwood in 2000. This represents a 9% decrease in production and 50% decrease in the number of producers over a mere five-year period.<sup>58</sup> In the 1940s there were over 1,000 sawmills throughout Iowa that provided jobs for 3,000 to 4,000 people.<sup>59</sup>

Figure 6.1 shows roughly how much Iowa forest landowners earned from timber for several different years. In 2005 Iowa forest landowners were collectively paid approximately \$20 million by sawmills for logs harvested from their land. The little data that exists shows that the average earnings per board foot increased from \$0.08 in 2000 to \$0.09 in 2006.

**Figure 6.1 Value Paid to Iowa Forest Landowners for their Timber.**

Year	Value Paid to Forest Landowners	Average value paid to Forest landowners for Timber (\$/bdft)
2007	\$21.8 million	
2006	\$19.5 million	0.09
2004	\$20.7 million	
2003	\$15.0 million	
2000	\$17.3 million	0.08
1999	\$12.5 million	

Source: Aron Flickinger.

Technological improvement, aging work forces and exhausted equipment have led to the consolidation of the sawmill industry in Iowa. Though it is difficult to track data for portable sawmills, a May 2007 directory indicates that there at least 47 such sawmills in the state.<sup>60</sup> As the wood industry continues to shrink, the value of timber in Iowa woodlands will decrease because it will be more difficult to transport products to markets. The cost of hauling equipment to cut and remove logs from a forest will become an inhibiting factor as well if the industry continues to dwindle, as forest landowners will no longer be able to justify the costs associated with forest stand improvement.



**Portable sawmill.** Photo by Bruce Blair.

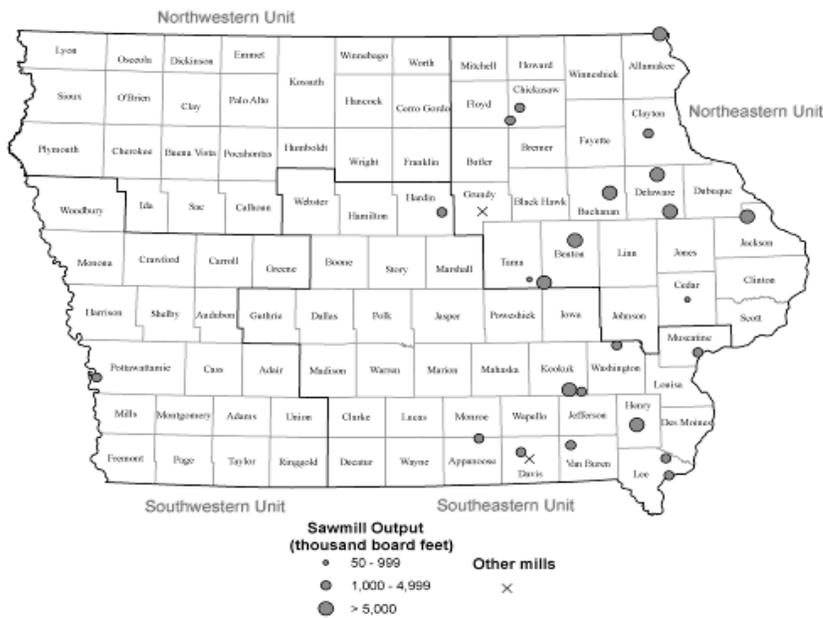
<sup>58</sup>Haugen and Michel.

<sup>59</sup>A Recommended Forestry Program for Iowa. Society of American Foresters, Iowa Chapter. Isaac Walton League of America, Inc. December 1950.

<sup>60</sup>Forestry Extension Notes – Directory of Sawmills in Iowa (Iowa State University Forestry Extension). <[www.extension.iastate.edu/forestry/publications/F-301.pdf](http://www.extension.iastate.edu/forestry/publications/F-301.pdf)>. March 5 2010.

Figure 6.2 shows the locations of primary sawmills in the state along with boundaries to indicate which counties are included in each of the four Forest Service-defined regions or units. The “other” category in Grundy County marks a veneer mill and no data was available for the mill in Davis County.

**Figure 6.2 Sawmill Locations in Iowa, 2005.**

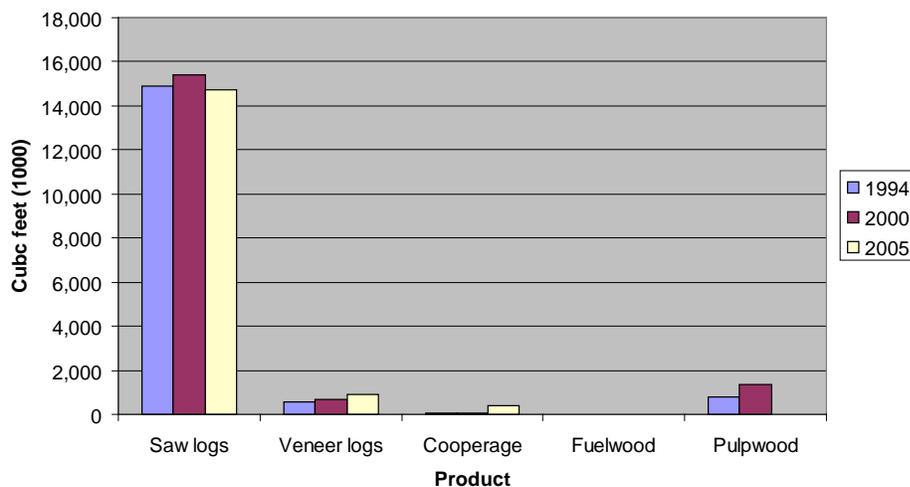


**Source: Leatherberry et. al. p.75.**

Figure 6.3 shows that output for wood product and furniture producers increased between 1994 and 2005. The value that these businesses generated also increased during this time period, as is indicated by Figure 6.4. In 2002 alone, the economic value for wood-related products in Iowa was over \$3 billion.<sup>61</sup>

**In 2002 alone, the economic value for wood-related products in Iowa was over \$3 billion.**

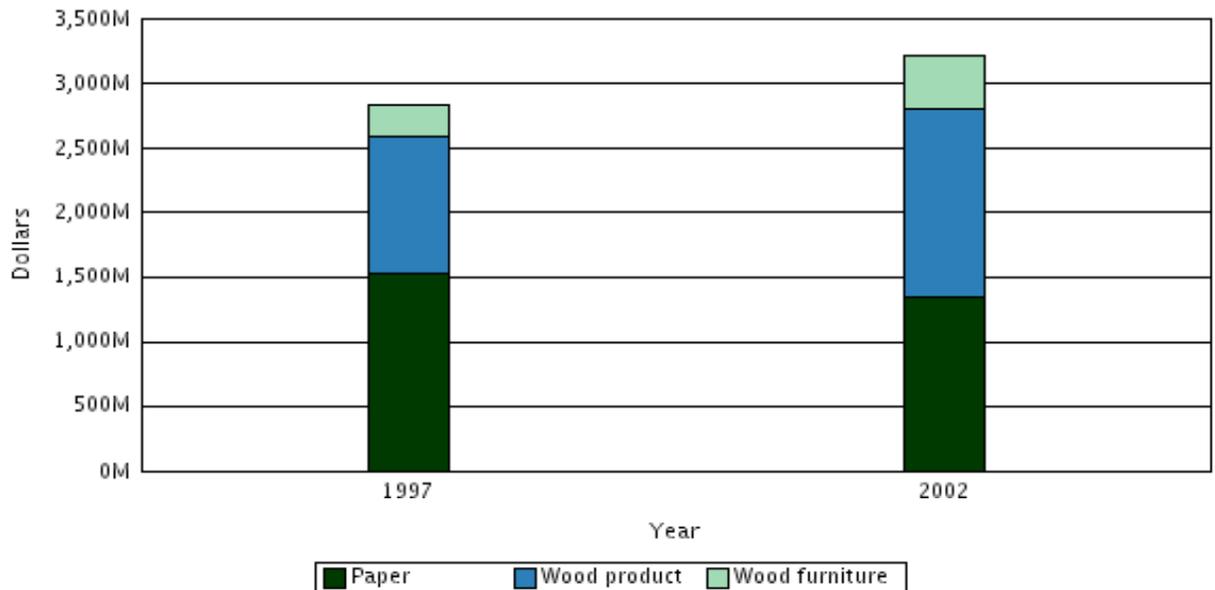
**Figure 6.3 Roundwood Production by Product for all Species Processed by Iowa Sawmills, 1994, 2000 and 2005.**



**Source: Haugen and Michel.**

<sup>61</sup>“Annual Survey of Manufactures: Geographic Area Statistics: Statistics for All Manufacturing by State: 2006 and 2005 .” U.S. Census Bureau – American Fact Finder. <factfinder.census.gov/servlet/IBQTable?\_bm=y&-geo\_id=04000US19&-filter=&-ds\_name=AM0631AS101&-dataitem=GEO\_ID\$NAICS2003|NAICS2003\$|RCPTOT|PAYANN|EMPSMAO|YEAR&-NAICS2007=>.

Figure 6.4 Iowa Wood Industry Value based on US Economic Census, 1997 and 2002.



Source: U.S. Department of Agriculture, Forest Service - Forest Sustainability Indicators Information System. [Database].

## 6.2 Production and Consumption of Timber

In 2002, there were 186 wood product businesses in Iowa that generated \$1.5 billion, an increase of \$400 million or 36% from 1997 levels.<sup>62</sup> These businesses employed 10,964 employees and had a total payroll of \$386 million. In 1997, the annual payroll for these businesses was \$225 million for 8,298 employees. This represents a 32% increase in workforce and 72% increase in payroll over this time period, and shows that despite the decrease in the number of employers, workforce and salaries are on the rise.

**In 2002, there were 186 wood product businesses in Iowa that generated \$1.5 billion, an increase of \$400 million or 36% from 1997 levels. These businesses employed 10,964 employees and had a total payroll of \$386 million.**

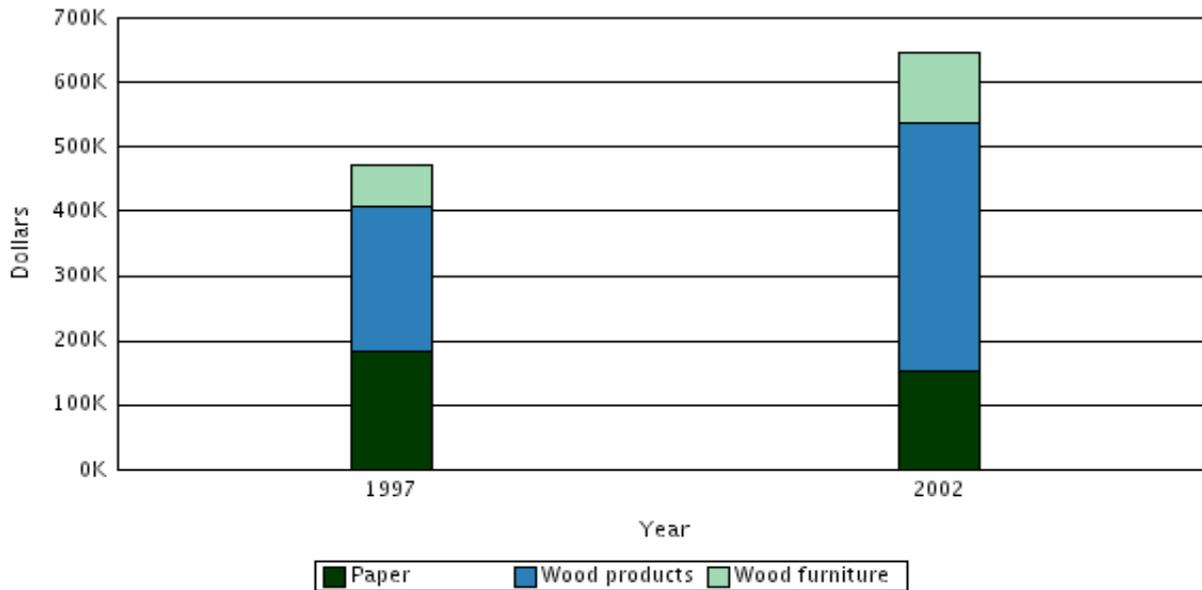
In 2002, sawmills produced \$54.2 million worth of goods and paid out \$10.9 million to 379 employees (Unfortunately, there is no data available from either 1997 or 2007 to use for comparison). In 1997 paper manufacturing companies employed 5,480 people who were paid a total of \$183 million; by 2002, both employment and payroll had dropped, to 4,186 and \$152 million, respectively. These companies produced \$1.5 billion worth of goods in 1997 and \$1.3 billion in 2002.

The wood furniture industry saw a 51% increase in sales from 1997 to 2002, from \$224 million to \$338 million; employment also rose by 28%, from 2,473 to 3,158, and payroll increased by 52%, from \$57.8 million to \$88.1 million.<sup>63</sup> Figures 6.5 and 6.6 show payroll and wage trends for the industry over this time period.

<sup>62</sup>“Annual Survey of Manufactures: Geographic Area Statistics: Statistics for All Manufacturing by State: 2006 and 2005 .”

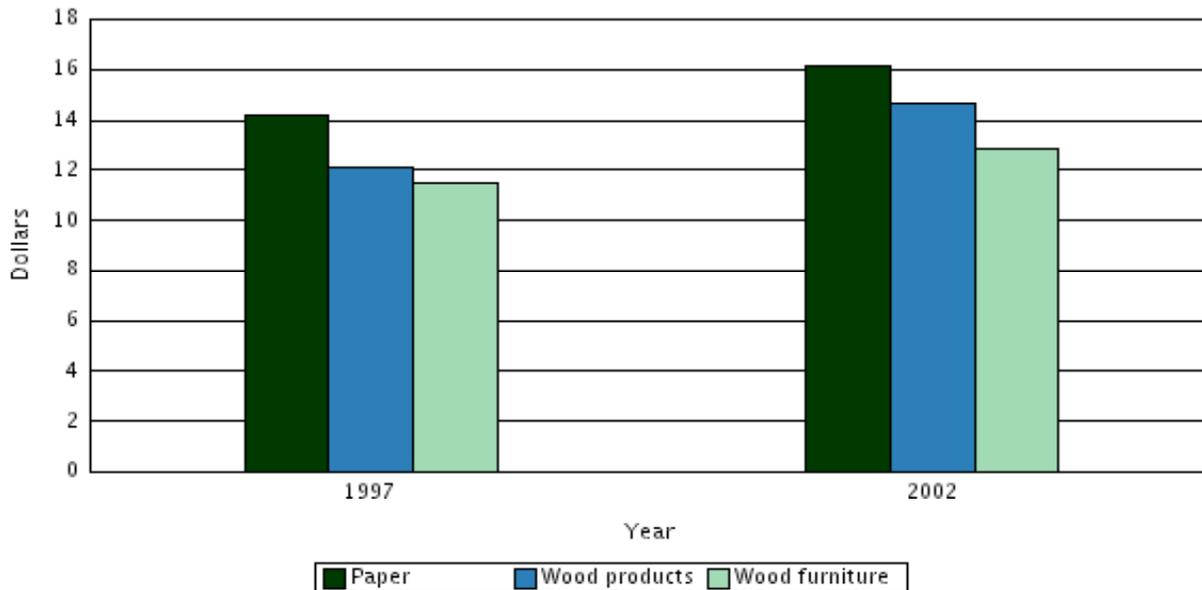
<sup>63</sup>“Annual Survey of Manufactures: Geographic Area Statistics: Statistics for All Manufacturing by State: 2006 and 2005 .”

**Figure 6.5 Iowa Wood-related Products Manufacturing Annual Payroll, 1997 and 2002.**



Source: U.S. Department of Agriculture, Forest Service - Forest Sustainability Indicators Information System. [Database].

**Figure 6.6 Iowa Wood-related Products Manufacturing Average Hourly Wages, 1997 and 2002.**



Source: U.S. Department of Agriculture, Forest Service - Forest Sustainability Indicators Information System. [Database].

Wood related products are an important piece of the overall manufacturing sector in Iowa. The annual payroll was 8 percent of the overall payroll for all of the manufacturing sectors in 2002. The wood related manufacturing payroll increased by more than 25% between 1997 and 2002, with the majority of the increase coming from wood products companies.

Economic opportunities are important for the sustenance of rural areas, for the retention of forests, for sustainable forest management and for employment within the wood products industry. From 1991 to 2003, \$6.2 million in federal funding yielding over 500 new and retained jobs, \$10 million in annual products and services, \$10 million in annual additions to businesses and \$27 million in

annual economic activity in rural areas. Unfortunately, these funds are no longer available.

Though relatively small, Iowa's wood industry makes a major contribution to both the economy and, through the production of beautiful products from diverse woodland species, aesthetics of the state. Without the economic incentives provided by a viable wood products industry, forest landowners have little reason to properly manage their forests. Unfortunately, USDA-FS-FIA data indicates that low to medium stocking levels are prevalent across the state, and such do not lead to the production of high-quality hardwoods.

## 6.3 Non-timber Forest Products

From 2002 to 2007, the number of farms growing Christmas trees decreased from 271 farms harvesting 57,254 trees on 2,578 acres, compared to 196 farms harvesting 39,575 trees on 1,552 acres in 2007. Christmas tree farms in the 10-19 acre size category dropped the most, from 83 farms in 2002 to 42 farms in 2007. Figure 6.7 below gives a breakdown by farm size of the number of Christmas trees produced for the two years mentioned.

**Figure 6.7 Iowa Christmas Tree Farm Comparison, 2002 and 2007.**

Farm Size (acres)	Number of Farms in 2002	Number of Farms in 2007	Number of Trees Harvested in 2002	Number of Trees Harvested in 2007
1-2	79	50	4,027	-
3-4	42	50	3,218	4,498
5-9	83	42	12,715	9,570
10-19	30	30	11,406	6,971
20-49	28	23	17,438	13,583
50-99	7	1	-	-
100+	2	0	-	-

Source: Mike Bevins, Iowa Department of Agriculture.

Fruit and nut trees also provide locally grown products that can benefit Iowans and wildlife. In 2004, Iowa apple orchards were 28th in the nation in production with a total output of 262,000 bushels.

Non-traditional forest goods and products include ginseng, morel mushrooms, wildflowers, berries and wild fruits, aromatic compounds, cones and seeds, forest botanicals, honey, nuts, syrup, weaving materials and dyes. Production figures for these products are not kept, which makes it difficult to determine how they contribute to the state's economy. Such products are important for both consumers and producers, and like many of the services trees provide, these products add to the quality of many people's lives.

The one item that is reported in Iowa is ginseng. In 2008, there was 775 dry weight pounds of ginseng harvested from Iowa forests, and harvesters earned more than \$749,000.

Thirty-six counties reported ginseng harvests, with Clayton, Allamakee and Muscatine counties all reporting over 100 pounds harvested that year (a table listing all of the counties that had ginseng harvested in 2008 can be found in Appendix H).

**Ginseng earned harvesters more than \$749,000 in 2008.**

## 6.4 Outdoor Recreational Participation and Facilities

Dr. Thomas H. Macbride, President of the University of Iowa from 1914 to 1916 and considered by many to be the father of conservation in Iowa, spoke out in the June 1931 Palimpsest about the need to start conserving pieces of Iowa land for public recreational, educational, and scientific uses. He believed that “this establishment of parks, would promote public health and happiness, serve as community object lessons in forestry, and preserve to those who come after us something of the primitive beauty of this part of the world.” When the first of Iowa’s 84 state parks was finally dedicated in 1920, the local citizens, politicians, bands, and conservationists came out en-force to celebrate, as Dr. Macbride put it, a new “place of quiet beauty” preserved for all future Iowans. These were places where families explored, picnicked, and relaxed. They were local tourist areas and by the early 1930s they were a popular state institution. In the early 30’s there were 36 dedicated state parks that had about 180,000 people visiting; only half that many people visited all of the national parks at that same time.



**Trail at Yellow River State Forest.** Photo by Bruce Blair.



Photo by Mark Vitosh.

Iowa’s park system has been evolving for the last 80 years. So too have the social and economic factors affecting people’s leisure time. Over those years the public has continued to express its desire and increasing demand for outdoor recreation services and facilities that are provided by both the private and public sectors.

Outdoor recreation has numerous benefits for both the public and the environment. Recreation areas provide the public with places to gather with family and friends, places to relax and places that promote physical activity. These places add to the quality of life of the people and places that surround them. Recreation areas also help to shape a community through planning efforts to provide adequate recreation spaces and facilities. Parks and open spaces can also provide environmental benefits such as buffers between conflicting land uses.

A healthy, vibrant state park system with beautiful natural areas is important to the physical, spiritual and economic well-being of the citizens of Iowa. The DNR manages 85 parks and recreation areas, several state forest campgrounds and 92 state preserves spanning 63,000 acres. Within

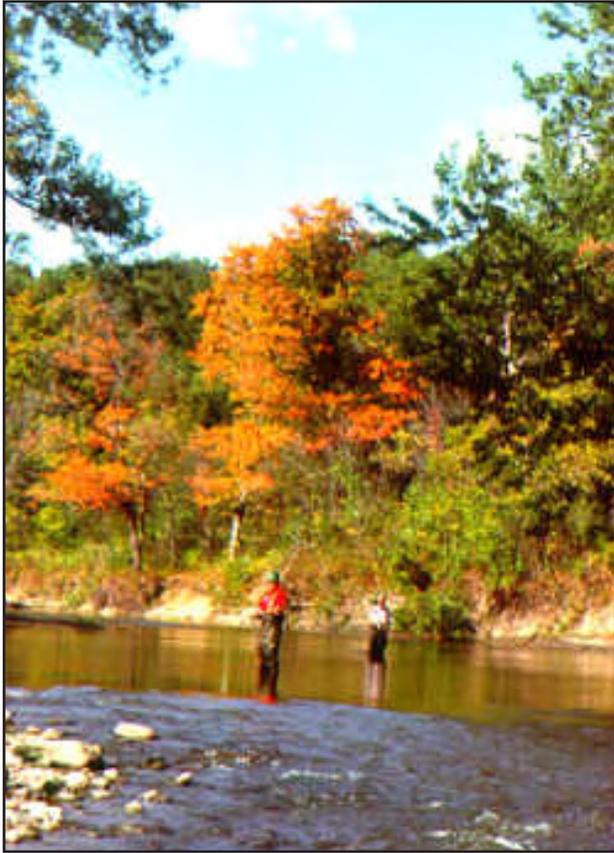


Photo by Ken Formanek.

those areas are 72 cabins, 26 day-use lodges, 34 beaches, 5,100 campsites and shower buildings in 62 campgrounds, numerous open picnic shelters and park office maintenance buildings. These parks provide important cultural and recreational opportunities to approximately 14 million visitors annually. Parks are significant contributors to local economies; Iowa parks and recreation areas generate \$155 million in economic activity annually, much of which is spent in local communities. (A party of 4 spends \$51.50 with each visit.)

Iowa ranks 49th in the nation for percentage of land that is available for public recreation. Seeking public support for a sustained, dedicated funding source to maintain and upgrade recreational trails would improve the management of the natural resources people are coming to visit and enjoy. By creating more access to natural resources, those areas are more vulnerable to invasive species, increased water runoff, increased erosion. This side effect creates more management to maintain

the ecosystem as it was discovered originally, now that the ecosystem has been altered by trails, buildings and roads.

One example of an issue occurring on state forest lands is the impact of equestrian riding. When these trails are not maintained, equestrian users travel around bad spots, creating new, less adequate trails, not to mention damaging more of the ecosystem they came to experience. Trails that are built and maintained properly will lessen the impact to the ecosystem and provide a better experience for the users.

The need to provide Iowans with quality outdoor recreation opportunities remains very high. There are several factors contributing to the demand for outdoor recreation. The rapid expansion of urban areas puts great stress on nearby existing areas and often reduces the amount of land available for park and recreation developments. The continual increase in the use of existing parks and recreation areas is evidence that there is great demand for outdoor recreation opportunities.

Further evidence lies in the fact that outdoor recreation habits are ever-changing, as activities such as soccer, skating and off-road vehicle riding have become increasingly popular. Each year the amount of funding requested for recreational programs increases while the amount available decreases, leaving many recreational needs unfulfilled. In 2000, the State of Iowa had \$248,500 available through the Land and Water Conservation Fund but had over \$2 million in requests. Also in 2000, the State of Iowa had \$3 million available through the Recreation Infrastructure Grant Program but had over \$5.3 million in requests.

Hikers, campers, canoeists, boaters, snowmobilers, equestrians, bikers, hunters, picnickers and bird-watchers have access to 1,350 miles of shared trails, including 645 miles of hiking trails in State Parks and 90 miles in State Forests. In addition there are 254 miles of equestrian trails

in State Parks. In the winter there are 5,000 miles of snowmobile trails and 8 ATV parks with approximately 1,560 acres for riders to enjoy. There are also 32 archery and shooting ranges. The 66 state parks and recreation areas, with more than 53,000 acres, host 10 to 15 million visitors each year. Nearly 2,000 miles of trails traverse those parks and forests.

County conservation boards manage numerous outdoor recreation areas, wildlife habitats and preserves containing hundreds of acres of wetland and riparian areas. Conservation boards manage these areas for their multiple-purpose values, including recreation, habitat, environmental quality and environmental education. Many county conservation boards also cooperate with other public natural resource agencies and private conservation groups to assist private landowners in the development, protection and management of wetland and riparian areas. Iowa's innovative County Conservation Board system provides close-to-home recreation. The 99 boards manage nearly 1,500 diverse areas. Private conservation groups also identify and protect natural areas and wildlife habitat.



Photo by Greg Ludvigson.

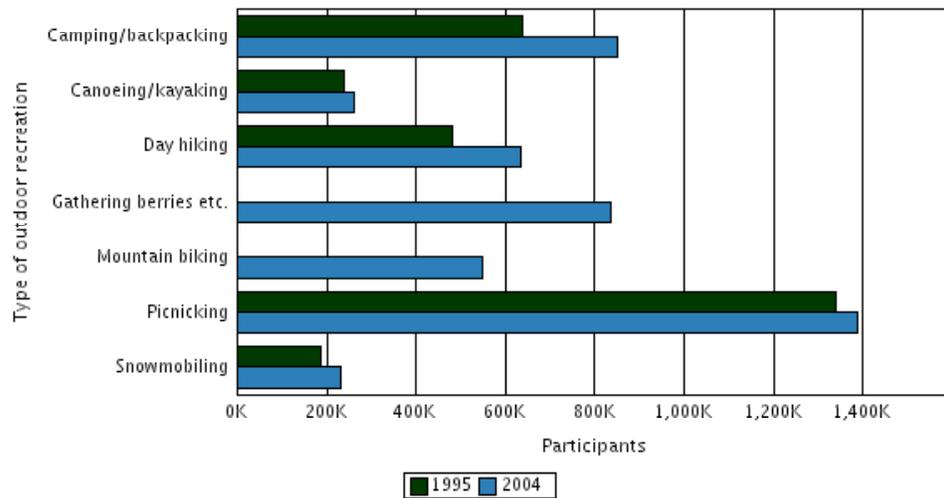
Within the 20 states comprising the northeast region, there are 1.2 acres of forest per citizen; this is compared to a national average of 0.56 and an Iowa average of 1.0. Most of Iowa's forest land is in private ownership, which leaves only a small amount for public use.

Canoe, kayak and inner tube rental businesses generate more than \$1 million in rental fees, which in turn generates \$4 million in related spending, according to a new survey conducted by Iowa Department of Natural Resources' Rivers Program in conjunction with Iowa State University's Department of Landscape Architecture. The survey was administered as part of the water trails and low-head dam safety statewide planning process initiated by the Iowa General Assembly in 2008. The following are some of the highlights of the survey:

- Liveries contribute \$5.14 million to Iowa's economy, including \$1.14 million in rental receipts and \$4 million for related spending (i.e. lodging, auto-related expenses, food and drink).
- Four rivers – the Upper Iowa, Des Moines, Maquoketa and Iowa– accounted for \$650,000, or 57 percent, of the total estimated receipts.
- Liveries use public accesses, and some have requested additional public services, including water trail development, law enforcement and hazard mitigation.
- Canoeing accounted for 48 percent of the total estimated 41,713 trips per year. Inner tubing accounted for 44 percent of the total trips, and kayaking accounted for 8 percent.

The entire report is available on the web at: [www.iowadnr.gov/watertrails/planning.html](http://www.iowadnr.gov/watertrails/planning.html).

**Figure 6.8 Outdoor Recreation Participation in Iowa, 1995 and 2004.**

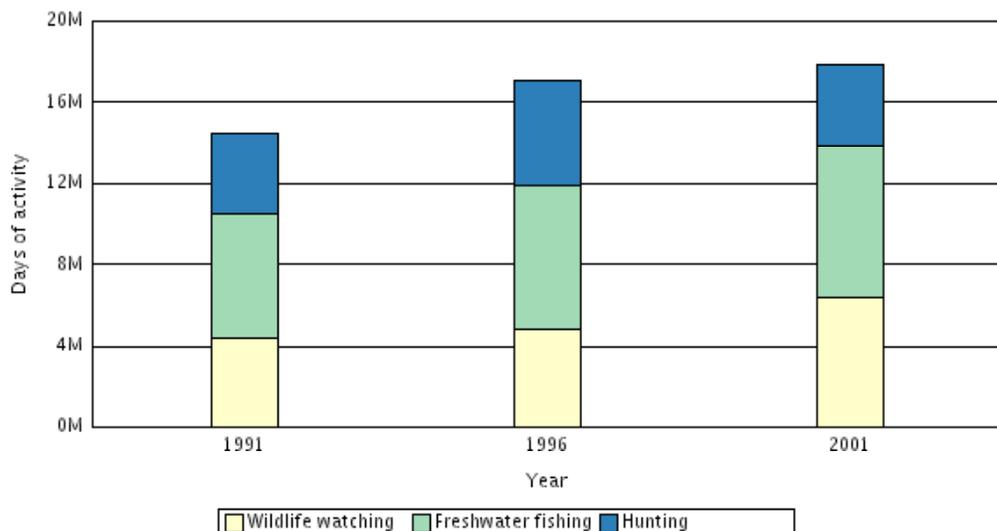


Source: U.S. Department of Agriculture, Forest Service - Forest Sustainability Indicators Information System. [Database].

Figure 6.8 above shows recreation participation rates on both forest and non-forest land in Iowa for 1995 and 2004. The most popular type of recreation continues to be picnicking followed by camping/backpacking, gathering berries etc., day hiking, mountain biking, canoeing/kayaking and snowmobiling. All activities have shown an increase between 1995 and 2004.

In 2008, the average visitor to Iowa spent \$291.34 over the course of 4.4 days.<sup>64</sup> The average age of the visitors surveyed was 52 years and the majority traveled with their families. Most visitors came from Minnesota, Illinois, Nebraska, Wisconsin, Missouri, Kansas and South Dakota (ordered from most to fewest visitors). In northeast Iowa, it is estimated that tourists spend \$6 million annually while viewing fall color in the autumn.<sup>65</sup> Bird watching has also become extremely popular in the state and, along with general wildlife viewing, generates more than \$300 million annually.

**Figure 6.9 Days of Participation in Freshwater Fishing, Hunting and Wildlife Watching in Iowa for all Participants, 1991, 1996 and 2001.**



Source: U.S. Department of Agriculture, Forest Service - Forest Sustainability Indicators Information System. [Database].

<sup>64</sup>Iowa Department of Economic Development, Tourism. <<http://www.traveliowa.com/welcomecenters.aspx>>. March 11 2010.

<sup>65</sup>Stone.

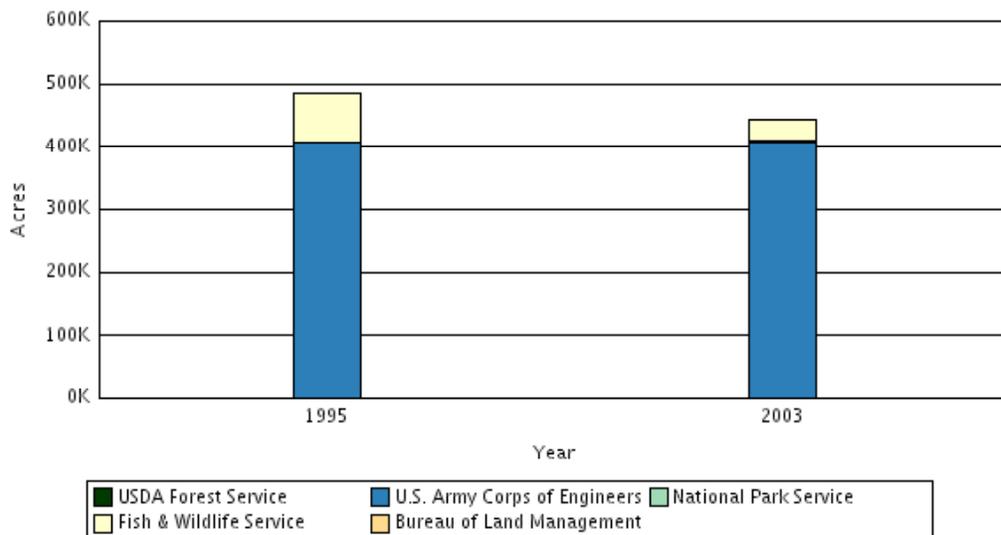
According to Figure 6.9, which shows the total number of days that all outdoor recreation enthusiasts spent fishing, hunting and wildlife viewing for three years in Iowa, wildlife viewing is the fastest growing outdoor activity in the state; hunting, on the other hand, has experienced a decline over this time period.

In 2006, roughly 250,000 hunters generated more than \$450 million in economic activity for the state.<sup>66</sup> Maintaining habitat that is supportive of wildlife for hunting is difficult given the limited amount of available public land; as a result of this, it has been necessary to offer educational and financial incentives to private landowners who allow people to hunt on their lands.

## Federal Land Open to Recreation

Figure 6.10 below shows the amount of federal land open to outdoor recreation in Iowa in 1995 and 2003. According to the figure, more than 90% of recreation land is owned and managed by the U.S. Army Corps of Engineers, while the rest is under the jurisdiction of the Bureau of Land Management. Compared to other states, Iowa ranks quite low in terms of land available for outdoor recreation.

**Figure 6.10 Amount of Federal Land Open to Outdoor Recreation by Agency in Iowa, 1995 and 2003.**



Source: U.S. Department of Agriculture, Forest Service - Forest Sustainability Indicators Information System. [Database].

<sup>66</sup>Stone.

## 6.5 Investments in Forest Health, Management, Research and Wood Processing

### Nursery Sales

The State Forest Nursery provides low-cost native tree and shrub material to encourage more planting in the state. Without it, forest landowners would be forced to pay more to plant trees on their property and in many cases would likely revert to buying their trees from out-of-state nurseries to get lower prices. In addition to bolstering the state's economy, use of native tree material ensures that insects and diseases that are not established are not brought in; moreover, seedlings from outside of Iowa may not be as adapted to the state's climate and may therefore be more susceptible to such problems because of stress. Non-native seedlings are often less productive at growing wood and mast as well.

One of the goals of the Iowa DNR Forestry Bureau is to promote the State Forest Nursery as the best source of native seedlings. Unfortunately, Iowa Code specifies that the nursery's budget for growing costs be dependent upon its seedling sales within a particular fiscal year, which makes for serious financial stress during years with poor sales. State rules and economic and political restraints can also make it difficult for the nursery to market its product and cover its operating costs.

Trees were planted on approximately 3,631 acres in Iowa between 1998 and 1999, which ranked the state 6<sup>th</sup> out of the twenty northeastern states for tree planting during this period. During years in which conservation programs promoting tree planting are particularly successful or widespread, State Forest Nursery sales are typically above average. Conversely, when conservation programs can't compete with commodity prices, tree sales go down. With a legislatively mandated requirement to operate at the cost of growing trees, the viability of the State Forest Nursery is a challenge because demand for seedlings is dependent on many programs outside of its control.

### Conservation Practices

The Forest Land Enhancement Program (FLEP) has not received the intended funding for private forest landowners to improve their woodlands that it was originally supposed to receive, and as a result it is therefore no longer in existence. Only \$146,000 was available to Iowa in 2003 and funding has decreased even more in subsequent years.

The Wildlife Habitat Incentive Program (WHIP) began in 2003 and, for the most part, has provided steadily increasing funding for Iowa (from \$52,000 in 2003 to \$93,000 in 2006). This federal program is administered through the NRCS with technical assistance provided by foresters, wildlife biologists or NRCS staff. Programs eligible for this funding assistance include tree planting, forest stand improvement and brush management.

The Environmental Quality Incentive Program (EQIP) has provided variable funding for forestry practices through the years and has provided funding for projects similar to those funded by WHIP. In 2001 over \$288,000 was provided to forest landowners, the most offered in any year through

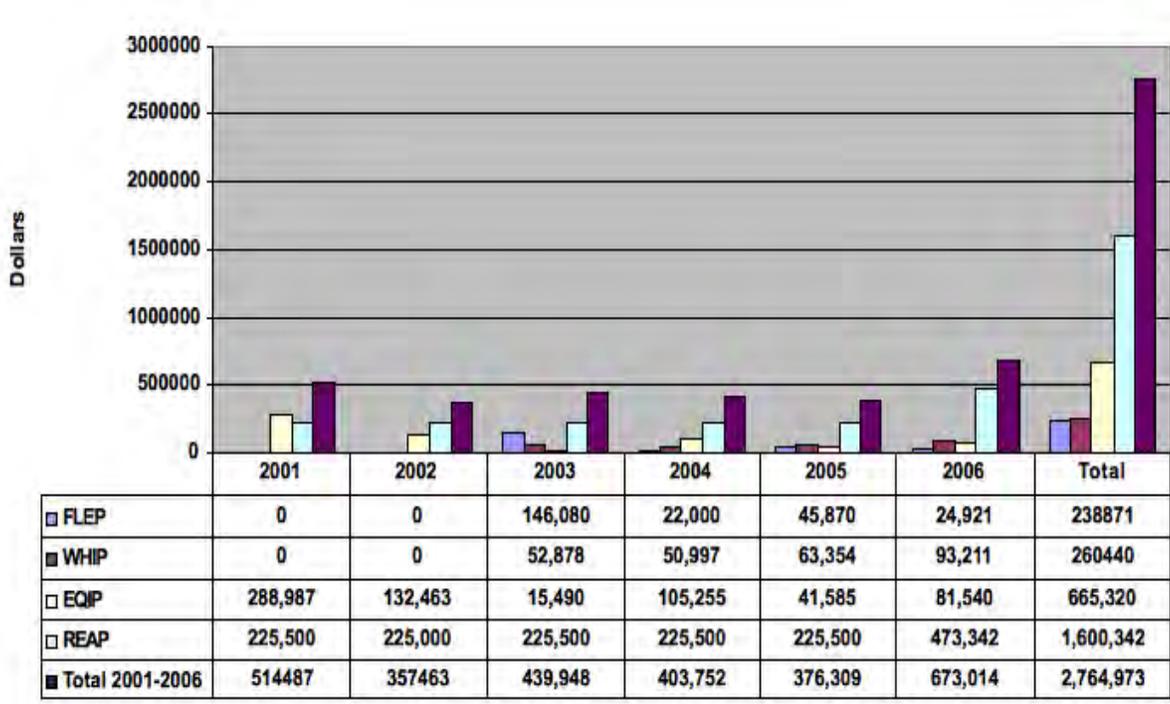
2006. In 2009 and 2010 approximately \$500,000 per year of EQIP funding was set aside for forestry practices on private lands.

The Resource Enhancement and Protection program (REAP) is a state program that has provided funding for forest landowners to get trees planted or to improve the woodlands on their property. As its name implies, REAP invests in the enhancement and protection of the state’s natural and cultural resources. Iowa is blessed with a diverse array of natural and cultural resources, and REAP is likewise diverse and far reaching. Depending on the individual programs, REAP provides money for projects through state agency budgets or in the form of grants. Several aspects of REAP also encourage private contributions that help accomplish program objectives.

REAP is funded from the State’s Environment First Fund (Iowa gaming receipts) and from the sale of the natural resource license plates. From 2001 to 2005 an allocation of \$225,500 was available annually, and 2006 saw an increase to \$473,000. The program is authorized to receive \$20 million per year until 2021, but the state legislature sets the amount of REAP funding every year. In 2009 REAP was appropriated at \$18 million plus \$1 million from license sales for a total budget of about \$19 million. REAP is expected to be funded at \$9 to \$12 million in state fiscal year 2011.

Figure 6.11 below shows how much money was spent on forestry projects for the aforementioned environmental enhancement programs in Iowa from 2001 to 2006.

**Figure 6.11 Comparison of Cost-Share Dollars spent on Forestry Practices by Program.**

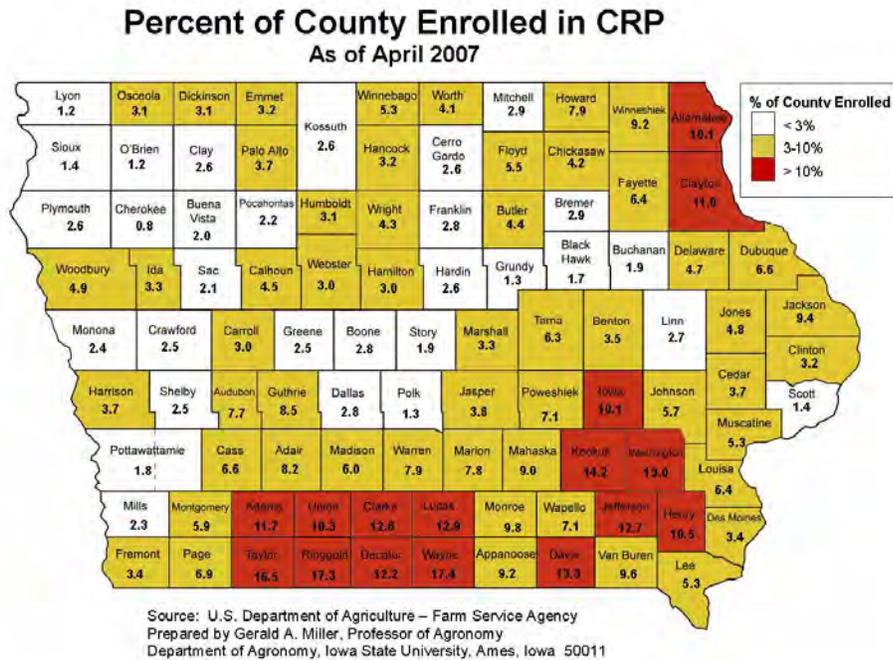


Source: State Forester, Paul Tauke.

A summary of Conservation Reserve Program (CRP) enrollment from the July 2009 report shows that Iowa had the most rental payments of any state with \$197,520,000. These rental payments were associated with 105,241 contracts on 52,965 farms protecting 1,705,312 acres.<sup>67</sup> Within the protected areas, 28,550 acres, or 1.7% of CRP acres, were planted for trees. If 700 trees were planted on each of these 28,550 CRP acres, nearly 20 million total trees would be planted.

<sup>67</sup>USDA, FSA, CRP, July 2009 Monthly Summary. <[www.fsa.usda.gov/Internet/FSA\\_File/july2009.pdf](http://www.fsa.usda.gov/Internet/FSA_File/july2009.pdf)>. April 16 2009.

Figure 6.12 Percent of County Enrolled in CRP as of April 2007.



Source: Iowa State University, Department of Agronomy, Gerald A. Miller.

A program like CRP benefits water quality and provides long-term soil protection on highly erodible soils. Landowners are less likely to remove trees after a 15-year contract. This provides society a good return on its investment because for the next 80-120 years those trees will continue to protect the soil, water, sequester carbon and provide wildlife habitat. Trees make sense for long-term protection of sensitive land because, once established, they are more difficult to remove; planting grass provides many good benefits but may not provide them for the same amount of time since it is much easier to remove. Nurseries that provide conservation seedlings and consultants that plant these seedlings for landowners benefit from tree planting incentive programs as well.

A lack of federal and state cost-share incentives makes it difficult to entice landowners to invest their time and money in forest stand improvement and reforestation. High corn, bean and land prices make it less financially viable for landowners to take land out of row crop production and into permanent vegetation like trees. With better prices for commodities and land, taking land out of row crop agriculture for permanent vegetation like trees, which have such a long time horizon for payback, is an ideal that most landowners can't afford to achieve on their own. Moreover, cyclical conservation practices are difficult because of unstable funding, as opportunities that are available during one year may dry up the next due to lack of resources. This cyclical nature also hurts nurseries, who's sales fluctuate from year-to-year in response to this changing funding.

## USDA Forest Service Funding

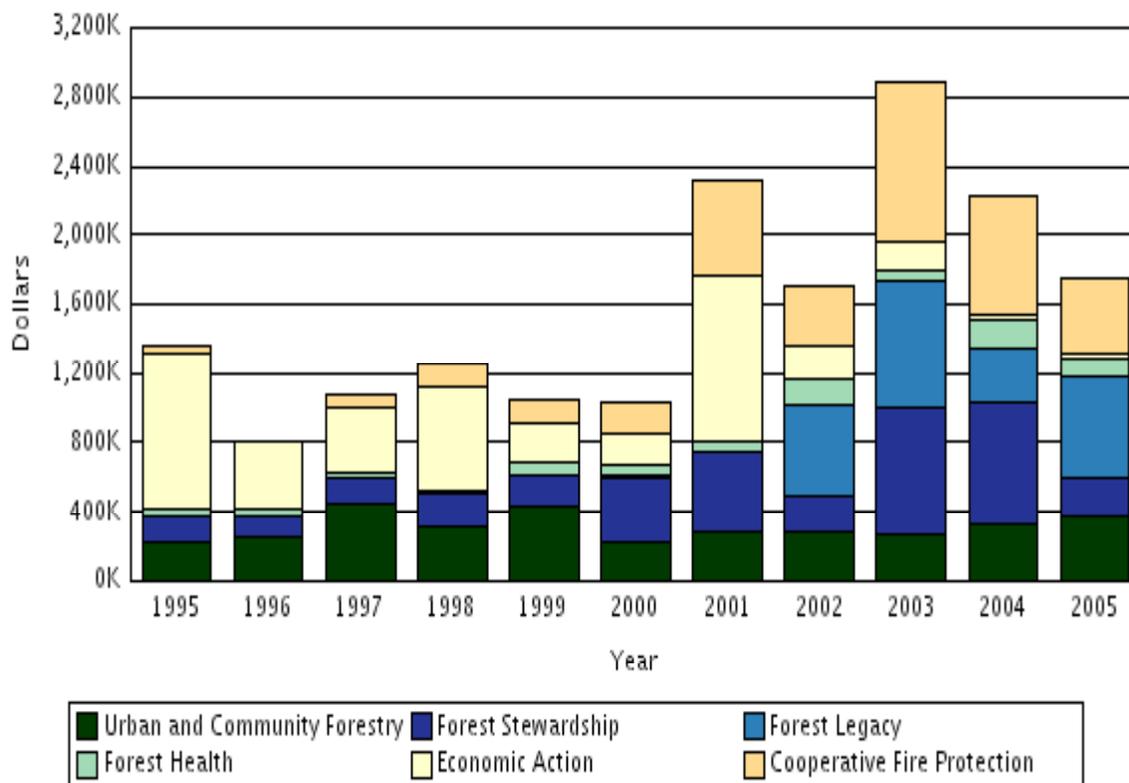
Iowa receives funding from the U.S. Forest Service to offer programs that address forest resource issues in a number of different ways: the Urban and Community Forestry statewide program works with communities to improve their tree resource; the Forest Health statewide programs works on detection and prevention of new insects and diseases that could cause detriment to the

forest resource; the Forest Stewardship statewide program offers assistance to Iowa's 150,000 forest landowners; the Cooperative Fire Protection statewide program helps with fire department's education and equipment needs to help with fire suppression and prescribed fire; and the Forest Legacy program helps protect working forest land in perpetuity.

There are several programs for which the U.S. Forest Service does not offer funding, and which the DNR Forestry Bureau believes provide important functions: the state lands management program guides management on forest land in the Forestry Bureau's operation; the State Forest Nursery grows native seedlings at a low cost to help landowners plant more trees on their land; the Tree Improvement program works to preserve the genetics of black walnut and butternut; the Utilization and Marketing program administers the bonded timber buyer program and keeps the wood industry up-to-date on issues that could both benefit and harm Iowa's wood industries; and conservation education is administered through funding from Iowa utility companies who work primarily with schools to educate children about the importance of tree planting and general conservation.

Figure 6.13 shows how federal funding for programs has varied between 1995 and 2005. The category for economic action disappeared for 2005 even though it provided the bulk of federal funding only ten years earlier. Though Forest Legacy has increased the overall federal allocation of money to Iowa, it hasn't helped to leverage the capacity of existing programs to increase or improve their effectiveness because the money is used to purchase conservation easements from private forest landowners. Varying levels of funding within programs makes it difficult to achieve their long-term goals.

**Figure 6.13 USDA Forest Service Funds Given to Iowa, 1995-2005.**



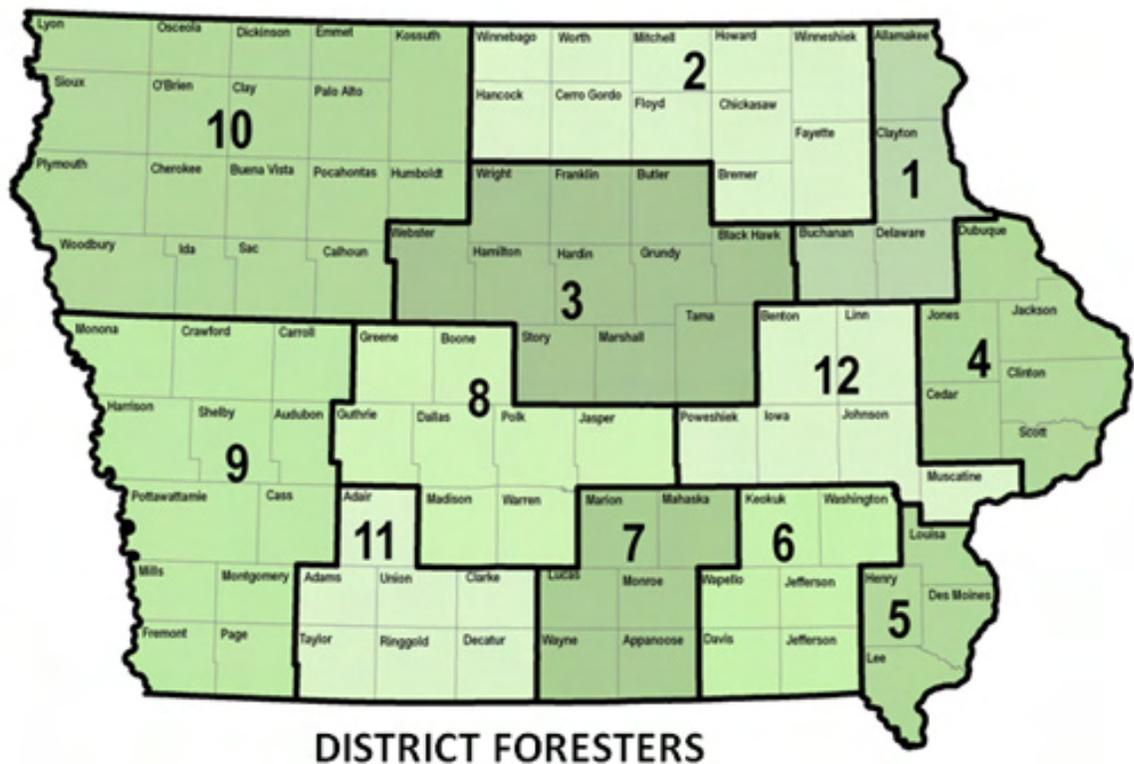
Source: U.S. Department of Agriculture, Forest Service - Forest Sustainability Indicators Information System. [Database].

## State of Iowa Forestry Staff

The Iowa DNR consists of about 970 permanent and 250 seasonal employees. There are a number of different bureaus that specialize in managing the state's natural resources for many different users.

Within the Forestry Bureau there are 15 district foresters located throughout the state who help the more than 150,000 private forest landowners manage their forest land and successfully establish tree plantings. Figure 6.14 shows how Iowa's 12 forest districts are divided up (some districts have more than one district forester).

**Figure 6.14 Forest Districts in Iowa.**

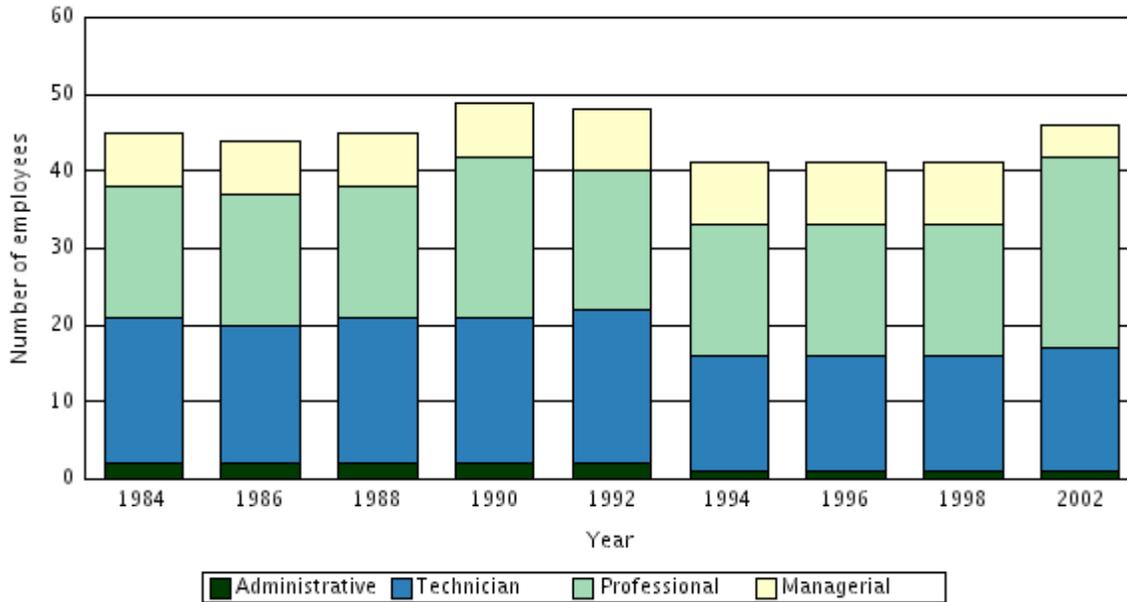


Source: Kathyne Clark.

There are a total of four area foresters and 9 natural resource technicians who manage over 45,000 acres on Iowa's four state forests. District foresters and area foresters are supervised by the Private Lands Forest Supervisor and State Forest Section Chief, respectively. Four more specialized foresters oversee forest health, fire, urban and special projects issues. The State Forest Nursery is also managed by the Private Lands Forest Supervisor as well as a secretary, a nursery forester, three natural resource technicians and an inmate crew capable of growing and shipping up to 4 million tree seedlings per year. Finally, the bureau as a whole is under the direction of the Forestry Bureau Chief.

In 2009 the Iowa DNR Forestry Bureau had 29 foresters, 16 natural resource technicians and one secretary to help Iowans with their forest land. The Fiscal Year 2011 budget caused the loss of 3 positions within the Forestry Bureau. Current state budget reductions may reduce the forestry staff described above. Figure 6.15 below shows the number of people employed by DNR Forestry Bureau per year from 1984 to 2002.

**Figure 6.15 Permanent State Forest Employees in Iowa, 1984 to 2002.**



Source: U.S. Department of Agriculture, Forest Service - Forest Sustainability Indicators Information System. [Database].

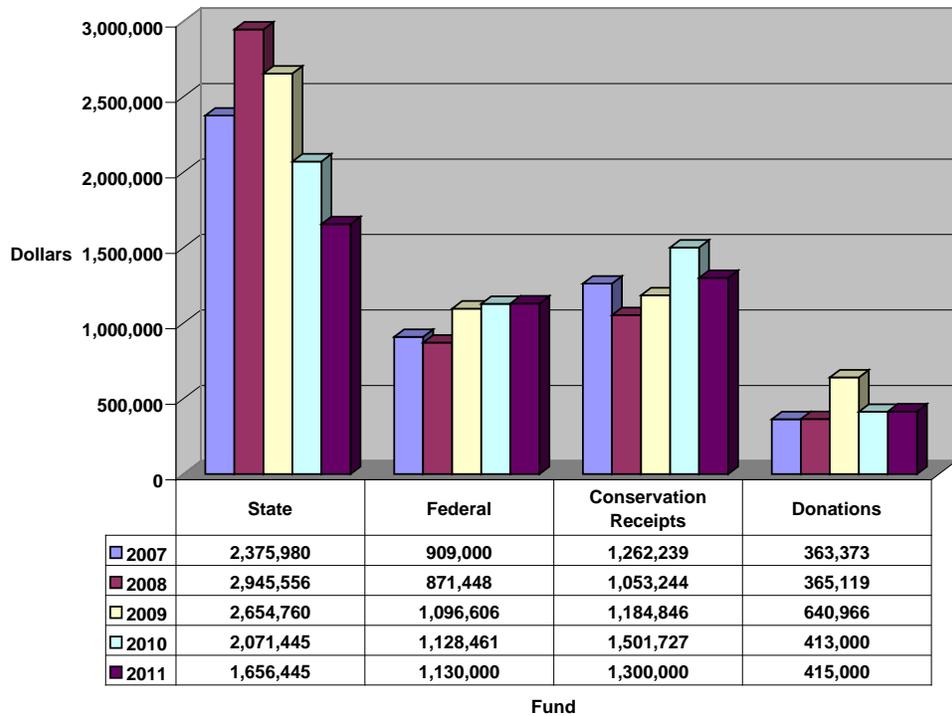
## State Funding for Forestry

There are five general sources of funding for the Forestry Bureau: general fund income, which is allocated by the state of Iowa through the Legislature and Governor's Office; federal funding, provided by the U.S. Forest Service to support priority programs; conservation funding, generated by the State Forest Nursery, timber sales, crop leases; the Forest Enhancement Fund, which provides \$0.05 for every conifer seedling and \$0.10 for every hardwood seedling sold to support district forester positions; and partner funding from organizations such as Alliant Energy, Mid-American Energy, Black Hills Energy, Trees Forever, Iowa Woodland Owners Association, Iowa Tree Farm and Iowa Bankers Association. Partner funding is dedicated to producing educational materials for the Trees for Kids and Trees for Teens programs and the majority of such funding goes toward residential tree distribution programs.

Figure 6.16 gives a breakdown of the DNR Forestry Bureau budget for 2007, 2008, 2009 and 2011. The budget for the bureau was about \$5.5 million per year for fiscal years 2008 and 2009. Unfortunately, due to across-the-board budget cuts, the bureau lost over \$550,000 in general funding during fiscal year 2010, though it was able to compensate for this somewhat due to an increase in federal funding of approximately \$250,000. Overall, the Forestry Bureau has had its State General fund allocation cut 40% or \$1,000,000 from State Fiscal Year 2009 to Fiscal Year 2011.

**From State Fiscal Year 2009 to 2011, the Forestry Bureau had a reduction in State General funding by \$1 million.**

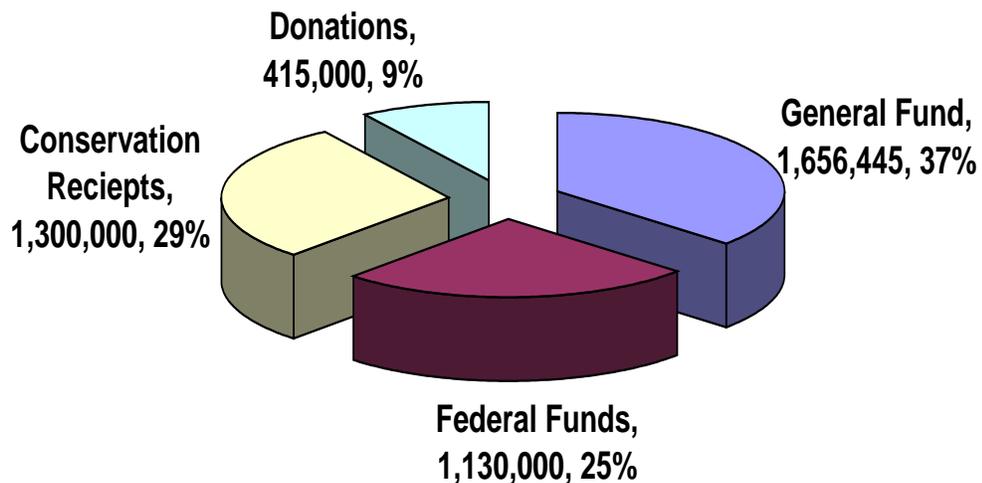
**Figure 6.16 Budget Breakdown for Iowa DNR Forestry Bureau, 2007-2011.**



Source: Paul Tauke.

General fund dollars are especially important for use in matching federal funding, and there could come a point when there are not enough general fund dollars available to match available federal funds. Currently, the DNR Forestry Bureau is able to bring in \$1.86 to \$2.05 of federal funding for every general fund dollar it receives. Figure 6.17 shows the breakdown by percentage of how the Forestry Bureau was funded for fiscal year 2011.

**Figure 6.17 2011 Forestry Bureau Budget.**



Source: Paul Tauke.

A study funded by the National Alliance of Forest Owners (NAFO) found that for every 1,000 acres of private working forest, eight jobs are created with a total annual payroll of \$270,000 and \$9,850 in annual state taxes. It has been estimated that 10% of private forest land in Iowa meets the definition of working forest and that Iowa's forests annually provide a payroll of more than \$70 million to roughly 2,200 employees who contribute over \$2.7 million in state taxes. Turning the roughly 90% of private forest land that is not currently working forest into working forest could create nearly 20,000 more jobs, an annual payroll of \$667,035,000 and over \$24 million more in annual state taxes. This shows just how much economic activity Iowa's forests could generate if properly managed.<sup>68</sup>

The Forestry Bureau received \$1,128,461 in federal funding to supplement stewardship, forest health, urban, and fire programs during fiscal year 2010. Additionally, the Forestry Bureau passes through an average of \$425,000 per year in federal funds to partners outside the DNR to perform important forest-related activities. These partners include volunteer fire departments, forestry contractors, RC&Ds, NGOs and Iowa State University.

Of the \$2,045,015 of general funding for 2010, \$988,703 was allocated for work on state forests; an additional \$389,632 was generated through crop rentals and timber sales, bringing the total operating budget for state forests to \$1,378,335. The remaining \$1,056,312 of general fund money was used to support 16 district foresters, their supervisor, four program staff and the Forestry Bureau Chief.

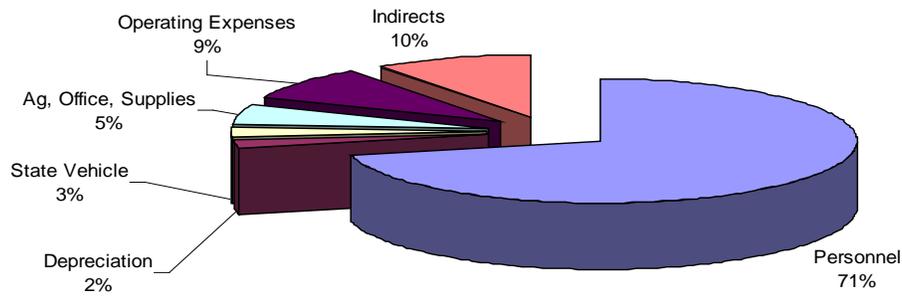
The above figures do not take into consideration positions that are left empty as a result of decreased general funding. When funding is slim, decisions must be made in regard to which services and positions will be maintained and which will be eliminated. One way to mitigate the loss of state funding is to pursue more federal funding opportunities. Many times federal funding defines specific tasks and deliverables that are expected in return for the money that is offered. These tasks may not be related to how the lost general funds were used before, but they at least allow for the retention of personnel. The priority given to certain activities within the forestry bureau is reflected in how the bureau's budget is broken up and where most of its money comes from. For example, when the budget shifts from reliance on general funding toward reliance on federal funding, district foresters must often sacrifice time and resources spent helping private landowners in order to perform forest health and other functions considered important by other agencies offering grants for work to be performed.

Figure 6.18 shows that personnel expenses make up the bulk of the forestry bureau budget at 71%; indirects such as accounting, customer service and computer services make up an additional 10% while the remainder is used for supplies, equipment repairs and other general operating expenses.

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<sup>68</sup><nafoalliance.org/featured/first-ever-study-quantifies-the-economic-impact-of-private-working-forests-in-the-u-s/>. January 23 2010.

**Figure 6.18 2010 Forestry Bureau Expense Budget.**

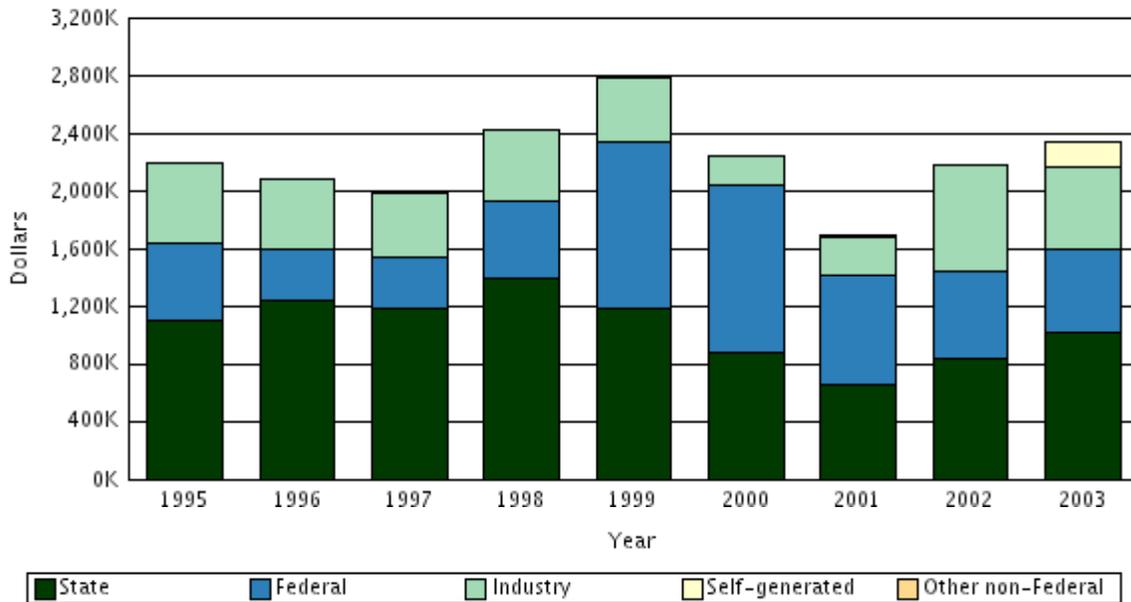


Source: Paul Tauke.

## Funding for Forestry Research at Universities

As Figure 6.19 reflects, funding for forestry research at universities has been increasing at the state level, decreasing at the federal level and increasing at the industry level in recent years, which has resulted in very little net change in funding.

**Figure 6.19 Funding for Forestry Research at Universities in Iowa.**



Source: U.S. Department of Agriculture, Forest Service - Forest Sustainability Indicators Information System. [Database].

Maintaining a solid forestry extension program through Iowa State University is integral if important messages and good advice are to be delivered to forest landowners at field days and workshops. An accredited forestry program and knowledgeable extension forester guarantee that terminology and silvicultural practices are consistent across the state. Unfortunately, some extension programs have been reduced or eliminated, which has been leading to a reduction in these necessary services.

The creation of a web-based Iowa forestry connection could facilitate better communication between ISU Extension, professional foresters, private forest landowners, public land managers, forestry organizations and other natural resource entities in the state. Keeping these groups informed about educational opportunities, discussion forums, employment opportunities, grant opportunities, on-going research, publications, wood industry information and the “ask a forester” blog could lead to the enhancement of forest activities in the state.

## 6.6 Forest Certification

### **Certified Products**

Pressure is mounting on retailers of forest products to purchase “green” certified lumber or paper products. Green certified products are those products that can be proven to be grown on property that is managed in a sustainable fashion. If the forest certification movement continues to gain momentum, Iowa’s forest owners may need to have their property or forest management practices certified as sustainable by a third party certifier to insure access to some markets for their forest products. However, the expense of certification and lack of additional revenue from having certified forests is prohibiting forest owners from becoming certified. Opportunities and challenges exist in developing a viable and inexpensive means of green certification for small woodland owners in Iowa.

### **Certified Management**

In 2009 Iowa had 1,107 forest landowners representing 93,166 acres of Iowa’s forest land who were certified under the American Tree Farm System. A forest landowner certified under this system must have a management plan that follows certain standards and guidelines; these guidelines show landowners how to manage their forest for clean water, wildlife, recreational opportunities and wood products. The number of forest acres being managed reflects the willingness of Iowa forest landowners to improve their forest.

## 6.7 Highlights of Maintenance and Enhancement of Long-Term Multiple Socioeconomic Benefits

Iowa lost more than 51% of its sawmills from 2000 to 2005.

There are currently no pulp mills or cellulosic ethanol plants that use softwoods or small-diameter, low-quality wood in Iowa.

Without a viable wood products industry, forest landowners wouldn't have the economic incentives to perform forest stand improvement activities.

Iowa ranks 49th in the nation for the percentage of land that is available for public recreation.

Due to a lack of funding and lack of understanding of forest management, many recreational areas in forest settings are improperly managed or unmanaged.

The need for public land for recreation has increased as the state's population has become increasingly urban.

Conservation programs cannot compete with agricultural commodity prices without sufficient economic incentives.

Taking land out of agricultural production for the promotion of permanent vegetation like trees is economically unfeasible for most landowners without assistance from state and federal programs.

State land management, native seed source protection, utilization and marketing, and conservation and education are activities that the Iowa DNR Forestry Bureau believes are important but that are not supported by the Forest Service.

From State Fiscal Year 2009 to Fiscal Year 2011, the State's investment in Forestry shrunk 40% or \$1,000,000.

If all of Iowa's forests were properly managed, nearly 20,000 more jobs and \$24 million more in annual tax revenue could be generated.

Only 10 to 15% of the Iowa DNR Forestry Bureau budget is available for discretionary spending, which leaves little money for improvements to the state's forest resource.

Only 93,000 acres of Iowa's 2.75 million acres of private forest land is enrolled in the American Tree Farm System.

# 7.0 Legal, Institutional, and Economic Framework for Forest Conservation and Sustainable Management

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Social, legal, economic, and environmental conditions reflect society's values and have a profound effect on forest conservation and sustainable management. These factors create a complex web of influences that can sometimes interact in unexpected ways. For example, some communities, in an effort to slow growth, have enacted zoning ordinances to require larger lot sizes. This has the unintended effect of fragmenting more forest land than if lots were clustered closer together.

The most important question is whether the region's legal, institutional, and social factors, when taken together, tend to support or undermine forest sustainability. A comprehensive planning and monitoring system is critical to answering this question. Some of the important factors to consider include population trends, technology, local, state, national, and international trade, land ownership and local, state, and national laws and regulations.

## 7.1 Forest Related Planning, Assessment, Policy and Law

### State Forest Planning

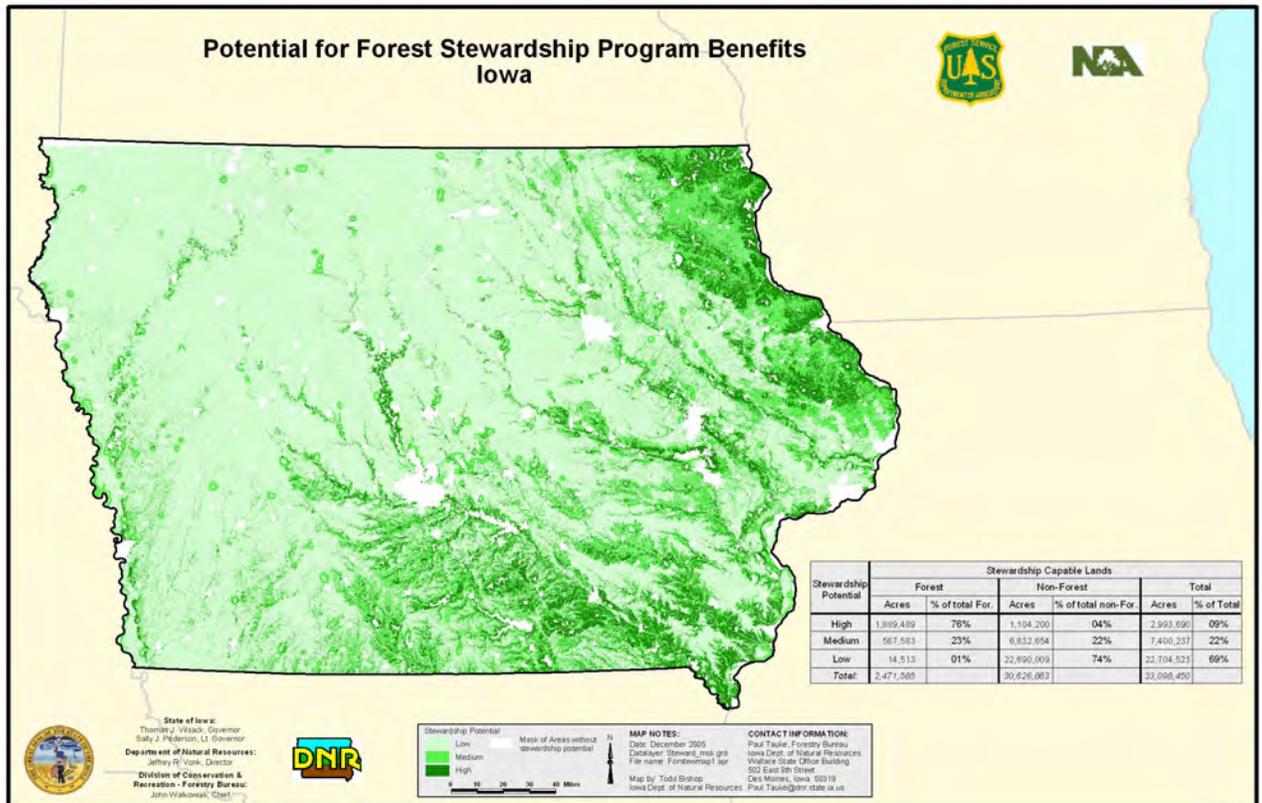
The approximately 35,000 acres of forest land the DNR Forestry Bureau manages have management plans to ensure that they are sustained for future generations and that the mission and core functions for the DNR and Bureau of Forestry are reflected in their management. These plans serve as a record of public input and desired uses and reflect the management intentions for the next twenty years based on current knowledge of land capability, inventory data, sound forestry practices, land stewardship and public demands. These plans are working documents, and are revised as needed to address the challenge of managing a constantly-changing forest resource.

In the planning process, goals and objectives are developed to move the forest resource to a desired future condition. These plans ensure a system of orderly management and development that reflects the current science regarding harvesting, forest stand improvement and reforestation. Management goals and objectives lay a foundation for the implementation of sound forestry management practices for these public forests. Of the 164,000 acres of state forest land, about 50,000 acres have management plans that ensure sustainability and multiple societal benefits. The remaining 114,000 acres are not actively managed.

### Private Forest Land

Private forest land management is completely voluntary and guidelines are offered through the use of free on-site visits from DNR foresters. Figure 7.1 shows areas of the state where there is potential for private land stewardship, with darker color representing greater potential (details about the criteria that went into the development of this map are provided in the next chapter).

Figure 7.1 Potential for Forest Stewardship Program Benefits.



Source: Kathy Clark.

Iowa has a voluntary best management practices guide for timber harvesting; there is a technical guide that includes federal standards and DNR Forestry Bureau standards that have to be met for all projects related to trees that receive state or federal cost-share assistance.

## 7.2 Incentives for Forest Landowners

District foresters provide no cost assistance to forest landowners. They work with landowners to apply for tree planting cost-share assistance at local FSA or NRCS offices to reduce the cost to the landowner for tree planting, forest stand improvement and wildlife habitat improvements. Landowners can receive stewardship plans for their existing timber to help them keep it healthy and productive.

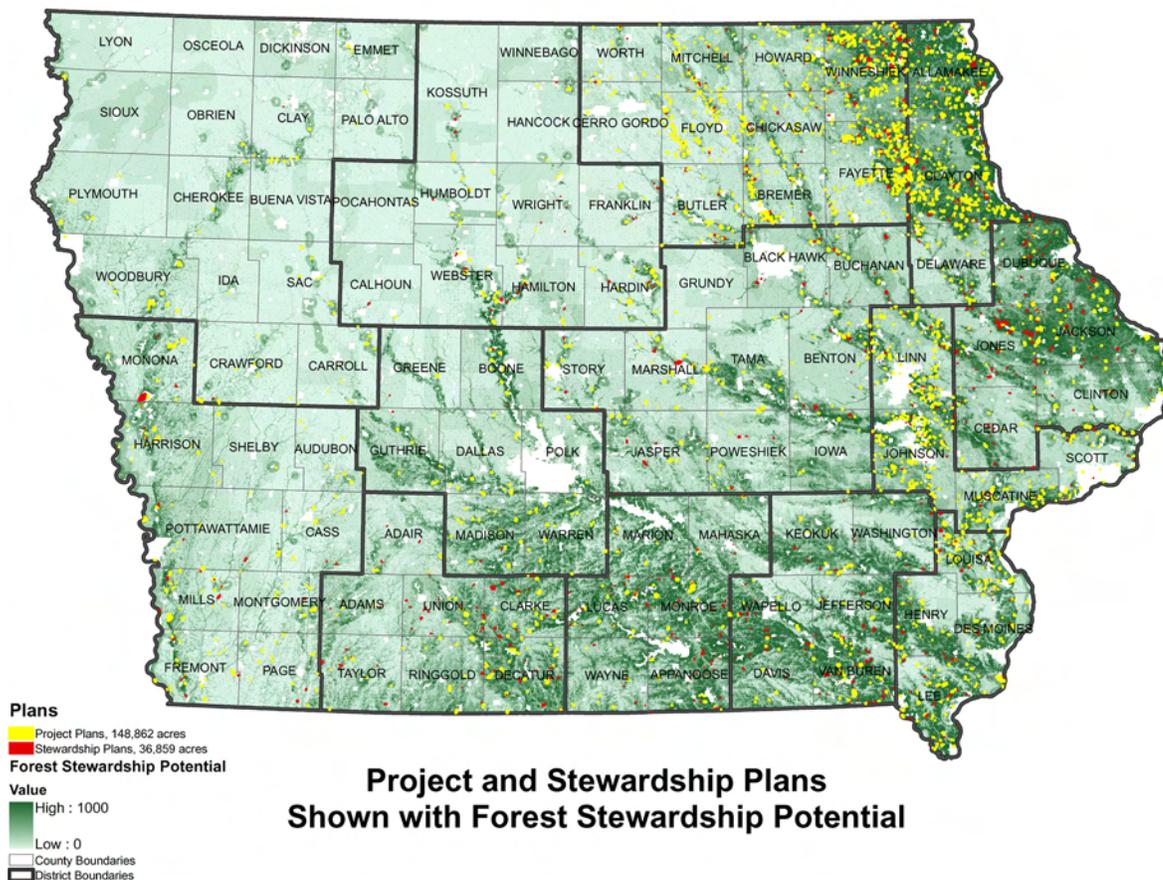
The State Forest Nursery provides low cost seedlings to assist people with planting more trees. By selling native conservation seedlings, Iowa forest landowners are able to purchase trees that are adaptable to Iowa’s climate at a low cost. Conservation programs that encourage tree planting are at a disadvantage when competing with agriculture, which generates income quickly and consistently; however, lowering the input costs of tree planting is one way to make forest-related activities more economically feasible.

Market-based incentives such as pollution taxes have been an effective way to implement environmental regulations. These incentives are being considered for use in the maintenance and enhancement of ecosystem services by encouraging the production of environmental “goods” rather than controlling environmental “bads”. Programs specifically designed to enhance the production of services like carbon sequestration, water and air quality and biodiversity conservation are newer and their impacts are therefore less certain.

## 7.3 Private Landowner Forest Planning

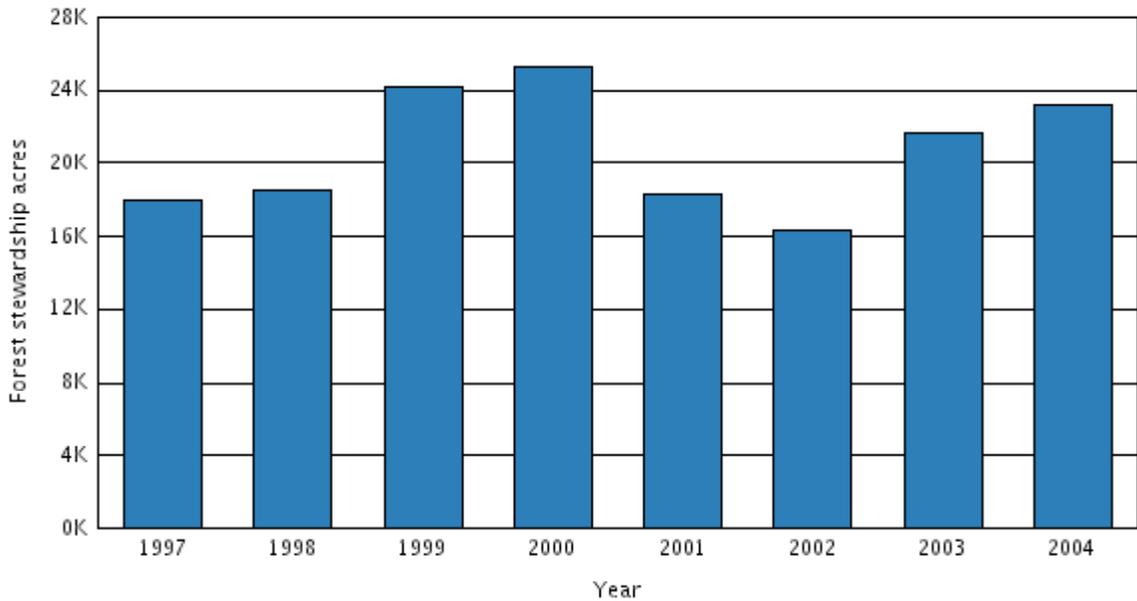
Figure 7.2 shows parts of the state where forest stewardship and project plans have been written for forest landowners from 1998 to 2009, while Figure 7.3 shows the number of acres of forest land for which stewardship plans were written per year from 1997 to 2004. In 2009 DNR foresters wrote stewardship plans for 21,375 acres of forest, or less than 1% of the state's 2.7 million private forest acres. Overall, stewardship plans have been written for over 190,000 acres of forest in the state, which still only accounts for 7% of total forest land. As the number of landowners in the state increases, it becomes more and more difficult for the decreasing number of district foresters to meet the needs of these landowners; furthermore, as private landholdings decrease in size, the management plans that are carried out come to represent smaller and smaller pieces of Iowa's total forest land.

**Figure 7.2 Project and Stewardship Plans Shown with Forest Stewardship Potential, 1999-2009.**



Source: Kathy Clark.

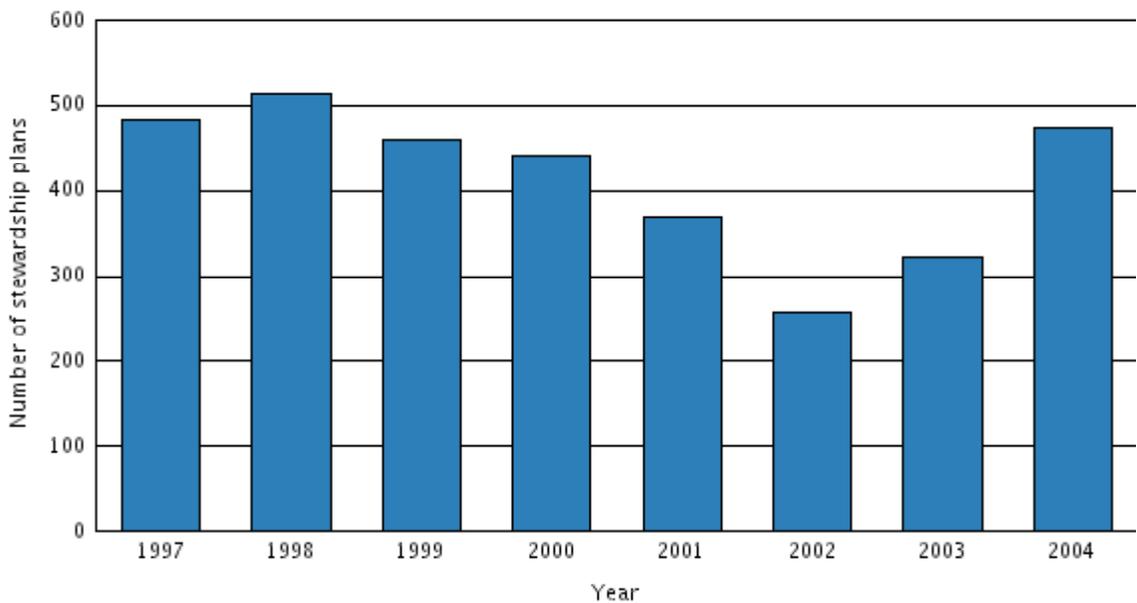
**Figure 7.3 Forest Stewardship Acres on Non-industrial Private Forest Land, 1997-2004.**



Source: U.S. Department of Agriculture, Forest Service - Forest Sustainability Indicators Information System. [Database].

Figure 7.4 gives the number of forest stewardship plans written per year from 1997 to 2004. A total of 435 stewardship plans were written in 2009, a number that falls within the range shown in this figure. On average, stewardship plans are drawn up for less than 1% of landowners annually and district foresters are able to write only two or three plans apiece per month (It is worth noting that in addition to stewardship plans, district foresters wrote over 700 other plans involving tree planting, forest stand improvement and other forestry-related work in 2009).

**Figure 7.4 Number of Stewardship Plans Written for Non-industrial Private Forest Lands, 1997-2004.**



Source: U.S. Department of Agriculture, Forest Service - Forest Sustainability Indicators Information System. [Database].

## 7.4 Forest Laws and Policies

**According to the Code of Iowa:** *The State Forester has full responsibility and authority to plan and execute all technical phases of the forestry program in Iowa.*

Iowa's regulation of the timber industry is limited; though law requires anyone wishing to purchase timber from a landowner to be bonded and to have an application on file with the DNR Forestry Bureau, there are no requirements for management plans or best management practices during harvests. There is also no additional tax kept by the state to inspect timber harvests, and forest landowners are not required to provide any information about timber sales on their properties. The best the Forestry Bureau can do at this time is to encourage landowners to work with professional foresters so that their timber is managed as well as possible.

The development of this document is meant to guide the DNR Forestry Bureau to coordinate efforts with stakeholders to work on resolving issues facing the forest resource in Iowa.

### **Forest Reserve<sup>69</sup>**

In 1906 the Iowa Legislature passed a private landowner tax incentive known as the Forest and Fruit Tree Reservation Act to “reduce or eliminate property taxes to induce landowners to hold their poorer lands in timber not only as a source of farm income but also for erosion control, watershed protection and game cover”. This law allows forest landowners the opportunity to avoid paying property taxes on their forested property as long as it is:

*At least 2 contiguous acres in size and generally not less than 66 feet wide or a fruit tree reservation not less than 1 or more than 10 acres in total area.*

#### **And that it:**

*[does] not contain less than 200 growing trees, on a fruit tree reservation at least 40 apple trees per acre and other fruit trees reservations at least 70 trees per acre.*

*The definition of forest trees includes ash, black cherry, black walnut, butternut, catalpa, honey locust, Norway and Carolina poplars, mulberry, the oaks, sugar maple, cottonwood, soft maple, osage orange, basswood, black locust, European larch, other coniferous trees and all other forest trees introduced in the state for experimental purposes.*

*In forest reservations which are artificial groves, willows, boxelders and other poplars shall be included when protecting borders not exceeding two rows in width around a forest reservation or when used as nurse trees not to exceed 100 on each acre.*

*No cattle, mules, horses, sheep, goats or hogs are permitted on forest reservations.*

*Not more than 1/5 of the total number of trees in the forest reservation may be removed in any single year unless the trees die of natural causes. When the number of trees falls below 200 trees on each acre, the owner shall within one year restore the number of trees to not less than 200 trees per acre.*

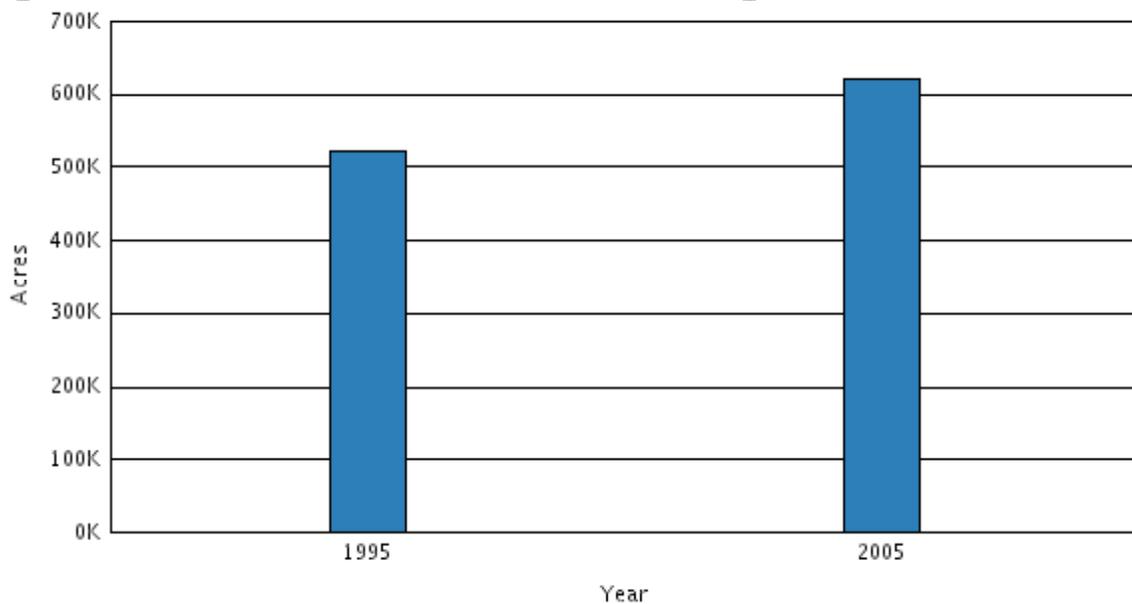
<sup>69</sup>Section 427 of the Iowa Code. <[www.iowadnr.gov/forestry/reserve.html](http://www.iowadnr.gov/forestry/reserve.html)>. April 15 2010.

*If any buildings are standing on an area selected as a forest reservation, one acre of that area shall be excluded from the tax exemption. However, the exclusion of that acre shall not affect the area's meeting the acreage requirement.*

*A forest reserve can not be used for leased hunting. (This is based on the presumption that wildlife is a product of the forest and not of the individual trees in the forest. The Iowa administrative rule does not specifically prohibit leased hunting). No forest management plan is required to be enrolled.*

Figure 7.5 gives a comparison of the number of acres of forest land enrolled in tax reduction programs in Iowa in 1995 and 2005. There were 659,562 acres of forest enrolled in forest reserve in 2008, which represents an increase of 28% over the 516,017 acres enrolled in 2000. Acres enrolled in forest reserve only represent 22% of Iowa's forest land as of 2008.

**Figure 7.5 Forest Land Enrolled in Tax Reduction Programs in Iowa.**



Source: U.S. Department of Agriculture, **Forest Service - Forest Sustainability Indicators Information System. [Database].**

### **State Forestry Advisory Committees**

There are several forest advisory councils, including the Urban Forestry Council, State Stewardship Committee, Forest Health Insect and Disease Management Council, that provide priorities for those programs to the State Forester in specialized areas affecting the forest resource.

## Partners with the DNR Forestry Bureau

Organizations that the Forestry Bureau works with to deliver services and programs to conserve and enhance the forest resource include:

- USDA Forest Service
- USDA APHIS
- USDA Natural Resources Conservation Service
- USDA Farm Service Agency
- Iowa Department of Agriculture and Land Stewardship
- Iowa Department of Transportation
- Iowa State University Forestry Extension
- Iowa DNR Wildlife Bureau
- Iowa Prison System
- Alliant Energy
- Mid American Energy
- Black Hills Energy
- Iowa Tree Farm Committee
- Iowa Woodland Owners
- Iowa Nursery and Landscape Association
- Iowa Bankers
- Northeastern Iowa RC&D
- Prairie Rivers RC&D
- Golden Hills RC&D
- Heartland RC&D
- Iowa Wood Industry Association
- Iowa Urban Forestry Council
- Northeastern Iowa Forestry Advisory Committee
- Iowa Arborist Association
- Iowa Association of Municipal Utilities
- Trees Forever
- Iowa Insect and Disease Management Council
- Iowa Wild Turkey Federation
- Pheasants Forever
- Iowa County Conservation Boards
- Iowa Soil and Water Conservation Districts
- Iowa Natural Heritage Foundation

## 7.5 Highlights of Forest Related Planning, Assessment, Policy and Law

Management plans exist for about 20% of public forest land and less than 10% of private forest land in Iowa.

Forest management plans are not required for enrollment in the Forest Reserve Program.

Best management practices are not required for timber harvesting and no information is collected regarding private forest land timber harvests in Iowa.

Incentives for forestry practices are rarely great enough to persuade landowners to invest in their forests or convert agriculture land to forest land.