

Forest Conservation and Management

Critical Trends Assessment Program (CTAP)

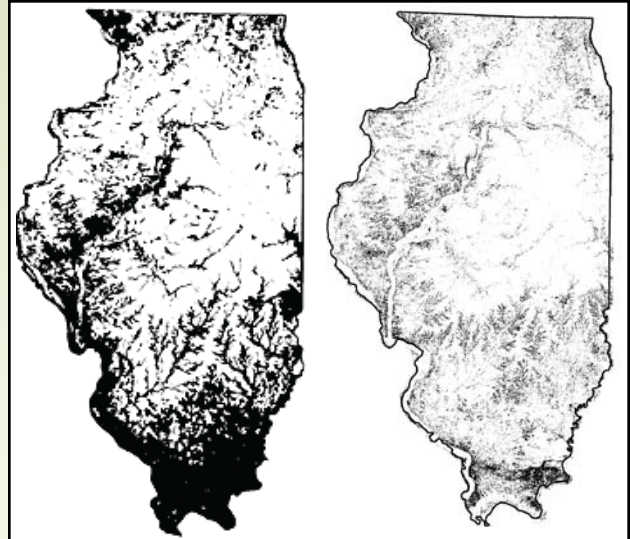
Forests in our agricultural or urbanized landscapes are especially vulnerable to degradation. Since 1997, the CTAP biological monitoring program has systematically studied Illinois' forests. This brochure summarizes the best science and data available regarding four major aspects of forest conservation and management. The last pages provide management recommendations. Look for future publications in this series on grassland and wetland habitats.

A Brief History of Illinois' Forests

The story of the Illinois landscape is one of dramatic change, both pre-historic and recent. As recently as 12,000 years-ago, much of Illinois was covered by glacial ice and tundra. As glaciers melted, Illinois changed into a northern spruce-fir forest, and then oak-hickory woodland. Finally,



A native Illinois forest with northern glacial relict paper birch & a ladies slipper orchid (Jo Daviess County).



Historic forest land cover (1820; left) and current forest (1999; right). Forests tracts are now much smaller and more isolated from one another (fragmented).

during a hot dry climatic period several thousand years ago, trees were largely replaced by more drought- and fire-tolerant grasses and wildflowers. Forests were pushed-back to areas protected from the hottest wildfire—moist ravines, steep slopes, and swampy bottomlands. The “Prairie State” was born. Each of these stages has left behind some plants and animals. Our highly productive and biologically diverse natural lands are a product of this historical mixing.

Recent man-made changes have been equally dramatic. To support the growing U.S. population, timber harvesting and agriculture clearing decreased forest coverage from around 39% of the state's land area in 1820, to around 8% in 1924. Since then, some woodlands have regrown to the current 14% coverage (see figure above). Despite this re-growth, heavy use and clearing has left deep scars in forests. While some plants and animals are resilient, much of our forest flora and fauna will not survive or return without management and conservation.

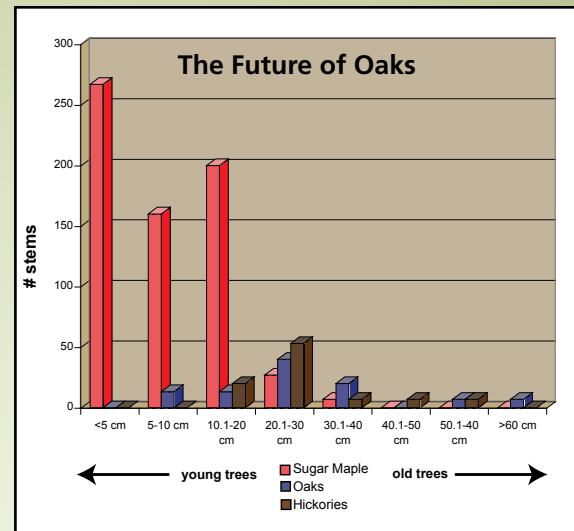
Issue # 1: The Future of Oaks and Hickories

Many foresters and botanists have noticed a disturbing trend across the Midwest. In many woodlands, oak and

hickory trees are not regenerating themselves. This may be the single largest forest change to these woodlands happening during our lifetimes.

For now, mature oaks and hickories often dominate our forests. The problem lies below the canopy of these big trees, where young oaks or hickories are rarely found. As older forests die off, new ones dominated by sugar maple, red maple, beech, ash, or elm often take their place. Historically these shade-loving species were limited to moist, cool, valleys, or lowlands where they cast a deep shade. Today they are moving into oak-hickory woodlands, often migrating up hillsides from lower, moister, areas. Like a yard too shady to grow a lawn, the deep shade that sugar maples cast can suppress oak-hickory regeneration and eliminate wildflowers in uplands.

In North America, oaks and hickories are keystone species. They are the key to the survival of many other plants and animals. Their nuts are food for turkey, squirrel, deer, and many others. The most diverse part of the forest, the ground floor, contains dozens of native wildflowers adapted to live underneath their canopy. Their leaf litter provides



CTAP forest site: The future forest will consist of small trees (left), which are largely sugar maple. While the big oaks and hickories of today (right) may be on their way out (Pope County).

food and cover for insects, salamanders, frogs, snakes, and ground feeding birds that the leaves of other trees may not. This coarse bark and stout leaves contain more insects and feed more birds than those of many other trees. When oaks and hickories decline in an area, so does food and habitat.



Upland forest undergoing sugar maple takeover. Look closely and you'll see that the largest and oldest trees (some dead) in the foreground are oaks, while the younger, smaller trees below them (orange-red leaves) are maple. Without management, maple will migrate up the slope and completely dominate the stand (Peoria County).

These forest changes can have several causes. Improper harvesting techniques (see Management Recommendations) can favor trees like sugar maple. Over-harvesting preferred trees like oak and walnut can remove seed trees for the future. In areas where white-tailed deer are over-abundant, they can preferentially browse oaks, reducing survivorship and timber quality. Where forests are isolated from one another by roads, development, and agriculture, the larger heavy-seeded, nut-producing trees are less successful at dispersing across the landscape, while lighter, wind-blown seeds of maple, elm, or ash, or bird-dispersed trees like wild black cherry and hackberry can still move long distances.

Perhaps the most important cause has occurred since the era of “Smokey Bear.” Today, small ground fires are extinguished. But, because our woodlands are adapted to ground fires, they need them to remain healthy. Fire-suppression favors thin barked, shade-tolerant trees (maple, ash, elm, etc.), at the expense of trees that tolerate ground fires, but not deep shade (i.e., oaks).

No one can say what future forests will look like, but between 1962 and 1985 the number of young maples in our forests increased by 410%, while oak numbers declined by 14%. Continued monitoring will tell us how we are doing; what management is working and what isn’t, and eventually, how to turn this trend around.

Issue #2: Future Uncertain for Forest Songbirds

Most forest songbirds such as Tanagers, Warblers, and Vireos spend their winters in the tropics. For some time it was

thought that deforestation in Central and South America was entirely responsible for declines in their numbers we were seeing here. New research suggests that tropical habitat loss is only part of the problem. CTAP, and other studies, show that shrinking forest sizes in the Midwest may be the real culprit (see graph below).



The brown cowbird egg will grow faster & larger than the blue Wood Thrush eggs (Union County).

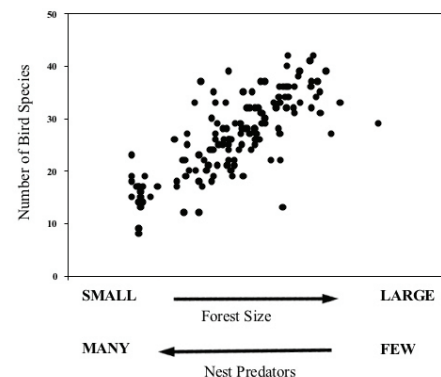
Ironically, the problem of forest size isn’t that birds don’t have enough space; the problem comes from the enemies lurking in smaller forests. One of the biggest is a little bird called the Brown-headed Cowbird (named because they perch on and feed around grazing cows and buffalo). Female cowbirds don’t build nests. Instead, they lay their eggs in other birds’ nests. These “nest parasitizers” are capable of laying 40 or more eggs in a single season. Parasitized parent birds unknowingly raise cowbirds as their own, while their own young often starve in the nest with larger and faster growing cowbird nestlings.

When forests tracts are large, cowbirds are uncommon—preferring not to stray far from open feeding grounds. But, since Illinois forests have become smaller and more fragmented, cowbirds easily make short trips from grass-land edges to lay eggs in nests of unsuspecting forest birds. They now have such easy access to forests that CTAP has



Typical fragmented Illinois forest (above). CTAP data (right) shows that fewer birds persist in small forests (Vermilion County).

CTAP Forests Sampled Across Illinois

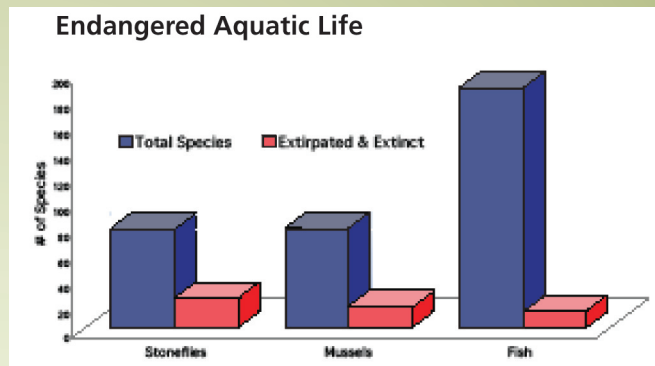


found this *grassland* bird is the second most common bird in our forests (they were found in more than 76% of forests surveyed, as often as in grasslands!).

Smaller forests also suffer greater attack from nest predators like raccoons, house cats, skunks, and black rat snakes, because these predators also prefer small woodlands and prefer not to stray into the largest forest interiors. Most Illinois forests have become a very unfriendly places for forest birds to raise a family. We think that most forest birds need about 500 yards of distance from the forest edge to be safe, but long-term study will help us understand better why songbirds are declining, and what we can do about it.

Issue # 3: Forest Streams

Aquatic or semi-aquatic animals live or die with water quality. The good news is that the treatment of domestic sewage and industrial pollution has dramatically improved since the Clean Water Act of 1970. The bad news is that “non-point source pollution” like runoff from construction sites, lawns, and agricultural lands are much more difficult to control. Both water quality and aquatic life for only 15% of Illinois streams can currently be considered to be in “good”



No groups have had more species eliminated or been driven globally extinct than our aquatic animals!

condition. As for the rest of the streams, “poor” water quality has a pretty obvious meaning, you wouldn’t want to drink or swim in it. But what does “poor” quality aquatic life mean?

A group of insects known as stoneflies are often mimicked in fishing lures. Once abundant and widespread across Illinois streams, they are quickly eliminated from entire stream systems with excessive nutrient inputs, changes to stream habitat structure, or stream temperature. In this way, they act as “bio-indicators”—they reflect the health of the

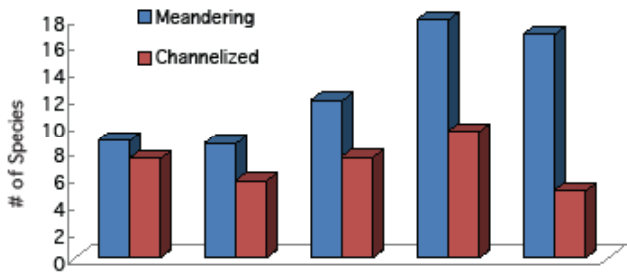
stream and the habitat around it. During the 20th Century, 20 species of stoneflies were extirpated (eliminated) from Illinois, while two others were forced to global extinction, never again to be seen. In fact, stoneflies have the highest known rate of extirpations and extinctions of any animal group in Illinois (29%), higher than freshwater mussels (21%) or for fish species (6%) (see figure above). Our stream and river life is in serious trouble.

Channelization is the act of straightening a stream channel to hasten drainage, and it appears to be the most important factor governing stream aquatic life for any stream size (see figure on next page). Channelized streams average



Scientists survey an abundance of freshwater mussels in a naturally meandering stream with cool, shaded water (McLean County).

Stream Degradation by Channelization



Data from 149 sites show that rare and sensitive aquatic insects are lost when natural meandering streams are channelized.

nearly 40% fewer rare insects than those that meander naturally. Since many fish and wildlife species rely on aquatic insects for food, the absence of these insects causes a negative ripple effect throughout the entire food chain.

Usually too steep or too flooded to be farmed or channelized, streams of forested regions in Illinois have generally fared better than those in historic prairie regions. For example, heavily wooded streams of the Shawnee Hills of southern Illinois still support nearly the full complement of their historic aquatic species.

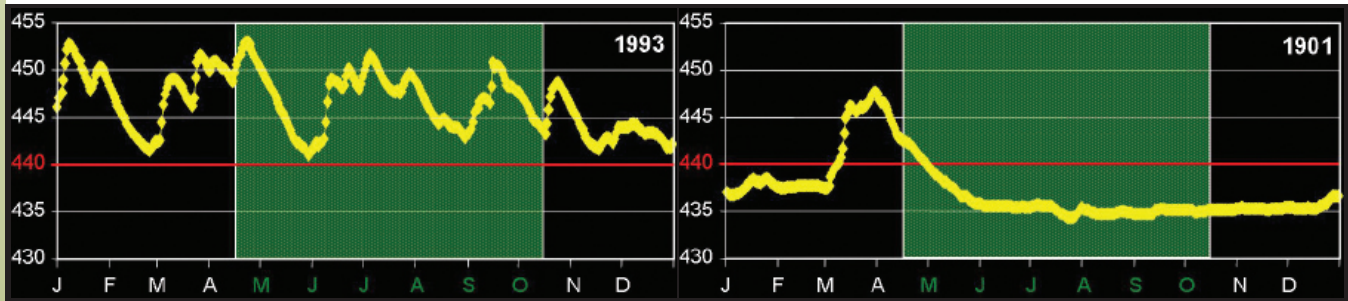
Wherever they are found, our best remaining streams often share common factors: 1) vegetation shades and cools the water in the summer, 2) large buffer zones of natural vegetation along them keep silt and fertilizer out, and 3) their waters meander naturally, unaltered by channelization, dikes, dams, levees, or ditches. Managing modern streams and their surrounding habitats to mimic these conditions will help bring back richer, more abundant stream life, and help provide the state with abundant safe freshwater.

Issue #4: Building a Better Bottomland

Floodplain or bottomland forests are highly diverse and productive for both wildlife and timber. As in uplands, nut producers and hardwoods are in decline. Trees such as pecan, walnut, swamp white oak, overcup oak, swamp chestnut oak, Shumard oak, pin oak, burr oak, sweetgum, cherry bark oak, and kingnut hickory are decreasing in Illinois bottomlands. These trees, which are prized by wildlife and people, are often being replaced by “weedier” trees like silver maple, black willow, cottonwood, sycamore, and green ash.

The cause of declines in valuable bottomland hardwoods is complex. Overharvesting seed trees, a lack of acorn and large nut dispersal, and a lack of ground fires have all affected bottomland oaks. Perhaps the most daunting problem relates to flood cycles. Surrounding wetlands and vegetation buffers once moderated water flow into waterways. They moderated annual flooding cycles to which bottomland hardwoods are adapted (see figure below). Faster runoff from urban areas, farm field tiles, stream channelization, and ditching has resulted in fast moving flood waters, deeper channels, more severe scouring of riverbanks, and higher flood stages. The modern landscape sees floods that are more extreme and can occur at any time during the year. Modern “flashy” floods, thick with sediment, favor less desirable trees because of their ability to tolerate being buried in sediment and water for long periods at any time of the year by growing adventitious roots, as opposed to bottomland hardwoods that are only adapted to regular spring floods.

Historic and Natural River Flooding vs. Modern Floods



Flooding events (river height) on the Illinois River past and present. The 1901 river (right) shows the natural flood cycle that bottomland hardwoods are adapted to, while today (left) only less desirable trees cope with extreme, year-round, flash flooding (Marshall County). The green area represents the growing season for trees (U.S.A.C.E.).

FOREST MANAGEMENT FOR THE 21st CENTURY

Good management decisions will maximize woodland health, wildlife habitat, species diversity, and timber productivity. More than 85% of Illinois forestland is privately owned, meaning that private citizens are responsible for our forest's future. Consider adopting these suggestions to improve forest health.

► **Keep out Invasive Species.** One of the fastest ways to ruin a forest is to allow invasive exotic plants to take over. Keep pests like garlic mustard, autumn olive, Japanese honeysuckle, bush honeysuckle, European buckthorn, *Microstegium*, wild potato vine, Tree-of-Heaven, and multi-flora rose out of your woods! Mowing the understory or creating too many large paths will help invasive plants establish, while harming ground-nesting birds and woodland wildflowers.

Publications and information on invasive plant identification and control:

- ◆ http://www.na.fs.fed.us/pubs/misc/ip/ip_field_guide.pdf
- ◆ <http://www.invasive.org/eastern/srs/>
- ◆ <http://www.mipn.org/>
- ◆ <http://www.invasivespeciesinfo.gov/unitedstates/main.shtml>

Information on Illinois tree pests:

- ◆ http://fhm.fs.fed.us/fhh/fhh-05/il/il_05.pdf
- ◆ http://na.fs.fed.us/spfo/pubs/pest_al/eab/eab.pdf
- ◆ <http://www.agr.state.il.us/eab/>

► **Timber Harvesting for Profit & Conservation.** If you're planning on harvesting timber, seek technical assistance from an Illinois Department of Natural Resources (IDNR) District Forester. They will help you maximize profit and minimize harvest damage. Make sure to leave plenty of mature oaks, hickories, and walnuts as future seed sources. Soil disturbance and ruts from heavy equipment can leave scars and eliminate rare wildflowers for many decades or centuries after a cut. Harvesting on dry or frozen ground can reduce soil damage.

Information on tree harvesting programs; contacting your District Forester; preparing a Forest Management Plan

- ◆ <http://web.extension.uiuc.edu/forestry/home.html>
- ◆ <http://dnr.state.il.us/conservation/forestry>
- ◆ <http://ifdc.nres.uiuc.edu/>
- ◆ http://na.fs.fed.us/spfo/pubs/wildlife/nesting_birds/index.htm

Hundreds of Forest Service publications

- ◆ <http://na.fs.fed.us/pubs/alpha.shtm>

► **Restore Fire.** Prescribed ground fires can help remove invasive species, promote oak and hickory regeneration, and attract wildlife to your forest. Many bottomland forests also benefit from periodic fire. Fires should be conducted under professional guidance with a prescribed burn plan. Conduct burns after leaf drop in the fall, but before native wildflowers emerge in spring (until March 15th). Burn no more than half of a forest stand at a time, every several years, to allow wildlife and beneficial insects a refuge in unburned patches. Contact your local fire department, conservation group, IDNR Restoration Ecologist, Wildlife Biologist, or District Forester for more information about prescribed fire. In areas where fire isn't a management option, contact your IDNR District Forester for timber stand improvement options to ensure oak regeneration.

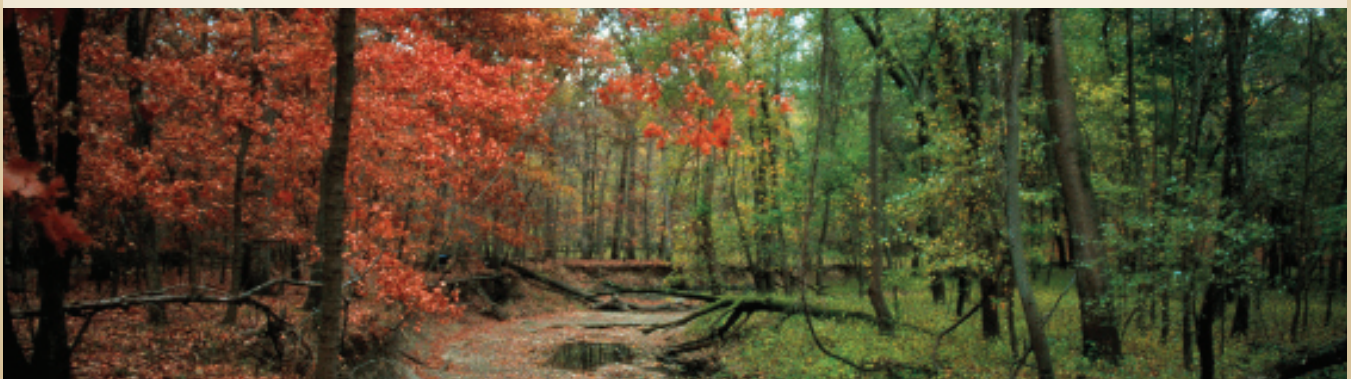
➤ **The Bigger the Better.** Larger, unbroken forest tracts provide habitat for many forest birds, mammals, and wildflowers that can't thrive in smaller tracts. Avoid breaking up contiguous forests with wildlife plantings, food-plots, roads, clearings, or other disturbances. This will minimize inroads for pests and invasive species to take hold. You can also reduce cowbird food near woodland edges by minimizing short grass, bare ground, and not closely mowing roadsides.

➤ **Hunting to Maintain Balance.** In many areas deer are overabundant and out of balance. When overcrowded, they can browse crops and gardens, impact tree regeneration, devastate wildflowers, remove understory bird nesting habitat, cause automobile accidents, and spread disease in the herd. Consider allowing deer hunting on your property.

➤ **Downed Wood, Tree Snags, Tree Cavities.** Leave dead or decomposing wood where it lies because it is a goldmine for animals. All wildlife—frogs, turtles, birds, salamanders, mammals, wildflowers, and beneficial insects— increase in numbers with dead wood to provide shelter, moisture, and food. Hollow trees and tree cavities are critical habitat for mosquito-eating bats, hibernating mammals, woodpeckers, and dozens of cavity nesting birds. Unless you know you have a specific disease or pest, leave dead wood to decompose naturally. IT WILL NOT CAUSE TREE DISEASE. Dead trees near structures should be dealt with, but in the forest, deadwood is beneficial to the forest. Naturally occurring wood snags left in streams will boost fish numbers and increase overall stream diversity as well.

➤ **Keep Streams Buffered.** Maintain the natural vegetation cover along streams to help keep water shaded, cool, and rich in oxygen for aquatic life. Keep at least a 50-foot natural vegetation buffer along the sides of streams to hold back pollution and to provide wildlife habitat. Eliminating nutrient additions to water from manure, soil erosion, fertilizer, septic waste, or livestock can stop the single largest destroyer of aquatic life in the Midwest—nutrient pollution. Restrict access of livestock to streams to maintain stream-bank vegetation to keep the soil in place and minimize livestock waste input.

➤ **A More Natural Flood.** Bottomland forests are adapted to regular, early winter and spring flooding that draws down in the summer and fall. Valuable bottomland hardwoods can be replaced by silver maple, cottonwood, sycamore, and willow when floodplains and waterways are highly altered with year-round flash flooding, soil-runoff, and large sediment deposits. Avoid channelizing streams and keep natural vegetation buffers around streams to allow for natural hydrology and moderate flood cycles.



Small differences in hydrology create upland or bottomland forest (Wabash County).

FOR FURTHER INFORMATION

Conservation Incentives

Information on tax incentives for conservation, legal protection of lands and habitats, and dedicating land trusts

- ◆ Contact your local Nature Preserves staff member for information on legal protection:
<http://dnr.state.il.us/INPC/fieldstaff.htm>
<http://dnr.state.il.us/INPC/protection.htm>
- ◆ The Conservation Stewardship Program provides tax incentives for maintaining natural lands:
<http://dnr.state.il.us/Stewardship/index.htm>



Wood Thrush (Champaign County).

CTAP Web Site

- ◆ <http://ctap.inhs.uiuc.edu/>

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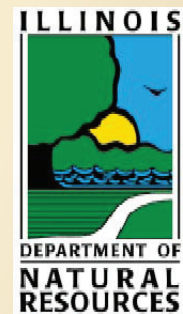
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Red fox (Peoria County).

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