



Strategic Plan

2020-2024

This Strategic Plan was developed by the Tippecanoe Invasive Cooperative Taskforce (TICT) to provide an approach to invasive species control and management activities over a five-year period. The TICT Steering Committee (current January 2020) involved in creating this Strategic Plan is:

Angie Miller	Tippecanoe County Soil and Water Conservation District
Zach Musser	Indiana Department of Natural Resources
Gus Nyberg	NICHES Land Trust
Mickey Penrod	Indiana Native Plant Society & Master Gardeners of Tippecanoe County
Bryce Patz	City of West Lafayette - Department of Development
Ben Wegleitner	City of Lafayette & Tippecanoe Co. Partnership for Water Quality
Ron Haston	Haston Habitat LLC Ecological Land Management



Bush honeysuckle (Lonicera spp.) and Canada thistle (Cirsium arvense) are examples of established invasive species in Tippecanoe County (Photo Credit: Tippecanoe County Soil and Water Conservation District).

Introduction

Invasive species are plants, animals, insects, or pathogens that are non-native to local ecosystem and whose introduction is likely to cause ecological or economic harm or have human health impacts. They outcompete native species in their introduced range because they grow quickly, reproduce rapidly, and lack browsers or predators that would otherwise keep their populations in check.

Invasive species primarily spread because of human activities. Ornamental and landscape plants escape cultivation to invade wild areas; seed mixtures are unintentionally tainted with the seeds of an invasive species; ships and boats carry aquatic organisms in their ballast water or on propellers; seeds from an invasive plant are translocated to new locations by sticking to clothing or footwear of hikers, hunters, or birdwatchers; invasive animals kept as pets escape or are intentionally released into the wild. Many of these example pathways for introduction are accidental or unintentional but the establishment of an invasive plant or animal population can incur serious consequences.

Economic Impacts of Invasive Plant Species

More than 120 invasive terrestrial and aquatic plant species have been discovered in the State of Indiana and preventing and controlling these species is paramount to the health of Indiana’s native ecosystems and economy. Control and management alone costs state and local governments and private landowners more than \$5.8 million each year in Indiana (Invasive Plant Advisory Committee, 2013). Preventing invasive species introductions or eradicating while population sizes are small are the most effective means for limiting the cost and effort required for controlling invasions. However, large-scale eradications are often infeasible or logistically impossible by the time population sizes are large enough to detect or cause obvious negative impacts (Figure 1).

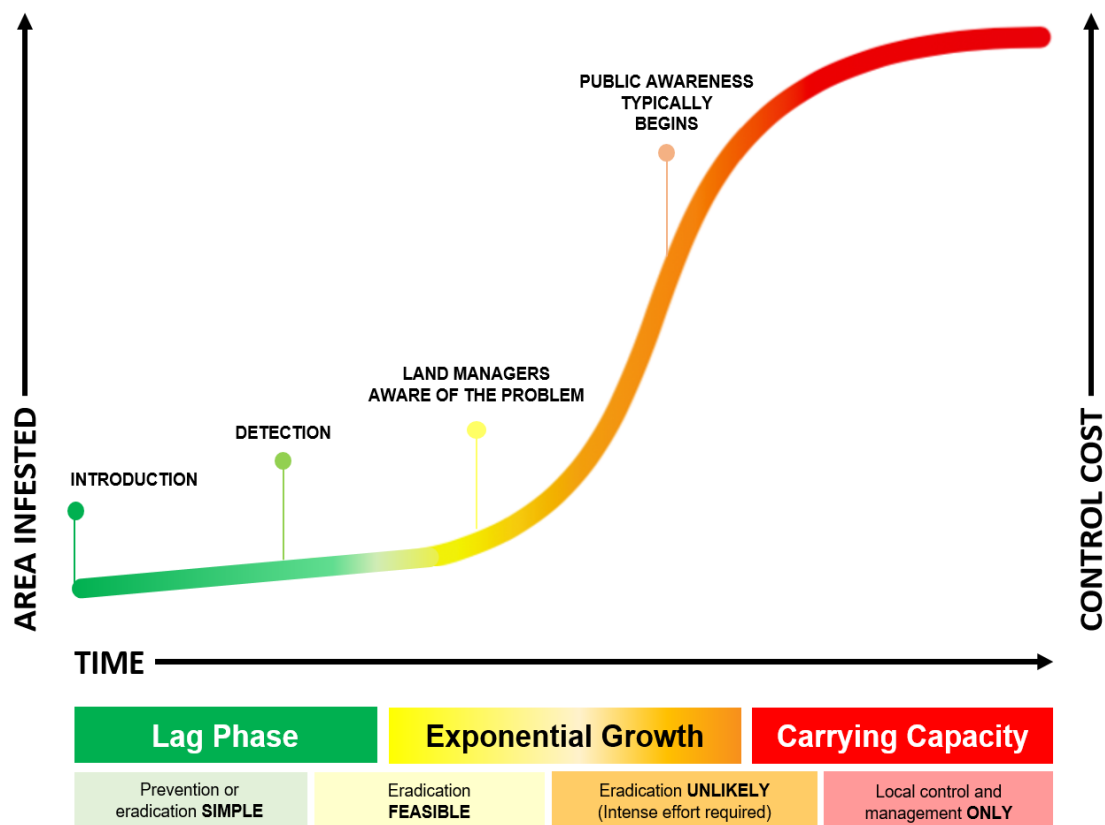


Figure 1. Invasion curve (adapted from Southwest Montana Science Partnership’s Module on Plants and Pollinators and the Oregon Statewide Plan for Invasive Species: 2017-2027).

Natural areas provide non-market values and ecosystem services—such as flood mitigation and water filtration, carbon sequestration, and landscape aesthetics—that can be lost when invasive species become established (Charles and Dukes, 2008; Holmes and others, 2009; Devine and Fei, 2011). All of these factors contribute to higher quality of life and increased property values for residents. Cities and local governments must actively engage in managing invasive species in public spaces to maintain these benefits for residents.

Ecological Impacts

Invasive plants can disrupt native communities through decreased habitat quality and can even displace native species that normally provide critical habitat resources for wildlife, including threatened and endangered species. And although dense stands of invasive plants can provide additional nesting or foraging opportunities for birds (McCusker and others, 2010), studies indicate that bird nest predation increases in areas dominated by exotic shrubs (Borgmann and Rodewald, 2004).

Invasive species can also directly harm native species through competition. Forest understories that are dominated by invasive bush honeysuckle can display a 53% reduction in annual hardwood tree growth, and regeneration of these native species is greatly impeded due to competition for sunlight, soil nutrient resources, and water (Hartman and McCarthy, 2007). These interactions directly and negatively impact Indiana's timber industry and hinder forest regeneration in the long-term.

Lastly, many ornamental plants are popular in the landscaping trade because they are not palatable to local (native) insects. Many songbird species rely on access to insects, particularly caterpillars, to feed their young. Although adult birds may be able to adopt a generalist feeding strategy by eating bird seed at a feeder, the species cannot survive without a local insect population to feed the young.

What's at Stake?

Beyond the economic costs and ecological impacts of invasive species (including budget), the establishment of invasive plants poses a direct threat to two major sectors of Indiana's economy: agriculture and forestry. The agriculture industry as a whole (including forest products) adds \$31.2 billion to Indiana's economy annually (Indiana State Department of Agriculture, 2019). As much as 84% of the land in Indiana consists of farms and forests (Indiana State Department of Agriculture, 2019)

Indiana's forests alone contribute an estimated \$9 billion per year to the state's economy — approximately \$1 billion of that coming from forest-based recreation and tourism (Indiana DNR Division of Forestry, 2013). Indiana ranks 9th in total lumber production and 3rd in hardwood lumber production in the nation (Indiana DNR Division of Forestry, 2013). The Department of Natural Resources estimates that each board foot harvested from Indiana forests has an economic impact of \$43 (Indiana's Hardwood Industry: Its Economic Impact, 2016).

In Indiana, 85% of wooded lands are owned by approximately 190,000 private landowners (Indiana's Hardwood Industry: It's Economic Impact, 2016). With so many landowners, controlling invasive species requires landscape-level planning and coordination that extends beyond property lines and political boundaries.

Regulatory Approaches

Beginning in 2008, the State of Indiana adopted a noxious weed law, requiring the removal or destruction of certain harmful plant species. In 2009, Governor Mitch Daniels signed legislation to create the Indiana Invasive Species Council to enhance the ability of local governments to monitor and manage invasive species and to increase public awareness. The council recommends policy and legislative changes to improve invasive species measures in Indiana.

In 2019, lawmakers passed Terrestrial Plant Rule 312 IAC 18-3-25, designating 44 terrestrial plant species as invasive pests. The rule makes it illegal to sell, distribute, or transport these plants in Indiana. While this new rule is expected to prevent new introductions of some invasive plants,

challenges remain in the effort to control impacts of species that are already well established in rural and urban areas throughout the state (*e.g.*, bush honeysuckle *Lonicera spp.*).

A Need for Education

A survey of 2,600 private woodland owners in Indiana conducted by researchers at Purdue University found that 34% self-reported as having no or low familiarity with invasive plants, while 26% were only moderately familiar but unable to identify common invasive species (Ma and others, 2018). Despite these numbers, nearly 77% of respondents reported a moderate to great level of concern about invasive plants in their own woodlands, and 68% reported the same level of concern about invasive species on nearby or neighboring private and public lands.

Box 1. USDA's Role in Invasive Species Management

The United States Department of Agriculture Natural Resource Conservation Service (NRCS) and county Soil and Water Conservation Districts are a major funding source for invasive species management in Indiana. The conservation practice “Brush Management” is eligible for cost-share funds under the Environmental Quality Incentives Program (EQIP), which includes the management and removal of woody and herbaceous invasive plants.

Brush Management is the second most planned conservation practice in the State of Indiana—second only to cover crops—with approximately 9% all EQIP of dollars obligated to the practice. Between 2011 and 2019, brush management was performed on 237,795 acres and paid \$24,032,968 in cost-share assistance to landowners. In 2019 alone, there were 18,225 acres planned for brush management in Indiana (although not all planned acres received funding).

In Tippecanoe County, more than \$248,000 in cost-share assistance has been paid to landowners for brush management on woodlands since 2008 (totaling 605 acres). Cost-share assistance for Tippecanoe County landowners implementing brush management was used to manage invasive species on total of 106 acres in 2019 (cost-share applications for brush management in 2019 exceeded 660 acres).

Our Area

Tippecanoe County is approximately 500 square miles in size. The county is primarily comprised of agricultural lands (71%) and developed urban or suburban areas (14%). Although forests make up less than 12% of land cover in Tippecanoe County, these wooded areas provide valuable habitat for game and non-game wildlife species and act as corridors between fragmented patches of quality habitat. These areas also provide recreation opportunities on public and private lands.

TIPPECANOE COUNTY, IN

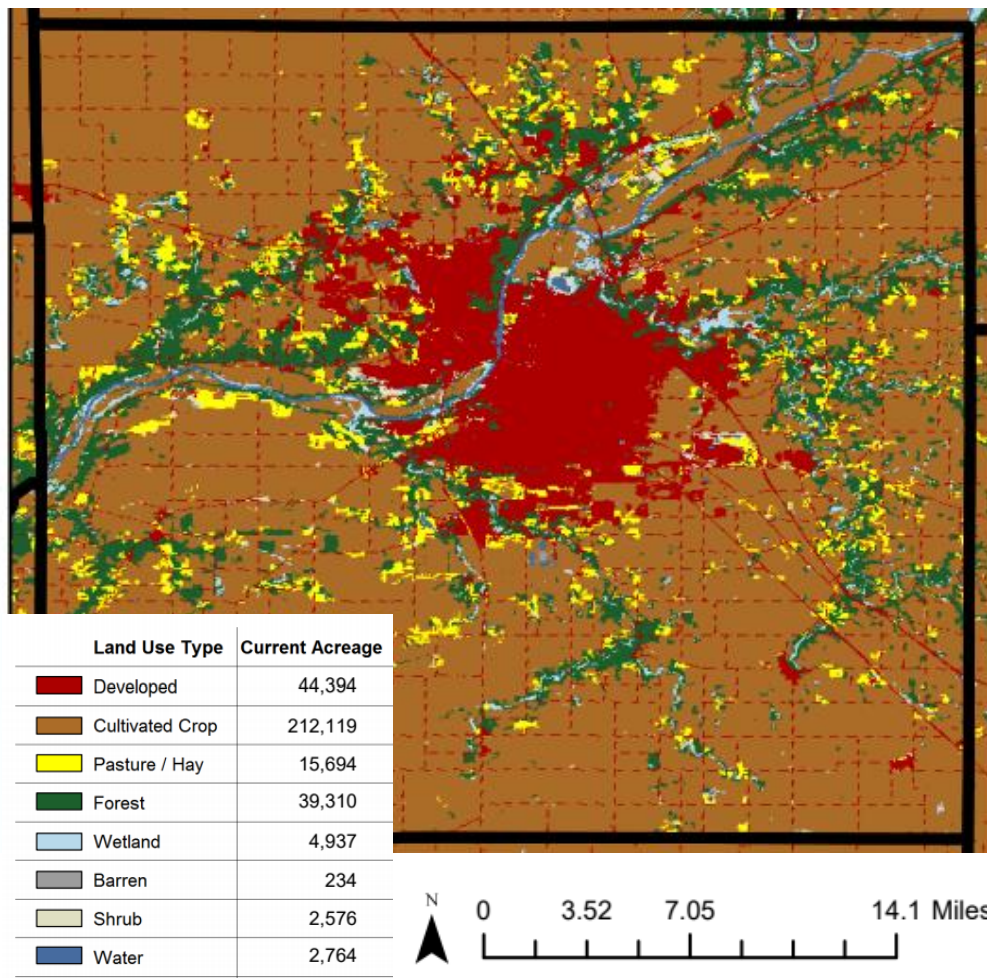


Figure 2. Tippecanoe County land use statistics (from NLCD 2016; summary created by Tipping Point Planner).

According to reports in the Early Detection and Distribution Mapping System (EDDMapS), 54 plants found in Tippecanoe County are listed as invasive (Appendix 1). Plants on this list include both woody and herbaceous species capable of invading a wide variety of landscapes including roadsides, agricultural fields, grasslands, wetlands and forests. The list classifies species according to invasion status, with 3 categories: low risk of establishment, great risk of establishment, and well established.

Tippecanoe Invasive Cooperative Taskforce

TICT is a stakeholder-guided organization, established with the intent to provide education about invasive species impacts and to facilitate collaboration between landowners, professionals, and volunteers throughout the county. The TICT Steering Committee has representatives from state, county, and municipal governments, non-government organizations (NGOs), education entities, and private contractors. TICT aims to maximize the effectiveness of collaborative efforts by coordinating support and resources—financial or otherwise.

External Guidance

Advisors from the Southern Indiana Cooperative Invasives Management (SICIM) were an integral part of the establishment of TICT. Through its work with the Indiana Invasives Initiative, SICIM has helped to establish Cooperative Invasive Species Management Areas (CISMAs)—including TICT—throughout Indiana. These CISMAs then address invasive species prevention, control and management at the local level. SICIM also provides guidance to inform TICT of statewide policy changes and align TICT’s goals with other CISMAs throughout Indiana to maximize outcomes and work across political boundaries.

Organizational Structure

The bulk of the work outlined in this Strategic Plan is completed by committees and working groups. Committees are established based on the goals and needs of TICT as a whole. TICT currently recognizes the following committees: Steering Committee, Education Committee, Eradication Committee, and Reporting Committee. Committees are guided by the leadership of representatives from partner agencies and organizations as well as volunteers.

At the time of the development of this Strategic Plan, TICT functions as an informal partnership between government agencies or departments and non-government organizations in Tippecanoe County. Moving forward, the organization will develop long-term, structural goals by 2024. This includes the development of bylaws and the creation of Memorandums of Agreement/Understanding with partner groups. TICT will also explore the option of adopting a 501(c)(3) status. In the long-term, TICT aims to formalize its structure in a manner that ensures that the group is viable and sustainable, even as individuals representing each of the entities on the Steering Committee change.

Our Mission

TICT prevents, controls, and reduces invasive species impacts in Tippecanoe County through community education and action.

TICT Strategic Plan

The strategic planning process was completed over a 12-month period using feedback from diverse stakeholders from Tippecanoe County. TICT will continually evaluate, adapt, then re-evaluate its operations and effectiveness to ensure the needs, challenges, and goals for invasive species management are being met throughout the county.

TICT developed the following five-year Strategic Plan as guidance for the organization framework and long-term direction of collaborative invasive species management in Tippecanoe County. Likewise, this Strategic Plan is the first step toward eligibility to apply for and access funding resources to accomplish the goals and objectives outlined below.

Focus Areas

In 2020-2024, TICT will direct its efforts in three focus areas: Prevention, Early Detection, and Management (Figure 3). Through these focus areas, we will bring information, training, tools, and coordination to efforts to prevent, control, and limit invasive species impacts in Tippecanoe County. The three focus areas encompass individual goals and desired outcomes related to invasive species management throughout the county.

Focus Areas	Goals
Prevention	Goal 1: Increase public knowledge of invasive species Goal 2: Decrease number of invasive plants bought, sold, or planted in Tippecanoe County
Early Detection	Goal 3: Increase the amount of invasive species reporting in Tippecanoe County
Management	Goal 4: Increase the amount of invasive species control in Tippecanoe County

Figure 3. Strategic focus areas and associated goals for TICT 2020-2024.

Focus Area: Prevention

Prevention remains the most efficient method for combating the spread of invasive species (Figure 1). The Indiana Invasive Species Council developed a list of 10 best management practices (BMPs) to minimize the risk of spreading invasive species across the landscape or through waterways. Some of these practices include using native plants and seeds from “weed-free” sources, monitoring disturbed locations for signs of invasive populations, keeping tools and equipment clean, and educating the public about invasive species and their impacts (a comprehensive list can be found on the IISC website; <https://www.entm.purdue.edu/iisc/index.html>).

The two primary prevention strategies for TICT are to 1) conduct public education and 2) partnering with—and providing education and training to—nurseries, landscapers, contractors, and other businesses to prevent invasive species from being intentionally planted. Public education and awareness of the issue of invasive species is recognized as being the first step to controlling existing populations. Educating more targeted audiences like landscapers and nurseries prevents the intentional planting of known invasive species and subsequent spread by seed dispersal.

Current Efforts in Tippecanoe County

Members and ambassadors from the Indiana Native Plant society, along with Tree Lafayette, West Lafayette Tree Friends, and other non-governmental organizations are already raising awareness about invasive species in Tippecanoe County through educational displays, speaking engagements, and events. Likewise, the Wabash River Enhancement Corporation encourages the use of native plants for their urban and agricultural cost-share programs.

Key Players

- Tippecanoe Co. Soil & Water Conservation District
- USDA Natural Resource Conservation Service
- Indiana State Department of Agriculture
- USDA Animal and Plant Health Inspection Service (APHIS)
- Indiana Department of Natural Resources

Partners

- IN Forestry & Woodland Owners Assoc.
- Tippecanoe County Naturalists
- Wabash River Enhancement Corporation
- City of Lafayette
- West Lafayette Tree Friends
- NICHES Land Trust
- Media Outlets
- Nurseries and businesses
- Purdue University Department of Forestry and Natural Resources
- Homeowners Associations and neighborhood associations
- Indiana Native Plant Society
- Soilmaker Composting
- Purdue University Extension Specialists
- City of West Lafayette
- Tree Lafayette
- Prophetstown State Park
- K-12 Educators
- Informal educators
- Neighboring CISMAs
- Resource users: hikers, bikers, birders, hunters, anglers, photographers

Goal I: Increase public knowledge of invasive species in Tippecanoe County

Strategies	Responsible Party	Timeframe
Develop “Top 3 Invasive Species” to prioritize early identification, control, & management	All Partners	Jan 2020
Create “Top 13 Invasive Species” list for awareness and removal in Tippecanoe County	All Partners	Jan 2020
Create “Invasive Species of the Month” programs, timed with optimal control periods	Education Committee	2021
Host field days, workshops, and outreach events to train the public to identify, report, and control invasive species (12 per year)	Education Committee	Ongoing
Identify priority areas (neighborhoods, townships, etc.) and conduct outreach (minimum of 10 by 2022)	Education Committee	Ongoing
Conduct targeted outreach campaigns to, organizations, clubs, demographics, etc.	Education Committee	Ongoing
Utilize traditional and social media/advertising for education and outreach	Education Committee	Ongoing
Create or modify fact sheets and other educational materials as needed	Education Committee	Ongoing
Conduct site visits for private landowners to survey extent of invasive species and begin steps toward removal/control (minimum 25 per year)	Steering Committee	Ongoing
Conduct formal surveys of public knowledge of invasive species in Tippecanoe County using social science techniques	Steering Committee	2022+

Outcomes

- Residents, landowners, and resource managers will recognize common invasive species and understand the negative impacts they cause
- Students and teachers will have a better understanding of invasive species and the threats they cause to native ecosystems

Performance Measures

- Educate 57,000 people (30% of population) in Tippecanoe County about invasive species
- 1,000 people will attend TICT events by 2024
- 15,000 people will engage with TICT via social media

Goal 2. Actively seek to reduce the number of invasive species bought, sold, and planted in Tippecanoe County

Strategies	Responsible Party	Timeframe
Conduct targeted education to plant nurseries	Steering Committee	2020; Ongoing
Distribute information about the statewide Terrestrial Plant Rule to landscapers, gardeners, and other audiences	Education Committee	2020; Ongoing
Update Purdue University Master Gardener and Master Naturalist curriculum to include invasive species	Education Committee	2021
Promote the use of native plants and Grow Native program to private citizens in urban and rural areas of the county	Education Committee	Ongoing
Develop a local invasive species ban on certain harmful plants not listed on the statewide prohibited species list	Education Committee	2024

Outcomes

- Residents, landowners, and businesses will have access to information, tools, and training to make sound decisions about invasive species prevention in landscaping and other situations
- Residents, landowners, and resource managers understand the importance of native species for habitat, biodiversity, and ecosystem services

Performance Measures

- No species listed as “invasive” by the Indiana Invasive Species Council or from the local list of banned species will be sold in Tippecanoe County

Focus Area: Early Detection

Second only to prevention, early detection is the last line of defense for a cost-effective and feasible strategy to combatting invasive species before exponential population growth begins (Figure 1). However, detecting populations when they are small enough to control—and subsequently having an expert validate the identification—is inherently difficult. These hurdles often lengthen the response time and can cause managers to miss the window of optimal timing of control.

Advances in smartphones and other technologies, however, have improved the reporting, validating, and mapping of invasive species. Applications like the Early Detection and Distribution Mapping System (EDDMapS) allow users to upload geotagged photographs of invasive plants to a database, where the identifications can be confirmed by expert users. The results automatically generate a map of verified invasive species in the county and provides an estimate of population size.

EDDMapS is the official invasive species reporting mechanism for Indiana recommended by the Indiana Invasive Species Council.

Current Efforts in Tippecanoe County

The Tippecanoe County Soil and Water Conservation District and the Indiana DNR Division of Forestry are currently working to document populations of invasive species in Tippecanoe County when afield. Other invasive species presence data has been collected intermittently by other non-government natural resource professionals and by informed public citizens using EDDMapS.

A more concentrated effort on data collection and mapping is needed to make informed decisions about resource allocation.

Key Players

- Tippecanoe Co. Soil & Water Conservation District
- USDA Natural Resource Conservation Service
- Indiana Department of Natural Resources
- Indiana Department of Agriculture
- USDA Animal and Plant Health Inspection Service (APHIS)

Partners

- City of West Lafayette
- City of Lafayette
- Land Management Contractors
- NICHES Land Trust
- Prophetstown State Park
- Indiana Native Plant Society
- Tree Lafayette
- Neighboring CISMAs
- Local and State Highway Departments
- Private Landowners
- Purdue University Extension Specialists
- Remove Invasive Plants (RIP) Squad
- Wabash River Enhancement Corporation
- Tippecanoe County Naturalists
- Purdue University Department of Forestry and Natural Resources
- Neighborhood associations

Goal 3: Increase the amount of invasive species reporting in Tippecanoe County to identify existing and emerging populations

Strategies	Responsible Party	Timeframe
Establish baseline invasive species presence data using transect methods	Steering Committee	2020
Develop list of target species to report	Reporting Committee	2020
Update list of target species to report based on emerging concern, new populations, new species, etc.	Reporting Committee	Ongoing
Host EDDMapS Reporting Blitz, and other reporting-specific outings (minimum 2 per year)	Reporting Committee	Ongoing
Host EDDMapS training sessions for public audiences and resource professionals (minimum 4 per year)	Reporting Committee	Ongoing

Outcomes

- Citizen science engagement and training leads to improving our knowledge of invasive species presence, distribution, and impacts in Tippecanoe County
- Early detection of new and emerging populations will lead to a more rapid response for control

Performance Measures

- 2,500 invasive plant reports will be collected in EDDMapS by 2024 to improve the baseline dataset

Focus Area: Management

Tippecanoe County is fortunate to have a number of departments, agencies, and organizations working to control and manage invasive species (in addition to all of the private landowners working independently). The following describes just some of the known past and current efforts to control and manage invasive species in Tippecanoe County.

Government Agencies and Departments

The DNR's Prophetstown State Park is actively working to control populations of invasive species, including autumn olive, honeysuckle, and garlic mustard, and the USDA NRCS and Tippecanoe County Soil and Water Conservation District (SWCD) have been working with private landowners to manage invasive species on over 600 acres in the county since 2008 (see Box 1 – page 6).

Multiple departments—including Lafayette and West Lafayette Parks, Tippecanoe County Parks, Lafayette Renew, and the West Lafayette Department of Development—are working to control invasive plants when they interfere with green space, green and gray infrastructure projects, and other routine departmental activities. However, because of time and budget constraints, invasive species management is not currently prioritized by any single department within the Cities of Lafayette and West Lafayette.

Organizations and Volunteer Groups

NICHES Land Trust manages multiple properties with eradication efforts underway for populations of honeysuckle, autumn olive, tree of heaven, and other species. NICHES is also working with Purdue University and the Wabash River Enhancement Corporation (WREC) to control invasive species on properties owned by these entities.

The Remove Invasive Plants (RIP) Squad is a volunteer organization working to control terrestrial invasive species in Tippecanoe County parks and city parks in both Lafayette and West Lafayette. Currently, this group only works on city or county-owned properties. In March-May 2019, volunteers spent over 127 hours in West Lafayette Parks, restoring habitat for native species in these ecologically sensitive areas.

Key Players

- Tippecanoe Co. Soil & Water Conservation District
- USDA Natural Resource Conservation Service
- Indiana Department of Natural Resources
- Indiana Department of Agriculture
- Prophetstown State Park
- City of Lafayette
- City of West Lafayette
- Local and State Highway Departments

Partners

- Private Landowners
- Land Management Contractors
- Remove Invasive Plants (RIP) Squad
- Wabash River Enhancement Corporation
- Indiana Native Plant Society
- The Nature Conservancy
- Purdue University Department of Forestry and Natural Resources
- Neighboring CISMAs
- Pheasants Forever
- NICHES Land Trust
- Homeowners associations and neighborhood associations

Goal 4: Increase the amount of invasive species control taking place in Tippecanoe County

Strategies	Responsible Party	Timeframe
Continue and expand upon the efforts of the Remove Invasive Plant (RIP) Squad	Eradication Committee	Jan 2020; ongoing
Host (or co-host) a minimum of 12 field days and workshops per year	Eradication Committee	Ongoing
Identify priority areas for invasive species control and conduct eradications (Minimum of 10 by 2022)	Eradication Committee	Ongoing
Develop contractors list, equipment loan framework, and other resources to improve rapid response across jurisdictions	Eradication Committee	2020; Ongoing
Secure funds for cost-sharing for invasive species control and increase availability	Steering Committee	2020
Work with agencies and governments to control invasive species on public lands	Steering Committee	2020; Ongoing
Gather feedback from field day/workshop participants, partners, and others and modify eradication strategies accordingly	Steering Committee	Ongoing

Outcomes

- Businesses and resource managers use tools and information to take actions that restore habitats, biodiversity, and ecosystem services in areas degraded by invasive species
- Improved collaboration between Tippecanoe County stakeholders and resource managers leads to better stewardship

Performance Measures

- Invasive species control will occur at 50 sites throughout all 12 townships of Tippecanoe County

Challenges to Implementation

TICT foresees the following challenges to implementing this strategic plan and succeeding in efforts to prevent, control, and reduce invasive species impacts in Tippecanoe County:

1. **Encouraging Behavior Changes** – Effective messaging and strong technical and financial support will be required to encourage behavior change from landowners and businesses. Likewise, engaging new participants to be involved with TICT education or removal programs presents a significant challenge. This includes recruiting new volunteers—and keeping them engaged—as well as getting private landowners to act on their properties.
2. **Acquiring and Distributing Resources** – Because of the current organizational structure, TICT will rely on its NGO partners to apply for (and accept) grants, while securing any matching funds from the governments supporting the group. TICT intends to work with these government and NGO partners to overcome this hurdle and further garner financial support to carry out TICT’s mission.
3. **Economic, Social, and Legal Hurdles** – The Terrestrial Plant Rule is not a comprehensive list and does not include popular landscape plants like Callery Pear (*Prunus calleryana*) and Burning Bush (*Euonymus alatus*), which are known to escape cultivation. Implementing a local ban on these and other unlisted species will present economic and social challenges for nurseries and plant sellers, homeowners, and businesses. Likewise, executing such a ban will require strong support for local governments and from engaged, active citizens who understand the impact invasive species have on our landscape.

A Path Forward

Invasive species are having a growing negative impact on local and state economies and ecosystems in Tippecanoe County and throughout Indiana. TICT has emerged as the umbrella organization to educate and engage the public in efforts to prevent, control, and manage invasive species impacts in our area. TICT is well positioned to coordinate and focus control efforts on the species that are having the greatest impact on these resources. Implementing this strategic plan will undoubtedly require effective partnerships and investment. Tippecanoe County is unique in that there are many government and non-government entities working on environmental and social issues. Adding invasive species to the list of priorities will have a drastic impact on the natural resources, economic stability, and quality of life in Tippecanoe County.

References

1. Borgmann KL and Rodewald AD (2004) Nest predation in an urbanizing landscape: the role of exotic shrubs. *Ecological Applications* 14:1757–1765. doi:[10.1890/03-5129](https://doi.org/10.1890/03-5129)
2. Charles H and Dukes JS (2008) Impacts of Invasive Species on Ecosystem Services. In: Nentwig W. (eds) *Biological Invasions. Ecological Studies (Analysis and Synthesis)*, vol 193. Springer, Berlin, Heidelberg https://doi.org/10.1007/978-3-540-36920-2_13
3. Devine K and Fei S (2011) A review of impacts by invasive exotic plants on forest ecosystem services. In: Fei, Songlin; Lhotka, John M.; Stringer, Jeffrey W.; Gottschalk, Kurt W.; Miller, Gary W., eds. *Proceedings, 17th central hardwood forest conference; 2010 April 5-7; Lexington, KY; Gen. Tech. Rep. NRS-P-78*. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station: 425-435.
4. Hartman KM and McCarthy BC (2007) A dendro-ecological study of forest overstorey productivity following the invasion of the non-indigenous shrub *Lonicera maackii*. *Applied Vegetation Science* 10:3-14. Retrieved from <https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1654-109X.2007.tb00498.x>
5. Holmes TP (2009) Economic Impacts of Invasive Species in Forests. *Annals of the New York Academy of Sciences* 1162(1):18–38. doi:10.1111/j.1749-6632.2009.04446.x.
6. Indiana Department of Natural Resources (Undated) Indiana forest facts. Accessed on February 7, 2020 from <https://www.in.gov/dnr/forestry/2881.htm>.
7. Indiana DNR Division of Forestry (2013) Forest management and the economy. Accessed on February 7, 2020 from [https://www.in.gov/dnr/forestry/files/fo-Management and Economy.pdf](https://www.in.gov/dnr/forestry/files/fo-Management%20and%20Economy.pdf)
8. Indiana State Department of Agriculture (2019) Indiana Agriculture Brochure. Accessed February 7, 2020 from [https://www.in.gov/isda/files/Brochure Indiana%20agriculture%20\(small\).pdf](https://www.in.gov/isda/files/Brochure%20Indiana%20agriculture%20(small).pdf)
9. Ma Z, Clarke M, and Church S (2018) Insights into individual and cooperative invasive plant management on family forestlands. *Land Use Policy* 75: 682-693. doi: [10.1016/j.landusepol.2018.02.010](https://doi.org/10.1016/j.landusepol.2018.02.010)
10. McCusker CE, Ward MP, and Brawn JD (2010) Seasonal responses of avian communities to invasive bush honeysuckles (*Lonicera* spp.). *Biological Invasions* 12:2459-2470. <https://doi.org/10.1007/s10530-009-9655-5>
11. Settle J, Gonso C, and Seidl M (2016) Indiana’s hardwood industry: its economic impact. An update of the 2010 Hoover/Settle report. Accessed on February 7, 2020 from https://www.in.gov/isda/files/Indiana_Hardwoods_and_Their_Economic_Impact.pdf

Appendix I. List of Indiana Invasive Species Council-classified invasive species detected in Tippecanoe County, as reported in EDDMapS (as of December 2019).*

Species reported in Tippecanoe County that are designated as “Highly Invasive”.

Common name (Scientific name)	
Norway maple (<i>Acer platanoides</i>)	Tree of heaven (<i>Ailanthus altissima</i>)
Garlic mustard (<i>Alliaria petiolate</i>)	Japanese barberry (<i>Berberis thunbergii</i>)
Musk thistle (<i>Carduus nutans</i>)	Asian bittersweet (<i>Celastrus orbiculatus</i>)
Spotted knapweed (<i>Centaurea stoebe</i>)	Canada thistle (<i>Cirsium arvense</i>)
Bull thistle (<i>Cirsium vulgare</i>)	Poison hemlock (<i>Conium maculatum</i>)
Field bindweed (<i>Convolvulus arvensis</i>)	Common teasel (<i>Dipsacus fullonum</i>)
Autumn olive (<i>Eleagnus umbellate</i>)	Wintercreeper (<i>Euonymus fortune</i>)
Japanese knotweed (<i>Fallopia japonica</i>)	Dame's rocket (<i>Hesperis matronalis</i>)
Narrow-leaved cattail (<i>Typha angustifolia</i>)	Japanese hops (<i>Humulus japonicas</i>)
Sericea lespedeza (<i>Lespedeza cuneate</i>)	Blunt leaved privet (<i>Ligustrum obtusifolium</i>)
Japanese honeysuckle (<i>Lonicera japonica</i>)	Amur honeysuckle (<i>Lonicera maacki</i>)
Morrow's honeysuckle (<i>Lonicera morrowii</i>)	Tatarian honeysuckle (<i>Lonicera tatarica</i>)
Bell's honeysuckle (<i>Lonicera bella</i>)	Purple loosestrife (<i>Lythrum salicaria</i>)
Japanese stiltgrass (<i>Microstegium vimineum</i>)	White mulberry (<i>Morus alba</i>)
Reed canarygrass (<i>Phalaris arundinacea</i>)	Common reed (<i>Phragmites australis</i>)
Curly-leaved pondweed (<i>Potamogeton crispus</i>)	Callery pear (<i>Pyrus calleryana</i>)
Multiflora rose (<i>Rosa multiflora</i>)	Johnson grass (<i>Sorghum halepense</i>)

Species reported in Tippecanoe County that are designated as “Somewhat Invasive”.

Common name (Scientific name)	
Queen Anne's lace (<i>Daucus carota</i>)	Russian olive (<i>Eleagnus angustifolia</i>)
Burning bush (<i>Euonymus alatus</i>)	Creeping Charlie (<i>Glechoma hederacea</i>)
English ivy (<i>Hedera helix</i>)	Korean lespedeza (<i>Kummerowia stipulacea</i>)
Yellow sweet clover (<i>Melilotus officinalis</i>)	Chinese maiden grass (<i>Miscanthus sinensis</i>)
Wild parsnip (<i>Pastinaca sativa</i>)	Bouncing bet (<i>Saponaria officinalis</i>)
Vetch (<i>Vicia cracca</i>)	Periwinkle (<i>Vinca minor</i>)

Species reported in Tippecanoe County that are designated as “Low Risk of Invasion” or “Caution**”.

Common name (Scientific name)	
St. John's wort (<i>Hypericum perforatum</i>)	Common barberry (<i>Berberis vulgaris</i>)
Princess tree (<i>Paulownia tomentosa</i>)	Jetbead (<i>Rhodotypos scandens</i>)
Spreading hedge parsley (<i>Torilis arvensis</i>)	Japanese hedge parsley (<i>Torilis japonica</i>)
Highbush cranberry (<i>Viburnum opulus</i>)	Large-leaved periwinkle (<i>Vinca major</i>)

*These tables do not indicate priorities for control in Tippecanoe County.

**Caution designation indicates that the assessment could not be completed due to lack of information on the impacts of this species in Indiana, but that there is potential for invasion and impacts.