Invasive Species Management Plan

Property Details:			
Landowner / Land manager:	Browsburg Parks & Recreation Greg Dickenson gdickenson@brownsburgparks.com	**Address (es):**	Arbuckle Park, 200 N Green St, Brownsburg, IN 46112 Williams Park, South Locust Lane, Brownsburg, IN
County:	Hendricks	**Area (ac.):**	52 / 77
Site Visit Date:	9/24/20	**Latitude:**	39.847361 / 39.829915
Follow up date:	Williams Park Weed Wrangle on Dec 5th 2020 & ongoing support as needed	**Longitude:**	-86.399692 / -86.413132

Property goals:
Plant identification & invasive plant management assistance / planning for Weed Wrangle support.

Invasive Species Found	Current % Cover[1/] (range)	Density[2/]	General Description of Population
Forbs (herbaceous plants)			
1) Garlic mustard, *Alliaria petiolata*	Unknown	Unknown	Remnants of 2nd year plants gone to seed observed in both Arbuckle Acres & Williams Park properties. Be on the lookout in fall and spring for basal rosettes and/or flowering plants.
2) Queen Anne's lace, *Dauca carota* *	<5%	Low	Observed in open unmown areas. Not a priority for initial control.
3) Lesser celandine, *Ficaria verna*	Unknown	Unknown	Not observed during site visit, but property manager confirmed species present in floodplain area at Arbuckle Acres. Be on the lookout in spring for occurrences of this species.
4) Creeping Charlie, *Glechoma hederacea* *	5-25%	Low-Medium	Throughout various sections of property. Not a priority for initial control.
5) Common orange daylily, *Hemerocallis fulva*	<5%	Low-Medium	Observed patches in wooded areas of Williams Park.
6) Moneywort, *Lysimachia nummularia*	5-25%	Low-Medium	Observed in wetland floodplain areas along White Lick Creek on both properties.
7) Wild parsnip, *Pastinaca sativa*	<5%	Low-Medium	Observed in wetland floodplain areas along White Lick Creek at Arbuckle Acres.
8) Asian smartweed, *Persicaria longiseta* *	5-25%	Low-Medium	Observed throughout various sections of property. Not a priority for initial control.
Graminoids (grasses or grass relatives			
9) Japanese stiltgrass, *Microstegium vimineum*	Unknown	Unknown	Not observed during site visit, but property manager confirmed species present in wooded areas of Williams Park.
10) Tall fescue, *Festuca arundinacea* *	25-50%	Medium-High	Observed as turfgrass in open areas. Not a priority for control due to mowing practices.

11) Reed canarygrass, *Phalaris arundinacea*	<5%	Medium-High	Patches observed in open floodplain areas along White Lick Creek on both properties.
Shrubs (low stature woody plants, ≤30 ft tall & typically multi-stemmed)			
12) Autumn olive, *Eleagnus umbellata*	<5%	Low-Medium	Observed in unmown open areas and wooded edges with smaller/fewer individuals popping up in wooded interior, on both properties.
13) Winged burning bush, *Euonymus alatus*	5-25%	Medium-High	Observed along wooded edge and wooded interior on both properties.
14) Border privet, *Ligustrum obtusifolium*	<5%	Medium-High	Observed along wooded edge and wooded interior on both properties.
15) Asian bush honeysuckle, *Lonicera spp*. ≠	25-50%	Medium-High	Observed in unmown open areas, wooded edges, and wooded interior, on both properties.
16) Multiflora rose, *Rosa multiflora*	5-25%	Low-Medium	Observed in unmown open areas, wooded edges, and wooded interior on both properties.
17) Japanese meadowsweet, *Spirea japonica*	n/a	n/a	Observed in landscape beds at Williams Park. Not an initial priority for control.
18) European cranberrybush, *Viburnum opulus*	5-25%	Low-Medium	Observed in wooded interior at Williams Park.
Trees (tall stature woody plants, ≥30 ft tall & typically single-stemmed)			
19) Norway maple, *Acer platanoides*	n/a	n/a	Intentional plantings at Arbuckle Acres. Be on the lookout for spread into wooded areas.
20) White mulberry, *Morus alba*	5-25%	Medium	Observed throughout unmown open areas, along wooded edges, tree lines, and wooded interior on both properties.
21) Callery pear, *Pyrus calleryana*	5-25%	Low-Medium	Observed throughout unmown open areas, along wooded edges, tree lines, and wooded interior on both properties. Also included in intentional plantings at Arbuckle Acres.
Vines (climbing and/or trailing plants, either herbaceous or woody)			
22) Asian bittersweet, *Celastrus orbiculatus*	<5%	Medium-High	Observed along wooded edge and wooded interior in Williams Park.
23) Wintercreeper, *Euonymus fortunei*	5-25%	Medium-High	Observed along wooded edge and wooded interior on both properties.
24) English ivy, *Hedera helix*	<5%	Medium-High	Observed along wooded edge and wooded interior in Williams Park.
25) Japanese honeysuckle, *Lonicera japonica*	<5%	Medium-High	Observed in unmown open areas & wooded edges on both properties.

1/ Estimate percent cover for the entire survey area.
2/ Qualitative assessment of how dense the species is where it is found (e.g. low, medium, or high). Example: low = single, scattered plants versus high = very dense, almost monoculture
≠ identification was not confirmed to the species level and/or multiple species in genera present
* ranked as invasive but not a primary priority for control

Priority Invasive Species to Control	Treatment Method (Digging, Pulling, Cutting, Chemical*, Controlled Browsing, etc.)[3/]	Timing of Treatment(s) or Plant Growth stage for Best Effective Control
1) Garlic mustard, *Alliaria petiolata*	**Manual:** Pull/dig plants, making sure to remove the upper portion of the roots and stem. **Chemical:** Foliar spray with 3% glyphosate product and 1/4% non-ionic surfactant	**Manual:** April – June and/or September-November **Chemical:** Foliar spray March-April before flowering or October – November basal rosettes
2) Lesser celandine, *Ficaria verna*	**Manual:** Pull/dig plants, making sure to remove all bulblets and roots **Chemical:** Foliar spray with 1-3% glyphosate or imazapyr product and 1/4% non-ionic surfactant	**Manual:** Feb-April **Chemical:** Foliar spray February- March before flowering when temperatures are above 40°F **Note:** For areas directly adjacent to waterway or where runoff is into surface water likely, use aquatic label glyphosate or imazapyr.
3) Common orange daylily, *Hemerocallis fulva*	**Manual:** Can pull/dig out smaller individuals **Chemical:** Foliar spray with 3% Glyphosate and 1/4% non-ionic surfactant	**Manual**: Anytime **Chemical:** Foliar spray June - September
4) Moneywort, *Lysimachia nummularia*	**Manual:** Can pull/dig out small patches anytime **Chemical:** Foliar spray with 3% glyphosate and 1/4% non-ionic surfactant **Cultural:** For disturbed areas, restore with native plantings of taller dense herbaceous plants such as sedges and grasses to shade & and outcompete	**Manual:** Anytime **Chemical:** Foliar spray October – March **Cultural:** Dormant seeding of perennial native plants late November – early February Chemical control is only shown to be marginally effective for this species.
5) Wild parsnip, *Pastinaca sativa*	**Manual/ Mechanical:** Pull/dig out young plants making sure to remove the entire taproot. Cut or repeat mow before flower stems produce flowers and/or setseed **Chemical:** Foliar spray with herbicide, either broadleaf specific 2-3% triclopyr and 1/4% non-ionic surfactant OR nonselective 3-5% glyphosate and 1/4% non-ionic surfactant	**Manual/ Mechanical:** Pull/dig in Spring & Fall. Cut/mow July-September **Chemical:** Foliar spray 1st year basal rosettes early spring March-April or late fall October-November **Note:** Protect skin from contact with sap during management. Sap on skin can result in extreme blistering upon exposure to UV light.

6) Japanese stiltgrass, *Microstegium vimineum*	**Manual/Mechanical:** Pull to uproot or string trim at ground level **Chemical:** Non-selective foliar spray with 1% glyphosate and 1/4% non-ionic surfactant (or grass-specific foliar spray with grass specific herbicide as per product label) For pre-emergent application recommendations, contact County Extension or Office of Indiana State Chemist	**Manual/ Mechanical**: Pull or string trim: June – September **Chemical:** Foliar spray June-September **Note:** Avoid mowing to prevent spread and reduce stimulating flowering & seed set below mower height.
7) Reed canaraygrass, *Phalaris arundinacea*	**Mechanical:** Mow/string trim in combination with chemical control **Chemical:** Foliar spray with 3-5% glyphosate and 1/4% surfactant **Cultural:** For disturbed areas, restore with native plantings of taller vegetation to shade & and outcompete	**Mechanical:** Mid-June & late September to reduce seed & encourage natives **Chemical:** May–June and/or September–October **Cultural:** Dormant seeding of perennial native plants late November – early February **Note:** For areas directly adjacent to waterway or where runoff is into surface water likely, use aquatic label glyphosate.
8) Autumn olive, *Eleagnus umbellata* *9)* Winged burning bush, *Euonymus alatus* *10)* Asian bush honeysuckle, *Lonicera spp. ≠* *11)* Border privet, *Ligustrum obtusifolium* *12)* Multiflora rose, *Rosa multiflora* *13)* Japanese meadowsweet, *Spirea japonica* *14)* European cranberrybush, *Viburnum opulus*	**Manual:** Can pull/dig out smaller individual plants **Chemical:** Foliar spray with 3% glyphosate or triclopyr with 1/4% non-ionic surfactant (on small shrubs or re-sprouts below chest height) Cut-surface treatment for larger shrubs, cut near base and treat with 20% solution of glyphosate active ingredient (~50% product concentrate / 50% water) Basal bark treatment with 20-30% triclopyr and 70-80% horticultural oil or basal oil (BBT not ideal for shrubs with multiple stems/trunks)	**Manual:** Anytime **Chemical:** Foliar spray May – September Cut surface treatment June – March Basal bark treatment September – March Can also cut, brushcut, bushhog, or mow with forestry mower/mulcher in spring then foliar spray once resprouts are 3-4 ft tall in summer – early fall.
15) Norway maple, *Acer platanoides* 16) White mulberry, *Morus alba* 17) Callery pear, *Pyrus calleryana*	**Manual:** Can pull/dig out seedlings & small saplings. **Chemical:** Foliar spray 3% glyphosate with 1/4% non-ionic surfactant (on small trees or re-sprouts below chest height)	Manual: Anytime Chemical: Foliar spray May – September Cut surface treatment June – March Basal bark treatment September – March

	Cut-surface treatment, specifically cut stump treatment, cut near base and treat with 20% solution of glyphosate active ingredient (~50% product concentrate / 50% water). Can also do hack-and-squirt for trees over 6 dbh with cut-surface solution above Basal bark treatment with 20-30% triclopyr and 70-80% horticultural oil or basal oil	Can also cut, brushcut, bushhog, or mow with forestry mower/mulcher eartly in growing season then foliar spray once resprouts are 3-4 ft tall in late summer-fall **Note:** Even young white mulberry seedlings may be difficult to dig up/pull due to long taproots.
18) Asian bittersweet, *Celastrus orbiculatus*	**Manual:** Can pull/dig out smaller individuals **Chemical:** Cut surface treatment with 50% glyphosate and 50% water. Foliar spray with 3% glyphosate and 1/4% non-ionic surfactant	**Manual**: Anytime **Chemical:** Cut surface treatment August - December Foliar spray June – September **Note:** Do not attempt to pull large climbing vines from trees due to the danger of falling limbs and heavy vines.
19) Wintercreeper, *Euonymus fortunei* 20) English ivy, *Hedera helix*	**Manual:** Pull/dig out small patches growing along ground. For wintercreeper, cut at base to kill climbing vines on trees and structures. **Chemical:** Foliar Spray with 3% Triclopyr and 1/2% non-ionic surfactant, due to waxy leaf. Cut-surface treatment of any large climbing vines with 20% solution of glyphosate active ingredient (~50% product concentrate / 50% water)	**Manual:** Anytime **Chemical:** Foliar spray October - March Cut-surface treatment of large climbing vines October - November **Note:** Do not attempt to pull large climbing vines from trees due to the danger of falling limbs and heavy vines.
21) Japanese honeysuckle, *Lonicera japonica*	**Manual:** Remove climbing vines and pull/dig small patches **Chemical:** Foliar spray with 3% glyphosate or triclopyr and 1/4 % non-ionic surfactant	**Manual:** Anytime **Chemical:** Foliar spray October - March

3/ Include specific application method(s), equipment type, herbicide type and rate.
* Before applying any chemicals, make sure to follow the manufacturer's labels and any applicable laws. Failure to do so is against the law.

Where to Start: Prioritizing Invasive Plant Control

The first step in managing invasive species is knowing what you have and how much, and this survey will help with this. Secondly, you will need to set your overall property goals and goals for each type of invasive plant. Think about why you want to protect this property and nearby natural areas from invasive plants and which areas are of most value and/or immediate concern. You can work to targeting a single species or genera (e.g. garlic mustard) or a group of similar species (e.g. invasive shrubs: Asian bush honeysuckle,

autumn olive, border privet, multiflora rose). It is also reasonable to start with species of lower abundance (e.g. Japanese honeysuckle) to prevent fruits, seeds, or other propagules from further spread. You can also work to control species that are a reoccurring problem (e.g. reed canarygrass). To help prioritize your efforts when managing species that are covering a lot of area (e.g. Asian bush honeysuckle), you could split the property up into high and low priority sections, and for each section, begin with smaller outlying populations before moving on to larger areas of infestation. Once you are ready to tackle the large areas, you can begin at the edge of each section and over time work inward (or in one direction from an edge).

Species Specific Prioritization: The priority species for control are ranked here roughly in order of precedence based on the ease of access, most ideal method of control for land managers & volunteers, species of concern, degree of infestation, and property goals:

1) First priority shrubs – autumn olive, winged burning bush, Asian bush honeysuckle, border privet, multiflora rose, European cranberrybush
2) First priority trees – Norway maple & Callery pear
3) First priority forbs – garlic mustard & lesser celandine
4) First priority grasses: Japanese stiltgrass
5) First priority vines: Asian bittersweet, wintercreeper, English ivy
6) Other grasses: Reed canarygrass
7) Other vines: Japanese honeysuckle
8) Other trees: White mulberry
9) Other forbs: Common orange daylily & Moneywort
10) Other shrubs: Japanese spirea

Prioritization for Volunteer and/or Property Management Efforts: Listed below are options for initial targeting of Weed Wrangle® Indiana/volunteer activities, and/or general property management:

1) Fall/winter 2020-spring 2021, hand pull garlic mustard in easy to access/highly visible portions of the property
2) Fall/winter 2020 and 2021, prioritize control of woody invasive shrubs and trees in easy to access/highly visible portions of the property
3) Spring 2021, map and begin chemical control of lesser celandine to halt population growth and reduce spread downstream. Make plans to continue efforts annually.
4) Summer 2021, hand pull or spray Japanese stiltgrass annually, since it is lower in abundance early action will reduce the need for future control
5) Fall/winter 2020-2021, cut and treat climbing vines of Asian bittersweet, wintercreeper, and English ivy
6) Summer 2021, foliar spray ground vines / resprouts of Asian bittersweet
7) Fall/winter 2021, foliar spray ground vines of wintercreeper & English ivy
8) Cut, string trim, and/or mow perennial invasive forbs, grasses, and vines to prevent production of seed and/or fruit to limit further spread (Common orange daylily, reed canarygrass, Japanese honeysuckle)
9) In general, manage easier to access invasives along trails, habitat edges, and property boundaries
10) Remove invasive plants form intentional landscape plantings and replace with native plant alternatives.
11) Publicize invasive removal & replacement efforts to broaden outreach and gain community support.
12) Restore areas with native plantings to follow any large-scale invasive removal.
13) Invite friends of parks, CISMA members, other parks affiliates, city and/or county groups, property neighbors, etc. to volunteer to help with invasive management and native plantings.
14) Encourage this same audience to remove and control invasive plants and plant native on their own properties.
15) Recognize & reward support of individuals, groups, partners, neighbors, and community representatives.

After initial control, it is important to keep in mind that many common invasives will need to be managed and monitored over time in the likelihood of continued and/or future infestation. In some cases, it may not be possible to completely eradicate a particular invasive plant species. However, working regularly to monitor and control invasive plants reduces their impacts and spread. We encourage you to stay positive and remember that continued diligence in invasive management benefits the health of your property and that of your neighbors'. Invasive plants and other types of species are a problem we all face, and you are not in this alone. Don't hesitate to reach out to Hendricks County - Invasive Management Cooperative, Hendricks County Soil and Water Conservation District, and Southern Indiana Cooperative Invasives Management for additional assistance and support.

Monitoring Plan	
Timing	Biannually or more frequently if possible.
Method	Thoroughly walk property to check for control success, resprouts, increased spread, and/or new occurrences.

Maintenance	
Re-treatments: As needed	Spot Treatments (Y or N): Y as needed
Specific recommendations for retreating areas: Keep on the lookout for invasive plants throughout your property and throughout the seasons. Resprouts and new infestations are likely for vines, shrubs, and trees. Persistent seedbank and new propagule sources can result in new populations for most types invasive plants. Areas to be on the lookout for new and continuing infestations include property borders, edge habitat, along waterways, and any disturbed sites. Disturbed sites may include canopy openings due to loss of ash trees from emerald ash borer. Also keep in mind that invasive plant removal activities can by necessity also cause disturbance.	

Additional Invasive Species Resources

LINKS TO GENERAL MATERIALS & RESOURCES

- SICIM brochure
- SICIM Toolkit-Links
- SICIM Invasive Management Contractor Listing
- R2R Quick Reference Guide for Mixing Herbicides
- INPS article "Where Do I Start?! Prioritizing Invasive Plant Control"
- INPS Pretty Awful brochure
- INPS Native Alternatives brochure
- INPS Grow Indiana Natives program
- IISC Terrestrial Plant Rule Fact Sheet
- IISC Office Invasive Plant List
- IISC Guide to the Regulated Terrestrial Invasive Plants Species of Indiana
- Purdue Extension Forestry & Natural Resources Invasive Species Control Webinar
- Indiana Woodland Steward Ecological Effects of White-tailed Deer in Hardwood Forests
- Woody Invasives of the Great Lakes Cooperative (WIGL) online resources
- EDDMapS / GLEDN info for reporting invasive species

ADDITIONAL INVASIVE CONTROL INFO

Important: The pesticide label is the law! When using any chemical control products, always read the entire pesticide label carefully, follow all mixing and application instructions, and wear all personal protective gear and clothing specified. For chemical control near waterways and/or where surface runoff into waterways is a concern, you are required to select aquatic label formulations of herbicides and adjuvants. For additional pesticide use requirements, restrictions or recommendations contact the Purdue Extension agency for your county or the Office of the Indiana State Chemist (OISC):

- Purdue Extension – Hamilton County: https://extension.purdue.edu/hendricks
- Office of the Indiana State Chemist (OISC) – Pesticide Section: https://www.oisc.purdue.edu/pesticide/contact.html

General: It is possible that there are invasive plants on the property that were not found and/or identified during the site visit based on the time of year or time limitations during our visit (e.g. lesser celandine). Please don't hesitate to send photos for help identifying any plants you are unsure and/or request additional technical assistance for invasive management support.

Note: Rule of thumb, when manually pulling and/or removing invasive plant material, ensure root portions don't remain in contact with soil, otherwise regrowth may occur. Also, manually pulling creeping invasive vines (e.g. purple wintercreeper) or herbaceous plants with tuberous or rhizomatous roots (e.g. lesser celandine) it is best that all plant material be removed from site and destroyed. If removing any invasive vegetation with viable seeds or other plant parts, these propagules should be eradicated, ideally by burning. If burning is not an option, viable plant material can be bagged in thick plastic, solarized to dry it out, and thrown away as solid waste (only after completely desiccated) rather than composted or left in place.

Garlic mustard: Garlic mustard is a biennial plant that generally forms basal rosettes the 1st year and flowers and sets seed the 2nd year. If flowering, any pulled plant material should be removed from the site, otherwise seed ripening can continue even after plants are uprooted if any root part is left in contact with soil. Seeds are viable in soil for many years, so it is necessary to continue to pull or kill plants each year until the seedbank is exhausted. Controlling 2 or more times a year is recommended since plants will continue to germinate, bolt, and set seed from late spring to early summer. For large areas of infestation, foliar application of glyphosate plus surfactant can provide effective control of actively growing seedlings and young plants but is likely to result in non-target damage to desirable native species. Aquatic label formulations of herbicide and adjuvants must be selected for application in areas next to surface water or when/where site conditions could result in runoff into surface water. Additional resource:

- https://www.canr.msu.edu/ipm/invasive_species/garlic_mustard/management_options

Lesser celandine: It is important to make sure of correct identification to avoid mistakenly targeting our native march marigold, which looks similar to lesser celandine and also blooms in spring. Lesser celandine grows 4-12 inch tall, and its flowers are born singly on each stalk, typically with 8 to 12 glossy petals and 3 (rarely 4) light green sepals below. To differentiate, marsh marigold can grow up to 2 ft in height, has 5-9 yellow sepals that resemble petals, and lacks bublets and tubers. For small infestations, lesser celandine may be pulled by hand or dug up, making sure to remove and destroy all bulblets and tubers. Any pulled plant parts should be removed from site and either burned or left in bags to solarize until desiccated and then discarded as solid waste. Take measures to reduce direct contact during manual control, since lesser celandine can cause skin irritation and blistering, and plant parts may be toxic if ingested. For larger areas, chemical control with a foliar spray of glyphosate or imazapyr herbicide plus surfactant is recommended in order to kill the entire plant above and below ground. For greater success, time chemical treatment for

warmer sunny days in late winter to early spring. Aquatic label formulations of herbicide and adjuvants must be selected for application in areas next to surface water or when/where site conditions could result in runoff into surface water. Due to its ephemeral growth, the treatment window for lesser celandine control is limited. Repeat control and monitoring will be required in spring of each year for long term success. Additional resources:

- https://www.co.walworth.wi.us/DocumentCenter/View/501/Lesser-Celandine-Flyer-PDF
- http://www.misin.msu.edu/facts/detail/?project=misin&id=183&cname=Lesser+celandine

Common Orange Daylily: Control of this species is important to prevent it from spreading into high quality wooded areas. Digging up rhizomes repeatedly over time would work to manage small areas. For more widespread patches, chemical control with foliar spray application of glyphosate plus surfactant is recommended. Follow up maintenance by pulling/digging of rhizomes and/or spot foliar treatment will likely be needed. Additional resources:

- http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_010241.pdf

Moneywort: For small areas, you can hand pull and remove plant parts to be destroyed or bagged, solarized and thrown away as solid waste. For larger areas, foliar herbicide application of glyphosate (non-selective) or triclopyr (broadleaf specific) may provide some degree of control, but there is little documentation on chemical control long-term success for moneywort. If chemical control is attempted, aquatic label formulations of herbicide and adjuvants must be selected for application in areas next to surface water or when/where site conditions could result in runoff into surface water. You can also augment and/or replace other control efforts with plantings of taller native plants such as sedges & grasses to help outcompete moneywort and reduce its impacts. Additional resources:

- http://www.tnipc.org/invasive-plants/plant-details/?id=134
- http://www.sicim.info/news/2020/7/2/invasiveofthemonthjuly2020

Wild parsnip: This species is a monocarpic perennials, meaning plants may spend one year or more in a vegetative stage before flowering and setting seed at the end of their life cycle. For small patches, manual control is effective. During the vegetative stage (typically a basal rosette), you can pull or dig up the plants by the root (often a tap root), ideally when plants are young. For smaller infestation which have flowered and/or are just beginning to set seed, cut the flower stems with clippers, bag and remove from site, and destroy cut plant material. Even if cut during flowering but before seed formation, cut material should be removed from the site and eradicated, otherwise seeds may continue to mature. Chemical control via foliar spray application is most effective for larger populations and is ideally targeted during the seedling or basal rosettes life stages but is less effective once plants enter the reproductive flowering stage. It is ideal to time chemical control for early spring or late fall when invasive plants are green and actively growing but native desirable vegetation is still dormant. Note: Wild parsnip sap can experience extreme dermal reaction and care should be taken to protect skin and eyes to limit direct contact with plants material.

- http://nyis.info/invasive_species/wild-parsnip/

Japanese stiltgrass: Steps should be taken to prevent the introduction and spread of Japanese stiltgrass to new areas. This includes limiting soil disturbance, cleaning equipment, boots, animal feet, etc. between sites, and timing entry & management of infested sites for when stiltgrass is not in flower and/or producing seed (end of August-October). Regular monitoring of areas affected by disturbance will provide opportunity for early detection and rapid response (EDRR) to reduce spread and future control requirements. Since stiltgrass is an annual grass with persistent seedbank, the key to management is to prevent it from producing seed for 5 years or more. Hand pulling before flowering & seed-set can be effective for small populations, since it's shallow rooted and generally easy to pull. Pulled plants without flowers and/or seeds can be left on-

site, but if flowers and/or seeds have formed the plants should be bagged, removed, and eradicated. Waiting to pull until July through early August allows time for the seedbank to germinate but does not offer sufficient growing season for any new plants to fully mature & produce seed. Another option is mechanical control by string-trimming before flowering and/or seed set, making sure each plant is cut flush with the ground, though this method results in soil disturbance. Avoid string trimming or other manual/mechanical control when flowers and fruits are present to prevent seed spread. Mowing is not recommended in areas where stiltgrass is present since this grass can bloom and set seed under mower height. There has been some success in smothering stiltgrass with 6+ inches or mulch or woodchips, specifically along trails or in areas of high foot and vehicle traffic (see NY Invasive Species resource link below), though this would be a costly and labor intensive for large areas of infestation. Chemical control with pre-emergent and post-emergent herbicides have been proven effective for managing larger populations. Pre-emergent herbicides can be applied at intervals throughout the growing season to prevent germination of seeds in the spring as well as when there is soil disturbance. Post-emergent foliar herbicides should be applied when plants are in full leaf and ideally before seed set. When using long-term chemical control for large infestations, it is necessary to rotate between various types of herbicide active ingredients (post vs pre-emergent and/or non-selective vs grass-specific) herbicides to increase effectiveness and reduce the chance of developing herbicide resistance. Aquatic label formulations of herbicide and adjuvants must be selected for application in areas next to surface water or when/where site conditions could result in runoff into surface water.
Additional resources:

- http://mc-iris.org/japanese-stiltgrass.html
- http://nyis.info/invasive_species/japanese-stiltgrass/

Reed canarygrass: Mowing or string trimming twice yearly (first in early to mid-June and again in late September-October) helps to keep reed canarygrass from producing seed and gives native vegetative the opportunity to establish. A combination approach involving twice a year mowing and twice a year seasonal chemical control treatment will offer more immediate success. Apply a foliar spray application of herbicide both in early spring when reed canarygrass, as a cool season grass, is actively green and growing and native vegetation is dormant, as well as in mid to late October, on new growth as a follow-up to late September mowing/trimming. Any herbicide application should be applied only when the plant is actively green and growing, making sure to remove dead foliage from the prior growing season to maximize exposure and minimize herbicide use. Aquatic label formulations of herbicide and adjuvants must be selected for application in areas next to surface water or when/where site conditions could result in runoff into surface water. Since reed canarygrass does not do well in shade, plantings of tall native shrubs and/or native wetland trees is an option to enhance long-term management. Any shrub and/or trees plantings should be spaced wide enough to allow access for continued mechanical and chemical maintenance as needed until native vegetation is mature enough to provide adequate shade. Since reed canarygrass will continue to germinate from existing and water-borne seedbank, especially along waterways, prioritize initial control for upstream populations before working on management downstream.
Additional resources:

- https://indiananativeplants.org/wp-content/uploads/Reed_Canarygrass.pdf
- https://hort.extension.wisc.edu/files/2014/11/Reed-Canary-Grass-Management.pdf

Autumn olive / winged burning bush / Asian bush honeysuckle / border privet / multiflora rose / Japanese meadowsweet / European cranberrybush: Small and medium sized individual shrubs can be pulled or uprooted manually, especially when soil is moist. However manual removal results in a high degree of soil disturbance and is not ideal for heavy infestations. For medium to large shrubs, cut-stump treatment is an ideal method to limit overspray of herbicide onto the soil and/or non-target plants. Cut horizontally at the base of the trunk(s) and immediately apply a high concentration, low volume glyphosate herbicide solution to

the cut surface. For larger stumps, you only need to apply herbicide to the outer inch of the cut stump surface to edgeto target the cambium layer. When tackling large areas of infestation where brush can be left standing, foliar spray is a less labor-intensive chemical control option. However, vegetation over waist height is not ideal for foliar treatment due to risk of overspray onto desirable vegetation and/or applicator exposure through spray drift. To increase understory access in large areas of infestation, cutting with a handsaw, chainsaw, brush-cutter (or forestry mow with a FECON Skid Steer attachment or equivalent) in early to mid-growing season followed by spot foliar treatment of resprouts once growth is roughly 3-4 ft tall, is a highly effective, multi-step operation. Additionally, for large shrubs with fewer stems, basal bark treatment is also an option, except in areas adjacent to surface water, since this is an oil-based herbicide treatment not labeled for use in and near surface water. For maintenance, biannual follow up of manual removal, cut stump, and/or foliar treatment of actively growing re-sprouts and/or new plants is recommended. Additional resources:

- Autumn olive: https://www.in.gov/dnr/files/Autumn_Olive.pdf
- Winged burning bush: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1081645.pdf
- Asian bush honeysuckle: http://www.sicim.info/s/Bush_Honeysuckle.pdf
- Border privet: https://www.in.gov/dnr/files/Blunt_Leaved_Privet.pdf
- Multiflora rose: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_014999.pdf
- Japanese meadowsweet: https://www.invasive.org/alien/fact/spja1.htm
- European high bush cranberry: https://www.invasive.org/weedcd/pdfs/wow/guelder-rose.pdf

Norway maple / white mulberry / Callery pear: Digging/pulling is possible for smaller seedlings, though more difficult for white mulberry due to the long taproot. Spot foliar herbicide treatment is ideal for actively growing young saplings or resprouts below chest or waist height. For medium to large mature trees, especially any along property edges, fence lines, walk-ways, and/or near structures, the ideal control option is cut stump treatment so that dead trees are not left standing with the danger of falling limbs. Cut at the base of the trunk(s) and immediately apply the high concentration, low volume herbicide solution to the cut surface. For 3 inch and larger trunks, you only need to apply herbicide to the outer inch of the cut stump surface to edge to target the cambium layer. In locations where large tree removal is a safety or liability concern, we recommend working with a certified forester or arborist for large tree treatment and/or removal. Basal bark treatment is an alternative option for larger trees that can be safely left standing in non-frequented locations, except in areas adjacent to surface water, since this is an oil-based herbicide treatment involving products not labeled for use in aquatic settings. For maintenance, biannual follow up by manual removal, cut stump, and/or foliar treatment of actively growing new plants and/or resprouts is essential for long term management success. Additional resource:

- Norway maple: http://nyis.info/invasive_species/norway-maple/
- White mulberry: http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_010306.pdf
- Callery pear: https://www.invasive.org/alien/pubs/midatlantic/pyca.htm

Asian bittersweet: Keeping this species from getting established is important since its a fast-growing vine and challenging to control once widespread. For the larger areas we spotted, it would be best controlled by both cut stem treatment of climbing vines and foliar spray of stems growing in the wooded understory. For cut stem treatment, cut and remove a section of the stem 1-2 inches above ground level and immediately apply the high concentration, low volume solution of glyphosate or triclopyr to the cut surface of the bottom portion of the vine. Do not attempt to pull large climbing vines from trees due to the danger of falling limbs and heavy vines. During the growing season, a foliar spray of glyphosate or triclopyr plus surfactant is effective for vines below waist height in the understory. Regular monitoring is key and repeat control is likely to be required. The sooner you begin control for this species, the less need for more involved control in the future. Additional resource:

- https://www.in.gov/dnr/files/Oriental_Bittersweet.pdf

Wintercreeper / English ivy: You can pull and/or dig smaller patches and cut climbing vines anytime. For manual control, all plant parts should be removed from site and destroyed or solarized and destroyed or discarded as solid waste. For large areas, manual removal may not be ideal due the high degree of soil disturbance. The first priority is to control vines that are climbing trees or structures otherwise they will produce berries that are then dispersed by birds and other wildlife. For large vines, cut stump treat by removing a section of the climbing vine with loppers, a saw, or hatchet and immediately apply the recommended the high concentration, low volume herbicide solution to the cut surface of the bottom portion of the vine. To avoid damaging trees, avoid cutting into the bark when cutting the climbing vines. Small vines can be cut at the ground (with the option to chemically treat each cut). Do not attempt to pull large climbing vines from trees due to the danger of falling limbs and heavy vines. Vines spreading on the ground can either be hand pulled repeatedly over time or treated with a foliar application by spraying the recommended solutions of glyphosate or triclopyr plus surfactant on the leaves. The higher mix ratio of surfactant of 1/2% is essential to penetrate through the waxy cuticle of the leaves. Since leaves are evergreen, timing foliar application in late fall to early spring will reduce damage to desirable vegetation. Be sure to time any dormant season chemical control for sunny days with temperatures 40°F or above. For chemical control in areas near surface water or where run-off into surface water is likely, be sure to select aquatic label herbicide products. Additional resources:

- wintercreeper: http://mc-iris.org/uploads/4/1/1/8/4118817/wintercreeper_detailed_control_info.pdf
- English Ivy: https://hgic.clemson.edu/factsheet/english-ivy-control/

Japanese honeysuckle: Small populations can be controlled by repeated hand-pulling vines and digging out roots over time. For harder to control larger infestations, vines may be treated with a foliar application of glyphosate or triclopyr herbicide with surfactant, ideally during the late fall or early spring when other vegetation is dormant but Japanese honeysuckle leaves are green and actively growing. For chemical control in the dormant season, it is ideal to time treatment for clear days that are over 50° F and sunny. Additional resource:

- http://www.sicim.info/s/Japanese_Honeysuckle1.pdf

Non-priority invasive plant information:

- Queen Anne's lace: https://www.invasiveplantatlas.org/subject.html?sub=5514
- Creeping Charlie: https://plants.usda.gov/plantguide/pdf/dpg_glhe2.pdf
- Asian smartweed: https://www.invasiveplantatlas.org/subject.html?sub=6213
- Tall fescue: https://mdc.mo.gov/trees-plants/problem-plant-control/invasive-plants/tall-fescue-control

Native Planting Resources

Once invasive plant management and/or site prep has been addressed, revegetation with native plants is key to prevent erosion, support natural resource health, and reduce the decline of pollinators, birds, and other wildlife. Restoration with native plants will help limit the need for continued maintenance and/or future control requirements. Encouraging or planting more of the native plants that are doing well on a particular site is an ideal strategy, since these plants are already demonstrating success. However, you can also explore additional native planting pallets based on region and site conditions.

For herbaceous plants, you can install seed mixes, plugs, and/or larger containerized material. For fast growing trees and shrubs, you can opt to plant either bareroot, live stake, and/or containerized material. When purchasing any plant material for landscaping and/or restoration, please be advised that many invasive plant species are being sold as live plants and/or in seed mixes. Information on trusted Indiana native plant material providers can be found specifically on the Indiana Native Plant Society's, Grow Indiana Natives website: http://growindiananatives.org/buy-native/

Here are some native plant alternatives for some of the invasive and aggressive introduced plants in your landscaping:

- Native grass alternatives to Maidenhair grass
    -
- Native shrub alternatives to Japanese barberry, border privet, Asian bush honeysuckle, European cranberrybush (as well as Forsythia & Rose of Sharon)
- Native tree alternatives to white mulberry & Callery pear:
- Native groundcover alternatives to wintercreeper (& bugleweed):

Additional resources for native plant selection & landscaping:

- Landscape uses of Native Plants, INPS: https://indiananativeplants.org/plant-pages-home/landscape-uses-of-native-plants/
- Plant Finder for Pollinators, INPS: https://indiananativeplants.org/plant-finder-for-pollinators/
- Native Plant Database, National Audubon Society: https://www.audubon.org/native-plants

Below are various resources for pollinator plantings etc:

- https://extension.entm.purdue.edu/publications/POL-5/POL-5.pdf
- https://www.indianawildlife.org/lib/uploads/files/Indiana%20Monarch%20Conservation%20Plan_8-10-18.pdf
- https://www.prairienursery.com/media/pdf/five-steps-to-successful-prairie-establishment.pdf

Other Plant Species Observed					
Status	**Common Name**	***Scientific Name***	**Status**	**Common Name**	***Scientific Name***
Ferns & Fern Allies (non-flowering herbaceous plants)			**Graminoids** (grasses or grass relatives)		
native	sensitive fern	*Onoclea sensibilis*	native	sedge	*Carex spp.≠*
native	horsetail	*Equisetum sp. ≠*	native	wood reed	*Cinna arundinacea*
Forbs (non-graminoid flowering herbaceous plants)			native	wood reed	*Cinna arundinacea*
introduced	cranesvill	*Geranium sp. ≠*	native	wild rye	*Elymus spp.≠*
introduced	lemonbalm	*Melissa officinalis*	**Shrubs** (low stature woody plants, typically multi-stemmed)		
introduced/native	plantain	*Plantago spp. ≠*	native	dogwood shrub	*Cornus sp. ≠*
introduced/native	dock	*Rumex spp. ≠*	native	spicebush	*Lindera benzoin*
native	three seed mercury	*Acalypha rhomboidea*	native	brambles	*Rubus spp. ≠*
native	white snakeroot	*Ageratina altissima*	Undetermined	American elderberry	*Sambucus canadensis*
native	agrimony	*Agrimonia sp. ≠*	native	blackhaw viburnum	*Viburnum prunifolium*
native	ragweed	*Ambrosia spp. ≠*	native	spindletree	*Euonymus atropurpureus or E. europaeus ≠*
native	thimbleweed	*Anemone virginiana*	**Trees** (tall stature woody plants, typically single-stemmed)		
native	dogbane	*Apocynum cannabinum*	introduced	Tatarian maple	*Acer tataricum*
native	wild ginger	*Asarum canadense*	introduced	ornamental plum	*Prunus sp. ≠*
native	American burnweed	*Erechtites hieraciifolius*	introduced	European linden	*Tilia × europaea*
native	fleabane	*Erigeron sp. ≠*	native	box elder	*Acer negundo*
native	boneset	*Eupatorium sp. ≠*	native	silver maple	*Acer saccharinum*
native	bedstraw	*Galium spp. ≠*	native	sugar maple	*Acer saccharum*
native	avens	*Geum sp.≠*	native	Ohio buckeye	*Aesculus glabra*
native	sticktight	*Hackelia virginiana*	native	pawpaw	*Asimina triloba*
native	sneezeweed	*Helenium autumnale*	native	Northern catalpa	*Catalpa speciosa*
native	false sunflower	*Helianthus helianthoides*	native	common hackberry	*Celtis occidentalis*
native	cow parsnip	*Heracleum maximum*	native	redbud	*Cercis canadensis*
native	jewelweed	*Impatiens sp. ≠*	native	hawthorn	*Crateagus sp. ≠*
native	great blue lobelia	*Lobelia siphilitca*	native	ash	*Fraxinus sp. ≠*
native	water horehound	*Lycopus sp. ≠*	native	honey locust	*Gleditsia triacanthos*
native	rattlesnake root	*Nabalus albus*	native	black walnut	*Juglans nigra*
native	wood sorrel	*Oxalis sp. ≠*	native	Eastern red cedar	*Juniper virginiana*
native	ragwort	*Packera sp. ≠*	native	tulip tree	*Liriodendron tulipifera*
native	beardtongue	*Penstemon sp. ≠*	native	American sycamore	*Platanus occidentalis*
native	Virginia knotweed	*Persicaria virginiana*	native	cottonwood	*Populus deltoides*
native	ground cherry	*Physalis sp. ≠*	native	black cherry	*Prunus serotina*
native	clearweed	*Pilea pumila*	native	oak	*Quercus spp. ≠*
native	Solomon's seal	*Polygonatum sp. ≠*	native	black locust	*Robinia pseudoacacia #*
native	selfheal	*Prunella sp. ≠*	native	sassafras	*Sassafras albidum*
native	black eyed Susan	*Rudbeckia spp. ≠*	native	bald cypress	*Taxodium distichum*
native	smooth petunia	*Ruellia strepens*	native	elm	*Ulmus sp. ≠*

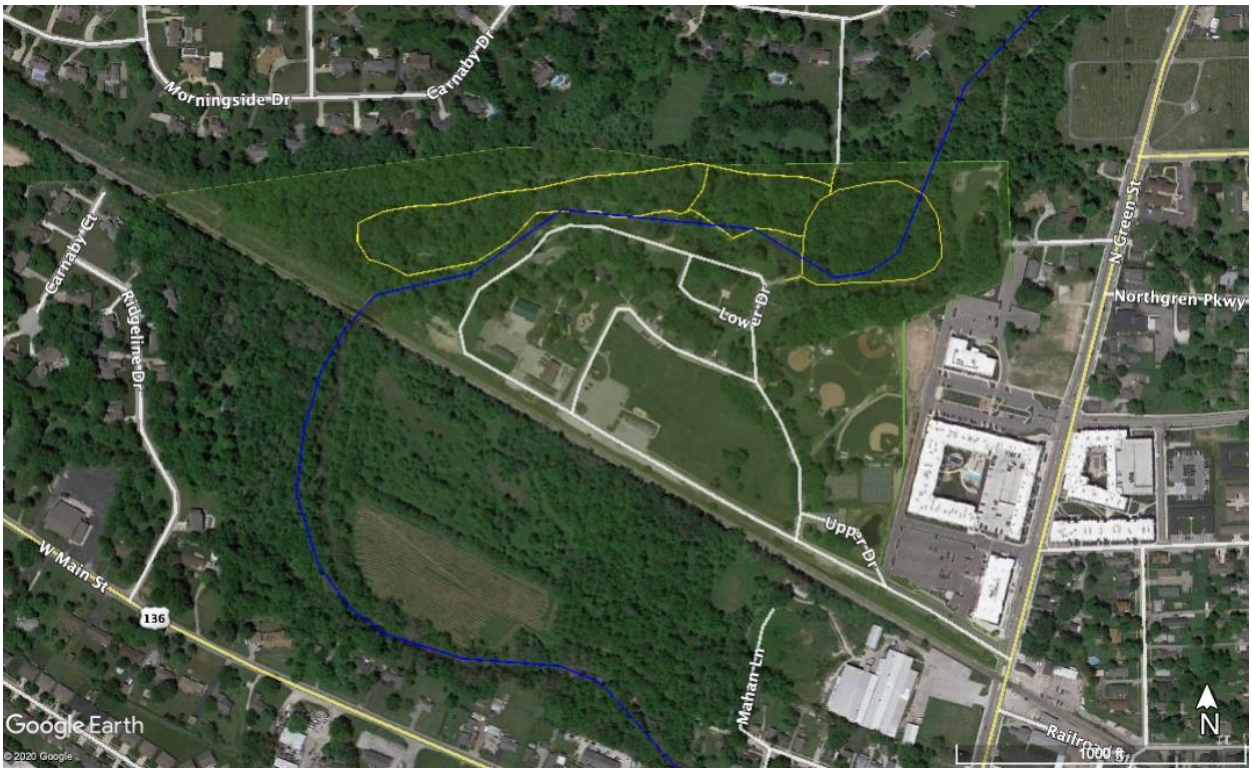
native	black snakeroot	*Sanicula sp. ≠*	undetermined	crabapple	*Malus sp. ≠*
native	cup plant	*Silphium perfoliatum*	undetermined	pine	*Pinus sp. ≠*
native	goldenrod	*Solidago spp. ≠*	**Vines** (climbing and/or trailing plants)		
native	aster	*Symphiotrichum ssp. ≠*	native	hog peanut	*Amphicarpaea bracteata*
native	American germander	*Teucrium canadense*	native	trumpet creeper	*Campsis radicans* #
native	spiderwort	*Tradescantia sp. ≠*	native	moonseed vine	*Menispermum canadense*
native	nettle	*Urtica dioica*	native	Virginia creeper	*Parthenogenesis quadrifolium*
native	white vervain	*Verbena urticifolia*	native	bur cucumber	*Sicyos angulatus*
native	yellow wingstem	*Verbesina alternifolia*	native	greenbriar	*Smilax sp. ≠*
undetermined	cocklebur	*Xanthium sp. ≠*	native	poison ivy	*Toxicodendron radicans* #
			native	grapevine	*Vitis sp. ≠ #*

° native to the Eastern US but not to Indiana and/or this region
native with value to wildlife but fast growing and aggressive spreader

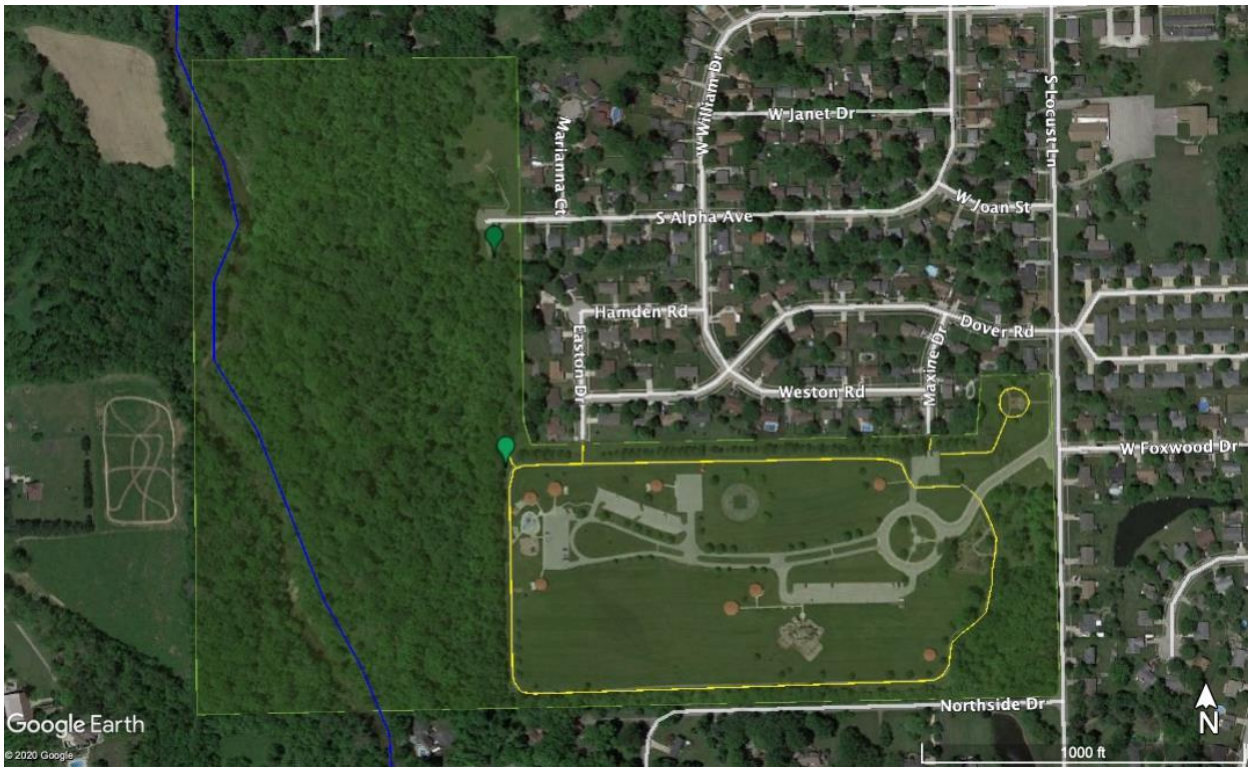
≠ not identified to the species level and/or multiple species found
+ not found on site but reported by land manager to be present

Property Maps

Arbuckle Acres



Williams Park



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Report Date:	12/2/20		
Signature:			

Local Resources by County			
SICIM Regional Specialist:	Mary Welz 812-219-2683 mary@sicim.info www.sicim.info	**Cooperative Invasive Species Management Area (CISMA):**	Hendricks County - Invasive Management Cooperative 317-745-2555 ext. 3 brianna.olier@in.nacdnet.net
Soil & Water Conservation District:	Bree Ollier Hendricks Co County SWCD 317-745-2555 ext. 3 brianna.olier@in.nacdnet.net www.hendricksswcd.org	**Natural Resource Conservation Service:**	Jerod Chew 317-745-2555 jerod.chew@in.usda.gov www.nrcs.usda.gov/wps/portal/nrcs/in/contact/local/
Purdue Extension:	Jeffery Pell 317.745.9260 jpell@purdue.edu https://extension.purdue.edu/hendricks	**District Forester:**	Jeremiah Lemmons 812-665-2130 jlemmons@dnr.IN.gov www.in.gov/dnr/forestry/4750.htm
Nursery Inspector & Compliance Officer:	Ren Hall 463-202-4168 rhall@dnr.IN.gov https://www.in.gov/dnr/entomolo/2899.htm	**Aquatic Invasive Species Biologist:**	Eric Fischer 317-234-3883 ais@dnr.IN.gov www.in.gov/dnr/6347.htm
Wildlife Biologist(s):	Mark Bennett 812-849-4586 mbennett@dnr.IN.gov www.in.gov/dnr/fishwild/2716.htm	**Nature Preserves Regional Ecologist:**	Andrew Reuter 317-234-8944 AReuter@dnr.in.gov https://www.in.gov/dnr/naturepreserve/4730.htm
Watershed Specialist:	Samuel Ennett (317) 308-3206 sennett@idem.in.gov https://www.in.gov/idem/nps/2359.htm	**Soil Conservation District Support Specialist**	Geneva Tyler 317.518.4036 gtyler@isda.in.gov www.in.gov/isda/2373.htm
Indiana State Forester:	https://www.findindianaforester.org/	**Consulting Foresters:**	https://www.in.gov/dnr/forestryexchange/INForestryX/FindaForester.aspx
The Nature Conservancy Land Manager:	The Nature Conservancy in Indiana 317-951-8818 https://www.nature.org/en-us/about-us/where-we-work/united-states/indiana/	**Other Land Trust(s):**	Central Indiana Land Trust, Inc 317-631-5263 http://www.conservingindiana.org/