

2021 PARKS DIVISION PESTICIDE REPORT

POLICY REGARDING PEST MANAGEMENT ON CITY PROPERTY

Policy Adopted 5/18/2004

1. The purpose of this policy is to eliminate or reduce pesticide use to the greatest possible extent. The City of Madison agrees with the US EPA that “all pesticides are toxic to some degree, and the commonplace, widespread use of pesticides is both a major environmental problem and a public health issue.” For this reason, all departments will evaluate and give preference to non-pesticide management practices and use reasonably available alternative pest control methods, will minimize their pesticide use through Integrated Pest Management, and will use least risk pesticides as a last resort.
2. Definitions of terms used in this policy.
 - a. Integrated Pest Management (IPM) is a decision making process. The essential parts of IPM are monitoring, setting threshold levels for pests, identifying the causes of the pest problem, addressing the cause of the problem, and using the most effective, least harmful, methods to control the problem, before using chemical controls. IPM develops ways to change the conditions that cause the pest problem, so that pests will be prevented in the future or minimized. Preventive maintenance using pesticides for pest problems does not adhere to IPM. Prevention of pests should be managed with non-toxic methods.
 - b. Biological Controls – support or introduction of natural predators or parasites of the pests to be controlled.
 - c. Cultural Controls - practices that can reduce pests by making the environment less favorable, such as improved sanitation or horticultural practices.
 - d. IPM Coordinator – Department staff person who is responsible for developing and implementing the pest management plan for the Department.
 - e. Mechanical Controls - direct measures that either kill the pest or make the environment unsuitable for their entry, dispersal, or survival, such as tilling the soil to expose insects or hand pulling weeds.
 - f. Physical Controls - practices that physically keep pests from places where they're not wanted, such as window screens and sealing cracks and crevices.
 - g. Pesticides – substances that destroy or repel pests. For the purpose of this document, they include herbicides, insecticides, fungicides, and rodenticides.
3. Chemical pesticide may be considered if:
 - a. The non-toxic methods of pest control, such as Cultural Controls, Physical Controls, Mechanical Controls, and Biological Controls have been shown to be ineffective; and,
 - b. Monitoring has indicated that the pest will cause unacceptable health or safety hazards, or an unacceptable reduction in the intended use of the property.
4. All departments will maintain appropriate records on pest monitoring data collected, pest control actions attempted (both non-chemical and chemical), and results of pest control activity. All departments will submit by February 1st an annual report to the Public Health Commission. This report will contain the following information:

- a. Completed Pesticide Application Summary for all pesticide applications made in the previous year. Application data must include: purpose, location, and amount of each pesticide product applied, including the amount of active ingredient.
 - b. Annual summary of non-chemical pest control activities.
 - c. Estimated size of the total area managed for each pest problem in a given year. The area managed will likely exceed the area treated.
 - d. A summary of any complaints received regarding use or the perceived need for use of pesticides, including the date complaint(s) was (were) received and the nature of the complaint(s).
 - e. A pest management plan for the coming year. The plan will contain the following information for each type of pest problem:
 1. Definition of Roles. Identify who will: serve as the IPM Coordinator, perform pest monitoring, evaluate pest control alternatives, decide which pest control alternative to use, and implement pest control measures.
 2. Pest Management Objectives. Identify the action thresholds (i.e., pest population levels) to be used to decide when some type of action should be taken to control the pest problem.
 3. Monitoring Plan. Describe the methods to be used to monitor the pests and the frequency of monitoring.
 4. Control Method Selection. Describe the types of pest control methods to be evaluated and the criteria used to choose the appropriate control method. IPM control methods may include:
 - i. Modifying the environment to increase the effectiveness of biological, mechanical, cultural, or physical controls such as blocking mouse holes, keeping areas clean where insects may be attracted, improving soil health, etc.
 - ii. Destroying pests breeding, feeding, or shelter habitat.
 - iii. Using pest resistant varieties of seeds, ornamentals, trees, etc.
 - iv. Using chemical control strategies as a last resort only after a mix of other strategies is shown to be ineffective.
 - v. Using mechanical methods and biological methods (parasites, predators, disease).
 - vi. Spot-treating pest problems when chemical methods are used.
 - f. Parks Division Pesticide Report A standard notification plan that provides, at a minimum, readily visible posting for a period of 24 hours prior to a pesticide application (when possible) and a minimum of 48 hours following the application. These time intervals may be extended based on health or safety concerns. For areas that receive pesticide applications on a regular basis, permanent signs will be posted
5. Annual evaluation of pest management activities on City property will be performed in the following manner:
- a. Public Health Department staff will summarize pest management activities. This summary and individual Department reports and plans will be provided to the Pest Management Advisory Subcommittee of the Public Health Commission and the oversight commission of each department applying pesticides.
 - b. The Pest Management Advisory Committee, a commission of experts to be recommended by the Public Health Department and appointed by the Mayor's office, shall review the annual report and make recommendations to the Public Health Commission, will:

1. Review the available data and make recommendations concerning compliance with this Policy to the Public Health Commission.
 2. Following review of the available data a list of pesticides acceptable for use on city property will be generated.
 3. Report any contractors that are not complying with this policy to the Public Health Commission.
- c. The Public Health Commission will submit recommendations and concerns to each commission charged with oversight of a department that applies pesticide on City property. The public Health Commission will also forward to the Purchasing Supervisor of the Comptroller's office the names of any contractor that does not comply with the City's pesticide policy.
- d. The oversight commission of each Department with a need to manage pests on City property will have the following responsibilities:
1. Review the Department's pest management activities and plans,
 2. Consider recommendations and concerns from the Public Health Commission, the Common Council, and the public.
 3. Take appropriate action to ensure that the Department's pest management activities and plans are in compliance with this Policy
6. All Departments with a need to manage pests on City property will assign a staff person to serve as IPM coordinator. This person will be responsible for developing and implementing the Department's plan.
- a. IPM Coordinators from all Departments will be required to meet annually to discuss past experiences and recent advances in pest management practices. The group may choose to meet more frequently as needed.
- b. IPM Coordinators will receive IPM training.
7. All Departments will report any complaints regarding health effects possibly related to pesticide applications to the Public Health Department at the earliest opportunity.
8. Any unusual amount of pesticide use due to unusual circumstances will be reported to the Director of Public Health or his/her designee at the earliest opportunity.
9. The IPM Coordinator and all supervisors having responsibility for the handling, application, disposal or storage of pesticides shall be State certified under the Department of Agriculture, Trade and Consumer Protection's Pesticide Applicator Certification Program for the appropriate type of pesticide application engaged in. All employees and volunteers applying pesticides shall be State certified or working under the direct supervision of a certified applicator. All employees having any involvement with pesticide handling, application, disposal or storage shall receive basic training in pesticide safety.
10. All Departments storing, using and disposing of pesticides and pesticide containers will do so safely, according to label directions and any State and Federal regulations where applicable.
11. If the pest control program is performed through a private contractor, the contracts for these services will require the contractor to comply with this policy. The contractor must furnish the IPM Coordinator for the Department served with the following for each pesticide applied:

- a. Date, purpose, location, amount of product, and amount of active ingredient for each application.
- b. Product labeling and material safety data sheets for each product applied,
- c. Documentation of applicator certification and conformance with other Federal and State laws.

Monitoring should not be solely performed by the contractor hired to treat the pest problem. The IPM Coordinator should oversee the monitoring.

- 12. If a private contractor is found to be out of compliance with this policy by the Pest Management Advisory Subcommittee, this non-compliance will be considered grounds for terminating an existing City contract with the contractor and the contractor will not be allowed enter into a contract with any City department for 1 year after the date that non-compliance was determined.
 - a. A list of non-compliant contractors will be kept by the Purchasing Supervisor. The Purchasing Supervisor shall notify all IPM coordinators of non-compliant contractors.
- 13. This policy does not apply to disinfectants used in the routine maintenance of city facilities.
- 14. The City shall NOT USE pesticides to control dandelions and other broadleaf weeds on general parklands, median strips, street terraces, roadsides, general lawn areas, and athletic fields that are not reserved, nor are fees paid for their use.
 - a. Guidelines for Pesticide Use
 - 1. Cosmetic use of lawn and garden areas (including medians) will be managed using non-toxic methods. These methods can be sought out and used on all city properties.
 - 2. Because of concern over the health of children with repeated exposure to pesticides when playing sports, lower priority athletic fields in particular should have a much higher tolerance for weeds and should use non-toxic weed management methods if desired.
 - 3. Golf courses have the opportunity for pesticide reduction by incorporating more cultural method and increasing weed tolerance of golfers through educational efforts, following guidelines set forth by the Audubon Golf Sanctuary Program.
 - 4. Olbrich Gardens and other city property managing large garden areas ought to continually seek out resources for non-toxic garden management.
 - 5. An Integrated Pest Management professional ought to be used as a resource by the city to help coordinate and integrate non-toxic pest management methods.
 - 6. All use of pesticides for conservation purposes for the control of invasive species, must be managed by the conservation supervisor and comply with all other aspects of the pest management policy including reporting and posting requirements. No pesticide will be used for conservation management in areas dedicated for use by children.
- 15. Any use of a pesticide under EPA Special Review is prohibited.

Pesticide Report – Parks Division 2021

The I.P.M. Coordinator for the Parks Division is Assistant Parks Superintendent, Lisa Laschinger. She can be reached at 608-266-9214. The Parks Division consists of several Sections with each Section Supervisor being responsible for complying with the City's Pesticide Policy, and following the guidelines of Integrated Pest Management: establishing action thresholds, considering alternative control measures, the proper application of any pesticide, and all record keeping as required.

GENERAL PARKS

Managed by geographically-based operations sections (East, West and Central) the general parks offer a wide variety of urban and suburban recreational opportunities. These parks range in size from small "mini" parks, to neighborhood parks that serve an area within walking distance, to larger community parks with athletic facilities, parking lots and large swaths of open space. While the majority of the acreage in general parks consists of turf, there is also a significant amount of managed pollinator habitat, unmanaged open space, and borders along bike paths. The general parks sections also maintain the turf in boulevard medians throughout the City. In addition to turf-surfaced athletic fields for baseball, softball, football, and soccer, staff also maintain hardscaped tennis and basketball courts, picnic shelters and sidewalks. In total, General Parks sections maintain more than 4,000 acres of land.

The Parks Division is thankful to all of the volunteers who assisted us in our integrated pest management efforts throughout the year. While the list of partner organizations and individual volunteers is too long to include here, their efforts included establishing and promoting healthy vegetation and removing invasive species in manicured landscape beds, native plantings, and natural areas within the parks. This involved planting desirable species and cultivars, hand-weeding planting beds, hand-pulling garlic mustard and other invasive plants from native plantings and natural areas, and cutting invasive shrubs such as buckthorn and honeysuckle from many park areas. Though complete hours have yet to be compiled, approximately several thousand hours of labor for mechanical and cultural control was provided by volunteers in both general and conservation parks in 2021.

The Parks Division uses a number of practices to maintain our parks year-round. We are conservative in our use of pesticides and limit their use in recreation areas to facilities where reservation fees are collected. This includes certain athletic fields and shelters, and surrounding spaces immediately adjacent, such as sidewalks and hardscape that serve these facilities. In natural areas, we use pesticides to efficiently and effectively control invasive species. In some cases, we use pesticides to control weeds in our highest use areas because heavy landscaping makes hand weeding very time-consuming and less efficient. We continue to work to enhance the surfaces of our athletic fields, as use and consequent wear of the fields continues to increase each year. We constantly strive to balance competing needs and demands of diverse user groups, constituents, and policy makers in all services provided. All staff and volunteers who apply herbicides are trained and certified in the appropriate State of WI Commercial Pesticide Applicator category, as are contractors hired for Land Management projects.

INVASIVE WOODY SPECIES CONTROL

Targeted Species: Buckthorn, honeysuckle, boxelder, black locust, poison ivy, sumac, privet, elm, mulberry, Oriental bittersweet, maple, willow, ash, hawthorn and euonymus.

Purpose: To control invasive woody species growing in landscaped beds, managed meadows, overgrown natural areas, park borders, athletic fence lines, and natural shoreline buffers.

Locations: Applied as cut-stump treatments or spot foliar treatment at Tenney, James Madison, Goodman, Greenside, Giddings, Glen Oak, Heistand, Hudson, Yahara River Parkway, Paunack, Garner, Nakoma, Hiawatha, Olive Jones, Medical Society, Glenway Woods, Apple Ridge, Thousand Oaks, Highlands East.

Pesticides Applied For Invasive Woody Species Control:

Product(s) Used	Active Ingredient (A.I.)	Total Amount of A.I. Used
Pathfinder II Garlon 3A Garlon 4 Element 4 Vastlan	Triclopyr	6.4576 pounds
Polaris AC	Isopropylamine salt of Imazapyr	0.0778 pounds
Escort	Metsulfuron methyl	7.2432 pounds
Clash	Diglycolamine salt of 3, 6-dichloro-o-anisic acid	0.4343 pounds

HERBACEOUS WEED CONTROL

Targeted species: Weedy grasses and broadleaf annual and perennial weeds, including teasel, burdock, Japanese knotweed, tansy, dame's rocket, garlic mustard, Canada thistle, bird's-foot trefoil, crown vetch and wild parsnip.

Purpose: To control weed populations in areas that park users rent and reserve, which include athletic fields, ball diamonds and areas of park shelters, fence lines, adjacent parking lots, basketball and tennis courts, and landscaped planting beds. Also to control invasive species in newly established managed meadow plantings.

Locations:

Spot treatment and foliar applications were made at Elver, Highland Manor, Forest Hill, Warner, Goodman, Goodman Pool, Vilas, Garner, McPike, Kingswood, Olive Jones, Glenway Woods, Demetral, Cypress, Tenney, Marshall, Law, Reston Heights, Hiestand, Lake Edge, Portland, High Crossing, Droster, Kingston Onyx, Olbrich, Kennedy, Monona, Sherman Village, Whitetail Ridge, OB Sherry, North Star, Elvehjem, Sycamore, Burke, Secret Places, Lakeland, Owl Creek, Honeysuckle, Veterans, Hawthorne, Reston, Orlando Bell, Eastmorland, Park and Ride, Mallards Stadium. Northeast Greenspace

Pesticides Applied For Herbaceous Weed Control:

Product(s) Used	Active Ingredient (A.I.)	Total Amount of A.I. Used
Ranger Pro Kleenup Pro Cropsmart Makaze Round-up Journey Aqua Neat	Glyphosate	65.6441 pounds
Trimec:	2-4,D Propionic Acid 3,6 dichloro-o-anisic acid	0.3364 pounds 0.09 pounds 0.0356 pounds
Preen	Trifluralin	0.9849 pounds
Snapshot	Trifluralin Isoxaben	1.03 pounds 0.2575 pounds
Polaris AC Habitat	Isopropylamine salt of Imazapyr	0.359 pounds
Element 4 Vastlan	Triclopyr	0.7681 pounds
Intensity	Clethodim	0.0998 pounds
Method	Potassium salt of aminocyclopyrachlor	0.0036 pounds
Milestone	Aminopyralid	0.2235 pounds

BROADLEAF WEED CONTROL IN TURF

Targeted species: Broadleaf annual and perennial weeds

Purpose: To control weed populations on playing surfaces of designated playing fields and fenced field spaces, to improve health of turf and user experiences.

Locations: Everglade, Lucia Crest, Woodland Hills, Wexford, Flad, Hoyt, Raymond Ridge, Rennebohm, Elver, Greentree, Meadowood, Pilgrim

Pesticides Applied For Broadleaf Weed Control in Turf:

Product(s) Used	Active Ingredient (A.I.)	Total Amount of A.I. Used
Speed Zone	2,4-D, 2-ethylhexyl ester	2.1515 pounds
	Mecoprop-p Acid	0.675 pounds
	Dicamba acid	0.1968 pounds
	Carfentrazone-ethyl	0.0703 pounds
Horse Power	2-Methyl-4-Chlorophenoxyacetic Acid	92.34 pounds
	3,5,6-Trichloro-2-Pyridinyloxyacetic Acid	9.234pounds
	3,6-Dichloro-o-Anisic Acid	9.234 pounds

INVASIVE PLANT (woody & herbaceous) CONTROL APPLICATIONS BY VOLUNTEERS IN PARKS

Targeted Species: Bird's-foot trefoil, Canada thistle, Japanese knotweed, buckthorn, crown vetch, honeysuckle, Japanese barberry, and reed canary grass.

Purpose: To control aggressive exotic plant species while populations are small. They threaten native plant diversity if left unmanaged.

Locations: Westmorland, Odana Golf, Hoyt, 1000 Oaks, Apple Ridge, Blackhawk, Country Grove, Cross Country Road Prairie, Eagle Trace, Elver, Flagstone, Garner, Glacier Crossing, Glenway Golf Woods, Haen, High Point, Huegel, Ice Age Ridge, Junction Ridge, Manchester, Maple Prairie, Odana Hills Park, Olin, Raymond Ridge, Sauk Creek, Stricker's Pond, Valley Ridge, Walnut Grove, Wexford, Woodland Hills

Pesticides Applied by Volunteers For Control of Invasive Plant Species:

Product(s) Used	Active Ingredient (A.I.)	Total Amount of A.I. Used
Milestone	aminopyralid	0.5494 pounds
Ranger Pro Makaze CropSmart	glyphosate	2.1795 pounds
2,4-D	2,4-D Amine 4	1.5211 pounds
Pathfinder II Garlon 4	triclopyr	5.5437 pounds
Intensity	clethodim	0.0156 pounds
Crossbow	2,4-D	0.0917 pounds
	Triclopyr	0.0458 pounds
Round-up RTU	Glyphosate	0.0156 pounds
	Pelargonic Acid	0.0234 pounds

Adopt-A-Park Tree Program

The Parks Division allows interested parties to contract with pre-qualified contractors to inject approved trees with insecticide. This is intended to protect the ash trees against the Emerald Ash Borer, and the application must be repeated every 2-3 years as long as the insect remains a concern (likely for the remaining life of the tree).

Targeted species: Emerald Ash Borer

Purpose: To control insect populations in ash trees and help prolong the life of trees by preventing harmful infestation.

Locations: Lerdahl, Yahara River Parkway, Elmside Circle, Wirth Ct., Orlando Bell, Droster, Eastmorland, OB Sherry, Olbrich, Brittingham, William Slater, Oak Park Heights, Pilgrim, Walnut Grove, Lucia Crest, Wingra

Pesticides Applied to Park Trees:

Product(s) Used	Active Ingredient (A.I.)	Total Amount of A.I. Used
Tree-age Mectinite	Emamectin Benzoate	1.3464 pounds

Non-Chemical Means of Pest Control

Numerous hours were spent by staff and volunteers hand-weeding in general park areas. Staff and volunteers removed seed heads from invasive species and mechanically removed woody invasive shrubs. In addition, staff controlled weeds by mowing and string trimming. Turf grass was improved and supported with core aeration, over-seeding, and fertilizing, as well as returning mulched leaves and clippings to the turf. These improve turf health, improving the quality of the surface, and allowing it to out-compete weeds and withstand heavy traffic. Mulch was used in some areas to help decrease weed populations.

New for 2021

After a slow start resulting from the COVID-19 pandemic, the Organic Turf Pilot Program began in 2021 at Olbrich softball field #2 and Flagstone Park. The program is made possible by a grant received in 2019 through Stonyfield Organic. This was the first year of full organic maintenance at the two fields. It went well, but will take several years before we start to see the returns on changes made in our maintenance practices. Next year, we plan to advance the rehabilitation of the soil composition with organic compost applications and liquid compost tea applications.



Complaints/Inquiries Received

The sole inquiry in 2021 was from an individual who requested information about an application that was made to a soccer field at Rennebohm Park. They contacted Parks directly, as well as the Alder for the area. A response to their inquiry was written and no further communication was needed.

Plan for 2021

The overall land management and pesticide plan for 2022, in accordance with our approved Land Management Plan, is much the same as that of 2021. We do intend to continue increasing our efforts on natural areas and prairie plantings as well as continuing work on athletic fields. We will do this through a combination of cultural practices and, when necessary, judicious use of herbicide when cultural and mechanical methods are not effective or efficient. We will continue to refine athletic field management by combining herbicide and fertilizer applications along with proper mowing, aeration and overseeding. We will continue to work with a consultant as we implement our Organic Turf Pilot Program.

FOREST HILL CEMETERY

Plunkett's Pest Control was contracted in 2021 for insect and rodent control in and around the mausoleum.

Product(s) Used	Active Ingredient (A.I.)	Total Amount of A.I. Used
Weatherblok XT (rodent)	Brodifacoum	0.000109375
Advion (insect)	Indoxacarb	0.001
Demand CS (insect)	Lambda cyhalothrin	0.041
Temprid FX (insect)	Imidacloprid	1.0
	Cyfluthrin	0.5

Non-Chemical Means of Pest Control

Forest Hill Cemetery uses a variety of mechanical and cultural practices to manage cemetery grounds as an alternative to chemical use. These include, but are not limited to, the following: regular mowing to maintain turf height of 3" or higher, string trimming around trees and more than 30,000 headstones, hand removal of volunteer trees, suckers and weeds between markers and in landscape beds, mechanical trapping of rodents in buildings, installation of door sweeps, and cleaning gutters to deter insects.

MALL CONCOURSE

Non-Chemical Means of Pest Control

No pesticides were used on the Mall Concourse service area in 2021. Numerous hours were spent mowing, string trimming and hand-weeding turf, landscape beds, and cracks in sidewalks. Turf health was promoted with core aeration, compost topdressing, over-seeding, fertilizing, and returning mulched leaves and clippings to the turf. Mulch was used in areas to help decrease weed populations.

Complaints

We received no complaints in 2021 for pesticide use in the Mall Concourse.

Plan for 2022

The Mall Concourse maintenance plan for 2022 is the same as that of 2021.

WARNER PARK COMMUNITY RECREATION CENTER (WPCRC)

Rodents are the primary pest at WPCRC, which re-opened for public use in spring of 2021, after the initial phase of the pandemic. Plunkett's Pest Control was contracted in 2021 for rodent control at WPCRC.

Product Used	Active Ingredient (A.I)	Amount Used	Purpose
FirstStrike	defathialone	168 blocks	Rodent control
Weatherblok XT	3-(3-(4'bromo[1,1'- pipehnyl]-4-yl)-4- hydroxy-2h-1- benzopyran-2-one	96 blocks	Rodent Control

Non-Chemical Means of Pest Control

Trash is removed and facilities cleaned daily to reduce attractants for insects such as ants. Trash is removed from the building and stored in exterior dumpsters. Door sweeps and vents are kept in good working order to prevent pests from entering.

Complaints

We received no complaints in 2021 for pesticide use at WPCRC.

Plan for 2022

The WPCRC maintenance plan for 2022 is the same as that of 2021.

OLBRICH BOTANICAL GARDENS

General rodent and insect control

Rodent and insect control is conducted throughout and around the facility (including the Bolz Conservatory and Production Greenhouses). Control is practiced only in areas where there is a known problem. Rodenticide is contained in bait stations which are concealed, tamper-proof, and not accessible to the public. Orkin Pest Control was contracted in 2021 for rodent and insect control at Olbrich.

Product Used	Active Ingredient (A.I)	Total A.I. Used	Purpose
Final All-Weather Blox EPA# 12455-89	Brodifacoum 0.005%	320 blocks	Rodent control
Contrac with Lumitrack EPA# 12455-133	Bromadiolone 0.005%	38 blocks	Rodent control
Talstar Professional EPA# 279-3206	Bifenthrin 7.9%	20 ounces	Insect control
Phantom Termiticide EPA# 241-392	Chlorofenapyr 21.45%	24.5 ounces	Insect control
InTice 10 Perimeter Bait EPA# 73079-6	Orthoboric Acid 10%	12 ounces	Insect control
Suspend Polyzone EPA# 432-1514	Deltamethrin 4.75%	8 ounces	Insect control
PT Fendona Pressurized Insecticide EPA# 499-569	Alpha-Cypermethrin 0.05%	6 ounces	Insect control

Product Used	Active Ingredient (A.I.)	Total A.I. Used	Purpose
Tandem Insecticide EPA# 100-1437	Thiamethoxam 11.6% Lambda-Cyhalothrin 3.5%	6 ounces	Insect control
PT Phantom II pressurized Insecticide EPA# 499-548	Chlorfenapyr 0.5%	6 ounces	Insect control
Patrol EPA# 100-1066	Lamda-Cyhalothrin 9.7%	6 ounces	Insect control
Tekko Pro IGR Concentrate EPA#53883-335	Pyriproxyfen 1.3% Novaluron 1.3%	6 ounces	Insect control

Complaints Received

There were no visitor complaints regarding rodent or insect control in Olbrich facilities in 2021.

Non-chemical Pest Control Measures in the Eugenie Mayer Bolz Conservatory

Since the Bolz Conservatory opened to the public in November of 1991, the insect control program has strived to use the least toxic methods of pest control. No chemical pesticides are used on the plant collection within the Conservatory. Our Integrated Pest Management strategy within the Conservatory relies primarily on biological control and manual removal as means of controlling insect pests. Beneficial insects are routinely released to target plant-damaging insects. Some of these have a broad diet of prey species, while others target a single insect. The following beneficial insects are released into the conservatory as the situation warrants:

Beneficial Insect	Target Pest
Amblyseius cucumeris (predator)	Thrips, Mites
Aphidius colmani	Aphids
Phytoseiulus persimilis	mites
Chrysoperla spp. (predator)	Several Insects
Cryptolaemus montrouzieri (predator)	Mealybugs, Scales, Aphids
Encarsia formosa (parasite)	Whitefly
Delphastis pusillus	Whitefly
Orius spp. (predator)	Thrips, Aphids, Mites

Birds, specifically Quail (*Coturnix coturnix*), have been effective at controlling the nuisance palmetto bugs found in the conservatory. Assorted frogs and toads living in the conservatory also use the palmetto bugs as a food source. Populations of these animals are maintained as part of the pest control program.

Vigorous daily or weekly washing of the plants in the conservatory has also proven to be very effective at controlling unwanted insects. This practice will continue as part of the pest control program.

The conservatory insect control program will continue to evolve as new beneficial insect species and additional control methods are carefully trialed. It is obvious from past success that it is possible to maintain a healthy plant collection while relying on least-toxic and non-traditional methods of insect control.

Pest Control in Olbrich Production Greenhouses (Not Open to the Public)

Chemical applications within a greenhouse setting are a regular part of IPM. Conservatory staff continually try to keep chemical pesticide use in the production greenhouses as low as possible. We continue to investigate and use additional least toxic or non-traditional pest control methods.

Pesticides Used to Control Pests in Production Greenhouses:

Product Used	Active Ingredient (A.I.)	Total A.I. Used	Purpose
SuffOil-X	80% Mineral Oil	117.00 fl. oz.	Spray oil emulsion fungicide, insecticide, and miticide.
Kopa Insecticidal Soap	47% Potassium Salts of Fatty Acids	140.80 fl. oz.	Insecticide, Miticide, Fungicide
Zerotol 2.0	27.1%Hydrogen Peroxide 2.0%Peroxyacetic Acid	93.00 fl. oz.	Fungicide, Bactericide, and Algaecide for pest prevention and suppression
Talstar P Insecticide	7.9% Bifenthrin	8 fl. oz.	Insect control
Cease	1.34% QST 713 Strain of <i>Bacillus subtilis</i>	0.688 lbs	Bio-fungicide
Marathon Granular	1.0% Imadacloprid	1.5 lbs	Systemic Insect control
Decathalon 20WP	20.0% Cyfluthrin	0.15 lbs	Insect control
Avid 0.15 EC	2.0% Abamectin	2.4 fl. oz.	Insect control
Safari 20 SG	20.0% Dinotefuran	3.1125 lbs	Systemic Insect control
Botanigard 22 WP	22%Beauveria bassiana strain GHA	0.60 lbs	Biological insecticide
Rootshield Plus	1.5% Trichoderma harzianum Rifai strain T-22 0.61% Trichoderma virens strain G-41	0.875 lbs	Biological fungicide
Pyrethrum TR	4.0% Pyrethrins 16% Piperonyl Butoxide	0.125 lbs	Total Release Aerosol Insecticide.

Non-chemical Pest Control Measures in Greenhouses

Use of Rootshield Plus®, a non-chemical product that is composed of beneficial soil organisms, continues to be successful in reducing the need for traditional chemical-based soil fungicides. Beneficial insects are also released as the situation warrants for specific pest control. The following beneficial insects were released into the greenhouses as the situation warranted:

Beneficial Insect	Target Pest
<i>Amblyseius cucumeris</i> (predator)	Thrips, Mites
<i>Aphidius colemani</i> (parasite)	Aphids
<i>Chrysoperla</i> spp. (predator)	Several Insects
<i>Cryptolaemus montrouzieri</i> (predator)	Mealybugs, Scales, Aphids
<i>Encarsia formosa</i> (parasite)	Whitefly
<i>Hypoaspis miles</i> (predator)	Gnats, Thrips, Soil Insects
<i>Orius</i> spp. (predator)	Thrips, Aphids, Mites

In addition, some plant material is washed with water or pruned to control pest infestations. Other times, manual removal or a treatment with oil, soap, hydrogen peroxide solutions or isopropyl alcohol is used for insect control.

Complaints Received

There were no visitor complaints regarding chemical use in Olbrich Production Greenhouses in 2021.

Pest Control in the Outdoor Gardens

Olbrich Botanical Gardens is committed to eco-friendly gardening and to setting an example for our visitors, showing them that beautiful gardens can be created and maintained without the use of large amounts of pesticides. The horticulture staff continues to face new disease and insect challenges, some of which may be tied to our changing climate. As always, the principles of Integrated Pest Management (IPM) are applied to our gardening practices throughout the gardens.

Pesticides Used to Control Pests in Outdoor Gardens

Product Used	Active Ingredient	Total A.I. Used	Purpose
Attain	Bifenthrin	0.01 lb	Insect Control
Botanigard	<i>Beauveria bassiana</i> Strain GHA	0.0092 lb	Insect Control
Bt	<i>Bacillus thuringiensis</i> (subspecies <i>kurstaki</i> strain)	0.0028 lb	Insect control
Decathlon	Cyfluthrin	0.093 lb	Insect control
Glyphosate Pro	glyphosate	6.00 lb	Weed control
K-Tea	Copper trimethylamine	0.347 lb	Algae control
Marathon 1%	Imidacloprid	0.005 lb	Insect Control
M-Pede	potassium salts of fatty acids	0.37 lb	Insect control
Pyrethrum	Pyrethrins Piperonyl butoxide	0.01 lb 0.04 lb	Insect control
Reward	Diquat dibromide	0.138 lb	Weed Control
Suffoil-X	Mineral oil	0.2 pounds	Insect control
Tordon RTU	Picloram 2,4-dichlorophenoxyacetic acid	0.0049 pounds 0.0191 pounds	Weed control
VoleX	Corn Gluten meal Sesame Sodium Chloride Citric Acid	1.1 lb 0.45 lb 0.15 lb 0.1lb	Rodent control
Xytect 2F	Imidacloprid	0.69 lb	Insect control

Non-chemical Pest Control in Outdoor Gardens

In 2011, we began working with Bando Organics, an outside contractor that specializes in applications of compost tea. The goal was to reduce the use of standard chemical products by inoculating our soils with a multitude of beneficial microorganisms. This practice has led to healthier soils and more resilient plants, minimizing the need for synthetic fertilizers and pesticides. Multiple areas are given season long applications last year, including all of our lawn areas that are heavily used for special events at the Garden.

In 2021, Olbrich continued its efforts to keep chemical pesticide use in the outdoor gardens as low as possible. This can be challenging, given the high aesthetic standards expected by our visitors, but we tolerate insect and disease damage that won't lead to fatal results of plants within the collection. We also use the damaged plants as an opportunity to educate our visitors through interpretive signage, trying to let people know that most insect or disease problems do not require the use of pesticides and with time, Mother Nature will alleviate the problem.

Olbrich's Garden Scouts are a volunteer team created and supported by our horticulture staff. They embrace our commitment to sustainable gardening and discontinuation of chemical use, and support experimentation with natural alternatives and the creation of insect-inspired elements throughout the gardens. These volunteers help staff scout for beneficial insects, pollinators, and pests from May through October. They've participated in educational lectures, helped fill native bee houses, created beneficial 'beetle bump' habitat, tagged Monarch butterflies, and planted bulbs for early spring pollinators. We look forward to more great work from this team effort in 2022.

The principles of Integrated Pest Management (IPM) are applied to all of our gardening practices. IPM stresses evaluating a wide range of criteria to decide when and what treatments are necessary for dealing with garden pests; and, selecting solutions that minimize the amount and types of products used to combat them. Below is a listing of some of the strategies that fall under the guidelines of Olbrich Botanical Garden's IPM program.

Select disease and pest resistant varieties. One good example is the selection and planting of only the most disease-resistant ornamental flowering crabapples in the gardens. Disease-susceptible cultivars have been culled from the collection over the years – those selections that would require the use of fungicides to keep them healthy.

Assess damage thresholds. Staff are willing to tolerate damage, both aesthetic and pathological. For instance, minor cases of powdery mildew on ornamental plants, while easily cured by common fungicides, are usually ignored. The same holds true for many of the minor insect problems that are present. Pesticides are applied only if the health of the plant is greatly compromised or the visual attraction of the plant is greatly affected. Turf weeds are tolerated within the aesthetic standards of the Garden. Less toxic solutions are utilized before selecting a more toxic product. Minor localized problems may be pruned out rather than treating the entire plant with a chemical - for instance, a single branch on a fruit tree with tent caterpillars. Olbrich does treat selected valuable specimen trees, and two ash trees were treated against Emerald Ash Borer in 2021.

Manual/cultural controls. The great majority of weed control in the gardens is accomplished by manual pulling and preventing them in the first place by liberal and frequent applications of leaf and wood mulches. Vulnerable new plantings around the Learning Center and elsewhere were equipped from the start with wire cages to prevent rabbit and vole damage.

Let nature help. When gardens are healthy, there is a natural balance between predator and prey that helps keep plant collections and gardens protected from visible damage. When the gardens function as an ecosystem, there are natural checks and balances that minimize the amount of chemical inputs required. Birds and beneficial insects help keep pest insects in check and resident foxes, red-tail hawks and mink have helped reduce rodent and rabbit problems. Rabbits are live trapped and relocated when their population reaches damaging levels. A cyclical increase in the population causes an increase in efforts in this area, which continues into the winter. This year we saw a large increase in the vole population, with significant damage to the garden. Physical barriers and organic baits were used in control, and the garden saw a noticeable increase in the population of hawks as well, an added bonus to tolerating some damage.

Complaints Received

There were no visitor complaints regarding chemical use in the Gardens in 2021.

Pesticide Management Plan for the 2022 Season

The Gardens' staff will continue to work with an Integrated Pest Management (IPM) program. Staff will monitor the Gardens' indoor and outdoor plant collections for optimum health and vigor, strive to improve the cultural and biological environment, provide mechanical eradication if possible, use resistant plant varieties, eliminate the plant if the problem persists and, as a final option, use pesticides to control plant pests. This past year saw a continuation of the use of beneficial insects in the Bolz Conservatory with satisfactory results. Canopy birds and ground quail also assist in keeping pest populations low in the Bolz Conservatory. The outdoor garden staff will continue to seek out less toxic pesticides that will provide control of pests while providing a safe environment for visitors. Staff will continue to experiment with alternatives to the use of traditional pesticides, including the use of beneficial insects in the greenhouse.

GOLF ENTERPRISE PROGRAM (GEP)

The Madison Parks' Golf Enterprise Program (GEP) consists of 72 golf holes at four facilities (Yahara Hills, Odana Hills, Monona, and Glenway golf courses) encompassing approximately 750 acres of City-owned property. GEP's Integrated Pest Management (IPM) philosophy is a multi-faceted approach that integrates all beneficial measures into a comprehensive program that controls pests in golf settings. Through the implementation of comprehensive Integrated Pest Management strategies that include establishing pest thresholds, monitoring for pests, cultural practices (mowing, rolling, irrigation, fertilization) and judicious use of pesticides, the Golf Enterprise Program meets the expectations of our customers while managing our courses in an environmentally sustainable and responsible manner.

Turf Insect Management in GEP

There were few major insect problems at our facilities in 2021. Some secondary damage caused by animals (skunks, raccoons, cranes, etc.) feeding on white grubs has been reported on areas of rough that we currently do not treat with insecticides. Should damage continue to increase in these non-treated areas, preventative insecticide applications may be necessary. Additional future insecticide treatments will follow best management practices for protecting pollinators in turf settings. Recently published guidelines are available (<http://ncipmc.org/action/bmpturf.pdf>), and will be implemented in our pest management programs.

Pesticides Used for Control of Insect Pests on Golf Courses:

Product(s)	Active Ingredient	Total A.I. Used	Areas Treated
Merit Lesco fertilizer with Merit Prokoz Zenith 75 WSP, 2F	Imidicloprid	49.63 pounds	tees, fairways, Rough
Syngenta Acelepryn	Chlorantraniliprole	4.82 pounds	greens, tees
Aloft	Bifenthrin	0.97 pounds	greens
Arena, Aloft	Clothianidin	1.54 pounds	greens, tees
Talstar	Zeta cypermethrin	.05 pounds	greens Glenway

Turf Disease Management

The 2021 golf season was moderately challenging in terms of disease management. Turf diseases which are rarely observed, such as pithium blight, made appearances again this season and necessitated fungicide treatments (mefenoxam). More moderate weather patterns and fewer heavy rainfalls resulted in less disease pressure in areas prone to flooding. However, other areas suffered increased disease pressure (anthracnose) due to drought conditions. While a large proportion of our disease management currently focuses on dollar spot and preventing snow molds, anthracnose on *Poa annua* is increasing to problematic levels. We are collaborating with the University of Wisconsin by providing study sites for research of anthracnose control products and strategies, and will continue to do so. Diseases detected this season included pithium blight, brown patch, dollar spot, anthracnose (both foliar and basal rot), necrotic ring spot, and fairy ring.

Fungicides Used for Control of Turfgrass Disease

Products	Active Ingredient (A.I.)	Total A.I. Used	Areas Treated
Daconil Ultrex, Lesco Manicure Ultrex	Chlorothalonil	693 pounds	greens, tees, fairways
Bayer Chipco 26019, Lesco 18-Plus	Iprodione	699.44 pounds	greens, tees, fairways
Torque Fungicide, Omni Tebuconazole 3.6 Foliar Fungicide, Albaugh Tebuconazole 3.6F T&O	Tebuconazole	173.67 pounds	greens, tees, fairways
Banner Maxx II Fungicide, Lesco Spectator Ultra 1.3 Fungicide, Albaugh Agri Star Propi-Star EC	Propiconazole	246.68 pounds	greens, tees, fairways and trees in rough
BASF Insignia, Lexicon brand fungicides	Pyraclostrobin	15.1 pounds	greens
Syngenta Heritage, Quali-Pro Azoxy 2SC	Azoxystrobin	1.24 pounds	greens
Quali-Pro Mefenoxam 2AQ	Mefenoxam	9.5 pounds	tees

Armor Tech Rotator Atticus Detour 4 SC Syngenta Secure	Fluazinam	105.33 pounds	greens, tees, fairways
Syngenta Posterity Fungicide	Pydiflumetofen	2.74 pounds	greens, tees
BASF Xzemplar, Lexicon brand fungicides	Fluxapyroxad	12.47 pounds	greens, tees
Turficide 10 G	PCNB	50 pounds	greens Glenway
Syngenta Velista	Penthiopyrad	9.25 pounds	greens
NuFarm Spotrete	Thiram	126 pounds	tees
Pillar G	Triticonazole	0.9 pounds	greens Glenway

Plant Growth Regulation

Plant growth regulators are being incorporated into our IPM program. They promote plant health and reduce the frequency of mowing required to meet play surface specifications. This in turn also reduces costs for fuel, labor and equipment maintenance, and reduces our carbon footprint. Ethephon, trinexapac-ethyl, and prohexadione-calcium are plant growth regulators that slow the growth of turf grass and are used to suppress seed head formation on *Poa annua*.

Chemicals Used to Regulate Plant Growth

Product(s)	Active Ingredient	Total A.I. Used	Areas Treated
Bayer Proxy, Helena Oskie	Ethephon	138.75 pounds	greens
Syngenta Primo Maxx, Quali-Pro T-Nex	Trinexapac-ethyl	36.09 pounds	greens, tees, fairways
Nufarm Anuew, Rightline Prohex	Prohexadione-calcium	3.3 pounds	greens

Turf Weed Management

As a general rule, highly maintained and properly irrigated turf is very healthy and out-competes most weeds. Therefore, our reliance on herbicides to control weeds in turf is actually quite limited. A slight decrease in overall herbicide treatments was observed in 2021, with the exception of a slight increase in glyphosate, which was attributed to a single larger application for site preparation for a prairie planting at Glenway. This application was made on 5.35 acres of existing turf grass, in order to allow establishment of native grasses and prairie plantings on site.

Herbicides Used to Control Turf Weeds

Product(s)	Active Ingredient	Total A.I. Used	Areas Treated
Bayer/Monsanto Roundup Lesco Ranger Pro	Glyphosate	78.14 pounds	Tree circles within rough and bunkers
Lesco 3-Way Gordons Trimec Classic Helena Vision Herbicide	Dicamba	4.45 pounds	fairways, roughs
Dimension Lesco Fertilizer with Dimension	Dithiopyr	40.99 pounds	tees, fairways, rough
Quicksilver	Carfentrazone-Ethyl	1.42 pounds	greens

Contracted Pest Control at GEP Facilities

GEP contracts with KwikKill Pest Control to provide year-round pest control at Odana and Yahara, and seasonal pest control at Monona and Glenway Clubhouses. The contractor monitors pest populations, makes applications only when necessary, uses glue and spring traps, fills holes to prevent rodent entry and makes recommendations to staff based on observations. Facilities are cleaned daily and trash is removed daily to outdoor receptacles.

Insecticides and Rodenticides Used by KwikKill to Control Pests in Golf Clubhouses

Product Used	Active Ingredient (A.I)	Amount Used	Purpose
Talstar Pro	Bifenthrin	0.31 pounds a.i.	Insect control
Weatherblok XT	Brodifocoum	0.129 pounds a.i.	Rodent Control
Temprid FX	Imidacloprid	0.2 pounds a.i.	Interior insect control
Termidor SC	fipronil	0.09 pounds a.i.	Interior insect control

Non-Chemical Means of Pest Control

GEP relies heavily on cultural practices to manage the turf stand. These include mowing, vertical mowing, watering, fertilizing, aerification, topdressing, and rolling. Regular mowing at the proper height directly controls many annual weed species, and promotes the rhizomatous and stoloniferous growth habitat of most turf species, which then helps prevent establishment of new propagules of weed species. As a general rule, higher cut heights promote healthier turf stands. For example, a rough grass stand mowed to 3 inches will have far less crabgrass than a turf cut to 1.5 inches. A putting green cut to 5/32 inch will have fewer disease, algae, and moss infestations than a green cut to 1/8 inch or less. Staff carefully monitor moisture levels and provide irrigation to prevent drought stress. Semi-regular fertilization and regular aerification promote healthy growth, drainage and air flow that allows the turf to grow vigorously and withstand traffic and pests. Topdressing with sand provides smooth putting surfaces, increases drainage and dilutes organic matter, allowing the turf to withstand traffic, and pests such as anthracnose. Rolling helps smooth the playing surface and reduce mowing frequency, and has been shown to directly reduce the severity and incidence of the common turf grass disease dollar spot.

Complaints

The GEP did not receive any complaints in 2021 related to pesticide usage.

Plan for 2022

The Integrated Pest Management plan and pesticide use for 2022 is expected to be similar to that of previous years, as Glenway Golf Course is expected to re-open mid-year. As always, we will use adaptive management to conserve our budget, meet customer expectations, and respond to unforeseen factors such as changes in customer volume and weather conditions.

CONSERVATION PARKS (2021)

WOODY PLANT CONTROL APPLICATIONS BY STAFF

Targeted Species: Amur maple, buckthorn, burning bush, honeysuckle, Kentucky coffee-tree, Norway maple, privet, Asiatic bittersweet, porcelain-berry, white mulberry, white poplar, multi-flora rose. Certain ash, black cherry, elm, hickory, and walnut were also targeted as part of oak woodland restoration efforts.

Purpose: The purpose of herbicide applications is to reduce the presence of these species in Conservation Parks in order to preserve the native diversity of plants and animals. Controlling woody vines is becoming an increasing point of emphasis as these species are spreading rapidly. Trail improvement projects also require herbicide to prevent re-sprouting.

Locations: Cut stump treatment, spot foliar, and basal bark applications were made at Cherokee Marsh (North Unit and South Unit), Edna Taylor, Kettle Pond, Knollwood, and Owen Conservation Parks.

Pesticides Applied by Staff For Control of Woody Species

Product(s) Used	Active Ingredient (a.i.)	Total Amount of A.I. Used
2,4-D	2,4-dichlor-phenoxyacetic acid	5.47 pounds
Garlon 3A	triclopyr amine	5.01 pounds
Garlon 4 Pathfinder II	triclopyr ester	5.24 pounds

HERBACEOUS PLANT CONTROL APPLICATIONS BY STAFF

Targeted Species: Bird's-foot trefoil, burdock, crown vetch, teasel, dame's rocket, garlic mustard, Miscanthus, Phragmites, purple loosestrife, reed-canary grass, tansy, and wild parsnip.

Purpose: To control aggressive exotic plant species while populations are small. They threaten native plant diversity if left unmanaged.

Locations: Cherokee Marsh (North Unit and South Unit), Edna Taylor, Owen, and Prairie Ridge Conservation Parks, and Vilas Park.

Pesticides Applied by Staff for Control of Exotic Herbaceous Plants:

Product(s) Used	Active Ingredient (A.I.)	Total Amount of A.I. Used
2,4-D	2,4-dichlor-phenoxyacetic acid	3.73 pounds
AquaNeat	glyphosate	0.04 pounds
Garlon 3A	triclopyr amine	2.39 pounds
Intensity	clethodim	0.005 pounds

WOODY AND HERBACEOUS PLANT CONTROL APPLICATIONS BY VOLUNTEERS

Targeted Species: Bird's-foot trefoil, buckthorn, Canada thistle, crown vetch, honeysuckle, Japanese barberry, Miscanthus, Phragmites, and reed canary grass.

Purpose: To control aggressive exotic plant species while populations are small. They threaten native plant diversity if left unmanaged.

Locations: Cherokee Marsh (North, South and Mendota Units), Meadow Ridge, Owen, Prairie Ridge, and Stricker's Pond Conservation Parks.

Pesticides Applied by Volunteers For Control of Exotic Plant Species:

Product(s) Used	Active Ingredient (a.i.)	Total Amount of A.I. Used
Milestone	aminopyralid	0.024 pounds
Intensity	clethodim	0.094 pounds
Aquaneat Makaze	glyphosate	4.181 pounds
Garlon 4 Pathfinder II	triclopyr ester	2.473 pounds

HERBICIDE APPLICATIONS BY CONTRACTORS

Targeted Species: Woody species include autumn olive, bittersweet nightshade, black locust, buckthorn, mulberry, honeysuckle, Japanese barberry, multiflora rose, Siberian elm, sumac, Asian bittersweet, and porcelain berry. Herbaceous species targeted include bird's-foot trefoil, burdock, cattail, crown vetch, dame's rocket, daylily, garlic mustard, Himalayan pokeweed, Japanese hedge parsley, Lamium, and motherwort.

Purpose: To control aggressive exotic plant species while populations are small. They threaten native plant diversity if left unmanaged.

Locations: Cherokee Marsh (North Unit and Mendota Unit), Edna Taylor, Elvehjem Sanctuary, Heritage Sanctuary, Knollwood, Moraine Woods, Owen, Prairie Ridge, Stricker's Pond, and Turville Point Conservation Parks.

Pesticides Applied by Contractors:

Product(s) Used	Active Ingredient (a.i.)	Total Amount of A.I. Used
Aquaneat	glyphosate	2.31 pounds
Escort	metsulfuron methyl	0.52 pounds
Detail	suflufenacil	0.32 pounds
Garlon 3A Vastlan	triclopyr amine, triclopyr choline	35.76 pounds
Garlon 4	triclopyr ester	21.93 pounds

NON-CHEMICAL PEST CONTROL MEASURES SELECTED AS PART OF IPM PROGRAM

The level of effort devoted to mechanical weed control methods continued to increase in 2021.

Hand-pulling, digging: Staff spent approximately 200 hours this spring hand pulling garlic mustard and Japanese hedge parsley at Cherokee Marsh, Edna Taylor, Heritage Sanctuary, Owen, and Prairie Ridge.

The Friends of Cherokee Marsh, Friends of Edna Taylor, Friends of Owen, and other volunteers spent **430 hours** hand-pulling garlic mustard, dame's rocket, Japanese hedge parsley, and sweet clover, and digging burdock and wild parsnip at Cherokee Marsh, Edna Taylor, Meadow Ridge, Owen, and Stricker's Pond. An undetermined (unrecorded) number of hours were also spent by volunteers pulling garlic mustard at Acewood Pond, Kettle Pond, and Sandburg Woods, where casual efforts were encouraged by posting of designated weed compost/collection sites for target plants pulled in these parks.

Prescribed Fire: The use of fire is an important land management practice which helps promote native species over exotics. The timing of burns can help set back exotics (e.g., late spring burns harm cool season weeds but promote native warm season plants). Burns can also cause mortality to small woody exotics like buckthorn and honeysuckle. If the timing is perfect, fire can even kill entire cohorts of first year garlic mustard seedlings. Unfortunately, the number of days suitable for burning is limited by both weather conditions and staffing levels. Conservation staff burned approximately **184 acres** in 2021.

Prescribed grazing: Goats were used to graze **43 acres** at Acewood, Knollwood, Owen, and Turville Point in 2021 to control woody invasive species and brambles.

Mowing: Considerable time (**approx. 120 hours**) was spent spot-mowing bird's-foot trefoil, crown vetch, Japanese hedge parsley, sweet clover, teasel and wild parsnip, as well as invasive brush. Mowing was used at Cherokee Marsh, Edna Taylor, Elvehjem, Owen, Prairie Ridge, and Turville Point.

PLAN FOR 2022

Conservation's IPM Program will be implemented in 2022 similarly to how it was in 2021 in accordance to the Parks Division's Adopted Land Management Plan. Staff will continue to target priority invasive species, striving for complete control, in priority management units. These efforts will be complemented by volunteer-led efforts in adjacent management units. Visual estimates of canopy cover will be used to prioritize areas for brush mowing, and to determine thresholds for hand-pulling versus mowing versus foliar herbicide applications, for those invasive species that can be effectively controlled with mechanical methods only. Chemical control will be used in conjunction with mechanical methods wherever possible, in order to reduce the amount of pesticide required.

Large-scale restoration efforts are planned for Acewood, Cherokee Marsh, Knollwood, Moraine Woods, Owen, Sandburg Woods and Turville Point. Contractors will be hired to make cut-stump applications to buckthorn and honeysuckle, as well as foliar applications to bird's-foot trefoil, burdock, crown vetch, daylily, garlic mustard, dame's rocket, Himalayan pokeweed, and reed canary grass. Some areas will be forestry mowed, and woody re-sprouts sprayed early in the growing season while they are still small.

Following invasive species control efforts, native grasses, forbs, shrubs, and trees will be seeded or planted to complement recovery from the natural seed bank as part of the restoration process.

Prescribed fire, prescribed grazing, mowing, and hand-pulling will continue to be used as management tools in 2022.