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Integrated Pest Management Plan

Washington County

Public Works Department

Parks Division

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Introduction

Washington County Parks Division has adopted this Integrated Pest Management (IPM) Plan for the grounds, facilities and natural areas it manages. An IPM system establishes a sustainable approach to managing pests by combining cultural, mechanical, physical, biological and chemical tools to eliminate or mitigate economic, environmental and health damage caused by pests. A pest is an organism considered injurious or unwanted by humans. This can include, but not limited to groups, including animals, plants, fungi, and viruses. The primary audience for the IPM is full-time and seasonal staff in the parks.

Objectives

- Identify cultural, mechanical, physical, biological and chemical control methods to manage noxious plants and pests, parking lot and pavement preservation, trail maintenance, ROW maintenance, turf areas, and natural areas.
- To reduce pesticide usage.

IPM Decision Making Strategy

An Integrated Pest Management decision shall consist of the following steps:

1	Identify noxious plant/pest species	Proper and accurate ID of pests is essential for choosing the appropriate control method.
2	Monitor and assess the action threshold levels of pests	Some pests and plants can be tolerated at low levels. Monitoring on a regular basis ensures staff is taking action when an action threshold has been reached.
3	Select management methods based on site conditions	Cultural, physical, biological and chemical control methods are reviewed based on site.
4	Record keeping	Staff will record when a management action is taken, including pest identification, population size, distribution, recommendations for future prevention. Records will be maintained at each facility for at least two years.
5	Assess effectiveness of pest management	Using the records the IPM coordinator will review the management methods used and adjust IPM strategies in the future.
6	Tactics for future pest prevention	Park staff will use preventative actions to reduce conditions that attract pests to both the facility grounds and buildings such as proper design, soil preparation, proper planting/irrigation, and mulching practices. Include preventative measures into future and existing structures and designs.
7	Further evaluation	The IPM coordinator will review and update annually.

IPM Coordinator

The IPM Coordinator is the Natural Resource Coordinator, who is responsible to implement the IPM plan and update the IPM program.

Control Methods

Once the pest has been identified and determined to be at an action threshold, below are the types of control methods to consider in order from most desirable to least desirable.

Control Strategy		Examples
1	Cultural	-Selecting resistant species -Use of winter cover crops and altering planting dates -Proper planting and watering techniques -Ensure healthy soil by using organic soil amendments -Habitat modification -Prescribed burns -Mulching (use of shredded bark, wood chips, plastic) -Sanitation practices (removing food, water, and shelter from competing pests)
2	Mechanical	-Cultivation (mowing, disking, cutting, uprooting, trapping and pruning) -Exclusion (caulking, meshing, screens, plastic barriers) -Propane torches -Hand pulling
3	Physical	-Over-seeding, dethatching, aeration, -Thinning plant canopy
4	Biological	-Enhancement of environment for natural enemies of pests -Introduction of predators, parasites, pathogens, and competitors -Use of natural grazers such as goats, sheep, cattle and bison
5	Chemical	-Use of selective or non-selective pesticide/herbicide only after exhausting non-chemical controls. -Chemical information for specific pests is provided below

Pesticide Application and Training

The IPM Coordinator shall provide pesticide application training for staff and ensure record keeping. Applicators must have the appropriate Minnesota Department of Agriculture pesticide license.

Plant-specific strategies for Minnesota noxious weeds

Minnesota State Statute 18.75 provides a list of plant species that are required to be controlled due to their aggressive nature, and potential to cause economic damage to landowners. Washington County uses this list to prioritize control efforts, the table below provides a description of each species known within the parks and control methods.

Plant Eradicate List	
<i>Species</i>	Oriental bittersweet (<i>Celastrus orbiculatus</i>)
<i>Info</i>	There is small population within Big Marine Park Reserve as of 10/16/2016 which will be targeted in 2017.
<i>Biological</i>	Use of goats
<i>Chemical</i>	-Foliar treatment: Garlon 3a, triclopyr amine, 2% solution with water -Cut-stem treatment: Garlon 3a, triclopyr amine, 25% with water

Plant Control List	
<i>Species</i>	Canada thistle (<i>Cirsium arvense</i>)
<i>Info</i>	Present at each park. The primary control areas within the parks occur along major roadways and campgrounds. Largest infestations are at Lake Elmo Park Reserve and St. Croix Bluffs Regional Park. Primarily in old fields and un-mowed areas of Kentucky blue grass (<i>Poa pratensis</i>) and smooth brome (<i>Bromus inermis</i>).
<i>Cultural</i>	Annual fires done in late spring (end of May) have been shown to reduce the above ground populations of Canada thistle. Burns should not take place in early spring, otherwise it increases reproduction.
<i>Mechanical</i>	Spot mowing should be used at least once, prior to their flowering in June, and needs to be done multiple times throughout the summer to deplete root reserves otherwise it stimulates plant growth.
<i>Physical</i>	After the prescribed burns take place, intensive over-seeding of grasses can be used to shade the Canada thistle seedlings.
<i>Biological</i>	-There are many species of insects that have been found to slightly lessen the spread of Canada thistle; weevils are primarily used in the Midwest. Results of successful <i>C. littura</i> use are highly variable from Canada to Montana and further research is being conducted across the United States. -Selective grazing with goats, sheep and cattle can damage Canada thistle populations if linked correctly to the noxious weed's growing season. Sheep and cattle tend to only graze the plant while in the seedling stage because of the lack of spines, whereas goats will eat the mature plants.
<i>Chemical</i>	Foliar treatment: Milestone, 5 to 7 ounces per acre, in summer or fall.
<i>Species</i>	Common tansy (<i>Tanacetum vulgare</i> L.)
<i>Info</i>	Found in Lake Elmo Park Reserve in scattered clumps on the west side of Eagle Point Lake. Actions will be taken in 2017 to control the clumps.
<i>Cultural</i>	Native plants can out-compete common tansy when planted in large densities, including Black-eyed susan (<i>Rudbeckia hirta</i>) and ox eye sunflower (<i>Heliopsis helianthoides</i>).
<i>Mechanical</i>	Mowing is an optional control method for larger infestations, which needs to occur before the plant flowers. Additional mowing also needs to occur throughout the growing season. Mowing alone will not eradicate common tansy and should be used with other control methods.
<i>Physical</i>	-Hand pulling can be an effective method for common tansy found in small patches. This does not remove all of the plant's roots, which leads to re-sprouting, so consistent monitoring and frequent re-pulling will need to take place. Personal protection equipment (gloves and long pants/shirts) due to the plants toxicity. -Over seeding native plant species after biological control
<i>Biological</i>	Common tansy can be grazed by sheep and goats, which will graze on the plant throughout its life cycle. Note: Common tansy has little protein associated with it so supplemental food sources are necessary for grazers.
<i>Chemical</i>	Herbicides, for example Escort, can be used with other control methods and applied during proper stages of the plant's development (late June to early July).
<i>Species</i>	Garlic mustard (<i>Alliaria petiolata</i> , Bieb.)
<i>Info</i>	At Cottage Grove Ravine Regional Park, Pine Point Regional Park and Lake Elmo Park

	Reserve. Highest densities are within Cottage Grove Ravine, while scattered populations are found along the trails at Pine Point Regional Park. The University of Minnesota and MN DNR have been conducting monitoring of plots at Cottage Grove Ravine Regional Park for the last ten years. They are seeking approval for releasing a bio control within the park that targets the plant.
<i>Cultural</i>	Certain native species can outcompete garlic mustard.
<i>Mechanical</i>	Hand pulling can be used to remove second-year plants from the infested area, though this does not exterminate plant roots. The best time to hand pull garlic mustard is in the spring when the plant is flowering, but before it has gone to seed, and when the ground is damp so more of the roots can be pulled out with the plant. The pulled plants need to be bagged and properly disposed of in a timely manner.
<i>Physical</i>	Over-seeding native species is a method to dissuade further infestations of garlic mustard. The Ontario Invasive Plant Council has a list of native plants.
<i>Biological</i>	-Recent studies have shown that the univoltine root mining weevil (<i>Ceutorhynchus scrobicollis</i>) is capable of reducing seed and biomass production, and increases mortality of over-wintering rosettes of garlic mustard. In 2012 a petition was submitted to the Technical Advisory group of Biological Control of Weeds to recommend the release of the weevil in the United States. - Garlic mustard is a non-toxic, edible plant that can be selectively grazed on by goats.
<i>Chemical</i>	Foliar treatment: Organic Soil Tech Corp <i>Phydur</i> , SummerSet <i>AllDown</i> , at a rate pf 2 to 1. Or Rodeo at 2% solution on dense patches in the fall and/or early spring.
<i>Species</i>	Musk thistle (<i>Carduus nutans L.</i>)
<i>Info</i>	At Lake Elmo Park Reserve in old fields with low diversity.
<i>Cultural</i>	Musk thistle prefers land that has been over-grazed or uninhabited. Proper management practices, for instance, livestock rotation and planting native grasses or other species can prevent the musk thistle from invading.
<i>Mechanical</i>	Hand pulling, cutting, and mowing can all be effective ways to reduce or eradicate musk thistle populations if performed at the correct time in the plant's life cycle. All mechanical controls should first be performed before the plant flowers (late June through early July). Mechanical control methods need to occur multiple times throughout season.
<i>Biological</i>	The musk thistle rosette weevil (<i>Richosirocalus horridus</i>) and the musk thistle flower head weevil (<i>Rhinocyllus conicus</i>).
<i>Chemical</i>	Foliar treatment: Milestone at 5 to 7 ounces per acre.
<i>Species</i>	Purple loosestrife (<i>Lythrum salicaria, virgatum L.</i>)
<i>Info</i>	At Big Marine Park Reserve, In the 2000's a bio release was completed to help control the population which has been effective.
<i>Cultural</i>	Reduce the presence of exposed soil produced from grazing livestock, bulldozers, shore manipulation and other practices that disturb the area.
<i>Biological</i>	Biological agents are the main method used against purple loosestrife in Minnesota. Two species of leaf beetles (<i>Galerocella pusilla</i> and <i>G. californiensis</i>) can be used to attack the growth and seed production, leaves, and new shoot growth of purple loosestrife. Adult weevils feed on young plant tissue while the larva feed on the foliage. According to the Minnesota DNR, "Biological control insects released between 1992 and 2009 has established reproducing populations at more than 75% of the sites visited." The

	loosestrife defoliating beetle (<i>Galerucella pusilla</i>) can be purchased from the Biological Control of Weeds, Inc. website, costing \$150.00 for 105 adults.
<i>Species</i>	Spotted knapweed (<i>Centaurea stoebe</i> spp. <i>micranthos</i>)
<i>Info</i>	At each park, abundant at Lake Elmo Park Reserve, in areas along horse trails.
<i>Cultural</i>	Limit the amount of bare soil in an area. Open/bare areas of soil allow spotted knapweed and other noxious weeds to spread faster. Planting native species with extensive root systems and ground cover helps keep invasive species out of natural areas.
<i>Mechanical</i>	-Small infestations can be removed by hand pulling. -Mowing is most efficient when used with other control methods such as seeding or spraying small amounts of low level herbicide.
<i>Biological</i>	-The MN DNR has successfully used weevils to control spotted knapweed. There are two seed head weevils (<i>Larinus minutus</i> and <i>Larinus obtusus</i>) and one root boring weevils (<i>Cyphocleonus achates</i>). The <i>Larinus</i> spp. costs \$75.00 for 210, while <i>Cyphocleonus</i> is \$100.00 for 105 adults. -Selective grazing sheep/goats can reduce densities. The grazers prefer the plant in the earlier stage of life (rosette). Grazers can reduce the size and seed production, but more effective when combined with other control methods.
<i>Physical</i>	After a knapweed outbreak has been eradicated or controlled, over-seeding the disturbed soil with native plants is the best control method.
<i>Chemical</i>	Foliar treatment: Milestone at 5 to 7 ounces per acre.
<i>Species</i>	Wild parsnip (<i>Pastinaca sativa</i> L.)
<i>Info</i>	Warning – Skin contact to the juice/sap of wild parsnip in the presence of sunlight can cause a rash, severe blistering, burns, and discoloration of the skin (phytophotodermatitis). Proper personal protective equipment (gloves, long sleeves, and pants) are required. Found in 2016, on the west edge of Lake Elmo Park Reserve. Efforts will be made to remove the parsnip in spring of 2017 using mechanical and herbicide treatments
<i>Cultural</i>	Selecting native seeds such as golden alexander
<i>Mechanical</i>	-Use a shovel to remove the plant and its taproot before seeding occurs. Plants should be collected and dried on site. Plants should be dried for a minimum of one week then transfer to bags. - Mowing is a method that can deter seed production if done after flowering and prior to seeding (late May to early June). Continuous mowing throughout the summer will be necessary to combat regrowth. Equipment must always be washed on site to prevent the spread of seeds.
<i>Physical</i>	Maintaining a diverse prairie can prevent wild parsnip from entering the site. Plant native species in any areas of exposed soil.
<i>Biological</i>	The parsnip webworm (<i>Depressaria radiella</i>) has been shown to reduce populations of wild parsnip.
<i>Chemical</i>	Foliar treatment: Rodeo, 2 % solution with 1 oz. Escort® plus surfactant mix can be spot applied to basal rosettes. This is recommended for the late fall because then it will minimize the potential harm to non-target species. Mature plants can be spot treated from when the plant is bolting until it is flowering (mid-May to mid-June).

Restricted Plant List	
<i>Species</i>	Common buckthorn, European buckthorn (<i>Rhamnus cathartica</i>) and Glossy buckthorn (<i>Rhamnus frangula</i>).
<i>Info</i>	Found throughout the Washington County park system at varying densities.
<i>Cultural</i>	Burns can be used to help kill smaller buckthorn seedlings and top kill larger buckthorn stems, preventing the species from going to seed.
<i>Mechanical</i>	Forestry mowing and mowing re-sprouts.
<i>Physical</i>	Use of oats in areas initially removed of buckthorn.
<i>Biological</i>	Goats are tolerant of the secondary plant compounds in buckthorn which makes them useful for removal. On average, ten goats can clear an entire acre of buckthorn in a week. They can more cost efficient than herbicide for managing natural areas. Goats were used in the Cottage Grove Ravine Regional Park in fall of 2016. Nineteen goats cleared around three acres in two weeks.
<i>Chemical</i>	-Foliar treatments: Garlon 3a at 5%. -Cut-stump treatments: Garlon 4ultra or Garlon 3a at 25%, with basal oil.

Specially Regulated Plant List	
<i>Species</i>	Poison Ivy (<i>Toxicodendron radican</i>), (<i>Toxicodendron diversilobum</i>)
<i>Info</i>	-Present at Square Lake, Lake Elmo Park Reserve, Cottage Grove Ravine Regional Park, and St. Croix Bluffs Regional Park. Occurs along forest edges, trails and open fields.
<i>Cultural</i>	Poison ivy quickly invades areas of disturbed soils.
<i>Physical</i>	Over seeding an infected area with native species after a control method has been used.
<i>Biological</i>	Goats and sheep will feed on poison ivy. This method needs to be executed yearly to deplete seed banks.
<i>Chemical</i>	Foliar treatment: Rodeo at 2%.

Parking Lot and Pavement Preservation

To prevent weeds from destroying parking lot pavement, the following methods can be used.

<i>Cultural</i>	-Portable torches should be used in early spring and summer as the annual and perennial weed emerges. Controlling the vegetation at an early stage will save on time and fuel. - Torch control works best when the vegetation is one to two inches tall.
<i>Physical</i>	Use flat shovel to remove weeds if not many are present.
<i>Chemical</i>	Foliar treatment: Alldown Concentrate, be mixed two part of chemical to one part water (2:1 ratio). Or Rodeo at 5% solution.

Trail Maintenance

Management of trails (both paved and hiking trails) in regards to IPM primarily involves the removal of invasive species. Park staff identifies the plant in question, and selects the appropriate control method.

<i>Cultural</i>	- Pruning shrubs and trees on the perimeter. -Use of cover crops to reduce invasive re-sprout (ryegrass). -Prescribed burns.
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	-Mulching 3-6" in depth around desirable trees, fence posts, and sign posts along trail.
<i>Physical</i>	Overseed exposed areas with native seed.
<i>Mechanical</i>	-Use of a forestry mower to mulch vegetation -Trimming -Raise mower blades to 3" to reduce broadleaf re-sprouts.
<i>Chemical</i>	Organic herbicide for paved paths: Alldown Concentrate, be mixed two part of chemical to one part water (2:1 ratio). Foliar treatment for foliar re-sprouts: Rodeo or Garlon 3a at 5% Cut-stump treatment: Garlon 4ultra or Garlon 3a at 25%, with basal oil.

Parks Right of Way Maintenance

Right of ways within the parks include medians, curbsides, ditches, and landscape beds within the right of way.

<i>Cultural</i>	-Reducing mowing frequency. -Selecting native species for ROW projects -Applying 3-6" of mulch to landscape beds.
<i>Physical</i>	-Overseeding native species into areas with noxious weed problems.
<i>Mechanical</i>	-When mowing the shoulder, limit mowing to 6' -Use of mower at a height of 10" -spot mowing to maintain adequate sight (inside curves, intersections, private entrances) -Avoid mowing milkweed and other native plants.
<i>Chemical</i>	Use specific herbicides to target plant pests.

Turf Areas

The following steps will be used for maximizing soil health and plant growth by using cultural, mechanical and biological and chemicals when an action threshold is reached.

Below are five turf IPM fundamentals:

1.	Prevention	Organisms are kept from becoming pest problems through planning and properly managing turf areas. Especially minimizing bare soil and seeding.
2.	Monitoring/ Identification	Turf pests, beneficial species, and damage to turfgrass are identified and monitored regularly.
3.	Action thresholds	Action thresholds are used to decide when to treat pest problems.
4.	Control	Control strategies include cultural, biological, physical, or chemical methods.
5.	Evaluation and records	The effectiveness of the IPM program is regularly evaluated with complete and accurate records.

Turf Management Priority Areas and Action Thresholds

Priority levels have been assigned to each turf area by park to help establish action thresholds for control practices. An action threshold is the invasive pest population level at which a decision is made that some intervention is needed. Below are the types of sites and action thresholds.

High Priority Turf Areas by Park (Low action thresholds)

Rank	Big Marine Park Reserve	Cottage Grove Ravine Regional Park	Historic Courthouse	Lake Elmo Park Reserve	Pine Point Regional Park	Point Douglas	St. Croix Bluffs Regional Park	Square Lake
1	Playground	Shelter Area	Entire Grounds	Swim Pond	Restroom building	Swim area	Campground	Swim area
2	Swim Area			Playground			Park office	
3	Park office			Park office				

Medium Priority Turf Areas by Park (Medium action thresholds)

Rank	Big Marine Park Reserve	Cottage Grove Ravine Regional Park	Lake Elmo Park Reserve	Pine Point Regional Park	Point Douglas	St. Croix Bluffs Regional Park	Square Lake
1	Picnic Area	Parking lots	Modern Campground	Parking lot area	Grill areas	Shelters	Grill area
2	Boat launch		Shelters		Parking lot	Boat launch	
3			Nordic Center				
4			Group Campground				

Low Priority Turf Areas by Park (High action thresholds)

Rank	Big Marine Park Reserve	Cottage Grove Ravine Regional Park	Lake Elmo Park Reserve	Pine Point Regional Park	Point Douglas	St. Croix Bluffs Regional Park	Square Lake
1	Play area near maintenance building	Turf along trails	Picnic Areas	ROW	Turf along trails	Turf along trails	Parking lots
2	Fishing pier	ROW	Boat launch		ROW	Parking lots	Boat launch
3	Turf along trails		Turf along trails			ROW	ROW
4	ROW		Parking lot				
5			ROW				

Turf Management Calendar

This turf care calendar is to be used as a guide for Midwest turfgrass maintenance and weed control. Note that many of the physical strategies, such as, over seeding, aeration, and dethatching are practiced in the fall.

LAWN CARE ACTIVITY	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV
SEEDING		-----			-----			-----
SODDING		-----	-----	-----	-----	-----	-----	
FERTILIZING		-----	-----		-----	-----		
MOWING		-----	-----	-----	-----	-----	-----	-----
WATERING		-----	-----	-----	-----	-----	-----	
AERATION		-----			-----	-----		
DETHATCH		-----			-----	-----		
WEED CONTROL: Crabgrass*		Pre-emerge	Post-emerge					
WEED CONTROL: Broadleaf			-----			-----		
LEGEND								
<p>----- Indicates the best time to perform this lawn care activity for optimal results.</p> <p>----- Indicates acceptable time to perform this lawn care activity.</p>								
<p>* Pre-emergence herbicides are applied before crabgrass seedlings have emerged from the ground. Do not apply if you have seeded. Post-emergence herbicides are applied to the visible crabgrass plants and should be applied when crabgrass plants are small.</p>								

Control Strategies

Cultural	Mechanical	Physical	Chemical
-Seed selection	-Mowing blades raised to 3”>.	-Aeration (alleviate compaction of soil, increases water and fertilizer intake, and allow needed air to reach root system).	-Use of fertilizer.
-Soil pH (acidity levels between 6.0-6.8 are ideal) by adding lime.	-Maintaining sharpened mower blades.	-Overseeding with use of slit seeder to increase seed/soil contact.	-spot treatment.
	-Use of cultipacker.	-Dethatching (if thatch is >1/2” thick before seeding)	
		-Use of slit seeder (make two passes and cut at 45 degree angles)	

Discussion on turf thickness

Above practices can be used to give turfgrass better growth, enhanced color, and greater resistance to disease and drought. Below are IPM steps to ensure proper turf health.

1. Aeration: Increases water and fertilizer intake, and allows air to reach root system.
2. Overseeding: Use a slit seeder and broadcasting seed but ensure soil and seed contact.
3. Thatch maintenance: Thatch must be monitored to < or equal to 1/2” thick before seeding.
4. Soil samples: Need before adding lime, or nitrogen, phosphorus, and potash to soil.
5. Mowing: Maintaining proper mowing height to >3” and regularly sharpening blades.
6. Spot treating: Spot treat weeds in fall when action threshold is reached.