

NATURAL RESOURCE & ENVIRONMENTAL MANAGEMENT PLAN



**City of Washington
Parks and Recreation Department
2012**

TABLE OF CONTENTS

| | |
|-----------|---|
| Chapter 1 | Plan Overview |
| Chapter 2 | Natural Resource Characteristics |
| Chapter 3 | Open Space, Greenways, Wildlife Corridors, Trails |
| Chapter 4 | Natural Resource Management and Maintenance Procedures/Guidelines |
| Chapter 5 | Integrated Pest Management (IPM) |
| Chapter 6 | Best Management Practices (BMP's) |

CHAPTER 1

PLAN OVERVIEW

1.1 INTRODUCTION

The public is coming increasingly to expect that all public lands – especially parks – be managed with natural resource management as a priority. This shift in public opinion is tied to a growing consensus that quality of life in communities is integrally linked to environmental quality – that clean air, clean water, protected open space, vibrant natural communities, and diverse wildlife habitats, are just as important as sound economic development, well-developed transportation infrastructure, and high-quality educational systems.

Increasingly, terms such as “green infrastructure,” “sustainable landscapes,” and “livable communities” are finding their way into the lexicon of public parks and recreation. Citizens expect their park and recreation agencies to be leaders in improving the quality of life and the health of their communities. And, to that end, they demand improvements like integrating healthy landscapes into park design, managing natural settings that are safe and healthy for children, and reducing costs by conserving energy and following sustainable practices. Conservation practices are also cost savings practices – and taxpayers expect their parks and recreation managers to demonstrate leadership in both.

1.2 MISSION

To manage, protect, and sustain natural resources such as vegetation, wildlife, soil, water and energy, and to serve the public and facilitate their participation in park and recreational activities and to provide opportunity for all citizens to use, enjoy, and learn about natural resources.

1.3 PRINCIPLES

The informing principles are that natural resources:

- Constitute a valuable global, regional and community resource, and are critical to wildlife habitat.
- Are essential to sustainability and biodiversity.
- Contribute significantly to park experiences.
- Contribute significantly to the cultural and heritage values of the City.
- Can provide many important benefits when they are effectively managed, and can become community liabilities if they are neglected or mismanaged.

1.4 PURPOSE AND SCOPE

The purpose of this Plan is to provide overall direction to the Parks and Recreation Department in the management of natural resources. This Plan strives to balance the duality of providing for recreation in all park areas while responsibly managing natural resources such as vegetation, wildlife habitat,

soil, water, and energy. This Plan will provide sound direction in the maintenance of parks and public landscaped areas to ensure optimum benefits to the environment and the community.

This management Plan provides strategic direction as follows:

- An assessment of current conditions.
- Goals and Objectives.
- Procedures and Guidelines that enables the Parks and Recreation Department to protect, preserve, and enhance natural resources.

1.5 CURRENT CONDITIONS

The City of Washington is bordered by the Missouri River on the Northern side, where most of the land near the river is either undeveloped or is park land serving as a buffer between the river and developed areas. Other areas of the City are heavily developed with small creeks, rocky soils and outcroppings. Within the borders of the City, natural areas are under pressure due to continued growth and development. This continued growth and development can lead to the decline and damage to local hydrology that contributes to changes that tend to fragment the natural resource.

The natural resources in the City of Washington are subject to the following impacts and stresses:

- Deforestation and fragmentation.
- Recreation and general use.
- Public attitude toward the “untidiness” of natural areas.
- Land development and drainage alterations.
- Vandalism and dumping of yard waste.
- Excessive, indiscriminate mowing, pruning, or thinning practices.
- Exposure to pollutants.
- Invasion and displacement by exotic plant species.
- Destructive arthropod and pathogen invasions.
- Soil compaction and topsoil erosion.

1.6 GOALS AND OBJECTIVES

1. Protect, preserve, sustain, and enhance the resource, providing both wildlife habitat and recreational opportunities. A lack of knowledge can reduce some residents’ ability to enjoy natural resource areas and outdoor pursuits. Increased understanding of our natural resources will allow citizens to make better decisions about these resources and to experience the many benefits that nature has to offer. The City will not stop at educating citizens about natural resources in parks, but will make information available that allows the public to apply conservation practices in their homes, neighborhoods, and communities.
2. Adopt a sustainable approach to landscape maintenance that sustains or enhances the environment. Landscape maintenance for sustainability requires managing to provide for ecological, economic, and social benefits over time. This does not preclude the need to sometimes develop natural areas for a variety of uses, but asserts the importance of

implementing strategies that meet the needs of the future. The City must integrate the needs of the users with management techniques that conserve vegetation, soil, air, water and energy. Parks and Recreation management will give priority to avoiding adverse effects on indigenous flora and fauna and where this is not possible, mitigation or remedial actions must be adopted.

3. Preserve, protect and enhance the native vegetation in natural areas. There is a need to set aside natural areas in perpetuity for the enjoyment and benefit of all generations, and to manage these areas with the intention of preserving the vegetation resource. Due to urban development, many areas are subject to increased threat of exotic plant invasion and natural area disturbance. Active intervention is necessary in urban natural areas due to the introduction and establishment of exotic invasive plant species.
4. Instill the Precautionary Principle (to make choices based on the least environmentally harmful alternatives) when making decisions, to reduce waste generation, to lessen the use of potentially environmentally damaging products, to reduce pollution, and to decrease energy consumption within the parks and recreation system.

CHAPTER 2

NATURAL RESOURCE CHARACTERISTICS

2.1 OVERVIEW

Washington's natural systems of forests, wetlands, and riparian corridors help define our City and make it unique. Several major stream/creek systems carry surface water through several recreational, business, and neighborhood sites to the Missouri River. These stream systems contribute to the wide plant and animal diversity existing in many of our wetland systems.

Washington's urban forest stretches throughout the City. The City includes waterfront along the Missouri River, which creates interests in natural outdoor recreation activities. The City's topographic variation results in views of hills, valley's, water, and urban areas. It is not surprising the Washington residents have placed a high priority on retaining open space and natural areas. It is one of the reasons they choose to live here.

Public stewardship of these natural systems is a key element in the parks and recreation system plan, and many of these important systems are owned by the Parks and Recreation Department. While we have a wealth of natural resources in the City, many of these areas are privately owned. As population of Washington continues to grow, remaining environmentally critical areas will under increasing development pressure. We must continue to protect key pieces of environmentally critical areas and wildlife corridors.

2.2 FOREST AND WETLAND RESOURCES

The Washington area is dominated by vegetation characteristics of both forest and wetland environments. Most areas of the City contain some natural systems. These natural systems provide important wildlife habitat, as well as providing opportunities for aesthetic, recreational, and educational activities.

A number of year-round and intermittent streams and groundwater drainage systems contribute to the City's native wetland habitat. Wetland functions include flood water attenuation, stream base flow maintenance and groundwater support, water quality improvement, erosion and shoreline protection, wildlife habitat, and opportunities for passive recreation, education and open space.

2.3 WILDLIFE HABITAT

As stewards of Washington's public open spaces, it is the Parks and Recreation Department's responsibility to identify and preserve areas that provide food and habitat and travel/migration corridors needed to maintain the wildlife within our City. Wildlife habitat types in Washington include the following general categories: riparian/wetland habitats, lowland forest and steep slopes, open water, and agriculture, pasture, mixed and urban environments. Although continued private development to accommodate growth will have accumulative adverse impact on wildlife, the City will play an increasingly important role in protecting wildlife habitats and corridors by enhancing and preserving land currently in public ownership.

CHAPTER 3

OPEN SPACE, GREENWAYS, WILDLIFE CORRIDORS & TRAILS

3.1 INTRODUCTION

Washington is fortunate in having a unique mosaic of lakes, streams, wetlands, river, and forests located within its boundaries. Preserving these environmentally sensitive areas is increasingly important as Washington's population continues to grow. Preserving and connecting these sensitive areas via greenways, wildlife corridors, and trails will enhance the environmental, social, and recreational benefits for both people and wildlife. These benefits include:

- Native plant and wildlife habitat protection, including fish spawning habitat.
- Stream corridor, wetland, and forested slope preservation.
- Storm water biofiltration for improved water quality.
- Land use buffer and contrast to urban environment.
- Outdoor classrooms for environmental education.
- Providing park and open space linkages for people and wildlife.
- Hiking, canoeing, bird watching, and other forms of recreation.
- Places of tranquility for personal reflection, inspiration, and other forms of passive recreation.
- Natural beauty preservation.

3.2 ENVIRONMENTAL IMPERATIVE

Environmental issues are now as relevant to the public as other key social and political issues. As such, Washington residents place a high priority on open space, greenways, parks and trails.

Environmental quality remains a high public priority as well as both large and small scale environmental problems threaten our health and well-being. Washington's parks, especially natural areas, wildlife corridors, and trails, are part of the solution. Tree masses absorb carbon dioxide, emit oxygen, reduce erosion, moderate temperatures, protect wildlife, and provide aesthetic relief. Wetlands filter pollutants, absorb surface water runoff, help maintain stream base flows and groundwater replenishment, and provide a rich biological habitat. Riparian corridors, which include the stream channel and the stream side vegetation, provide flood water attenuation, groundwater replenishment, water quality filtering, and fish and wildlife habitat. The combination of urban forests, wetlands, streams, and meadows provide a safe haven for a large number of animal and bird species.

As a growing suburban center, Washington must provide a balance between development and preserving or enhancing environmental quality. The following programs acknowledge the importance of preserving important open space and wildlife habitat areas, providing connections, encouraging public education and awareness of our natural systems.

3.3 PRESERVING OPEN SPACE

Washington's open spaces are an integral part of the City. Open space areas include ecologically sensitive and/or unique natural areas, parks, greenway, wildlife corridors, historical lands, and trails. Dispersed throughout the City are a variety of these open space areas that add to the City's look. Well distributed and connected parks, trails and open spaces provide important linkages for habitat and people, bring beauty closer to everyone, and maximize opportunities for enjoying the environment.

3.4 PARKS

The City's parks and recreation system contains a variety of recreational spaces, incorporating features such as environmentally sensitive and open space areas, a combination of structured and unstructured recreational activities, trail systems, streams, lakes, forests, and landscaped areas.

3.5 GREENWAYS

The greenway is an old concept with exciting new application for urban living. Greenways have historically provided a natural contrast to urban density. They combine the natural functions and separations provided by a greenbelt with the linear and connected orientation of a parkway.

Population and density increases, coupled with natural resource depletion and exploitation, have triggered a renewed interest in greenways. Greenways are an enlightened response to the realities of today's development patterns. Given the limitations of public resources, greenway systems must be sensibly created and carefully managed. Greenways can provide multiple benefits at an affordable price to a wide array of citizens.

The idea of greenway linkages is crucial. By connecting different sites via boulevards, trails, and natural areas, parklands become more usable, accessible, and visible. The parks and recreation system achieves a sense of integration and completeness. It begins to affect our daily lives, where we work, live, and play. The system connects neighborhoods, commercial areas, parks, schools, and other points of public interest in a unique way. In short, it becomes a part of the community fabric, waving together elements of our daily lives.

3.6 TRAIL SYSTEM

Trails play an important role in open space, especially in large parks, greenways, and wildlife corridors. Trails, which can also function as greenways, are often the sole means of connecting parklands and open space. They provide pedestrians and other non-motorized user's shorter and safer connections between various neighborhoods and open space.

Major non-motorized routes traversing the City have been designated are considered priorities in completing the trail systems. The Rotary Riverfront Trail is the backbone of trails throughout the northern corridor of the City connecting parks, people, and nature.

The City has also completed a Pedestrian and Bicycle Master Plan. This plan provides the framework for building a safe non-motorized transportation system to schools, parks, shopping areas, and places of employment throughout the City.

The City is looking into the possibility of additional trail systems acquisitions either through direct acquisition as part of a public park or open space system or through partnership opportunities with public utilities, schools, and private land owners.

3.7 MEDIAN/STREET TREES AND ARTERIAL LANDSCAPING

Median/Street trees and arterial landscaping are valuable assets and an essential part of the City's urban forest. The trees and plants filter air pollutants, produce oxygen, buffer noise, create separation between pedestrians and vehicles, and provide beauty and shade. Median/Street trees add a scale to the built environment and help soften effects of urbanization. Arterial "greening" identifies streets and highways as part of the overall open space system.

The City is currently planning the development of landscaped medians on Highway 100 from Highway 47 to International. These medians will be planted with native grasses, plants and trees.

3.8 NATURAL/NATIVE LANDSCAPING

Natural/Native landscaping is the design, construction, and maintenance of lawns and landscapes which provide the beneficial natural functions that are lost through cultivation of conventional lawns and landscaping. Natural/Native landscaping stresses the preservation and reintroduction of grasses and plants native to our area. The native plants used in natural landscaping are hardy and attractive. They can be used to stabilize soil, reduce flooding, absorb pollutants, and sustain wildlife. Conventional turf grasses, composed of cool season grasses (e.g. fescues, Kentucky bluegrass, rye, etc.), is costly to maintain; dependent upon environmentally damaging chemical; non-supportive of the diversity of organisms that are characteristic of a healthy environment; and lacking in visual interest.

3.9 ENVIRONMENTAL STEWARDSHIP

The Parks and Recreation Departments "Vegetation Management Program" provides a systematic process to manage the vegetation ecosystem. Starting with a site inventory and analysis, staff develops a vegetation management plan to improve degraded vegetation conditions resulting from past and present land use activities. Where necessary, trees and vegetation are removed and replaced to create a viable natural ecosystem. With several species of wildlife utilizing tree snags for nesting, breeding, food sources, and refuge, snag creations is also part of the program. The goal of the program is to re-establish natural ecosystems which will sustain wildlife, as well as provide a visual amenity for the City.

The Parks and Recreation Department is working towards being certified as a "Community Wildlife Habitat with the National Wildlife Federation. As part of this certification, it is the Parks and Recreation Department's goal to have a majority of the parks within the parks and recreation system,

to be certified as a Backyard Habitat. Furthermore, it is the department's goal to pursue the Audubon Cooperative Sanctuary Program ISO 14001 Environmental Management Systems certification through Audubon International.

3.10 ENVIRONMENTAL EDUCATION

Environmental education is an important component to a successful parks and recreation system. Educating the public about the importance of our natural systems helps them understand the benefits provided by these systems. The public endorses environmental preservation when connections between the environment and quality of life are fully understood.

Proper interpretation of our natural resources creates a sense of wonder and instills a sense of responsibility to protect and manage the resources wisely. Examples of environmental education and interpretation programs include Earth Day/ Arbor Day celebrations and the Garden Tour. In addition to formal environmental education programs, use of the City's trails and parks provide the public with informal environmental education opportunities as they experience these natural systems.

The importance of wise environmental stewardship will increase as the City's natural areas come under increasing development pressure. To help achieve environmental protection through public education, the Parks and Recreation Department should expand existing public environmental education and outreach programs, in addition to exploring and expanding partnership opportunities.

The Parks and Recreation Department currently works cooperatively with other City departments, Urban Forestry Council, resource management agencies, and concerned citizens to improve wildlife habitat and provide public access.

CHAPTER 4

NATURAL RESOURCE MANAGEMENT AND MAINTENANCE PROCEDURES AND GUIDELINES

4.1 INTRODUCTION

The following activities should be included in annual work plans that direct department administration, management, and maintenance. These activities encourage a sustainable, healthy vegetation resource, provide for biodiversity and ecosystem integrity, plan for appropriate age class distribution throughout natural areas and ensure a safe and meaningful experience for park patrons.

4.2 SOIL, WATER, AND QUALITY

Soil, water, and air are interconnected so that any change in one aspect results in broad changes throughout the system. Air pollutants may already be important stresses for natural biota. The use of herbicides, pesticides, and other chemicals contribute to soil, water, and air pollution. Riparian areas are subject to undesirable changes due to urban development. The number one pollutant entering Missouri's waters is soil. As soil is washed from the land, it takes other pollutants, such as pesticides, bacteria and fertilizers, with it. Conservation practices such as reduced mowing, efficient irrigation, and vegetation bare ground keep this soil from entering our waterways.

Action Strategies

- When choosing landscaping, species choices should be made to reduce water needs, reduce soil erosion, and reduce the need for fertilizers and herbicides. Chemical treatments should be used only when absolutely necessary.
- Manage storm water according to the specifications described in the Metro St. Louis Sewer District (MSD) Landscape Guide for Storm Water Design.
- Allow for natural cycles of decay of woody debris in appropriate areas, to enhance the soil and provide habitat.
- Ensure that facilities and management activities are in compliance with the Clean Air Act, the Clean Water Act, and state and local air and water quality policies.
- Minimize air pollution emissions from park operations.
- Re-vegetate immediately after construction to reduce soil loss.
- Take erosion control measures where appropriate, such as the use of soil retention blankets.
- Establish protection boundaries for soil and water resources during construction projects.
- When adding soil to an area, use local sources to reduce the possibility of altering the native soil characteristics or introducing unwanted seed sources.

4.3 VEGETATION MANAGEMENT

Exotic plants have the potential to displace native plants and alter the structure and processes of native plant communities. With several highly invasive species currently established within the City, a

comprehensive management strategy focused on early detection and eradication will prevent many species from becoming widespread, ecologically damaging, and expensive problems. Many noxious weeds and invasive plants are so successful because they have weedy, invasive strategies that also limit control or eradication efforts. Many noxious weeds and invasive plants have prolific soil seed banks that can maintain viability for several years after mature plants are removed, maintaining their potential for re-invasion. In addition, standard, effective control methodologies have not been established for all exotic species, so experimental control within an adaptive management process may be necessary. In all cases, the most recent methodologies should be researched and utilized.

Noxious Weeds

| | | |
|--------------------|----------------|-------------------|
| Canada Thistle | Common Teasal | Cut-leaved Teasal |
| Field Bindweed | Johnson Grass | Kudzu |
| Marijuana | Multifloa Rose | Musk Thistle |
| Purple Loosestrife | Scotch Thistle | |

Invasive Plants

| | | |
|-----------------------------|----------------------|----------------------|
| Autumn Olive | Black Locust | Bush Honeysuckle |
| Common Buckthorn | Crown Vetch | Garlic Mustard |
| Gray Dogwood | Honey Locust (Seeds) | Japanese Honeysuckle |
| Leafy Spurge | Osage Orange | Reed Canary Grass |
| Sericea Lespedeza | Sesbania | Smooth Sumac |
| Sweet Clover (White/Yellow) | Wintercreeper | Callery Pear |

Nuisance Plants

| | | |
|----------------|------------|---------|
| Poison Hemlock | Poison Ivy | Ragweed |
|----------------|------------|---------|

Action Strategies

- Refer to the Shaw Nature Reserve Landscape Manual, Chapters 1-3, when planning restoration or reconstruction of native landscapes.
- Create a structurally diverse ecosystem with a mix of ages, species, and sizes of plants that embodies a healthy vegetation resource.
- Integrate vegetation management initiatives with other management initiatives-recreation in park areas is often competitive with the development of a healthy vegetation resource. A reasonable balance should be achieved by considering park use types when developing a landscape plan.
- Choose native plants when appropriate, and always choose non-invasive species
- Regardless of the plant's country of origin. Establish planting programs in natural
- Areas in order to replace native species and discourage invasive plants.
- Provide suitable habitats and food sources for indigenous species where appropriate.

- Monitor vegetation diversity and condition; use inventories to keep track of plant health condition in the long term.
- Mitigate or remove vegetation that is hazardous to humans in developed sites.
- Make species choices to reduce the need for chemical treatments and excessive water needs.
- Utilize the Shaw Nature Reserve Native Landscape Maintenance Schedule to guide area maintenance.
- Control and manage invasive species in established natural areas according to the established best management methods in the Missouri Department of Conservation Vegetation Manual and Shaw Nature Reserve Native Landscaping Manual, Chapter 3.

4.4 NATURAL RESOURCE PROTECTION

Development in City parkland can threaten existing, healthy landscapes, especially trees. Valuable natural resource assets can be severely damaged if proper precautions aren't taken to protect them before construction projects occur. Lands cleared for new development frequently have a remaining over story that is thinner, may have been mechanically damaged, or possesses an unnatural vegetation structure and composition, altered soil characteristics, higher risk of topsoil erosion, and altered hydrology. Construction equipment and materials are also a vector for new and continued introduction of exotic plant and pest species. Land clearing can promote further establishment of contained exotic species populations into newly disturbed areas.

Action Strategies

- Inventory the condition and extent of the project area prior to construction, including soil characteristics, geology, and vegetation composition and cover.
- Protect existing vegetation, soil, and water resources during construction.
- Enforce the construction standards.
- Review contract specifications to ensure that construction projects do not introduce exotic pest plants – eliminate use of straw products or non-sterile, imported soils. Require use of certified seed.
- Use an inventory to monitor trees and tree lines for hazards.
- Use construction and building techniques that mitigate for soil loss.
- Avoid soil compaction during construction by limiting the size of equipment and
- Designating appropriate work limits and travel routes.
- Re-vegetation following construction is necessary to stabilize soils, facilitate establishment of a native vegetative cover, prevent invasion by exotic species, and provide screening and landscaping.
- De-compact soils prior to re-vegetation and apply soil protection measures, such as wood chip mulch or soil retention blankets to prevent soil erosion.
- Use temporary irrigation and weeding as necessary to establish new plantings.

4.5 EDUCATION AND AWARENESS

Visitors have an impact on natural areas in parkland. When careless or uninformed, negative consequences such as injury to plant populations, soil compaction and erosion, and altered hydrology

can result. Collecting plants or animals in natural areas can result in the spread of unwanted species, the reduction of desired species, or the disruption of necessary ecological relationships. Creation of unapproved trails can result in soil disturbance that results in compaction, erosion, and ultimately water resource problems. Also, the increasing use of the natural areas and native vegetation in some areas of parks can be viewed as “messy” or even “derelict”.

Action Strategies

- Public education should facilitate an understanding of the importance of natural areas in urban parks, with an emphasis on the high maintenance needs of formal, non-native landscape types.
- Informational newsletters and brochures should be free and easily available to the public, most especially online.
- Interpretive signs should be used where appropriate to educate and inform the public. This should not be limited to established areas, but also to areas of current or future development to educate visitors on the process of restoring and maintaining natural landscapes.
- Periodic articles in the paper or online should address park projects, natural areas, and park goals relating to natural resource management.
- Educate visitors on the impact they can have when visiting the natural area. Prohibit the creation or use of informal trails and collection of plant or animal species in natural areas.

4.6 ENERGY EFFICIENCY AND RESOURCE CONSERVATION

The simplest way to reduce the City’s footprint and protect the future of the world’s natural resources is to reduce consumption and utilize existing opportunities to reuse or recycle. Office policies should reflect the City’s dedication to reducing energy usage and conserving natural resources. New or upcoming opportunities to increase energy and conservation should be pursued consistently, for both existing and new facilities. Effort should be made to obtain efficiency or conservation related certifications.

The following should be followed within the parks and recreation system, as long as the budget allows and the activity is reasonable and feasible by the department.

Recycling

The following target materials should be recycled after final use throughout the parks and recreation system:

- White office paper, cardboard, news papers, magazines, paper mail, and plastic, glass and metal containers.
- Ink and toner cartridges, cell phones, and cell phone adapters.
- All hazardous waste products need to be disposed of pursuant to state law, including, but not limited to electronic equipment, batteries, and automobile fluids.

Waste Prevention

- At a minimum, park visitors shall have access to a recycling collection area.
- The default procedures for photocopying and printing with the Parks and Recreation Department should be double sided unless otherwise necessary.
- Electronic documents and communications should be utilized over paper versions.
- Utilize the internet to reduce paper usage. Registration for parks and recreation programs should move towards online service, and schedules and programs as well as educational information materials should be made available on the City website.
- Encourage the use of digital file storage.

Environmentally Preferable Purchasing

- A minimum 10% post-consumer recycled material, which includes printing paper, envelopes, note pads, post-it-notes, toilet paper, paper towels, and any other paper products where there exists a recycled alternative.
- Products that have reduced packaging and/or recycled content packaging.
- Bathroom products, cleaning products, or any other products that do not contain CFC's or HCF's.
- Bathroom products, cleaning products, or any other products that contain minimal VOC's, minimal bioaccumulative toxins, and minimal cosmetic additives such as dyes and fragrances.

Efficient Energy Usage

Energy consumption should be minimized within the parks and recreation system. As such, the following methods for reducing energy should be implemented.

- All computers, printers and copiers shall be shut down at the end of every workday.
- Where feasible, all lighting fixtures should be supplied with energy-saving light bulbs and non-mercury ballasts upon replacement.
- All lights must be shut off at the end of the workday or at the end of the use of a room or facility, and motion-sensors for lighting shall be implemented where necessary.
- Additional efforts should be discussed and implemented where feasible with periodic HVAC system inspections conducted.

Pollution Prevention

Pollution prevention tactics should be implemented as needed and the following activities will be undertaken by the department:

- Ensure hazardous substances (solvents, oils, etc.) are properly stored and disposed.
- All park properties including parking lots, vehicles, and facilities are well maintained and cleaned in an environmentally friendly manner.

- Operations that may result in pollution or utilize potentially polluting chemicals should periodically be evaluated, and make adjustments where feasible to ensure human and environmental safety.
- Follow Missouri Department of Natural Resources (MDNR) Phase II Storm Water Runoff Regulations.

Action Strategies

- Work to reduce, reuse, and recycle wastes generated.
- Initiate, manage, monitor, assess, follow-up, and report energy conservation changes throughout the parks and recreation system, and provide information on efforts to expand the conservation program.
- Use Best Management Practices and P2 tactics in all activities conducted.
- Provide necessary updates to ordinances, policies, and permits for protecting natural resources and wildlife.
- Actively explore, create and implement new ways to expand upon the environmental sustainability.
- Pursue conservation certifications through the National Wildlife Foundation.
- Pursue Audubon Cooperative Sanctuary Program ISO 14001 Environmental Management Systems certification through Audubon International.

CHAPTER 5

INTEGRATED PEST MANAGEMENT (IPM)

5.1 INTRODUCTION

The City's parks and natural areas are a reflection of the values of the community. The Parks and Recreation Department strives to ensure that public landscapes remain attractive and meet the expectations of thousands of users, and preserve natural ecosystems for future generations. These green open spaces offer Washington residents the opportunity to enjoy a natural environment within their community. Trees, shrubs, flower beds, ponds, rivers and lakes make up these open spaces, and require maintenance and protection from damage by both humans as well as biological pests.

Integrated pest management (IPM) is a sustainable approach to managing pests by combining biological, cultural, physical and chemical methods in a way that will minimize the effects on the environment, minimize domestic and health risks, while considering budgetary restrictions. The Parks and Recreation Department has adopted this IPM, which outlines how both passive and active modes of maintenance are vital to the preservation of any environment. The objectives of the Parks and Recreation Department's IPM program are as follows:

- To protect the health, safety, and welfare of the community
- To provide efficient cost effective maintenance of the City's park resources, which includes non-chemical controls whenever possible
- To design new and renovate existing landscape areas that suit site conditions with sustainable maintenance practices, thus providing a comprehensive stewardship of parks and natural resources
- To restore, create and protect environmentally valuable areas such as wetlands and riparian areas, aquatic and terrestrial wildlife habitat, forests, and meadow areas.

5.2 DEFINITIONS

Integrated Pest Management (IPM) – A decision-making process to determine if, where, when and how pest problems will be managed. An IPM program includes all potential pest control strategies, but focuses on non-chemical controls whenever possible, in order to perpetuate a sustainable environment. The following four pest control methods may be employed in an IPM program:

- **Cultural Control:** The use of sound horticultural practices to optimize plant health and to suppress insects, disease, and weed growth. Other cultural controls include site-appropriate design and the use of disease or drought-resistant plants.
- **Mechanical Control:** The use of a variety of tools and equipment for the purpose of eliminating pests.

- **Biological Control:** The use of biological control agents that act as predators or parasites of pest species. The use of other beneficial organisms that improve plant health by enhancing soil quality.
- **Chemical Control:** The application of various agricultural products such as herbicides, insecticides or fungicides or other chemical compounds to a target pest as a means of control.

MSDS – Material Safety Data Sheets or MSDS are prepared by manufacturers of chemical products to relay the necessary safety and protective information to users about the said chemical compounds.

Pesticide – Any material including agricultural chemicals, herbicides, insecticides and fungicides, or biological agents applied to a target pest as a control measure.

Pest – The word “pest” has been broadly defined in this document to include “injurious” insect species, plant pathogens, noxious or invasive vegetation, vertebrate animals such as rodents, structural pests or any other factor that creates an unhealthy environment for landscapes and structures.

Threshold – The term “threshold” refers to the point at which pest injury can no longer be tolerated without compromising the health or aesthetic value of a plant, ecosystem or other assets of value including human health. Once a threshold is being approached, some control measure may be necessary to suppress pest activity to acceptable levels.

5.3 BACKGROUND

Policies and Regulations

By legal definition, a pesticide is any substance for which a manufacturer or distributor claims pesticidal value. Today there are more than 32,000 pesticide products registered to destroy, prevent, attract, or in some manner, control pests.

The first act of pesticide control was passed in 1910 called the Insecticide Act of 1910. Since then there has been the Federal Insecticide, Fungicide, and Rodenticide Act of 1947 (FIRFA) and more recently, the Federal Environmental Pesticide Control Act of 1972. The major provisions of this act are:

- All pesticides must be registered with the U.S. Environmental Protection Agency (EPA). Qualified states may also register pesticides under special conditions.
- All pesticides will be classified for either general or restricted use.
- Only certified applicators, or those under their supervision, may apply restricted use pesticides. States have the authority to certify applicators.
- Use of pesticide inconsistent with labeling instructions is prohibited.
- Violators may be fined or imprisoned or both.

Other important regulations pertain to working within a protected areas, such as wetlands and riparian corridors, steep slopes and native growth protection areas. Certain activities are restricted in these areas and may require special permits granted by the City of Washington and other regulatory agencies.

Pesticide Use Decision

The following individuals are involved in the determination of when to use pesticides within the Washington Parks and Recreation System.

- **Parks and Recreation Director and Parks Foreman** are responsible for upholding and applying City and Park's pesticide policies and procedures within their areas of control.
- **Parks Foreman and Crew Leaders** are responsible for ensuring that any personal protective equipment (PPE) is available and properly fitted for use by applicable staff for any chemical application. He/She is also responsible for coordinating the mandatory annual recertification training for all licensed pesticide applicators.
- **Parks Foreman and Crew Leaders** determine the most appropriate control measure for actual landscape pest situations, including selecting the most appropriate pesticide products, if necessary. They are also responsible for the safe storage and handling of pesticides, spill responses and related training.

Pest Management Guidelines

The following pest management guidelines generally apply to all City of Washington Parks and Recreation Department landscapes:

- Park landscapes shall be designed to minimize pest management. Where resources are available and existing design themes will not be compromised, modifying landscapes will be considered to reduce pest management.
- All reasonable, cost effective non-chemical pest control options shall be considered before resorting to the use of pesticides.
- The Parks & Recreation Department shall practice IPM in all pest management situations, understanding that some situations will require the use of a pesticide.
- Certain levels of pest problems or populations shall be accepted within established thresholds. Those thresholds will vary with the pest and the landscape setting.
- Only pesticides approved for that particular use will be used for the prescribed applications. When pesticides are applied, the smallest effective area will be treated, and the application will be timed to minimized public contact and the effects on the environment.
- Whenever possible, pesticide applications will be carefully timed to control the pest and reduce the need for re-treatment.
- In accordance with the Missouri State Licensing Guidelines, all staff and contractors who are engaged in the use, application and storage of pesticides, shall have a current Missouri State

- Pesticide License. Contractors must notify appropriate Department representatives prior to the application of any pesticide for approval to use such pesticides.
- Parks & Recreation Department pesticide applicators shall strictly observe all pesticide products label requirements. All chemicals used within the Parks & Recreation System will have an MSDS on file, and will be available to all staff, contractors and the public upon request.
- Pesticides shall not be used to control plants with edible fruit during the fruiting season unless the plant being controlled is not of sufficient size to produce fruit. Fruiting plants such as blackberries should be first cut to the ground, allowed to re-sprout and then chemically controlled before the plant can produce fruit. Plants controlled in this manner should never be allowed to produce fruit in the future.
- All sites where pesticides have been applied shall be posted, as required by the Missouri State Department of Agriculture. As required by the MSDA, all applications of pesticides will be recorded.
- When pesticides are used in confined environments such as greenhouses, the facility shall be clearly posted "Closed to Entry" until the re-entry time period has elapsed.
- The Parks & Recreation Department will continue its aggressive training program for all staff that apply pesticides, and will continue to emphasize learning new pest control techniques, as they are available.
- The Parks & Recreation Department will continue to field test alternative controls to pesticide use and will implement successful control options as time and budget allows.
- The City shall comply with all Federal, State and Local regulations pertaining to the application, handling, storage, and disposal of pesticides.

Components of an IPM Program

IPM involves a structured decision-making process that embodies the philosophy and components of the IPM system. Through the following applications, as well as the proceeding guidelines, a well managed IPM program can be implemented.

- 1. Identification of pest populations:** Identify the nature, locations, scale and the intensity of the problem.
- 2. Determine plant injury levels:** Define the tolerance levels for aesthetic and economic injuries. Prescribe the point at which actions must be taken to avoid exceeding the tolerance level.
- 3. Design and implement the pest management treatment:** Research all possible options and design strategies. Non-target organisms must be considered at this time. Use of pesticides is limited to situations where other cultural and biological options are not likely to be successful within the context of available resources. The pesticide chosen shall be the least toxic of those available and with the minimal of impact, as defined by that chemical's use.

4. **Evaluate results:** Conduct follow-up inspections to support evaluation:
 - Did the pest population decline to acceptable levels?
 - Was there a negative impact on non-target organisms?
 - Do the host plants appear to be able to thrive following a successful treatment?
5. **Adjust and extend program as indicated:** Decide whether further treatment will be necessary, either on a temporary or permanent basis. If it will be on a permanent basis, plan potential site modifications to eradicate the problem or prevent future recurrences.
6. **Create documentation of all research, monitoring, and application data:** A comprehensive system of forms for monitoring data and documenting treatment is a key component of a successful IPM program.
7. **Share pest management information with decision-makers and other maintenance staff:** Professional staff must know the degree to which landscape pest management programs impact existing staff, maintenance budgets, and park assets. Only through such understanding and ongoing communication can the best long-term strategies be developed for managing pest populations.

IPM Alternatives Selection Hierarchy

The following section rationales are used as a guide in determining whether pesticides shall be used in place of other control methods:

- Proper planning and management decisions begin the IPM process.
- Cultural methods of vegetation and pest control will be employed next where feasible, and then,
- Biological means of vegetation and pest control will be employed next where they are practical and feasible.
- Pesticides will be used when no other feasible method exists that will control the pest within the realities of the location, site conditions, budget, time and other relevant considerations. At the same time, it is recognized that pesticide use is a legitimate element of an IPM program.

6.1 STORAGE AND USE GUIDELINES

Every employee has a personal responsibility to themselves, other staff, and the public to follow safe work practices when storing or using pesticides.

1. Management Practices

- Always read the label of the chemical that you will be using.
- Store and handle all chemicals or fertilizers in a manner that minimizes worker exposure and potential for contamination of surface and ground water.
- Always have the correct Material Safety Data Sheet (MSDS) on hand for all chemicals or fertilizers at you site (required by law).
- Always check the MSDS for the type of protection needed and the recommended re-entry time before the chemical is applied.
- When possible, purchase the smallest amount of any pesticide needed and avoid stockpiling of chemicals.
- Store fertilizer in a separate weatherproof area, and apply as soon as possible.
- All spray equipment shall be maintained in proper working order and stored in an approved site.
- All protective gear (masks, filters, rain gear) will be stored separately from any possible contamination.
- Store and mix all chemicals in an approved storage and mixing area. Label storage area with a coded sign to protect Fire Department or Hazmat personnel in case of emergency.
- Any pesticides in inventory that are no longer needed for use will be disposed of through hazardous materials disposal practices.
- A pesticide inventory shall be maintained by the Parks Foreman.

2. Pesticide Application Equipment

Pesticide application for all listed areas will be carried out by hand with directed, low-volume, single-wand sprayers, wiping, daubing and painting equipment, injection systems, or drop spreaders. Typically, applications are done with backpack sprayers, but may also include sprayers with larger fill tanks providing the same kind of hand application method is used. These methods of delivery result in low-volume applications at low nozzle pressures. This practice minimizes the formation of fine mists that can result in pesticide drift. These practices also help ensure that the pesticide plied will reach only its intended target. In large open turf areas, boom type sprayers may also be employed. Boom sprayers are efficient and expedient, used to destroy weeds species after they have exceeded the acceptable threshold level.

3. Personal Protective Equipment (PPE)

The table shows the personal protective equipment required by City, state and federal regulations for pesticide use.

4. Chemical Application near Watercourses & Aquatic Habitats

Generally, the use of chemical products within 50 feet of a watercourse shall be prohibited in favor of an alternative control method. If a pesticide or herbicide must be applied within the 50 foot buffer, only products registered for use near water bodies (Rodeo or equivalent) shall be used, and great care will be taken to ensure that the product does not migrate into the watercourse either through drift or by overland flow. Weather conditions must be monitored carefully to avoid applying a chemical near a watercourse immediately before heavy rains. Soil conditions and site topography must also be carefully studied to determine the appropriate timing of a chemical application **and/or whether a chemical should even be applied at the site.**

6.2 IPM BEST MANAGEMENT PRACTICES (BMP's)

The Parks & Recreation Department maintains a wide-variety of landscape types, each with unique pest control issues and control measures. For these reasons, the pest control measures specific to each landscape are dealt with separately in this section. If chemical applications are required, only chemicals approved for a specific location will be used in that location. The Parks & Recreation Department only uses approved chemicals within the Parks and Recreation System.

IPM BMP's For Trees

Trees are an integral part of most landscapes, whether formal or natural, and are considered an asset. They provide shade, clean the air of pollutants, modify both micro and macro climates, and provide visual relief to the urban environment. Because trees are often very large and tall, accessing and managing insects and disease can be quite difficult and costly.

1. Pest Tolerance Thresholds

- In general, insect and disease pests in trees are tolerated.
- Insect or disease pests in selected, high-value specimen trees may be subject to control measures.

2. Pest Management Strategies

- Physical Damage to Trees – Physical damage to trees can be a major factor in overall loss of trees. This damage most often occurs in one of two ways. One is when trees are repeatedly struck by mowing equipment. A second form of injury is by string trimmers, which can damage

bark leading ultimately to tree loss. Many trees are also lost to lack of appropriate care during construction projects within existing parks.

- Removing turf from around the tree base to create tree mulch rings 3 to 4 feet in diameter can substantially reduce damage caused by mowers and trimmers. With tree mulch rings, a mower or trimmer never has to come close enough to the tree to cause damage. The tree mulch ring will need to be kept free of grass and weeds.
 - Construction Site Management substantially reduces or eliminates damage from construction activities.
 - All pruning for tree health reasons and for hazard reduction will be done in conformance with the International Society of Arboriculture standards.
- Insect Control – The Parks & Recreation Department does not actively control insect pests in trees. This is particularly true of large trees where the control of the pest might require the use of large aerial spray equipment, which carries with it a high probability of the insecticide, applied leaving the area due to wind drift. When insect pests are controlled in trees, the following measures are used:
 - Trees that are highly susceptible to specific insect pests may be removed from the landscape and replaced with resistant species.
 - When possible, the portion of the tree affected by the insect can be physically removed, eliminating the pest.
 - An insecticide may be applied to control a specific insect pest in very selected situations. These situations include pests on specimen quality trees at special gardens or in high visibility locations where the presence of the pest threatens the life of the tree. In these situations, general foliar applications will not be made unless the potential for product drift can be controlled.
 - New injection technology may allow for systemic control of certain insect pests with minimal or no impact to human or environmental health. The Parks & Recreation Department will continue to explore this technology as a potential control in the future for insect pests that may threaten the health of valuable park trees.
- Disease Control – Most diseases are tolerated in trees, unless they lead to a tree becoming a hazard to the surrounding environment. As with insecticides, it is unlikely that the Parks & Recreation Department will subscribe to general foliar applications of fungicides or similar pesticide products to control disease pests in trees. The following are control measures that can be performed:
 - Trees that are susceptible to particular disease pathogens may be removed from the landscape and replaced with resistant varieties.
 - When possible, parts of trees affected by disease should be pruned out and properly disposed to stop the spread of disease within the tree and to adjacent trees.
 - An appropriate fungicide may be applied to control a specific disease pathogen in very selected situations. These cases include specimen quality trees in special gardens or in

high-visibility park locations where the presence of the disease threaten the life of the tree. In these situations, general foliar applications will not be made unless the potential for product drift can be controlled.

- New “injection” technology may allow for systemic control of certain disease in trees pests with minimal or no impact of human or environmental health. The Parks & Recreation Department will continue to explore this technology as a potential control for disease pests that may threaten valuable trees in City parks.

IPM BMP's For Turf Grasses

The City of Washington's Parks & Recreation System maintains a variety of turf grass types. These include park lawn areas (both formal and informal), athletic fields, meadow areas and other turf grass types. Each of these turf grass types has different pest management challenges, and practices may vary accordingly:

1. Pest Tolerance Thresholds

- Some level of weed, insect, and disease pests are tolerated in general park lawn areas.
- Pests in highly maintained turf such as athletic fields and other high-visibility/high-use areas are generally controlled through good turf grass cultural practices.
- Because of the unique conditions present on athletic fields, a variety of pest control measures are used, including mechanical, cultural and chemical.

2. Pest Management Strategies

- Broadleaf Weeds – Weeds in turf grass are tolerated, to some level, with the exception of athletic field turf grass and a few high-visibility park turf grass areas. When control is necessary, the primary method is through the following practices:
 - Careful monitoring of watering practices
 - Fertilization
 - Aeration
 - Top-dressing
 - Over-seeding
 - Chemical

By performing these cultural practices, park turf grass is made healthier and better able to compete with various broadleaf weeds. Chemical weed control will be generally used in high-visibility turf areas.

- In these situations the least toxic, least residual pesticide will be used for treatments.
- Timing of such applications will be made to avoid contact with the public to the extent possible.
- Posting of the site that has been treated will meet or exceed legal requirements.

Maintenance for the City's athletic fields generally does have to control for broadleaf weeds. This control is done through cultural practices and chemical application of carefully selected herbicides.

- Insect Control - The only real insect pest currently of significance for turf grass in the Washington area is the grub worm.
 - Chemical control is used only in the very limited circumstances to turf grass of very high visibility and value such as athletic fields and selected high-visibility/high-use park turf grasses.
 - Any chemical applications will be treatments directed specifically at the turf grass areas containing the pest.
 - The preferred initial choice for application in high-use areas is the "safest" or least toxic product available.
- Disease Control General Park Turf Grass – Disease in general park turf grass is typically tolerated and not actively controlled.
 - In high-use/high visibility park turf grass areas, disease will be controlled to a considerable degree by performing sound cultural practices.
 - Pesticides may be used as a last resort to control disease in park turf grass areas.
- Athletic Field Turf Grass – Because turf grass disease can be a significant problem on athletic fields, it must be controlled to preserve the function of this asset. Athletic Field turf grass must perform under extreme conditions of maintenance and use. These conditions make athletic turf grass more susceptible to disease than general park turf grass.
 - Athletic Field turf grass disease is controlled through good cultural practice to the extent possible.
 - Certain diseases are controlled through the application of an appropriate fungicide.
 - When used, fungicides are applied to the diseased turf grass only.
 - The least toxic and still effective products are used.
 - The fungicide used will be rotated yearly to reduce the chance of the turf grass disease developing a resistance to the chemical control.
- Grass Trimming Abatement – The control of grass growing along fence lines and around trees, bollards, posts and other landscape features is a regular maintenance activity that helps preserve the asset by allowing large riding lawn mowers to steer clear of objects. This is especially important around trees where impact from mower damage can easily lead to tree loss. At the same time, keeping this grass controlled allows the Parks and Recreation Department to present parks that appear clean and well kept. This grooming affects how the public uses our facilities. Well-maintained parks are subject to less vandalism and related misuse. The following are BMP's for grass trimming:

- *String trimmers or push mowers.* The grass is trimmed using gas-powered string trimmers or push-type lawn mowers. This labor-intensive practice is costly and produces noise and air pollution.
- *Herbicide.* Applications are performed annually or semi-annually, to provide pre-emergent control of weed and grass seed not yet germinated in tree mulch rings, plant beds and similar areas.
- *Mow strips.* As resources are available, it is sometimes possible to provide a “mow strip” of concrete, rock, marble dust/granite sand, mulch or a similar low maintenance product around some landscape features to eliminate the need for grass trimming. This control option is costly and doesn’t work in all situations.

IPM BMP’s For Natural and Sensitive Areas

Greenspace Preservation Areas (Natural areas) are City-owned property with critical environmental resources. These sensitive habitats shelter native ecosystems and wildlife habitat. For the purposes of this BMP manual, these resource assets are divided into three (3) major groups:

- Wetlands, riparian corridors, shorelines and aquatic habitats
- Forests
- Meadows

1. Pest Tolerance Thresholds

- Invasive plants are generally not tolerated. Invasive plants will be controlled in conjunction with natural resource enhancement efforts in these environments as resources permit and where control can be practically achieved.
- Noxious weeds will not be tolerated and will be controlled when found in conformance with State of Missouri mandate.
- Only insect pests that pose a risk to the public (such as hornets) or to the resource (emerald ash borer) will be controlled.
- Plant diseases will generally be tolerated unless: a specific control can be employed that will be effective in ensuring the health of particularly valuable assets; or if they pose a threat to other plant populations outside of the natural area; or if they pose an unacceptable risk to the public.
- Herbicide Use: The use of herbicides in any natural environment must be carefully considered. Herbicides will be used for weed control in natural areas only when reasonable and/or feasible. For wetland or water environments, only approved wetland herbicides (Rodeo or equivalent) will be used.

When needed, herbicide use practices are as follows:

- Cut and stem treatment (daubing or painting) is the preferred choice for natural area management.

- Certain invasive plants are difficult to treat and control in their mature form. If possible, remove existing growth manually or mechanically. Wait for new growth to become established. Then treat with the appropriate and approved herbicide.

-

2. Pest Management Strategies

- Weed Control - An overriding principle of the IPM is the maintenance of healthy plant communities. That means weed control of the following types:
 - *Timed Mowing*. Carefully timed mowing before seed set can effectively reduce weed seed sources. Frequent mowing can eliminate woody species.
 - *Mulching*. Mulching around the base of plantings is widely accepted as a horticultural practice for soil fertility and weed control. In most instances, composted wood chips or recycled leaf litter are adequate materials. Avoid wood chips from diseased trees. Mulch should be between 2 to 3 inches deep for best results.
 - *Weed watch during mulching*. Care must be given to not incorporate new weed problems when importing mulch materials.
- Woody Brush Control – The control of woody brush is very important in certain park locations. Often these plants are found in transition areas between developed park areas and natural areas. If not controlled, woody brush can easily over take forest-edge environments, elimination vital habitat opportunities. Control measures for woody brush include the following:
 - Manual or mechanical removal using hand tools or gas-powered equipment. Special tools are now available for removing woody brush. In many areas, this can provide effective control.
 - Chemical control can be employed when other measures are not mechanically or economically feasible. Spot applications are preferred, whenever possible, to large area applications.
- Insect Control – Insects like the emerald ash borer can potentially devastate Washington’s urban forest. The Parks & Recreation Department will cooperate with state and federal agencies in their monitoring and control programs to prevent the introduction of these pests.
- Disease Control: Root Rots – Even native forests can have serious disease problems. Root rots are the most serious problem, leading often to the death of significant trees. Several strategies help control root rot in forests:
 - Remove infected wood
 - Plant resistant varieties
 - Treat resulting stumps
 - Do not change site conditions on mature trees

- Stump Re-Sprouting Control – Often there is a need to remove small trees and prevent re-sprouting of a stump. Methods for controlling the re-sprouting of stumps include the following:
 - If the location of the stump(s) will allow access by equipment, then they can be mechanically removed providing the location is not within an environmentally critical area.
 - Small stumps may be removed manually providing they are not on steep slopes or in other environmentally critical areas.
 - The re-sprouting of stumps can also be controlled by painting newly cut stump surfaces with an herbicide. Care will be taken to limit the application of the selected herbicide to the stump surface only.

- Invasive Plant Control – Invasive plants have taken over many of the City’s forested areas and have radically and negatively impacted pre-existing ecosystems. Attaining long-term control of invasive plants is essential to the recovery and preservation of Washington’s natural ecosystems. The goal is suppression of weed populations to below threshold (damage causing) levels. Eradication of certain ecological weeds (ivy) in all of the City’s natural areas is neither feasible nor cost-effective. However, controlling spread of the problem and eradicating it in certain priority locations are the Parks and Recreation Departments goals. Control methods include:
 - Use *extent of removal* and *type of habitat* to determine the pest control method.
 - Large areas that are totally infested can be mowed. Areas that are interspersed with invasive pests require more selective procedures such as manual removal.
 - Heavy equipment or manual removal can be used on firm soils. On either steep or saturated soil, use techniques that will minimize site or slope disturbance.
 - Where mechanical or manual removal is neither possible nor practical but control is essential, careful and selective use of an approved herbicide is permitted. Use of these chemicals shall conform to the guidelines listed below in “Herbicide Use”.
 - Re-establishing a new native planting regime as quickly as possible following the removal of invasive plants is critical to successful forest restoration. These new plantings will require care for several years to guarantee establishment.
 - Preserve established native plants when possible rather than reestablishing new plants after the clearing of invasives.
 - Public education and outreach concerning plant identification and management techniques will also aid the City in controlling noxious weeds.

- Nuisance Wildlife Control – Beavers, moles, coyotes, opossums, raccoons, waterfowl and other species can be destructive to natural areas when their activities are excessive. Overall, the Parks and Recreation Department does not encourage the interference with wildlife, and prefers to leave them to their natural behaviors. If control of wildlife is deemed necessary, the Parks & Recreation Department will work with the most appropriate city, county or state agency to formulate a control solution.

IPM BMP's Trails

1. Pest Tolerance Thresholds

- Invasive plants that invade the trail area are generally not tolerated. Invasive plants will be controlled in conjunction with ecosystem restoration efforts on any park trail as resources permit.
- Noxious weeds will not be tolerated and will be controlled when found in conformance with State of Missouri mandate.
- Weeds are generally found on trails and many will be tolerated within nature trail areas. Weeds that begin to form a hindrance of trail function will be eradicated.
- Only insect pests that pose a risk to the public (e.g. hornets) will be controlled.

2. Pest Management Strategies

- Weed Control – Weeds on trails are generally tolerated, until they begin to interfere with trail function. When control is necessary, the primary method is increasing mulch on, or resurfacing trail surface.

Chemical weed control is often not necessary on most trail surfaces, but will be used for controlling particularly difficult weeds.

- In these rare situations the least toxic, least residual herbicide will be used for spot treatments.
 - General broadcast treatments will usually be avoided.
 - Timing of such applications will be made to avoid contact with the public to the extent possible.
 - Posting of the site that has been treated will be done as legally required.
- Insect Control – Overall, insects on trails are tolerated. Only insects that can cause a health risk are controlled. Wasps and hornets are some of the few insects that will be eradicated immediately when encountered. When this is necessary, chemical control, with an approved insecticide, is the preferred method.

6.3 TRAINING

Because IPM is an ecologically sophisticated process that requires professional expertise in vegetation and pest management, it demands trained field personnel that are knowledgeable about:

1. Ecological interactions and relationships among vegetation and pests;
2. Potential tools and materials that can be used to effectively manage vegetation and pests by manipulating environmental conditions; and
3. Correct timing for implementing specific management practices relative to vegetation and pest biology.

Educational and career opportunities in IPM will enhance crew professionalism, their knowledge of current vegetation and pest management practices, and their stewardship of managed landscapes. Each landscape type will have an individualized training program developed and accessible to all applicable staff.

APPENDIX

COMMON WEEDS

Crown Vetch

1. Crown vetch is a low growing plant that quickly takes up large patches of landscape. It has pink flowers starting in late spring.
2. Should be sprayed with Roundup or Rodeo (If near water), several times a year while it is actively growing, starting in early spring

Honeysuckle

1. Honeysuckle is a soft wooded shrub that can grow to be quite large. It has fragrant white flowers in late spring, turning to red berries in summer and fall.
2. Honeysuckle can be sprayed with Roundup or Rodeo (If near water), then cut to the ground, or can be cut first and then treated with herbicide on the freshly cut stump to prevent re-sprouting. Young sprouts can be pulled from the roots.

Cottonwood

1. Cottonwood is a tree that seeds itself prolifically. It has a distinctive D-shaped leaf.
2. Pull young sprouts by the roots, or cut at ground level and herbicide fresh stumps if it has grown too large to pull.

Dogwood

1. Dogwood is a nice native tree that unfortunately can become invasive. Look for a twig with leaves opposite of each other, and a pinkish hue at the very tip.
2. Pull young sprouts by the roots, or cut at ground level and herbicide fresh stumps if it has grown too large to pull.

Willow

1. Willow is a tree with thin, spear shaped leaves. It sprouts from the root systems of other willow trees.
2. Pull young sprouts by the roots, or cut at ground level and herbicide fresh stumps if it has grown too large to pull.
3. Any willow seedlings should be pulled or cut and treated with herbicide at the stump.

Elm

1. Elm is a tree that sprouts up in small numbers. Look for a seedling with compact growth and serrated leaf edges.
2. Pull young sprouts by the roots, or cut at ground level and herbicide fresh stumps if it has grown too large to pull.

Johnson Grass

1. Johnson Grass is a tall grass that grows in large clumps. It is usually 6 feet tall or more, with large seed heads in summer.
2. Johnson Grass should be sprayed with a grass specific herbicide, and should never be allowed to go to seed. If it is not treated with herbicide in time, it should be cut back before seeds drop.

Nutsedge

1. Nutsedge is a small, grass like plant that produces spiny round yellowish seed pods in the summer.
2. It is easiest to hand pull nutsedge, but it can be sprayed with Roundup if necessary

| Plant Species | Treatment | Time of Year |
|----------------------|------------------------------|---|
| Crown Vetch | Spray | Early spring and throughout summer |
| Honeysuckle | Spray, pull or cut and treat | Pull year round; cut and treat in spr/sum |
| Cottonwood | Pull or cut and treat | Pull year round; cut and treat in spr/sum |
| Dogwood | Pull or cut and treat | Pull year round; cut and treat in spr/sum |
| Willow | Pull or cut and treat | Pull year round; cut and treat in spr/sum |
| Elm | Pull or cut and treat | Pull year round; cut and treat in spr/sum |
| Johnson Grass | Spray | Mid-late spring and throughout summer |
| Nut Sedge | Spray or pull | Throughout growing season |

