

Organic Land Care Best Management Practices Manual









RUTGERS
New Jersey Agricultural Experiment Station

ORGANIC LAND CARE BEST MANAGEMENT PRACTICES MANUAL

A guide to recommended practices and practices to avoid when conducting effective organic land care

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Rutgers Organic Land Care Program Best Management Practices Manual

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INTRODUCTION

The purpose of this manual is to provide recommendations to land managers and landscape contractors on best management practices for effectively conducting organic land care. Organic land care is a holistic approach to land management that integrates cultural, biological, and mechanical practices by fostering cycling of resources, promoting ecological balance, and conserving biodiversity. Organic land care is not simply about substituting organic-approved products for synthetic materials. Rather, it is a series of practices that together create a holistic approach to land management where the soil, plants, and animals within the system are interdependent and should sustain each other. In an organic land care program, an integrated system of pest and disease management is utilized with products approved by the Organic Materials Review Institute (OMRI). The goal is to decrease or eliminate the use of synthetic pesticides, synthetic fertilizers, and synthetic soil amendments. This document is meant to be a field guide with basic information about background theory for many of the recommendations.

These recommendations for organic land care are philosophically and technically based on the United States Department of Agriculture's National Organic Program (NOP) for food and other agricultural products that are produced through approved methods (USDA, 1990). The federal government, through the NOP, developed regulatory, national organic standards for *agriculture* and a certification program identified by the "USDA Organic" symbol, which certifies that agricultural products meet federal organic standards. Currently, there are ***no*** federal standards for organic land care. Practitioners that choose to adhere to the guidelines outlined in this manual do so voluntarily. Currently, there are no universally accepted standards or regulatory requirements for organic land care outside of agriculture production.

The Rutgers Cooperative Extension Organic Land Care working group developed this manual in order to educate and assist practitioners in determining what is acceptable under an organic land care program. Much of the recommendations come directly from the NOP, but with additional consideration for addressing issues such as tree and shrub care, lawn management, native and invasive plants, water management and incorporation of federal, state, and local regulations.

Federal, state, and local laws and mandated emergency protocols (i.e. USDA protocols for the eradication of specific invasive species) need to be followed regardless of the organic status of the property.

Several organic principles form the basis of any organic land care program and are repeated throughout the manual (Heckman, 2013). They include:

- "Do no harm" by protecting the natural elements of a site
- Treating the landscape as an integrated system
- Reducing energy, water, and material inputs
- Practicing the "law of return", such as returning grass clippings back to the landscape
- Promoting soil health which translates to healthy plants
- Fertilizing with naturally-occurring materials to supply essential nutrients based on a soil test
- Favoring cultural practices over chemical applications for managing pests and diseases
- Avoiding the use of prohibited materials
- Encouraging biodiversity and avoiding monocultures
- Running an organic business with honesty and integrity

A practitioner that is new to organic management might consider implementing recommended practices a little at a time and monitoring for changes in order to get used to how a landscape responds. Sites with

high quality soils where proper cultural practices have already been implemented will most likely respond quickly and positively to organic management. Severely degraded sites may take years to transition to a condition that is acceptable to clientele under an organic management plan. Open communication with clientele is paramount in order to have realistic expectations for organic management on a site by site basis.

SITE ASSESSMENT

Site assessment is the most important first step in determining if organic land care is a viable option for the landowner and landscape manager. An initial site assessment of a property should involve gathering information about soil and light conditions, the current drainage of the property, the development of a plant species list, and determining how the property is used by the owner or resident (Mazza, 2013). Energy consumption can also be addressed by examining the presence of wind breaks, tree placement, and the exposure of the site's buildings. The primary goals are to evaluate data collected from the site inventory and to try to resolve any existing problems while identifying new design features or identifying plants that are better suited for the site. These initial meetings with the client should also involve an explanation of organic land care management, how it is conducted, as well as what practices are encouraged and not recommended.

Recommended – Site Analysis First Steps

- **Review your business services and costs briefly with customers.**
- **Determine the level of interest of the customer before proceeding further with regard to organic land care, as well as if the customer will be involved in gardening on the site.**
- **Develop a list of client needs and desires.**
- **Site Inventory - Initial visit and walk of property**
  - ✓ **List all existing conditions such as: underground utilities, slope, grade, drainage, compaction, sunlight, shade, surface roots, impermeable areas, runoff from surrounding properties or roads, reflective mulches (white stone), current plants on the property, water bodies, soil conditions, etc.**
  - ✓ **List problem plants or issues that need immediate attention – hazard trees, plants that historically attract pests and/or are prone to disease problems.**
- **Create a rough sketch of the property.**
- **Discuss an agreement/contract based on the site inventory and preliminary analysis based on needs and desires of the client.**

When documenting site conditions on a property it is helpful to first acquire a copy of an existing map or plan of the site or to sketch out the general layout and dimensions of the property. Walk the property and note the positive and negative features and what should be saved, modified or removed (Hansen de Chapman, 2008).

Recommended – Site Analysis/ Site Inventory

- **Soil**
  - ✓ **Determine soil type, pH, nutrient levels and organic matter content from a soil test.**
  - ✓ **Assess whether the soil is compacted, shallow, gravelly, or limiting in another manner.**
  - ✓ **Look for and note on a map any inconsistencies of soil conditions across the landscape.**
- **Water and drainage**

- ✓ **Determine the water drainage from a property by assessing the slope from buildings or structures, hardscaped areas, and gutter and foundation drains.**
- ✓ **Note standing water or obvious problems with grade.**
- ✓ **Determine the location and type of irrigation systems.**

- **Mulches**
  - ✓ **Assess the types of mulch used, including wood chips or white reflective stone, and thickness of mulch around plants**
- **Plants**
  - ✓ **Determine whether existing plants are native or non-native (cultivars or varieties if known), the aesthetic value, location – distance from buildings and structures, sizes, and age.**
- **Waterbodies**
  - ✓ **Identify water bodies on site (if relevant for site); their flow patterns, water quality, and if there is erosion along bank.**
- **Light**
  - ✓ **Assess sunlight patterns or limitations on the property to assist in appropriate planting locations. Determine sun/shade patterns by determining the property orientation – identify North, South, East, and West.**
  - ✓ **Identify sunny locations – greater than 6 hours of sunlight. Identify shady location- greater than 6 hours of full shade**
- **Climate/Microclimate**
  - ✓ **Determine the direction of prevailing winds on the property. In general they will be from the northwest**
  - ✓ **Use data from local weather stations to determine average temperatures for each season and annual precipitation**
  - ✓ **Utilize USDA plant hardiness zone maps to determine climatic zones which will help in choosing appropriate plant types. New Jersey falls within zones 6a, 6b, 7a, and 7b. http://planthardiness.ars.usda.gov/**
  - ✓ **Microclimates consist of small scale temperature and exposure differences on the property. Document any enclosed areas, windbreaks, influence from buildings (wind blocks, color), and bodies of water that may influence microclimates.**
- **Wildlife/Ecology**
  - ✓ **Document the existence of deer, small animals, birds, and existing insects (both beneficial and problematic) as well as diseases, or weed problems on property or nearby.**
- **CALL BEFORE YOU DIG- 811 (http://www.call811.com/) In New Jersey, New Jersey One Call 811 or 1-800-272-1000 or www.nj1-call.org. It is the law and the contractor will be held liable for any damages to person or property if the markout has not been done.**
  - ✓ **If any digging will occur on the property call 811 before you dig to document existing utilities and power lines. Note locations of septic systems or underground tanks.**
  - ✓ **Maintain compliance with municipal and neighborhood development codes including ordinances for fencing, structures, and plant material.**
- **Current Use of Yard or Property**
  - ✓ **Determine family entertaining areas, recreational areas for children and pets, and personal preferences with regards to the landscape space.**

SOILS AND SOIL HEALTH

A healthy soil is the foundation for sound organic land care management. Creating optimum soil conditions will make all aspects of organic land care easier. The objectives of promoting healthy soil include:

- Increasing soil organic matter through the application of compost and other organic materials
- Correcting soil pH to maximize soil biological activity and nutrient uptake by plants
- Promoting beneficial soil organisms which help make nutrients available to plants
- Reducing unnecessary applications of fungicides and acidic fertilizers that may impact existing beneficial soil microorganisms.

The "Soil Food Web" is the term used to describe the complex interaction of life in the soil. A spoonful of soil contains millions of beneficial microorganisms including bacteria, fungi, actinomycetes, protozoa, micro-arthropods, and nematodes (Ingham, 2009). These beneficial organisms help plants obtain nutrients and water from the soil, protect plants from pathogens, and degrade compounds that could inhibit plant growth. In addition, a healthy soil food web can, over time, improve soil structure, and benefit overall plant health. Soil organisms create a living, dynamic system that can do all these things, but must be managed properly for optimal plant growth.

Recommended - Soil Testing

- **Soil should be tested for fertility, pH, and organic matter content. Organic fertilizers and amendments should be applied based on test results.**
- **Soil samples should be collected as per the procedure outlined by Heckman, et al., 2003, here.**
- **Tools and containers used for soil testing must be clean.**
- **Soil testing on a property should be performed every 3 years or less.**
- **In cases where the soil lab provides non-organic recommendations, adjust amendments to meet organic recommendations outlined in this manual.**
- **Maintain complete, up-to-date records for each site. Include all plant health care applications such as compost, compost tea, biological inoculants, organic fertilizers and other approved soil amendments. Document any changes.**

Not Recommended

- **The use of home field soil test kits or equipment to determine application of soil amendments is not recommended.**

Recommended - Soil Cultural Practices

- **If the soil is heavily compacted, consider some type of tillage to loosen the soil profile as deep as is practical. Mechanical aeration of compacted lawn areas should be done in the fall.**
- **For new lawn areas, apply approximately 1/2 inch of good quality compost and till into the soil to a depth of 2-4 inches (Landschoot, et al., 2013). Mix in any other soil fertility amendments as recommended by soil test prior to seeding.**
- **For established lawn areas, top dress with compost based on the following guidelines;**
  - ✓ **Turf: 1/4 inch 1-2 times a year followed by aeration (Landschoot, 2017)**
  - ✓ **Perennials: 2 inches or less at the beginning of the season (Finneran, 2012)**
  - ✓ **Woody ornamentals and shade trees: 3 inches or less (NOFA, 2011)**

- **Avoid the use of manure-based composts on soils that test optimum or high for available phosphate to reduce the risk of phosphate runoff.**
- **Leave grass clippings on the lawn after each mowing event and mulch mown leaves back into the turf. If not practical, then compost clippings and leaves onsite and utilize later as topdressing.**
- **Use an air excavation tool to reduce compaction in beds and in the root zone of shade trees.**
- **Maintain records for each site, including application and summary of any changes.**

Recommended - Soil Amendments

The following materials are acceptable as soil amendments in an organic land care program:

- ✓ **Any material that is acceptable under Section 205.203 of the NOP**
- ✓ **Organic Materials Review Institute-approved products**
- ✓ **Composted yard waste that was made on site**
- ✓ **Pesticide-free compost from local sources**
- ✓ **Aerobic compost tea and/or extracted compost tea made from local sources**
- ✓ **Fish hydrolysate, emulsion or meal**
- ✓ **Humic and fulvic acids**
- ✓ **Alfalfa meal, feather meal and other low phosphate organic materials**
- ✓ **Non-GMO microbial inoculants**

Not Recommended

The following materials are not acceptable as soil amendments in an organic land care program:

- ✓ **Any material prohibited under Section 205.203 of the NOP**
- ✓ **Synthetically-derived products**
- ✓ **GMO microbial inoculants**
- ✓ **Sewage sludge (sometimes referred to as biosolids)**
- ✓ **Compost that has gone anaerobic (It will often have a rotting, sulfur, or ammonia smell.)**

ORGANIC TURF MANAGEMENT

Turfgrass Selection

Whether seeding for the first time or overseeding an established turf, selecting a properly adapted turfgrass seed blend or mixture is important. Selection of turfgrass species and varieties that are well adapted to the landscape soil and climatic conditions is critical for a successful organic turf management program.

A thorough site assessment and understanding of the function of turf areas in a landscape provides information useful in the proper selection of turfgrasses. A land manager should match the strengths of various turfgrasses to the site conditions, maintenance plan and use.

Recommended – Turfgrass Selection

- **Full sun – Use blends or mixtures containing improved varieties of tall fescue, Kentucky bluegrass and/or perennial ryegrass. Select low maintenance fine fescues and tall fescues to reduce inputs of fertilizers and irrigation water (Murphy, 1996, and Park and Murphy, 2012, respectively).**
- **Shaded sites – Use blends or mixtures containing improved varieties of tall fescue or fine-leaf fescues (strong creeping red fescue, Chewings fescue, hard fescue). For dense shade, avoid turfgrasses and use appropriate groundcovers or mulch around trees and shrubs.**

- **Rapid establishment or repair – Use turfgrass blends or mixtures containing perennial ryegrass. Replace perennial ryegrass with lower maintenance blends of fescues for long term management (Murphy and Park, 2004).**
- **High traffic areas – Establish with blends or mixtures of improved turf-type tall fescue and Kentucky bluegrass; overseed for recovery with perennial ryegrass where appropriate.**

Mowing

Mowing is a fundamental practice of turf systems; key principles for mowing should not be overlooked.

Recommended – Mowing Practices

- **Mow as high as feasible based on the use/function of the turf. Taller-growing grass shades the soil, which suppresses weed germination and cools the soil. Organically managed turfs have been more successful at mowing heights of 3- to 4-inches (NOFA, 2011).**
- **Mowing height can be safely reduced to 2½- to 3-inches during autumn to:**
  - ✓ **Increase shoot density (thicken the turf).**
  - ✓ **Promote root growth.**
  - ✓ **Reduce lodging of leaves to inhibit snow mold diseases.**
  - ✓ **Enhance the removal of fallen tree leaves and other debris.**
- **Mow as often as needed to return clippings into the turf without clumping and smothering the grass.**
- **Mow with sharp blades as it causes less stress and damage to the turfgrass plant. Sharply cut grass blades will heal faster and reduce the potential for invasion of disease organisms.**
- **Alter mowing pattern to reduce wear damage/ruts that can occur from repeat mowing.**

Maintain or Improve Soil Health

Turf health and persistence is greatly affected by soil health. Soil tests help to guide practices needed to optimize soil health. See Soil and Soil Health section for more information.

Fertilization

Nitrogen is an essential plant nutrient that has the greatest impact on turf vigor and growth. Standard soil testing does not measure N levels. Rather, research has determined optimum fertilizer applications for each turf species and use situation. Other important factors that need to be considered when designing a fertility program include the age and vigor (health) of the turf, soil organic matter content, mowing (clipping removal), and availability of irrigation. For example, older turfgrass growing on high-quality soil will not require as much N fertilization as a new turfgrasses growing on poor soil. **Nutrient content of compost should be considered as part of the fertility equation. Compost needs to be tested to understand nutrient load in topdressing applications.**

Recommended – Fertilization Practices

- **Nitrogen inputs for turf areas can come from natural organic fertilizers and composts. Biological fixation from organisms such as clover and soil cyanobacteria is another possible source of nitrogen.**
- **Returned mower clippings will re-cycle nitrogen back to the turf/soil. Clippings can return up to 50% of the nitrogen needs for low maintenance turfgrass lawns (Qian, et al., 2003).**

- **Where appropriate, select turfgrass species that thrive under lower nitrogen levels. Turf-type tall fescues and fine fescues are the preferred species. Tall fescues have deeper and more extensive root systems to retrieve available soil nitrogen.**
- **If desired, dwarf white clover can be seeded at 2 to 4 ounces per 1,000 square feet in low maintenance turf areas to provide nitrogen for turfgrass (Murphy, 1995).**

Irrigation

Turfgrass grown in healthy soil will have a dramatically lower need for supplemental irrigation. Healthy, non-compacted soil will allow water to better infiltrate the soil and provide turfgrass plants the opportunity to establish deep, healthy roots. Keep in mind that irrigation is of little or no value if liming, fertilizing, and mowing and other practices are neglected or done improperly.

Recommended – Irrigation Practices

- **For established lawns, apply water as infrequently as necessary to maintain proper growth and avoid drought-stress of the turf.**
  - ✓ **Consider areas of turf in the landscape where irrigation can be reduced to encourage dormancy during drought and withhold irrigation.**
  - ✓ **Use irrigation systems with weather sensors to aid in determining irrigation frequency and volume.**
  - ✓ **Consider an irrigation audit to ensure that best practices are being followed.**
- **Allow the soil to become partially dry between irrigation events. Most grasses are adapted to occasionally dry conditions and will develop better root systems under this type of management.**
- **If watering is required, thoroughly water once or twice a week during periods of drought (no rain) as opposed to light daily sprinkling.**
  - ✓**Turf grown on very sandy soil may need more frequent irrigation during hot, dry conditions.**
  - ✓**Apply sufficient water in a single irrigation event to wet the entire root zone.**

Not Recommended

- **Excessive irrigation that produces runoff and leaching is not recommended. Excess irrigation can also increase the amount of weeds that may invade a turf.**

Overseeding

It is essential to overseed areas of turf that thin out from stress (use/play, pests, or climate).

Recommended – Overseeding Practices

- **Overseeding helps to maintain turf density, so seed/soil contact is critical. Overseed whenever thinning turf is observed. Disturbance of the soil surface should be minimized when overseeding during the spring and early summer to avoid increasing the risk of invasion by summer emerging weeds such crabgrass and goosegrass.**
- **During late summer and autumn, aerating, verti-cutting, dragging, and topdressing after overseeding will help work-in the seed. Repeated scattering of seed may be necessary if seed-to-soil contact is poor.**
- **Use a slit-seeder with vertical blades to slice open the soil surface and improve seed-to-soil contact, which will enhance the survival and establishment of new seedlings. Caution: disturbance of the soil surface during spring and early summer may encourage invasion of summer-emergent weeds.**

- **Use turfgrass seed that contains endophytes to produce turf with better tolerance to leaf- and crown-feeding insects. The seed of many new varieties of perennial ryegrass, tall fescue, and fine fescues contain endophytes. Seed containing endophytes should be stored under cool dry conditions because the endophytes in seed are lost (killed) when stored under hot, humid conditions for an extended period of time (several months).**
- **Frequent overseeding can be an effective tactic to reduce weed encroachment.**
- **Where possible, cover seed with a thin layer of compost and irrigate the area as soon as possible. Compost can help retain soil moisture needed for seed germination.**

Pest Management

Healthy turf is one of the best methods for reducing potential pest problems. Implementing the management practices discussed above will help maintain healthy turf and reduce pest activity. Unfortunately, even the best implementation of management practices can sometimes fail to suppress pest activity below levels (thresholds) that negatively affect the function of a turf. It is important to prevent large scale failure of turf. Loss of turf covers exposes soil to water (and wind) erosion, which will negatively impact water quality. Loss of turf cover will also encourage invasion of weeds.

Weed Management

Recommended –Weed Management Practices

- **Weeds can quickly invade thin turf, so effective weed management begins with maintaining a vigorous, dense turf. Cultural management practices (mowing, irrigation, soil fertilization and aeration) that enhance or maintain turfgrass density generally reduce weed competition and encroachment.**
- **Use an Integrated Pest Management (IPM) approach and scout for weeds based on the primary periods for germination and emergence. Be aware of the major weeds species and be familiar with weed life cycles.**
- **Strive to remove weeds at first appearance. Small immature weeds are easiest to remove. Hand-pulling of weeds is preferred.**
- **Organic herbicides should be used sparingly and applied typically as a spot treatment. Consider that organic pesticides can be toxic and pose a hazard to the applicator and the environment.**
- **Apply organic herbicides to immature weed plants for best efficacy, as mature perennial weeds can grow back from established taproots or rhizomes. Applications of organic herbicides may need to be repeated.**
- **Bare ground and areas of sparse turf should be consistently overseeded with a rapidly germinating seed blend to discourage weed establishment. Perennial ryegrass has the greatest potential for rapid re-establishment.**
- **Examine the ability to alter traffic patterns in turf areas to prevent loss and encourage recovery on high traffic turf. High traffic areas may require conversion to another groundcover such as mulch or hardscape.**

Recommended – Insect and Disease Control Practices

- **White grubs are the insect pest of greatest concern for turf in New Jersey. White grubs are soil inhabiting pests that feed on plant roots during summer, fall, and spring. Products containing insect parasitic nematode species or milky disease-causing bacteria provide biological control options for white grubs, but these products have limitations.**

- **Use turfgrass seed that contains endophytes to produce turf with better tolerance to leaf- and crown-feeding insects. The seed of many new varieties of perennial ryegrass, tall fescue, and fine fescues contain endophytes. Seed containing endophytes should be stored under cool dry conditions because the endophytes in seed are lost (killed) when stored under hot, humid conditions for an extended period of time (several months).**
- **Turf diseases are often present in landscape turf, but the damage to the turf frequently do not warrant treatment, especially when a sound management plan is practiced.**
- **Select turfgrass species and varieties with improved tolerance to important and most damaging diseases. Examples of this approach include the use of seed blends (two or more varieties) of perennial ryegrass that have good tolerance to gray leaf spot or Kentucky bluegrass and fine fescues with enhanced resistance to summer patch (Murphy and Park, 2004; Bonos, et al., 2004; Murphy, 1996). Tall fescue should have good tolerance to brown patch disease (Park and Murphy, 2012).**
- **Several biological disease control products are registered for use in turf. These biocontrol products contain microorganisms (typically beneficial bacterial or fungi) that suppress the populations of disease-causing microorganisms. These products are most effective when used on a preventive basis in areas with a history of disease and when disease activity is low to moderate. Efficacy of these products is usually poor when used on a curative basis or where disease pressure is high. To be effective over long periods, biocontrol products usually need to be reapplied periodically to maintain populations of the beneficial microbes at disease suppressive levels.**
- **Compost teas should not be viewed as fungicides, but are more accurately described as soil or foliar inoculants intended to promote soil and plant health.**

NATIVE, EXOTIC, AND INVASIVE PLANTS

Promoting biodiversity and habitat for beneficial insects and wildlife is an important goal of organic land care practitioners. Incorporating native plants (plants indigenous to our region) and eliminating invasive, exotic plants can help achieve this important goal. The use of native plants helps reduce the need for irrigation, fertilizer, and pesticides as the plants are adapted to local environmental conditions. Invasive plants invade natural areas outcompeting native plants and reduce overall biodiversity. Control of invasive plants include physical, chemical, and biological controls and it will be necessary to research the specific plant to determine the most effective eradication method.

Recommended – Native, Exotic, and Invasive Plant Practices

- **Preserve and restore native plant species.**
- **Increase biodiversity by attracting beneficial insects such as pollinators and predators of pest species.**
- **Plants should be multi-functional such as providing food for wildlife and/or humans and habitat for native wildlife species.**
- **Deciduous trees and large evergreens should be placed for maximum energy efficiency. Shade trees should be planted where the sun will shade the structure in the summer months and will allow sunlight to heat it in the winter. Evergreens should be placed to provide a wind break from winter winds.**

Not Recommended

- **The planting of monocultures (plant communities made up of one type of species)**
- **The use of plants that are vulnerable to pests and diseases.**

- **The use of plants known to be invasive to natural areas (See below for list).**

Recommended – Invasive Plant Controls – Adapted from US Fish and Wildlife (2009)

- **Physical controls**
  - ✓ **Handpulling**
  - ✓ **Digging out the entire root**
  - ✓ **Mulching or smothering using an impenetrable barrier. It is helpful to first cut the plants down.**
  - ✓ **Pouring boiled water on plant roots.**
  - ✓ **Soil solarization by covering wet soil with plastic to trap heat and kill plants and seeds. Be aware that this will also kill beneficial microbes in the soil.**
  - ✓ **Weed burners or flame guns. Note that private property owners who would like to conduct prescribed burns on their properties must apply for a permit through the New Jersey State Forestry Services for the winter/spring prescribed burn season- http://www.state.nj.us/dep/parksandforests/fire/permits.html .**
  - ✓ **Cutting or mowing done several times throughout the growing season. This is most effective before plants go to seed.**
  - ✓ **Girdling a tree by cutting into the bark and cambium in a complete ring.**
- **Chemical controls**
  - ✓ **Use of EPA Minimum Risk (25b) products or Organic Materials Review Institute (OMRI)-approved herbicides by basal bark, cut-stump, bundle and cut, or foliar spray technique. Chemical applications are often most effective in combination with physical controls.**
- **Biological controls**
  - ✓ **Use of beneficial insects such as predators, parasitoids, or pathogens (fungi and viruses) that have been proven to be effective for control. Some insects are available for purchase but a USDA permit may be needed for interstate shipments.**
  - ✓ **Use of grazing animals such as sheep, goats, or cattle.**
- **Disposal**
  - ✓ **Proper disposal of invasive plants once removed is essential to prevent re-sprouting or seed germination. Plants should be bagged up and can be left to cook in the sun for at least a week. Then they can be disposed as trash.**
  - ✓ **Some plants can re-sprout easily from plant fragments including: Oriental Bittersweet, Japanese Knotweed, Phragmites, and Japanese honeysuckle. Every effort should be made to completely eliminate plant fragments from these species from the site.**

The following is a partial list of plants that are considered invasive, should not be utilized in the landscape and once identified, should be eradicated.

Not Recommended – Invasive Plants – From New Jersey Invasive Species Strike Team (2015)	
Trees	**Herbaceous Plants (perennial, bulb, or grass)**
***Acer platanoides* - Norway maple**	***Alliaria petiolata* - Garlic mustard**
***Ailanthus altissima* - Tree of heaven**	***Allium vineale* - Wild garlic**
***Paulownia tomentosa* - Princess tree**	***Buddleia davidii* - Butterfly bush**
***Pyrus calleryana*- Callery pear**	***Centaurea biebersteinii* - Spotted knapweed**
Shrubs	***Chelidonium majus* - Celandine**
***Berberis thunbergii* - Japanese barberry**	***Cirsium arvense* - Canada thistle**

Berberis vulgaris **- Common barberry**
Elaeagnus angustifolia **- Russian olive**
Elaeagnus umbellata Thunb. **- Autumn olive**
Euonymus alata **- Winged euonymus**
Ligustrum obtusifolium **- Border privet**
Ligustrum ovalifolium **- California privet**
Ligustrum sinense **- Chinese privet**
Ligustrum vulgare **- European privet**
Lonicera x bella Zabel **- Bell's honeysuckle**

Ivy/Vine

Euonymus fortune **- Winter creeper**
Glechoma hederacea **- Ground ivy**
Lonicera japonica **- Japanese honeysuckle**
Rosa multiflora **- Multiflora rose**

Datura stramonium **- Jimsonweed**
Heracleum mantegazzianum **- Giant hogweed**
Iris pseudacorus **- Yellow iris**
Lysimachia vulgaris **- Garden loosestrife**
Lythrum salicaria **- Purple loosestrife**
Microstegium vimineum **- Japanese stilt grass**
Miscanthus sinensis **- Chinese silver grass**
Ornithogalum umbellatum **- Star-of-Bethlehem**
Phragmites australis **- Common reed**

PLANTING AND PLANT CARE

Proper Plant Selection

The first and most important step in designing and establishing landscape plantings that can be successful using organic practices is proper plant selection. An initial assessment of light conditions, soil conditions, and water availability will assist in selecting appropriate plants.

Recommended – Site Conditions Assessment

- **Obtain a soil test of landscape beds as part of overall site assessment and to determine input requirements.**
- **Use a compass and visual survey of the site to gain a strong understanding of sun movement throughout the day and year.**
- **Evaluate impact of existing tree canopy on landscape, soil health and water drainage patterns**
- **Look for site features, such as fences or large blank walls that might create stressful conditions for landscape plants.**

Not Recommended

- **Site assessment based on a single visit without taking daily sun movement, seasonal changes, and tree canopy changes into account.**

Recommended – Water Conditions Assessment

- **Look at overall plant health and examine plant for vegetative signs of excessive water availability such as limp wilted leaves, yellowing or browning leaves, or blisters on the undersides of leaves.**
- **Look for vegetative signs of limited water availability such as limp wilted leaves, crisp wilted leaves, dry soil, or slowed growth.**
- **Determine plant water needs based on soil test and/or percolation test.**

Not Recommended

- **Irrigation design for a site without adjusting for micro-climates.**
- **Irrigation design prior to plant selection.**

Recommended – Soil Conditions Assessment
• **Test the soil for both basic characteristics (pH, soil type, micronutrients, etc.) and soil food web recommendations and choose plants based on soil test results.**
• **Test compost for nutrient composition and to evaluate plant fertility needs.**
Not Recommended
• **The assumption of soil conditions based on those of a neighboring property.**

Sourcing Plant Materials

Build a relationship with nurseries that carry a broad selection of native and site-adaptive plants. Use the staff knowledge to your advantage. Contact your local County Extension office for additional guidance.

Recommended – Sourcing Plant Material
• **Be specific with plant requests and use the scientific names of the plants.**
• **Pay attention to plant sizes and the requirements needed to help the plant thrive.**
• **Pay attention to water or fertility requirements in the landscape bed.**
Not Recommended
• **The use of plants with different water or fertilizer requirements in the same bed/area.**
• **The allowance of substitutions, unless the suggested plant meets the same site condition requirements as the initial plant selection.**
• **The use of common names or the omission of plant size when specifying plants for a project.**

Recommended – Use of Native and Site Adaptive Plants
• **Use plants that are native to the region or that are non-invasive and adapted to the site conditions present. A list of native plants sorted by county can be found here (Native Plant Society of New Jersey, 2013).**
• **Maintain a list of acceptable natives for reference when designing/selecting plants for a site.**
• **Use plants that will perform well over time to limit the need for excessive maintenance.**
Not Recommended
• **The use of non-native plants whose potential for developing invasive qualities is in question.**
• **The use of native or ornamental plants not adapted to the present site conditions.**
• **The installation of trees and shrubs that will become too large too quickly and will require regular replacement or excessive pruning.**

Planting Practices and Techniques for Plant Survival

Once the correct plant is selected, proper installation of the plant is essential to ensuring that the plant not only survives, but has the vigor to perform well over its life. Proper hole sizing, planting depth, and the physical connection between plant and soil is key to the plant's survival.

Recommended – Planting Practices – Adapted from Polanin, et al. (2003)
• **Dig a hole 2-3 times the size of the root ball/container of the plant.**
• **Scarify the sides of the hole to avoid "glazing" or hole walls that are hard for roots to penetrate.**
• **Use native soil from excavation to backfill holes.**
• **Ensure a proper connection between the plant and the soil with few or no large air pockets.**
• **Remove any synthetic material, including twine, metal, and plastic used in the growing or labeling of the plant material.**

Not Recommended

- **Forcing a plant into a hole that is too small.**
- **Installing a plant in a hole that is too deep, which can cause settling of the plant.**
- **Planting a specimen so that the top of the root zone or root flare is below existing grade.**
- **Compaction of the soil backfill surrounding the newly-installed plant via stomping or tamping.**

Watering Practices – Installation

Watering before, during, and after planting is essential for initial plant survival.

Recommended – Watering Practices

- **Water newly-installed plant material thoroughly to ensure good soil-to-root contact.**
- **Water frequently during the first two weeks after installation to ensure proper plant establishment.**
- **Once plant is established, monitor plant health and limit plant watering to times of significant need or drought stress.**

Not Recommended

- **Shallow, frequent watering that limits root depth and establishment.**
- **Irrigation only at the base of a plant, which might discourage lateral root development.**
- **Excessive watering of newly-installed plants.**
- **The use of the same watering schedule for both landscape plants and turf.**
- **The use of reflective white stone mulch around trees and shrubs, which could lead to heat stress of the plants.**

Mulching Practices

Recommended – Mulching Practices – Adapted from Smith-Fiola, 2000

- **Mulch new plantings with organic mulches that provide nutrients to the soil as they break down.**
- **Design planting beds so that mulch becomes less necessary as plant establishment occurs.**
- **Mulch should be no deeper than 3" in depth and kept away from root base.**
- **Replenish/refresh mulch only when needed for plant health and weed suppression.**

Not Recommended

- **The use of non-organic/non-synthetic (stone, rubber) mulches unless necessary to perform other site functions.**
- **Mulch in excess of 3 inches or piled against the root base of trees and shrubs.**
- **The use of dyed or synthetic mulch products, including synthetic weed mats.**
- **Mulching every season if it is not necessary for plant health or weed suppression.**

WATER

Water should be conserved in the landscape as much as possible and the infiltration of water into the soil should be promoted. Excessive irrigation can not only lead to unhealthy plants, but also to excess runoff that carries pollutants to local water bodies. Stormwater runoff from rain events should be reduced and infiltrated onsite. Green infrastructure is an approach to managing stormwater that mimics the natural hydrology of a site by infiltrating it into the ground using vegetation or porous surfaces, or by capturing it for later reuse. Rain gardens, bioswales, pervious pavements, and rainwater harvesting systems are all examples of green infrastructure. Green infrastructure techniques preserve the water

quality of nearby receiving waters, as well as conserve the local water supply, and should be utilized whenever possible in the landscape (Rowe and Bakacs, 2012).

Recommended – Watering Practices – General Conditions

- **Conserve water as much as possible.**
- **Irrigate early in the morning to prevent water loss due to evaporation and minimize leaf surface wetness that promotes disease.**
- **Use drip irrigation when possible in beds or mulched areas.**
- **Use plants that are already adapted to New Jersey's climate.**
- **Group plants according to their water needs and avoid exotic plants with increased water demands.**
- **Use rain barrels or cisterns to collect rainwater for irrigation purposes.**
- **Water only when necessary – during plant establishment or during times of drought.**
- **Set up irrigation systems properly. Encourage weather-sensing systems. Consider the use of timers and override systems that can detect precipitation.**
- **Be mindful of existing water bodies/wetlands, riparian buffers, wetland laws, buffer rules, stormwater rules, and local regulations and ordinances.**
- **Minimize runoff by disconnecting impervious surfaces including rooftops, driveways, and walkways. This can be achieved via:**
  - ✓ **Directing downspouts to lawn or garden areas.**
  - ✓ **Directing downspouts to a rain garden.**
  - ✓ **Directing downspouts to a collection vessel such as a rain barrel or cistern for rainwater harvesting.**
- **Once plants are established, water deeply and thoroughly less often.**
- **Mulch planting beds and around trees for retention of moisture.**
- **Check irrigation lines for leaks and breakages each season.**
- **Disconnect rainwater harvesting systems for the winter.**

Not Recommended

- **Wasteful watering of the sidewalk or driveway, or irrigation during precipitation events.**
- **Excessive watering to the point of runoff generation.**
- **The use of exotic plants with high water demands.**
- **Irrigation at night as this may promote fungal diseases.**

WEED MANAGEMENT

A weed is a plant growing where it is not wanted. Even turfgrass, when growing unintended in a mulched bed or patio area can be called a weed. Weeds compete with desired plants for space, water, nutrients and light and can disrupt the appearance and use of landscapes.

The acceptance levels for weeds among property owners can be as variable as their personalities, so it is important to establish a tolerance level (threshold) for weeds within a landscape. Keep in mind that thresholds may need to be specific to a particular weed. Dandelions, for example, are often an unacceptable component of lawns for some property owners; whereas they may have value as edible vegetation or herbal medicine to others. Similarly, some property owners find clover to be an attractive component of a lawn or planting bed while others do not. In a low-maintenance lawn, however, dwarf white clovers can play an important role in recycling nitrogen back into the system and encouraging

beneficial microbes in the soil. Clover can naturally break up compacted soils, encouraging improved conditions for turfgrass growth in the future (USDA-NRCS, 2003).

Recommended – General Weed Management Principles
• **Become familiar with weed characteristics, growth habits and life cycles. These factors play a major role in weed identification and control options.**
• **Prevent addition of weed seed or vegetative parts in composts, manures, topsoil, etc. Thoroughly read seed labels and purchase commercial turfgrass seed mixtures and blends with little or no weed seed.**
• **Prevent build-up of weed populations and do not allow weeds to produce seed or spread vegetatively. Reduce weed population through mechanical, biological, and only when necessary, chemical (organic) methods.**
• **Maintain a dense ground cover (turfgrass, landscape plants, or mulches) to reduce open areas and prevent germination and emergence of weeds. Where appropriate, an organic pre-emergent herbicide (corn gluten) can be used.**
• **Physically remove weeds via hand-pulling / hand tools. Periodic shallow cultivation of planting beds may be needed to control infestations when they occur.**
• **Improve site, soil health, and overall conditions through cultural management that improves health and vigor of desired landscape plants. Higher plant densities will help suppress weed encroachment.**

Weed Management in Planting Beds and other non-Turf Areas

Recommended – Weed Management in Planting Beds and other Non-Turf Areas
• **Increase plant density when feasible and maintain plant vigor to out-compete weeds.**
• **Use mulch to suppress weeds. Maintain mulched beds and cultivate to discourage weed establishment.**
• **Mechanical or hand-pulling of weeds is preferred. Burning and freezing tools are also available to kill weeds. Juvenile, tender seedlings are easiest to control.**
• **Please be aware that in New Jersey, a pesticide applicator license is needed even when applying organic herbicides. Be sure to follow the product label and wear protective gear. http://www.nj.gov/dep/enforcement/pcp/pcp-FAQs.htm#general4**
• **Organic herbicides are allowed but should be used sparingly in affected areas. Organic herbicides work best on small, juvenile weeds. Large, perennial weeds often require repeated applications. Weeds can grow back from taproots or rhizomes.**
• **Natural barriers and edges can be used to limit the spread of vegetation into unwanted areas.**
• **Target the problem plant (weed) and avoid negatively impacting nearby desirable plants.**
Not Recommended
• **Weed barrier fabrics or materials that inhibit or prevent the infiltration of water and soil gas exchange, for example those containing PVC.**
• **Overuse of salt and vinegar-based organic herbicides can yield a negative impact on soil chemistry.**
• **Runoff of organic herbicides from hardscapes into planted soil can reduce soil quality.**
• **Organic herbicide contact with non-target plants as most herbicides are non-selective and will damage plants in the area.**

- **No synthetic substances should be utilized for pest management except what is allowed under Section 205.601 of the USDA National Organic Program regulations.**
- **Non-synthetic substances that are not allowed in an organic land care program are listed in Section 205.602 of the USDA National Organic Program regulations and include ash from manure burning, arsenic, calcium chloride, and lead salts among others.**

PEST MANAGEMENT

Proper cultural practices should always be the first line of defense when combating pest and disease problems. Cultural practices such as fertilization, irrigation, sanitation, mulching, pruning, plant selection, planting site, pest resistant plants, and others will all help reduce the incidence of pest problems. In some cases, no action needs to be taken.

To help Organic Land Care managers determine if pest intervention is required, an approach called the Appropriate Response Process (ARP) is suggested. The chart listed below (Table 1), illustrates that the focus should be on the 5-10% damage threshold range. Research has concluded that a majority of people detect aesthetic injury at levels between 5-10%. Therefore, the general rule of thumb for decision-making guidelines in landscapes is that plants suffering from 5-10% damage warrant control measures. Note that the actual pest density is not determined, but the symptoms, responsible environmental factors, and future forecasts of the potential problems are specified.

Table 1: Plant Damage and Recommended Actions – Adapted from Ball, et al. (1999)

Plant Class Ranking	Recommended Action
1. Normal appearance. No injury symptoms.	**No action needed.**
2. Minimal (<5%) injury symptoms	**Determine if problem is a true health threat or merely aesthetic injury. Notify client of observation.**
3. 5% to 10% injury symptoms.	**Notify client of observation. Treatment may be warranted.**
4. Plant health is compromised by the pest.	**Intense multiple treatments are essential.**
5. Plant is in severe decline.	**Remove portion or whole plant.**

Table 2 below shows approximate insect and mite density thresholds for woody plants in the landscape for integrated pest management treatment. The pest if the type of pest causing damage. The damage is typical damage type seen from that type of pest. The sampling unit is the representative part of the plant that should be examined for infestation. The sampling time is the period of growth or part of the life cycle that sampling should be executed. Infested sampling units is the minimum number of sampling units that should be infested in order to consider treatment. The density per infested units gives the general number of pests per plant part that would need to be seen in order to treat. Let's look at aphids, for example. If there is leaf curl damage on 7 out of 10 growing shoots on the same plant at the beginning of flush growth and 5 wingless aphids can be seen on each of those 7 shoots, those aphids may need to be treated.

Table 2. Approximate insect and mite density thresholds for woody plants in the landscape. Adapted from Sadof and Moser (1997).

Pest	Damage	Sampling Unit	Sampling Time	Infested Sampling Units	Density per Infested Units
APHIDS	Leaf curl, shoot distortion, sooty mold	**10** growing shoots per plant	Beginning of flush growth	**7**	**5** wingless aphids
	Towards end of growth	Treatment not usually needed	Peak of flush growth		**50** wingless aphids
BAGWORMS	Defoliation	Each foot of tree height (inspect whole plant)	Before eggs hatch	**1**	**1** bag (hand remove) **10** bags (for sprays)
			After eggs hatch	**5**	**1** larva (hand remove) **10** larvae (for sprays)
BORERS					
on shrubs	Dieback	Base of shoots	All year	**1**	**2** active holes
young trees		Trunk			**2** active holes
mature trees		Trunk			**4** active holes
BARK BEETLES	Dieback	Square foot of trunk	All year	**1**	**5** active holes
ELM LEAF BEETLES	Skeletonization	4 branches	May	**2**	**2** egg masses
					20 young larvae
					15 older larvae
			July	**2**	**4** egg masses
					30 older larvae
LEAF NOTCHING WEEVILS	Leaf notching, girdling	**4** branches per linear foot	June/July	**4**	**10** new notches
PEAR SLUGS	Skeletonization	**4** branches	When larvae feed	**2**	**5 larvae**
PINE SAWFLIES	Defoliation	**10** branches	Straw stage	**4**	**1** larval cluster
HONEYLOCUST BUGS	Leaf distortion	**4** branch tips	After bud break	**2**	**5** nymphs
			Mid May	**2**	**10** bugs of any stage
JAPANESE BEETLES	Skeletonization	**4** branches	Middle of flight period	**2**	**4** beetles per leaf
LACE BUGS					
on shrubs	Leaf discoloration	**4** branches	When nymphs active	**2**	**5** leaves with nymphs
on trees				**4**	**10** leaves with nymphs
LEAF HOPPERS					
on red maples	Leaf distortion	**4**	June-July	**3**	**3** per shoot
SCALES	Shoot dieback & leaf discolor	**10** shoots	All year	**3**	**10** live scales per inch of shoot
SPIDER MITES	Leaf discoloration	Beat **4** branches	Mid active season		**24** mobile mites/beat over white paper

Recommended – Insect/Disease Pest Management Practices

- **Monitor the landscape and only apply control strategies when damage thresholds have been exceeded.**
- **Learn to recognize common beneficial insects typically found in the landscape. Conserve and encourage their numbers through landscape design.**
  - ✓ **Complex landscapes with high plant diversity are most attractive to beneficial insects as they provide food and pollen sources for all stages of the beneficial insect life cycles and encourage them to stay in the area.**
- **Approved organic pesticides should only be utilized as a last resort. Oils/soaps, pyrethrum, *Beauveria bassiana*, *Bacillus thuringiensis,* Spinosad, Neem oils, and entomopathogenic nematodes generally work best when pest densities are low and before significant symptoms occur.**
- **Use EPA-registered beneficial microbes that antagonize or are competitive with certain disease pathogens. To be effective, these materials will generally need to be applied preventatively in order to suppress the buildup of soil pathogens.**
- **Well timed, selective targeted applications of approved organic pesticides are preferred and are the most effective approach to reduce problem pests.**
  - ✓ **Learn the life cycles and behaviors of common pests in order to increase efficacy of treatments.**
  - ✓ **Be aware of which environmental conditions are favorable to disease pathogens of concern and use that information to determine when suppressive treatments should be applied.**
- **Develop a written recordkeeping system, use it during every monitoring visit over the entire growing season. Written records will improve monitoring efficiency, improve and direct decision-making.**
- **Enroll in Extension educational classes to remain current in preferred pest management practices.**

Not Recommended

- **Reliance on a single tactic pest management approach.**
- **Routinely applying pest management controls before monitoring of the landscape has been performed.**
- **The planting of monocultures due to the tendency to encourage pests and disease.**
- **The use of microbial organisms that have been genetically-engineered is not recommended.**
- **No synthetic substances should be utilized for pest management except what is allowed under Section 205.601 of the USDA National Organic Program regulations.**
- **Non-synthetic substances that are not allowed in an organic land care program are listed in Section 205.602 of the USDA National Organic Program regulations and include ash from manure burning, arsenic, calcium chloride, and lead salts among others.**

WILDLIFE CONTROL

One of the major keys to success in wildlife control is to identify the species causing the damage to the landscaping. Looking at scat, footprints, and the damage to plants can help identify the culprit. Table 3 shows typical urban wildlife and the types of damage they can cause. Once the species is identified, an appropriate control strategy must be chosen.

Table 3. Typical urban wildlife and the types of damage caused					
Plant Damage Type	Deer	Groundhog	Vole	Rabbit	Raccoon
Browse damage	X	X			
Trampled vegetation	X				
Girdling of woody plants			X	X	
Rolled up sod					X
Surface tunnels in turf or beds			X		

Recommended – Deer Control Practices

- **High-tensile fencing – Adapted from Grande and Katz (2010).**
  - ✓ **7 – 10 feet high**
  - ✓ **Fence posts should be 5-6 inches in diameter**
  - ✓ **Space posts 25-30 feet apart**
  - ✓ **Set posts 36-40 inches below grade**
- **Electric fencing – Adapted from Grande and Katz (1998).**
  - ✓ **42-inch electric net**
  - ✓ **9 live horizontal wires**
  - ✓ **Bait the hot lines with peanut butter – be sure to turn the fence off when applying bait!**
- **Repellents**
  - ✓ **Start using repellents before problems start.**
  - ✓ **Alternate the types of repellents used.**
  - ✓ **Use the correct formulation for the season/weather.**
- **Recommended repellents**
  - ✓ **Ammonium salts of fatty acids**
  - ✓ **Capsaicin-based animal repellents**
  - ✓ **Bars of heavy-smelling deodorant soap hung off trees and shrubs 30 inches above the ground can be used as an area repellent. One bar of soap covers a 1-yard radius.**
  - ✓ **Repellents made from plant materials.**
  - ✓ **Dried blood**

Not Recommended

The following materials are not recommended for use as a repellent:

- **Any product prohibited by state law**
- **Predator urine**
- **Diesel fuel and kerosene-based sprays**
- **Products containing sewage sludge (biosolids).**

Recommended – Small Animal Management Practices

- **New Jersey Trapping and Relocation regulations must be followed. Current regulations can be found on the NJ Division of Fish and Wildlife page.**
- **Only live traps are legal in New Jersey and the trap must be set in an appropriate location.**
- **The correct bait is the key to success. See recommendations below for each small animal. Control practices adapted from (Hygnstrom, et al., 1994).**
- **Vole Control Practices**

- ✓ **To exclude voles, use hardware cloth cylinders. Protect seedlings that are 0.25-inch mesh or smaller. Bury the bottom of the cylinder 6 inches deep.**
- ✓ **Habitat modification can include mowing or mulch removal.**
- ✓ **To trap voles, utilize snap-back traps set perpendicular to the tunnel and leave the traps unset for a few days so the voles get used to them being there.**
- ✓ **Bait traps with peanut butter, a mix of peanut butter and oatmeal, or small pieces of apples.**

- **Groundhog Control Practices**
  - ✓ **Woven-wire fencing can be installed at least 3-4 feet aboveground and excavated underground at least 1 foot down and outward.**
  - ✓ **Electric fencing can be used.**
  - ✓ **The following fumigants can be utilized: carbon dioxide or sulfur dioxide bombs**
  - ✓ **To trap groundhogs, utilize single catch traps located close to the burrow exit.**
  - ✓ **Bait traps with cantaloupe, apple slices, carrots with the tops, lettuce, cabbage, or fresh peas.**
- **Rabbit Control Practices**
  - ✓ **To exclude rabbits utilize a foot-high non-plastic fencing material with 1-inch or smaller mesh. Make sure to excavate 1 foot below the surface**
  - ✓ **Install tree guards made of 0.25-0.75 inch mesh hardware cloth 1-2 inches away from the tree**
  - ✓ **To trap rabbits, utilize single catch traps near the nest or along edges where cover meets open land.**
  - ✓ **Bait traps with apples, carrots, or greens during the warmer months and winter corn cobs, dried fruit, or dried alfalfa or clover hay during the cold season.**
- **Raccoon control practices**
  - ✓ **Manage garbage and put bungee cords on lids to prevent entry.**
  - ✓ **Electric fencing can be used.**
  - ✓ **To trap raccoons, utilize single catch traps or a large cage trap and put behind the trigger mechanism and also leading to the trap entrance to lure them.**
  - ✓ **Bait traps with fish-flavored cat food, fish, chicken, marshmallows, or white bread.**
- **Bird Control Practices**
  - ✓ **Utilize netting, mylar tape, or prune around the area needing protection.**

Not Recommended

The following materials are not recommended for use as a fumigant:

- **Cyanides**
- **Strychnine**
- **Phosgene bombs**
- **Gas-producing devices**

PRUNING

Ornamental Trees and Shrubs

Pruning is the removal of plant parts. The main objectives of pruning are to manage plant growth and development by considering plant structure and plant health. The biology, growth and development of each plant must be understood before applying the principles of pruning and training. The necessity for pruning can be reduced by selecting the right plant for the right location on the property. Through

proper selection and limited pruning, the natural characteristics of the plant are enhanced and its integrity maintained (Fogerty, 2013).

Recommended – Timing of Pruning Practices

- **Start pruning when plants are young.**
- **Know the plant and the best pruning time for both aesthetic and functional reasons.**
- **Delay spring pruning for plants that bleed excessively. Some examples include:**
  - ✓ ***Cornus* spp. (Dogwood)**
  - ✓ ***Betula* spp. (Birch)**
  - ✓ ***Ulmus* spp. (Elm)**
  - ✓ ***Acer* spp. (Maple)**
- **Prune spring-flowering plants after the flowers have faded. Some examples include:**
  - ✓ ***Cornus florida* (Flowering Dogwood)**
  - ✓ ***Cercis canadensis* (Eastern Redbud)**
  - ✓ ***Forsythia* spp. (Forsythia)**
  - ✓ ***Syringa vulgaris* (Common Lilac)**

***Note:* Early pruning of spring flowering plants may reduce floral display.**

- **Prune summer-flowering plants in the winter or early spring. Some examples include:**
  - ✓ ***Abelia x grandiflora* (Glossy Abelia)**
  - ✓ ***Callicarpa americana* (American Beautyberry)**
  - ✓ ***Magnolia virginiana* (Sweet Bay Magnolia)**
  - ✓ ***Stewartia pseudocamellia* (Japanese Stewartia)**
- **Broadleaf evergreens usually require little pruning, but most can be pruned before new growth starts in the spring. Some examples include:**
  - ✓ ***Rhododendron* spp. (Rhododendrons and Azaleas)**
  - ✓ ***Ilex* spp. (Holly)**
  - ✓ ***Buxus* spp. (Boxwood)**
  - ✓ ***Kalmia latifolia* (Mountain Laurel)**
- **Narrowleaf Evergreens (Conifers)**
  - ✓ **Needle-leaf Types (branches radiate from main stem) require little pruning and often will not develop new shoots on older wood. Some examples include:**
    - ***Pinus* spp. (Pine)**
    - ***Picea* spp. (Spruce)**
    - ***Abies* spp. (Fir)**
    - ***Cedrus* spp. (True Cedar)**
  - ✓ **Scale-like Types (branches arranged irregularly from main stem) are more tolerant of pruning and are often pruned more than once during the growing season. Some examples include:**
    - ***Thuja* spp. (Arborvitae)**
    - ***Juniperus* spp. (Juniper)**
  - ✓ **Flat leaves (Feather-like arrangement on stem) are very tolerant of pruning and shaping throughout the growing season. Some examples include:**
    - ***Taxus* spp. (Yew)**

Not Recommended

- **Late summer-early fall pruning is not recommended. Pruning will stimulate new growth which may not harden adequately before frost or freezing weather resulting in injury or death of this growth.**
- **Pruning plants when they are under stress or are forming new leaves is not recommended.**

HOW TO PRUNE

Recommended – General Pruning Practices – Adapted from Vodak (1993).

- **Consider the reason or purpose before pruning the plant.**
- **Remove any dead, diseased, crossing, or broken stems or branches**
- **Remove weak growth like watersprouts (strong upright shoots) and suckers (shoots from the root system) from trees**
- **Remove branches from the center of trees**
- **Make training cuts for shape or size**
- **Large branches of a tree over 1 ½ inches in diameter should be cut using the three-part cut, partial undercut 6-8 inches from attachment; another cut completely through branch 6-8 inches beyond the undercut; the final cut at the branch bark ridge**
- **Prune to an outer bud**
- **Plants that "bleed" after pruning can be pruned later in the Spring/Early Summer**
- **Sterilize tools between cuts of diseased plants with 10% bleach solution or 70% rubbing alcohol. Wipe off sap with a clean cloth before sterilizing in bleach or alcohol.**
- **Prune out limbs as needed on select species that have acute upright angles.**
- **Pruning cuts should be made just outside the branch bark collar on a slight angle at the same angle as the ridge.**
- **Larger trees may require cabling or bracing when pruning**
- **Make sure pruning tools are sharp and clean**
  - ✓ **Use the correct tool for the job**
    - **Hand pruner – ½ inch branches or less**
    - **Loppers – ½ - 1 ½ inch branches**
    - **Pruning Saw – Larger than 1 ½ inch branches**
    - **Bow saw – Best for large branches**

Not Recommended

- **Topping or dehorning of trees.**
- **The pruning of V-crotch limb attachments.**
- **The making of flush cuts with the branch or trunk.**
- **Pruning more than 1/3 of the plant at any one time.**

EMERGENCY TREATMENT

Sometimes issues may arise that require the use of a prohibited substance to provide emergency treatment. One example of an emergency treatment would be to save the life of a specimen tree. Under the US Department of Agriculture's National Organic Program, there are no provisions for the use of prohibited substances for emergency treatment unless there is a federal or state mandate for the removal of a particular pest or disease problem. In the case of a federal or state mandate, following the USDA NOP standards, the property could still be considered organically-managed (Section 205.672).

For More Information

Technical Assistance

Contact your local Cooperative Extension office. In New Jersey, county Extension offices can be found at http://njaes.rutgers.edu/ In other states: https://nifa.usda.gov/extension

Readings

Bakacs, M., Boyajian, A., Haberland, M. (2010). "Rain barrels part I: How to build a rain barrel." E329. Rutgers Cooperative Extension, New Brunswick, NJ. http://njaes.rutgers.edu/pubs/publication.asp?pid=E329

Gimenez, D., Heckman, J., Muldowney, L., Murphy, S. (2012). "Soil organic matter." FS1135. Rutgers Cooperative Extension, New Brunswick, NJ. http://njaes.rutgers.edu/pubs/publication.asp?pid=FS1135

Gimenez, D., Heckman, J., Muldowney, L., Murphy, S. (2012). "Soil organic matter content and interpretation." FS1136. Rutgers Cooperative Extension, New Brunswick, NJ. http://njaes.rutgers.edu/pubs/publication.asp?pid=FS1136

Gimenez, D., Heckman, J., Muldowney, L., Murphy, S. (2012). "Improving soil quality by increasing organic matter content." FS1137. Rutgers Cooperative Extension, New Brunswick, NJ. http://njaes.rutgers.edu/pubs/publication.asp?pid=FS1137

Heckman, J. 2017. Organic lawn care case studies on home turf. *Research in Agriculture*. 2: 1-6. http://www.scholink.org/ojs/index.php/ra/issue/view/68

Mangiafico, S., Obropta, C. (2011). "Rooftop rainwater harvesting for plant irrigation I: Design concepts and water quantity." FS1162. Rutgers Cooperative Extension, New Brunswick, NJ. http://njaes.rutgers.edu/pubs/publication.asp?pid=FS1162

Mohr, M., Murphy, J. (2002). "Perennial ryegrass varieties for New Jersey." FS989. Rutgers Cooperative Extension, New Brunswick, NJ. http://njaes.rutgers.edu/pubs/publication.asp?pid=FS989

Smith-Fiola, D.C. 2000; Landscape Integrated Pest Management, The Alternative Approach to Traditional Landscape Maintenance; Rutgers Univ. Coop. Extension; *Chapter 1, What is IPM?* Pgs. 1-9.

Tukey, P. The Organic Lawn Care Manual. North Adams, MA: Storey Publishing, 2007. 272 pages.

Websites

New Jersey Division of Fish and Wildlife - http://www.nj.gov/dep/fgw/

New Jersey Invasive Species Strike Team - http://www.njisst.org

Northeast Organic Farming Association Organic Land Care - http://www.organiclandcare.net

Organic Materials Review Institute - http://www.omri.org/

Rodale Institute - https://rodaleinstitute.org/

USDA National Organic Program Standards – http://www.ecfr.gov/cgi-bin/text-idx?rgn=div8&node=7:3.1.1.9.32.7.354.2

REFERENCES

Ball, J. and P. Marsan, 1991; *Establishing Monitoring Routines and Action Thresholds for a Landscape IPM Service*; J. Arbor. 17(4): 88-93.

Bonos, S., Park, B., Murphy, J. (2004). "Kentucky bluegrass varieties for New Jersey sports fields." FS545. Rutgers Cooperative Extension, New Brunswick, NJ. http://njaes.rutgers.edu/pubs/publication.asp?pid=FS545

Finneran, R., (2012). "Fertilizing established perennials: Feed 'em and weep." Michigan State University Extension, East Lansing, MI. http://www.msusoiltest.com/files/fertilizing_established_perennials_finneran.pdf

Fogerty, E. (2013). "Pruning flowering shrubs." FS1221. Rutgers Cooperative Extension, New Brunswick, NJ. http://njaes.rutgers.edu/pubs/fs1221/

Grande, J., and Katz, L. (1998). "Portable electric fencing for preventing wildlife damage." FS888. Rutgers Cooperative Extension, New Brunswick, NJ. http://njaes.rutgers.edu/pubs/publication.asp?pid=FS888

Grande, J., and Katz, L. (2010). "High-tensile woven wire fences for reducing wildlife damage." FS889. Rutgers Cooperative Extension, New Brunswick, NJ. http://njaes.rutgers.edu/pubs/publication.asp?pid=FS889

Hansen de Chapman, G. (2008). "Landscape design: 10 important things to consider." ENH1112. University of Florida Institute of Food and Agricultural Sciences, Gainesville, FL. http://edis.ifas.ufl.edu/ep375

Heckman, J. (2003). "The Soil Profile Newsletter Volume 21". Rutgers Cooperative Extension, New Brunswick, NJ. http://njaes.rutgers.edu/pubs/soilprofile/sp-v21.pdf

Heckman, J., and Murphy, J. (2003). "Managing soil pH for turfgrasses." FS635. Rutgers Cooperative Extension, New Brunswick, NJ. http://njaes.rutgers.edu/pubs/publication.asp?pid=FS635

Heckman, J., Murphy, S., Lance-Sibilia, S. (2003). "Soil testing for home lawns and gardens." FS797. Rutgers Cooperative Extension, New Brunswick, NJ. http://njaes.rutgers.edu/pubs/publication.asp?pid=FS797

Hygnstrom, S., Timm, R., and Larson, G. (eds.) Prevention and Control of Wildlife Damage. University of Nebraska, Lincoln, NE, 1994.

Ingham, E. (2009). Soil Biology Primer, Chapter 4: Soil Fungus. Ankeny IA: Soil & Water Conservation Society. Pg. 22-23. www.soils.usda.gov/sqi/concepts/soil_biology

Landschoot, P., Carroll, M., Turner, T., and Goatley, M. (2013). "Establishment of lawns with compost and microclover in the Chesapeake Bay Watershed." Maryland Turf Council. http://www.mdturfcouncil.org/resources/Documents/TT%20Bulletins/Establishment%20of%20Lawns%20With%20Compost%20and%20Microclover%20In%20The%20Chesapeake%20Bay%20Watershed.pdf

Landschoot, P. (2017). “Using composts to improve turf performance.” Penn State Center for Turfgrass Science, State College, PA. http://plantscience.psu.edu/research/centers/turf/extension/factsheets/composts

Mazza, C. Site Assessment for Better Gardens and Landscapes. Ithaca, NY: Plant and Life Sciences Publishing, 2013. 81 pages.

Murphy, J. (1995). “Turfgrass seed selection for home lawns.” FS684. Rutgers Cooperative Extension, New Brunswick, NJ. http://njaes.rutgers.edu/pubs/publication.asp?pid=FS684

Murphy, J. (1996). “Fine fescues: Low-maintenance species for turf.” FS688. Rutgers Cooperative Extension, New Brunswick, NJ. https://njaes.rutgers.edu/pubs/publication.asp?pid=FS688

Native Plant Society of New Jersey. (2013). “Native plant list by New Jersey county.” http://www.npsnj.org/pages/nativeplants_Plant_Lists.html

Northeast Organic Farming Association. NOFA Standards for Organic Land Care: Practices for the Designs & Maintenance of Ecological Landscapes; 5th Edition, January 2011.

Park, B., Murphy, J. (2004). “Perennial ryegrass varieties for New Jersey sports fields.” FS546. Rutgers Cooperative Extension, New Brunswick, NJ. http://njaes.rutgers.edu/pubs/publication.asp?pid=FS546

Park, B. and Murphy, J. (2012). “Tall fescue varieties for New Jersey sports fields.” FS1189. Rutgers Cooperative Extension, New Brunswick, NJ. http://njaes.rutgers.edu/pubs/fs1186/Tall-Fescue-Varieties-for-NJ-Sports-Fields.asp

Polanin, N., Vodak, M., Vrecenak, A. (2003). “Transplanting trees and shrubs.” FS376. Rutgers Cooperative Extension, New Brunswick, NJ. http://njaes.rutgers.edu/pubs/publication.asp?pid=FS376

Qian, Y. L., W. Bandaranayake, W. J. Parton, B. Mecham, M. A. Harivandi, and A. R. Mosier. 2003. Long-term effects of clipping and nitrogen management in turfgrass on soil organic carbon and nitrogen dynamics. *J. Environ. Qual.* 32(5) 1694-1700.

Rowe, A., and Bakacs, M. (2012). “An introduction to green infrastructure practices.” FS1197. Rutgers Cooperative Extension, New Brunswick, NJ. http://njaes.rutgers.edu/pubs/fs1197/intro-to-green-infrastructure.asp

Sadof, C. and B. Moser. (1997). “Developing an Integrated Pest Management Program for Nurseries.” Purdue Univ. Coop. Extension Service Bulletin E-213, West Lafayette, IN. https://extension.entm.purdue.edu/publications/E-213.pdf

Smith-Fiola, D. (2000). “Problems with overmulching trees and shrubs.” FS099. Rutgers Cooperative Extension, New Brunswick, NJ. http://njaes.rutgers.edu/pubs/fs099/

US Department of Agriculture (1990). “National Organic Program.” Electronic Code of Federal Regulations. Title 7, Subtitle B, Chapter I, Subchapter M, Part 205. http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&sid=3f34f4c22f9aa8e6d9864cc2683cea02&tpl=/ecfrbrowse/Title07/7cfr205_main_02.tpl

US Department of Agriculture-Natural Resource Conservation Service (USDA-NRCS). (2003). “New Jersey Addendum: Use of deep rooted crops to break up soil compaction.” SQL-05, Somerset, NJ. https://prod.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs141p2_018352.pdf

US Fish and Wildlife. (2009, February 18) Managing Invasive Plants: Concepts, Principles, and Practices. Retrieved from https://www.fws.gov/invasives/staffTrainingModule

Vodak, M. (1993). “Christmas tree management shearing and pruning safely.” FS592. Rutgers Cooperative Extension, New Brunswick, NJ. http://njaes.rutgers.edu/pubs/publication.asp?pid=FS592



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