

STORMWATER POND DAM SAFETY PROGRAM

Integrated Pest Management Plan

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Watershed Protection and Development Review Department

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Adapted From:

1. Substation, Switchyard & Power Generation Facility Maintenance, Integrated Pest Management, Austin Energy, Prepared by: Carl Schattenberg, Utility Forester, Utility Forestry Section, Austin Energy, April, 1998.
2. Distribution System Maintenance, Integrated Vegetation Management Plan, Austin Energy, Prepared by: Carl Schattenberg, Utility Forester, Utility Forestry Section, Austin Energy, April, 1998.
3. Transmission Right-Of-Way Maintenance, Integrated Vegetation Management, Austin Energy, Prepared by: Carl Schattenberg, Utility Forester, Utility Forestry Section, Austin Energy, May, 1998.

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1.0 INTRODUCTION

The Watershed Protection and Development Review Department (WPDRD) maintains more than 600 stormwater management ponds. From this universe of ponds, approximately 130 (October 2003) are considered dams by state law (defined after this paragraph). Vegetation management is vital to the safe operation and maintenance of these dams. Problems arise from inadequate clearance from trees and vines around a dam structure or vegetation obstructing access near the dam for inspection and maintenance of the dam facility. The dam requires continual vegetation management to maintain access to the dam under all weather conditions.

Texas Administrative Code, Subchapter A: General Provisions §299.1, Definitions.

(1) **Dam** - Any barrier, including one for flood detention, designed to impound liquid volumes and which has a height of dam greater than six feet. This does not include highway, railroad or other roadway embankments, including low water crossing that may temporarily detain floodwater, levees designed to prevent inundation by floodwater, closed dikes designed to temporarily impound liquids in the event of emergencies, or off-channel impoundment's authorized by the commission in accordance with Texas Water Code, Chapter 26, or the Texas Solid Waste Disposal Act, Texas Civil Statutes Article 4477-7.

The objectives of dam maintenance is to avoid dangerous conditions and potential failure caused by tree roots damaging the dam structure, avoid possible damage to a dam caused by trees and other woody vegetation, maintain year-round access to the dams and lower the cost of future maintenance of woody vegetation on the dam. Integrated Pest Management (IPM) techniques effectively accomplish these goals and manage costs involved with the maintenance of dams.

There are many target pests of dams but the most prevalent is woody vegetation, therefore, the emphasis of this IPM plan will be techniques to manage woody vegetation. The other pests will be identified in the target pest section of this document.

The focus of this IPM plan for the dam is a mixture of manual, mechanical, and chemical approaches to manage woody vegetation on or near the dam to maintain safe clearance distances.

2.0 PROBLEM STATEMENT

The Watershed Protection and Development Review Department is responsible for maintaining approximately 130 dams. Periodic maintenance of vegetation is critical to prevent damage caused by vegetation encroaching on or near the dam structure and to maintain access for dam inspection and maintenance. Title 30 of the Texas Administrative Code, Chapter 299 requires dam owners to adequately maintain dams and associated facilities throughout their lives. The issue with woody vegetation on dams appears to exist at most of the 130 dams. More than 60 of these dams have a State of Texas classification of high hazard because of the location of residential structures immediately downstream of the dam.

In the case of most mowing operations and tree cutting, the remaining stump and exposed root crowns will resprout prolifically. This regrowth will emerge during the growing season and exhibits a phenomenal rate of growth much greater than the typical growth rate. Over time, these resprouts create dense, impassable thickets of brushy monoculture with little plant diversity. Under any situation, removal of a tree that resprouts is *not efficient nor cost-effective unless there is control of the resprouts*.

In some cases, herbicides may be preferred because they reduce the need for repetitive cutting. Improved environmental safety of the available herbicide products and technology make their use a more viable and attractive alternative for maintenance crews that do not have the equipment for manual and mechanical management methods.

The advantages and disadvantages of various vegetation management methods are considered and evaluated to assist in the decision making process involving the selection of the appropriate control methods. These are listed under Best Management Practices.

The long-term goal of a dam IPM program is to provide for public safety and to provide consistent ability to maintain and inspect dams by eliminating woody vegetation and other target pests from on or near the dam.

On a dam, properly executed IPM practices result in the conversion of a wooded dam to a plant community requiring minimal maintenance activities in the future to maintain accessibility. This can be accomplished by selectively controlling tall growing plant species, while preserving low growing grasses over a period of many years. Most dam safety experts consider it more appropriate to favor a dense Bermuda grass cover over the less desirable mesquite, brush or other woody plant communities on dams.

Low-growing plants, such as grasses and wildflowers, on dams may be effective means for controlling long-term cost. Establishing a low-growing plant community produces a cover type more resistant to the encroachment of woody plant species and usually supports more wildlife use and diversity. Low-growing vegetation, with the elimination of trees, will lower maintenance costs and increase the effectiveness of

dam maintenance. With proper management, low growing plants can eventually dominate the dam and retard the growth of the tall growing vegetation, thereby inhibiting incompatible vegetation and reducing the frequency of future treatments.

Opportunities exist for establishment and maintenance of compatible, desirable and diverse low-growing plant communities on Watershed Protection and Development Review Department maintained dams.

3.0 TARGET PESTS

The target pests for the City of Austin Stormwater Pond Dam Safety Program (SPDSP) are discussed in this section. The most significant pests are trees and woody vegetation.

3.1 Trees and Woody Vegetation

In the interface between vegetation and dams, trees are not compatible and pose a potential hazard. The location of a tree, in relation to a dam, is the first consideration in determining if the tree presents a potential problem to a dam. Access, tree species, size, condition, mature height, growth habits, and tendency to resprout are all considered in dam / tree decisions.

Problematic tree or plant species, which may be considered target pests, include all trees, such as those listed in Appendix F of the City of Austin, Environmental Criteria Manual, some large shrubs such as Ligustrum or Red-tip Photinia, bamboo and vines such as grapevines, wisteria and poison ivy. These and other similar plant species are considered problems when they negatively interfere with operation, maintenance or access to utility facilities, and are considered as target pests in these circumstances.

3.2 Fire Ants

Fire ants pose a threat to both the dam and to dam safety and maintenance personnel. Fire ants create problems for dams in the damage they can cause to the dam structure. Fire ants have the ability to displace more soil than earthworms. In addition, fire ants can penetrate as much as four-feet into the dam and build mounds as high as 14-inches above the ground. The depth can weaken soil and cause internal erosion. The mounds above the ground create hazards for maintenance personnel, especially those responsible for mowing the dam. Fire ants create problems for people in that some people are allergic to their bites. Fire ant elimination will be requested as mounds are discovered during routine inspections. Please refer to the Green Grow earth-wise guide on Fire Ants in Appendix D for management methods and potential chemical controls. Only the least-toxic fire ant baits and mound treatments will be used for the SPDSP IPM.

3.3 Burrowing Animals

Burrowing animals can endanger the structural integrity and proper performance of embankments and spillways. The activity of these animals can weaken the dam

structure and create an undesired water pathway through the dam. The City of Austin does not have a standardized program for the control of burrowing animals. The SPDSP staff will continue to explore methods for controlling these pests and will revise this IPM when better information is available.

4.0 IPM PRINCIPLES

Best Management Practices (BMPs) for control of problematic vegetation are based on IPM principles that will maintain the desired site conditions while minimizing any exposure to risk. The principles are designed to provide safe and efficient operating conditions while protecting workers, the general public, wildlife, groundwater, surface water and other environmental resources. These principles include:

- Maintenance activities will use IPM methods that are supported by scientific research as increasing effectiveness and minimizing risk. WPDRD will combine physical, biological and chemical controls, whenever practical.
- Correctly identify the plant target pest species and understand the biology to determine what control practices may be most appropriate.
- Determine the threshold levels at which a pest becomes a problem, a safety hazard or obstacle to determine if and when control is needed and which control method is best suited to the situation.
- Determine the most vulnerable stages of the life cycle of the pest to determine when the target pest is most susceptible to treatment for effective control.

When a BMP option indicates that pesticide applications are appropriate, control treatments will favor effective low volume applications of the safest and most environmentally-friendly and effective pesticides.

The determination of a treatment prescription and application method will take into consideration the situation, location and surrounding vegetation. Adjustments will be made, as needed, to accommodate special circumstances related to the facility location and adjacent environmental conditions.

5.0 BEST MANAGEMENT PRACTICES

5.1 Trees and Woody Vegetation: Manual

Manual activities involve physical labor to control vegetation growth with tree crews using chain saws.

Pros:

- The sole advantage of manual clearing is that this method can be selective as to the vegetation removed and retained.

Cons:

- Manual tree pruning and tree removal is physically demanding and very dangerous.
- Employers of laborers engaged in manual cutting are exposed to high liability and must pay very high workman's compensation insurance rates.
- Removal of hackberry, chinaberry and other common problematic trees, does not kill the root system and results in prolific stump and root sprouts, increasing the number of stems and density of regrowth.
- Because most of the problematic trees tend to resprout, cutting alone is very ineffective and even counterproductive in the long term. Cutting is needed more frequently due to prolific stump resprouting.
- Manual cutting with a chainsaw can release bar-chain lubricating oil, creating a potential for water pollution, in addition to the exhaust released into the air.

5.2 Trees and Woody Vegetation: Mechanical

Mechanical controls employ large heavy-duty equipment.

Pros:

- Mechanical controls can be effective for completely removing the woody vegetation.

Cons:

- Heavy equipment is very expensive due to all of the environmental site protection regulations.

5.3 Trees and Woody Vegetation: Chemical

Chemical vegetation management methods use herbicides to manage vegetation. When properly applied, herbicides can be the most cost-effective and efficient tool available to a vegetation manager.

Pros:

- Herbicides are very effective over the short and long term by controlling regrowth. Stump treatments control resprouts and minimize expensive, recurring maintenance. Herbicide can be applied directly to the plant or stump to control the target pest. Selective herbicides are effective in controlling target pests while not affecting others, for example, preventing resprouts on stumps while not affecting nearby plants. Selective applications can result in reduced herbicide usage as a result of species composition changes from incompatible plant species to compatible plant species. Herbicides reduce long-term maintenance costs by reducing the occurrence of incompatible or undesirable tree species on a dam. Herbicide treatments to the same areas will be minimized due to the selective nature of the application and with fewer target stems.
- Herbicide control methods are considerably more economical than other alternatives.

Cons:

- The use of herbicides requires hiring an outside contractor.
- Herbicides can create public concern and can lead to negative perception problems.
- Some negative perceptions of herbicide applications may not be based on facts, which often contribute to misunderstanding that is hard to dispel.
- Careless handling of concentrated herbicides when mixing solutions can cause possible skin irritation and eye injury.
- Some herbicides, if not handled responsively, can cause potential water pollution.

5.4 Trees and Woody Vegetation: Strategic Combination of Control Methods

The most appropriate, effective and safest control of a target pest is a strategic combination of several of the control methods outlined above, integrating herbicides into the available management methods. The combination of various manual, mechanical, and chemical methods is often the Best Management Practice for cost-effective and environmentally-safe management.

All options involving chemical control methods will be in strict compliance with product label requirements.

The proposed use of chemical controls in the following instances must be reviewed and approved by the City of Austin IPM Coordinator prior to their use:

- The proposed use of pesticides within 50' of surface water resources (standing water)
- The proposed use of pesticides within 150' of a cave, sinkhole, and/or other recharge features (Edwards Aquifer recharge zone)

6.0 PRODUCT SELECTION

The implementation of the SPDSP IPM program is dependent on the selection of safe and appropriate pesticides that meet certain WPDR and City of Austin guidelines and criteria.

Among the criteria considered in evaluating various products is applicator safety, maintaining environmental quality, preserving water quality, effectiveness on the target species, economics, natural degradation of the product in the soil, toxicity level, selective vs. broad spectrum activity and product application methods. All pesticide prescriptions will be carefully selected to balance environmental concerns, efficiency, safety and cost-effectiveness.

Preservation of water quality is important in the selection of the products to be used with the IPM program. Those products which degrade rapidly in the soil or in UV light or bind to soil particles and organic matter are preferred. Those pesticides which leach through the soil profile or those that leave persistent soil residues are not

desirable for the SPDSP IPM program. Safe and cost-effective management of target pests is very important for maintaining safe dams.

If in the event that a special situation requires the use of a product that is not listed in this initial IPM plan, the product must adhere to these standards of selection criteria and its use must be justified. Under no condition, would any pesticide product be used in a situation or manner which would deviate from strict label directions. Only pesticides registered by the U.S. Environmental Protection Agency and designated state agency shall be used.

The products chosen for the SPDSP IPM program will incorporate user safety, low environmental impact and selective control of the specific target pest species. An herbicide product should not be used if there is conclusive research and evidence of the product posing a serious health threat.

7.0 APPLICATION METHODS

A very important consideration in the selection of an herbicide is the manner in which it is applied. The SPDSP will use the products and methods of application that are the safest to the applicator, non-target plants, water quality and other natural resources.

Low-volume application methods are ideal to reduce the amount of product used, thus reducing the amount of a pesticide applied on an area. Individual Plant Treatments (IPT) are another effective way to reduce application volumes. IPT is the application of the vegetation management product directly to the target pest plant, while minimizing potential exposure to nearby plants. IPTs include cut stump treatment, basal stem applications, a directed application of a low-volume foliar spray and basal drench. Low-volume application and IPT methods minimize the amount of products used and provide good results.

7.1 Vegetation Management

For control of undesirable plants with herbicides, there are three potential ways to apply a product to introduce it into the target plant, a) foliar through the leaves, b) through the stem or c) through the soil into the roots.

The target pests on dams include brush, trees and other woody vegetation. The herbicide applications for IPM on dams may require a either stem treatment or foliar application, depending on the target pest and situation.

Low-volume foliar applications may be appropriate in certain situations with a very dense stand of woody vegetation up to 4 - 6 feet tall on the dam. Foliar treatment of vegetation taller than 6 feet is inadvisable. Low-volume foliar applications are best suited to control of dense regrowth of mesquite, hackberry and other woody plants on a dam.

Poison ivy on access gates and other similar areas is often effectively treated with a foliar

application of an appropriate herbicide. A wide selection of foliar herbicides offers more choices for the selection of the safest, most environmentally-friendly and effective option available.

For control of woody plants in low densities and few numbers from 4 feet tall and up, stem applications are very effective. Stem applications may be applied as a *Cut Stump* or a *Basal Bark* application. The stem application method is the appropriate choice for controlling woody vegetation and vines over 4-6' tall, on a small scale where stem density is low. This is effective with a select group of a few very safe herbicide products.

A *Cut Stump* treatment is the application of a herbicide to the outermost ring area (cambium) of the surface of the stump and to the exposed side of the stump and root flare. *Cut stump* treatment is ideal after the removal of a single tree of certain species prone to resprout, especially mesquite, hackberry, chinaberry and willow trees. Cut stump applications are used on stems larger than 2-4". This application method is not practical with a high-density or a large number of stems in a given area.

Basal Bark treatments involves the application of the product to the bottom 1 2 - 2 4 inches of the stem of a shrub or small tree (up to 2-4" DBH). This method is well suited to certain situations and during the dormant season. Again, this method is best suited to a few stems or a low-density of stems in a given area.

Soil active herbicides, wherein the chemical is applied to the soil and absorbed through the roots, present certain disadvantages and potential problems. Use of soil active herbicides are generally discouraged and may only be used upon approval from the IPM Coordinator.

7.2 Applicator Safety

Applicators must wear certain Personal Protective Equipment (PPE) to reduce exposure when using any of pesticides. For the herbicide products selected, the manufacturers recommend that the applicator wear long sleeve shirts and pants, shoes with socks, water-proof gloves or chemical-resistant gloves and safety glasses.

During applications the potential for exposure is only to the diluted herbicide mixture and that exposure is brief since workers apply the solution and then leave the area. After the herbicide is absorbed by the plant, direct exposure is virtually negligible. Any herbicide not absorbed by the plant is rapidly biodegraded by micro-organisms or light. Considering the low toxicity, rapid uptake and rapid biodegradation of most modern herbicides, any applicator exposure is minimal.

Applicators should wash their hands after working with these products. Applicators must always follow the product label directions for safety recommendations and specific instructions on use of a particular product.

7.3 Water Quality Protection

Water quality is an important environmental issue in relation to pesticide use. The strategies for reducing or preventing water contamination by these products are based on common sense. When applying pesticides, the applicator should read the product labels and use the lowest effective rate listed on the label for any one application. Applicators shall calibrate equipment, apply products according to label recommendations, and keep records of the amount of product applied. An applicator should NEVER "double the rate for better results" and NEVER deviate from strict label application rates.

The key to minimizing any impact is reducing the levels of possible pollutants that enter the system. Factors determining the potential for ground water and surface water contamination include tendency for the pesticide to attach to soil particles or organic matter, solubility in water, rate of degradation and volatility. Soil is a common pathway to groundwater and soil characteristics determine the rate at which chemicals move through it. High clay or organic-matter content of the soil is favorable to the binding of an herbicide molecule and tying up the material while it is decomposed in the soil by microorganisms or other degradation processes. Most Central Texas soils have a high clay content. To prevent contamination due to runoff, do not apply products within 24 hours of expected heavy rainfall.

Pesticide drift into waterways can be controlled by spraying only on calm days, using lower pressure, larger droplet size and drift control additives in the spray solution to reduce spray drift. These precautions should be taken to reduce spray drift on all occasions. More detail on managing spray drift is given in the following section of this IPM plan.

Accord™ is a product with an EPA clearance for use near water, in the rare case where this type of application may be needed.

One potential source of water contamination is the disposal of unused herbicide, product containers and rinse water. Prepare only the amount recommended for the area to be treated to prevent having any unused herbicide at the end of an application. Rinse all empty containers, regardless of their type, three times before disposal. Do not dispose of container rinse water where it may flow into a waterway. Instead, dispose of container and equipment rinse water by application on the treated area, if possible, or containerize it for use in mixing the solution for the next application of that same product. Dispose of the product containers according to label directions.

7.4 Spray Drift Minimization

Managing spray drift to avoid any off target movement of a pesticide is the *responsibility of the applicator*. The interaction of many equipment and weather-related factors determines the potential for spray drift. Wind velocity, spray droplet size, surface temperature inversions, nozzle shields, ambient temperature and humidity are all important aspects to consider to avoid spray

drift of a pesticide. Spray applications should not be attempted if wind velocities exceed 10 MPH, and this limit may be lower in many cases.

Drift potential increases at wind speeds of more than 10 miles per hour, or under conditions of a surface temperature inversion. *Avoid spray applications on windy or gusty days.* Surface inversions cause small suspended droplets to move laterally. Surface temperature inversions are more common under windless conditions (<3 mph) in the early morning hours, and can be indicated by low fog or smoke that layers and moves laterally, as opposed to smoke that moves upward and rapidly dissipates.

The most effective way to reduce spray drift is to apply the largest droplets (>150 - 200 microns) that provide sufficient coverage and control. Use low spray pressures and high flow rate nozzles to produce larger droplets which are less likely to drift off site. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly or under unfavorable weather conditions.

Shielding the individual nozzles can reduce the effects of wind, but precaution must be taken to avoid any interference with uniform application and deposition of the pesticide.

Drift control additives and wetting agents shall be added to the spray solution as additional measures to prevent spray drift and improve spray coverage of the application area.

8.0 SPILL RESPONSE AND CLEANUP GUIDELINES

Product labels, Material Safety Data Sheets (MSDS), and product data sheets will be provided when a chemical is proposed to be used.

The individual or applicator responsible for handling these products will also be responsible for immediate containment, recovery and clean up of a spill. Every applicator should be trained in cleanup methodology.

The intent of the SPDSP IPM program is to minimize the amount of product stored, transported or applied, so if a spill occurs, it would be of minimal volume, easy to contain and cleanup and of minimal impact to natural resources and personnel safety. In general, spills onto impervious surfaces such as asphalt or concrete can be contained by an applicator trained in cleanup procedures. Spills onto soil are more difficult to treat, and all but the smallest spills should be handled by certified spill response personnel.

Contained spills can be cleaned up by the personnel using the chemical, if a) the spill is contained and not spreading, and b) the personnel have the training on how to safely perform the cleanup. When personnel clean up their own spill, they should remove all visible signs of spilled material and place the material in a bag. The waste container should be labeled with the description of contents, location of spill, contact

person and date.

For uncontained spills, which may enter into waterways, storm drains, or in which the leak cannot be stopped and the chemical continues to spill, the Spill Response Team should be contacted to perform the spill cleanup (phone number 512-974-2550). If assistance is requested, provide the following information: Location of spill, materials involved, estimated volume spilled, whether source of spill is contained, and any other information that believed to be relevant.

The guidelines of this IPM program are not intended to replace any other regulations by which the contractor operates. Contractors for the WPDRD will be provided with a copy of this IPM.

8.1 Spill Cleanup Procedures for Spills on Impervious Surfaces

Spills on impervious surfaces such as asphalt or concrete are not particularly difficult to contain and cleanup if the operator is given basic spill containment/cleanup training.

8.1.1 Materials Required

Container(s): 5 gallon plastic bucket(s) or 55 gallon open top steel drum(s) with lids, plastic liner for containers, shovel(s), broom(s), hydrophilic absorbent (kitty litter), surfactant, and water. Absorbent socks may be required on larger spills to provide containment.

8.1.2 Protective Clothing:

Long sleeve shirt, long pants, shoes with socks, gloves and safety goggles.

8.1.3 Cleanup Procedure:

- 1 Containment: It is first necessary to contain any spill to prevent its spreading. This can be accomplished by the application of a berm (dam) of absorbent granules around the spilled liquid (preferred method) or the application of absorbent socks around the spill area. An absorbent berm is preferable in cases of smaller spills and socks in cases of larger spills or spills caused by leaking equipment where liquid continues to flood the contained area. It is important to provide containment before attempting to repair leaks. Drain leaking equipment into approved containers.
- 2 Apply absorbent to the spill area and work into the contaminant by brooming the absorbent into the spilled product. When absorbent is saturated remove with a shovel and place in a lined container or drum. If necessary, add additional absorbent granules and continue working it into the spilled product until the area appears dry.
- 3 Wet the contaminated area with a surfactant and work it in by vigorous brooming.
- 4 Apply absorbent and dry surface. Place used absorbent into the lined

container or waste drum.

- 5 Repeat steps 3 and 4.
- 6 Pour clean water on the surface as a rinse, brush in, and absorb as before. Sweep the area clean and place all waste in the lined container or spill drum(s).
7. Close drums, mark lid and side of waste drums with the following information: Date; Location (address) of spill; Product involved; Container contents; Number and total number of containers of waste generated (example: 2 of 5). It is recommended that paint pens be used for drum marking because these resist fading when exposed to the elements.

8.2 Spill Cleanup Procedures for Spills onto Soil

Spills onto soil are more difficult to cleanup, and all but the smallest spills should be handled by Certified Hazmat personnel.

8.2.1 Materials Required:

55 gallon open top steel drums with lids, plastic drum liners, pick, shovel, hydrophilic absorbent granules (kitty litter), absorbent socks.

8.2.2 Protective Clothing:

Long sleeve shirt, long pants, shoes with socks or PVC boots, leather work gloves.

8.2.3 Cleanup Procedure:

1. Containment: It is first necessary to contain spills that are spreading. This can be accomplished by application of local soil to form a berm or the application of absorbent granules (kitty litter) or absorbent socks. Containers should be placed to collect liquids leaking from equipment before attempting repairs.
2. Dig out all soil that shows signs of contamination (wet soil). Place this soil into lined 55 gallon drums for transportation and disposal.
3. Close drums. Mark lid and side of drum with the following information: Date: Spill Location (address of spill); Product involved; Drum number and total number drums generated in spill (example 2 of 5). It is recommended that paint pens be used for drum marking because these resist fading when exposed to the elements.
4. Deliver all cleanup waste to a facility licensed to accept the waste products.

8.3 Storage, Transport, and Disposal

The IPM products used by licensed personnel will be secured in a facility designed for the safe storage of pesticides. Rinse all empty containers three times before disposal. Puncture or break triple-rinsed containers to facilitate drainage and to prevent reuse for any purpose. Dispose of containers strictly according to label directions.

Dispose of rinse water in a responsible manner. Do not dispose of equipment rinse water directly into waterway or into storm drain that may discharge directly to a waterway. Water used to clean application equipment or from triple rinsing of containers should be collected in a suitable container for use in mixing the solution for the next application of that same product.

Materials recovered for a spill cleanup shall be disposed of according to directions given in the previous section of this document entitled "Spill Response and Cleanup Guidelines".

9.0 TRAINING AND PROFESSIONALISM

All personnel involved with the application of pesticides must be licensed by the State of Texas and will be required to complete various Continuing Education courses and training sessions, as required by State laws and department requirements. Personnel will be encouraged to exceed the minimum requirements for training and Continuing Education in the areas of IPM practices, principles and products. Contractor must provide regular updates on product labels & MSDS, laws and regulations and other relevant information to all involved personnel.

10. PRODUCT RECOMMENDATIONS

Given the selection criteria, a list of products were considered appropriate for use in managing vegetation and pests impacting operations and maintenance of dams. Label Signal Words are listed for each product and is either Caution (safest), Warning (Intermediate) or Danger (Toxic). These product recommendations are listed below:

Woody Vegetation Control

Herbicides

Product	Active Ingredient	Label Signal Word	Comments
Roundup Pro™	Glyphosate	Caution	Low-Volume foliar
Accord™	Glyphosate	Caution	Low-Volume foliar
Pathfinder II™	Triclopyr	Caution	Stump & Basal use
Garlon 4™	Triclopyr	Caution	Stump & Basal use
Garlon 3 A™	Triclopyr	Danger	LV foliar -Eye danger
Arsenal™	Imazapyr	Caution	Stump & LV foliar

Fire Ant Control

Pesticide

Product	Active Ingredient	Label Signal Word	Comments
Greenlight Fire Ant Control with Conserve™	Spinosad	Caution	Bait

For product labels and MSDS for the products listed above, please refer to Appendix C.

This IPM plan is a dynamic document and should be reviewed at a minimum of every 5 years. If other control tactics are found to be effective, appropriate and cost-efficient, then this document can be revised to include such methods. No regularly scheduled pesticide applications are planned, but regular monitoring and site inspections will be performed.

APPENDIX A

MINIMUM REQUIRED EQUIPMENT FOR APPLICATORS

SEE LIST ON NEXT PAGE

MINIMUM REQUIRED EQUIPMENT FOR APPLICATORS

The minimum equipment required for the applicators is listed below:

- * Copies of appropriate personnel's current Pesticide Applicators Licenses.
- * Current product Labels and MSDS' of all pesticide products transported on the vehicle.
- * Current insurance information.
- * Any product information provided for products transported.
- * Spill Response Guidelines or instructions.
- * Contractor & emergency contacts for more information.
- * Written instructions on spill containment and cleanup.
- * Work order & maps on the assignment, to be kept with application records.
- * Pesticide application record forms, as required for legal record keeping.
- * 1 Wind gauge to measure wind speed for record keeping.
- * 1 pair Nitrile™ or other appropriate protective gloves for pesticides.
- * 1 pair safety glasses, protective eye wear or goggles.
- * 2-1 quart bottles of saline eye rinse and eye cup rinse applicator.
- * 5 gallons of clean water for hand washing.
- * Liquid hand soap (4 oz. minimum) and heavy-duty disposable hand towels.
- * 5 gallons (minimum) of clean water for triple rinsing pesticide containers.
- * Measuring containers, graduated cylinder or measuring cups.
- * 2 Rolls of flagging tape & permanent marker.
- * 4 Plastic trash bags, large heavy duty.
- * 1 each of non-hazardous waste label + hazardous waste label
- * 5 gallons (minimum) absorbent granules (Kitty Litter).
- * 3 Absorbent pillows/pads, Chemsorb™ or similar, (2" x 2" min).
- * 3 Socks, Chemsorb™ or similar (3 " x 4 ' long, min), for containment.
- * Broom & shovel.

Additional items may include:

- * 1 Thermometer to measure air temperature for record keeping.
- * Clean, potable water for drinking (kept cool).
- * A change of clothes or clean coveralls for applicator personnel.
- * 1 set (minimum) safety wheel chocks and traffic cones.
- * 4 additional Plastic trash bags, large heavy duty.
- * 5 gallons, additional, absorbent granules (Kitty Litter).
- * 4 additional absorbent pillows/pads, Chemsorb™ or similar, (2' x 2' min), 4 additional socks, Chemsorb™ or similar (3 " x 4 ' long, min).
- * Rubber boots (optional but recommended).
- * Spray chaps or pesticide resistant leggings (optional but recommended).
- * First aid kit (optional but recommended).

APPENDIX B

PESTICIDE APPLICATION RECORD

SEE FORM ON NEXT PAGE

WEATHER CONDITIONS DURING APPLICATION (* Required)

	Wind Speed (MPH) *		Wind Direction *		Temperature *
	Clear/Sunny		Partly Cloudy		Overcast

Weather Conditions During Past Week (Describe - wet/normal/drought, clear/overcast, approx. temp.)**

Weather Conditions Next Day After Application (Describe - rain/dry, clear/cloudy, approx. temp.):

Licensed Applicator Signature and Date

Applicators License Type and ID Number

Applicators Equipment Decal Number

SKETCH OF TREATMENT AREA:

COMMENTS OR NOTES:

APPENDIX C

MATERIAL SAFETY DATA SHEETS

These must be provided by the pest management professional prior to the use of a product.

MSDS TO BE INSERTED AS PRODUCTS ARE SELECTED

APPENDIX D

GROW GREEN EARTH-WISE GUIDES

Poison Ivy

Fire Ants

Weeds

Invasive Plant Field Guide



earth-wise guide to

Poison Ivy



description

Consistently has three leaflets; leaf has smooth, wavy or serrated edges; leaflets are alternate on the stem; clusters of whitish flowers and fruit are not showy but noticeable

growth habits

Persistent perennial; young plants can be 1'-2' tall and are herbaceous; mature plants can be woody and cover hundreds of square feet; can grow to be vine-like, shrubby or a groundcover; roots easily when in contact with any object that will support it

growing preferences

Prefers fertile, well-drained soil; tends to like shady areas

problem:

Oily resin can cause severe itching, skin inflammation and blisters; oil can bond on to the skin within 20 minutes of exposure and stay active on any surface for up to five years; allergic reaction may take as little as four hours or up to 10 days; three out of four people will have some type of reaction within 24-72 hours. IF EYES SWELL SHUT, SEE DOCTOR IMMEDIATELY.

Least Toxic Solutions...

Physically Remove the Plant

- It is best to pull small plants when soil is moist - grab plants through a plastic bag and turn inside out over the plant
- Use a sharp shovel or grubbing tool to remove established plant roots
- If time is not an issue, cover with plastic to solarize (see Landscaping fact sheet) or smother with mulch
- Do not mow or string trim plants
- Salt is not recommended to kill the plants - the quantity necessary would stay in the soil and continue to kill anything planted until leached away
- Bag or bury the vegetation that is removed (do not burn foliage – may cause severe injury if inhaled)
- Might take persistence!

If you must use an herbicide...

- Use herbicide as a last resort
- Follow label instructions carefully
- Don't use herbicide right before a rain – it can run off to harm our creeks
- Apply post-emergent product when leaves are new for best results
- Use a wiper applicator or weed wand designed to apply herbicide directly on the vegetation to minimize drifting

- May require a series of applications
- Consult with your Extension agent or nursery professional for more information

**Leaflets of Three
Let it Be!**

Rash Prevention

- Prevent rashes by avoiding contact with the plant
 - o Wear gloves, long sleeves and pants
 - o Use a preventative lotion
- If you come in contact with the plant, remove the oil from your skin within 20 minutes of exposure, using a cleanser

Treatment

- If trying to wash off the oil, take a cold shower to close your pores
- Try over-the-counter anti-itch products for minor itching or swelling. Check with your pharmacist
- If case is severe, consult with your doctor



Poison ivy with fruit



Fall color



New poison ivy growth

product toxicity comparisons*

(not for endorsement purposes)

Toxicity/Threat: ○ low ○ low to moderate ● high ● highest
N/A not applicable ? unknown toxicity

Hazards:

human toxicity		aquatic life	birds, bees, pets	soil mobility	environmental persistence
acute	chronic				

Toxicity
least



most

CedarCide Ridaweed (acetic acid/horticultural grade vinegar)	●	○	○	○	○	○
BurnOut (acetic acid/horticultural grade vinegar)	●	?	○	○	○	○
Green Light® Com-Pleat® Systemic Grass & Weed Killer (glyphosate)	○	?	○	○	○	●
Round-Up Weed and Grass Killer (glyphosate)	○	?	○	○	○	●
Hi-Yield® MSMA Weed Killer (MSMA)	○	●	○	○	○	●/○
Ortho® Brush-B-Gon® Ready to Use (triclopyr)	○	?	○	○	●	○
Ortho® Weed-B-Gon® Lawn Weed Killer Ready-to-Use (mecoprop/MCPP, 2,4-D, dicamba)	○	○	○	○	●	○

Resources

American Academy for Dermatology

Poison Ivy, Oak and Sumac Information Center <http://poisonivy.aesir.com>

Weedalert.com

Don't be fooled! There are some plants that look like poison ivy that are harmless.



Virginia Creeper



Boxelder



Peppervine



Stinkvine

why grow green?

The Grow Green program educates Austin area residents on the LEAST TOXIC approach to pest management and responsible fertilizer use. The goal is to reduce the amount of landscape chemicals that "runoff" into our waterways or leach into groundwater and degrade water quality.

*Texas Cooperative Extension and the City of Austin provide this information as a comparative reference only. Listing of specific product trade names does not constitute an endorsement of its use. Many other pesticides and pesticide products are available and may be suitable for use other than those listed in these tables.

Products rated by the Washington Toxics Coalition. Contact Philip Dickey at 206-632-1545 for rating information, or see the Grow Green Products fact sheet.

www.growgreen.org



**Watershed Protection
Development Review**

974-2550



Texas Cooperative
EXTENSION

The Texas A&M University System

854-9600



recycled paper

Grow Green encourages least toxic solutions

03/06



earth-wise guide to

Fire Ants



Enlarged photo of fire ants

description

Fire ant colonies contain the queen(s), winged males and females, workers (wingless, sterile females) and brood (eggs, larvae and pupae).

infestation

Fire ants create mounds up to 18" tall. They prefer open sunny areas such as lawns, pastures, parks and disturbed areas, and often nest under side walks, slabs or at the base of trees.

problems

Fire ants can be a problem year round but are most prevalent in the spring and fall. Fire ants don't injure turfgrass but mounds become unsightly; ants are aggressive and cause painful stings that may become infected. They can invade electrical equipment and cause short circuits.



Fire ant mound

Least Toxic Solutions

- Properly identify as fire ants — many other species of ants occur in Texas and some are predators of imported fire ants; call the Extension office at 854-9600 for details, or visit <http://fireant.tamu.edu>
- Carefully pour a large pot (about 3 gallons) of boiling water on each mound. This will kill a mound about 60% of the time; this works best after a rain
- Nematodes (*Steinernema carpocapsae*) are small round worms that attack fire ant larvae, as well as grubs and other soil-dwelling larvae. They work best when applied to moist soil at dusk
- Choose baits over contact products; baits are safer to use because they are ant-specific and formulated with very small percentages of the active ingredients
- For less than 5 mounds per 1/4 acre, treat mounds individually
- For more than 5 mounds per 1/4 acre, broadcast ant BAIT products once or twice a year, mid-April and September (fall application reduces spring infestations)
- Apply baits when ants are foraging, (toss a potato chip next to an active mound in the yard and check back in 15 minutes to see if ants are feeding)
- In hot weather, apply baits in evening when temperatures are cooler
- Use fresh bait—opened containers may last only a few months
- Share bait with a neighbor before it goes stale; it can help lengthen the time between infestations
- Avoid application before rain (at least 8 hours)
- **DO NOT USE GASOLINE OR DIESEL FUEL TO TREAT MOUNDS**
- If you feel you must use a contact pesticide, make the most earth-friendly choice
- Use insecticides only where recommended on the product label — for instance, do not use them in the vegetable garden unless specified
- Make sure to apply the proper amount of bait (many baits are applied 1-1.5 pounds per acre)
- For small broadcast bait application, use a hand held spreader set on the lowest setting. Walk in a railroad pattern for good coverage of the whole area

Neighborhood Ant-Out!

Organize your neighbors to treat fire ants at the same time—you share the cost of the bait and control the pests rather than driving them from yard to yard. Call 854-9600 for information.

If you have unwanted or banned chemicals (Dursban or Diazinon) in your garage, please take them for safe disposal to a household hazardous waste facility. In Austin call 974-4343 for information.

product toxicity ratings*

Evaluation of active ingredients only; does not include toxicity information on inert or "other" ingredients

Toxicity/Threat:

○ low ○ moderate ● high ● highest
 N/A not applicable ? unknown 🌍 earth-wise
 ☠️ banned for residential use by EPA

Hazards:

human toxicity		aquatic life	birds, bees, pets	soil mobility	environmental persistence
acute	chronic				

Baits

Greenlight® Fire Ant Control With Conserve (<i>spinosad</i>)	○	?	●	○	○	○
Extinguish™ Professional Fire Ant Bait (<i>methoprene</i>)	○	?	●	○	?	●
Amdro® Fire Ant Bait (<i>hydamethylnon</i>)	○	●	●	○	○	○
Spectracide® Fire Ant Bait (<i>pyriproxyfen</i>)	○	?	○	?	?	?
Ascend™ Fire Ant Bait (<i>avermectins/Abamectin BI</i>)	○	?	●	●	○	●

Mound Treatment

Boiling Water (use 3 gallons per mound)	non-chemical control					
Flea Destroyer™ Beneficial Nematodes (<i>Steinernema carpocapsae</i>)	non-chemical control					
Victor® Ant Killer (<i>mint oil</i>)	?	○	?	?	?	?
Safer™ Fire Ant Killer (<i>d-limonene</i>)	●	?	○	○	○	○
Results™ Fire Ant Insect Control (<i>silicon dioxide, pyrethrins, piperonyl butoxide</i>)	○	●	●	●	○	○
Ortho® Fire Ant Killer (<i>acephate</i>)	○	●	○	●	○	○
Ortho® Max Fire Ant Killer (<i>bifenthrin</i>)	○	?	●	●	○	○
Green Light® Fire Ant Killer (<i>permethrin</i>)	○	●	●	●	○	●/○
Enchem's™ Rapid Kill Fire Ant Mound Drench (<i>fenvalerate/Pydrin</i>)	○	?	●	●	○	●
Ortho® Fire Ant Killer Granules (<i>diazinon</i>)	○	?	●	●	○	●
Hi-Yield® Ant Killer Granules (<i>diazinon</i>)	○	?	●	●	○	●

Broadcast - Granular

Garden Tech Over 'n'Out® Fire Ant Killer Granules (<i>fipronil</i>)	●	○	○	○	○	○
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most toxic

most toxic

why grow green?

The Grow Green program educates Austin area residents on the LEAST TOXIC approach to pest management and responsible fertilizer use. Our goal is to reduce the amount of landscape chemicals that "runoff" into our waterways or leach into our groundwater and degrade water quality.

Grow Green is a partnership between the Texas Cooperative Extension and the City of Austin Watershed Protection and Development Review Department. Call 974-2550 or 854-9600 for more information or visit our website at www.growgreen.org.

*Texas Cooperative Extension and the City of Austin provide this information as a comparative reference only. Listing of a specific product trade name does not constitute an endorsement of its use. Many other pesticides and pesticide products are available and may be suitable for use other than those listed in these tables. Products rated by the Washington Toxics Coalition. Contact Philip Dickey at 206-632-1545 for rating information, or see the Grow Green Products fact sheet.

www.growgreen.org



**Watershed Protection
Development Review**

974-2550



Texas Cooperative
EXTENSION

The Texas A&M University System



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03/07



earth-wise guide to

Weeds



description

A weed is a plant that is growing where it is not wanted; it easily reproduces and spreads; competes with desirable plants for space, light and nutrition; detracts from the aesthetics of the landscape; can harbor pests and diseases

germination

Weed seeds may lie dormant, germinating when soil is disturbed and seeds are exposed to light; seeds may be windblown, spread by birds or introduced with imported soil

goal

Disrupt the weed's lifecycle without damaging the environment

For assistance identifying weeds and choosing least toxic options, call the Cooperative Extension at 854-9600

Least Toxic Solutions

Prevent Weeds

- Keep plants healthy to help them out-compete weeds
- Do not let weeds flower or go to seed – it greatly increases their potential population
- Do not bring soil with weed seeds or roots on site
- Use drip irrigation in beds to put water only where you want it – weeds will have a much harder time growing without water
- Monitor and remove weeds regularly before they get established
- Prevent weeds from growing by blocking light and/or creating a physical barrier to growth

Weed Barrier Options

- Cover plant beds with 4-6" of mulch
- Cover dirt with 4-6 sheets of newspaper and cover with leaves to make a weed barrier in plant beds (lasts several months)
- Use weed control fabrics that allow water and air to reach plant roots (weeds may germinate in soil or fine-textured mulch on top of the fabric)
- Use a layer of cardboard covered with mulch for non-planted spaces like utility areas
- Avoid black plastic - it is non-biodegradable and reduces air exchange with roots

- Solarize new areas before planting to kill weeds and seeds (See Grow Green Landscaping fact sheet)
- Fill in pavement cracks with caulking compound formulated for asphalt or concrete

Physically Remove

- Pull weeds regularly to keep populations from getting out of hand
- Weed by hand when practical
- Pull or hoe weeds when plants are small and the soil is moist
- Use hoes designed to move horizontally below the soil surface to avoid bringing seeds to the surface
- Be careful not to damage shallow rooted landscape plants

Weed Disposal

- Dispose of weeds that have flowered or gone to seed in the trash
- Put vegetative structures like rhizomes (underground stems) from Johnsongrass and "nutlets" from nutsedge in the trash – not in the compost pile

Avoid using weed and feed products because:

- the best time to treat weeds is not the best time to fertilize
- broadcasting weed killer is usually overkill

Name	Description	Growing Season	Comments/ Growing Conditions	Least Toxic Solutions
PERENNIALS, BROADLEAF				
Broadleaf Plantain <i>Plantago major</i>	<ul style="list-style-type: none"> Rosette with large, rounded, wavy-edged leaves Greenish flowers on 5-10" stalks 	<ul style="list-style-type: none"> Warm season perennial Seeds germinate early to late spring 	<ul style="list-style-type: none"> Reproduces by seed Resprouts from root system Prefers rich soil and moderately wet areas 	<ul style="list-style-type: none"> Remove by hand or weed fork Be sure to remove the entire crown of the plant
Dandelion <i>Taraxacum officinale</i>	<ul style="list-style-type: none"> Rosette with lobed and serrated leaves Round, fluffy seed heads Yellow flower Milky sap 	<ul style="list-style-type: none"> Cool season perennial Seeds germinate in fall 	<ul style="list-style-type: none"> Reproduces by seed Resprouts from root Prefers moist areas in full sun Edible 	<ul style="list-style-type: none"> Can easily be removed with a weed fork Must remove the taproot
Dichondra <i>Dichondra repens</i>	<ul style="list-style-type: none"> 1/2 to 3/4" kidney shaped leaves Inconspicuous in turf 	<ul style="list-style-type: none"> Warm season perennial Seeds germinate in spring 	<ul style="list-style-type: none"> Creeping stems root where nodes contact the soil Seeds may stay dormant for years Grows in both sun and shade Prefers fertile soil that is frequently watered 	<ul style="list-style-type: none"> Shallow roots make it easy to remove by hand if soil is moist and loose Use a diamond, swan neck or stirrup hoe
Field Bindweed <i>Convolvulus arvensis</i>	<ul style="list-style-type: none"> Vine with 3-10' long stems; can run along ground or climb Flower similar to Morning Glories Leaves are alternate with smooth edges 	<ul style="list-style-type: none"> Warm season perennial Seeds germinate in spring and summer 	<ul style="list-style-type: none"> Reproduces by seed Plant fragments of roots as short as 2" can form new plants Seeds may live in soil 60 years 	<ul style="list-style-type: none"> Dig out root with a weed fork to eliminate Repeat every 2 or 3 weeks or as soon as the bindweed reaches 6" in length
Poison Ivy <i>Toxicodendron radicans</i>	<ul style="list-style-type: none"> Creeping or climbing woody vine Leaf edges may be smooth, wavy or serrated Alternate leaves with 3 leaflets 	<ul style="list-style-type: none"> Leafs out from deciduous stem in spring with onset of warm weather 	<ul style="list-style-type: none"> Reproduces by rhizomes* and seeds spread by birds Resprouts from root Can cause rashes when dormant Fumes from burning can cause lung damage 	<ul style="list-style-type: none"> Wear gloves, long sleeves and long pants if removing manually Must eliminate roots
PERENNIALS, GRASSY				
Bermudagrass <i>Cynodon dactylon</i>	<ul style="list-style-type: none"> Fine-textured grass, often used as a turfgrass Becomes a weed when it starts creeping into landscape beds 	<ul style="list-style-type: none"> Warm season perennial Goes dormant with the onset of cold weather 	<ul style="list-style-type: none"> Spreads by seeds, rhizomes* and stolons** Spreads rapidly during hot times of year Grows in any soil; prefers full sun 	<ul style="list-style-type: none"> Use barriers that extend 8-10" below the surface Dig out as much of the roots and stolons** as possible with a Korean hoe May take several tries
Dallisgrass <i>Paspalum dilataum</i>	<ul style="list-style-type: none"> Low-growing, coarse-textured grass Light green leaves Long seed heads on tall stalks 	<ul style="list-style-type: none"> Warm season perennial Seeds germinate in spring 	<ul style="list-style-type: none"> Grows faster than most turfgrasses Thrives in hot, humid conditions Prefers moist soil Tolerates sandy and clay soils 	<ul style="list-style-type: none"> Dig out crown of the plant and remove all of the stem with a weed fork
Johnsongrass <i>Sorghum halepense</i>	<ul style="list-style-type: none"> Wide leaf blade with white strip down the center Can grow up to 6' Thick, creeping rhizomes* 	<ul style="list-style-type: none"> Warm season perennial 	<ul style="list-style-type: none"> Reproduces by rhizomes* and seeds Stems root at the nodes Sometimes introduced by soil brought in from off site 	<ul style="list-style-type: none"> Take out as much of the rhizome as possible Persistent so may take several tries
Quackgrass <i>Elytrigia repens</i>	<ul style="list-style-type: none"> Grassy plant can grow 1-3.5' tall Resembles wheat 	<ul style="list-style-type: none"> Evergreen 	<ul style="list-style-type: none"> Reproduces by seed and rhizomes* Tolerates all types of soils 	<ul style="list-style-type: none"> Do not till -- broken segment of plants can root and sprout into new plants Persistent so may take several tries
PERENNIALS, SEDGE				
Nutgrasses Yellow Nutsedge <i>Cyperus esculentus</i> Purple Nutsedge <i>Cyperus rotundus</i>	<ul style="list-style-type: none"> Grass-like in appearance Has a triangular stem Some rhizomes* terminate in hard tubers (nutlets) 	<ul style="list-style-type: none"> Emerges from nutlet in spring 	<ul style="list-style-type: none"> Spreads via rhizomes* and seeds Often reappears after a good summer rain Prefers sun Sometimes introduced by soil brought from off site 	<ul style="list-style-type: none"> Thoroughly remove with a weed fork in the spring before nutlets form Persistent so may take several tries

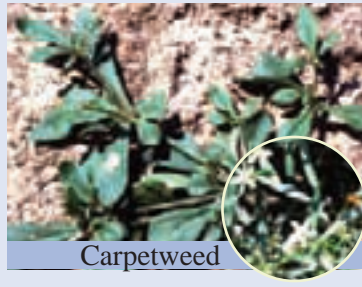
* rhizomes- underground stems **stolons- above ground stems



Broadleaf Plantain



Bermudagrass



Carpetweed



Spotted Spurge



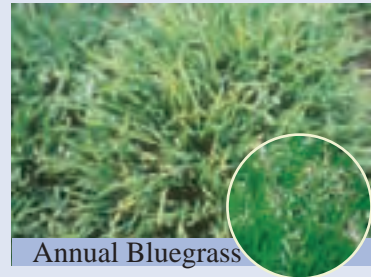
Dandelion



Dallisgrass



Chickweed



Annual Bluegrass



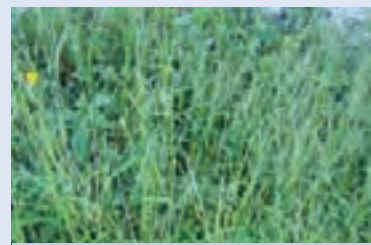
Dichondra



Johnsongrass



Common Lambsquarters



Large Crabgrass



Field Bindweed



Quackgrass



Henbit



Sandbur



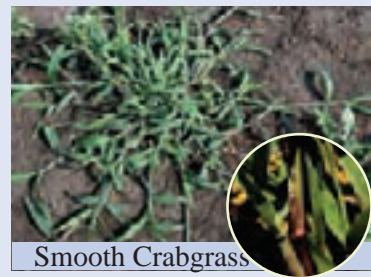
Poison Ivy



Yellow Nutsedge



Purslane



Smooth Crabgrass

PERENNIAL SOLUTIONS

Least toxic solutions

- Manually remove the root system
- Water thoroughly 1-2 days before digging to soften soil
- Remove flower or seed heads to prevent spreading

Did You Know...?

Atrazine has been detected in 70% of Austin's springs

If you must use an herbicide...

- Herbicides are more effective against young growing weeds
- Choose a product that is formulated to kill the specific weed (non-selective products will kill or set back any plants they come in contact with)
- Read and follow label directions
- Spot treat problems when possible
- Be aware that very aggressive weeds may require more than one application

ANNUAL SOLUTIONS

General habits

- Annual weeds germinate from seeds each year; usually mature in one growing season and die within 12 months
- Cool season annual seeds typically begin germinating in late September and grow through the winter months; warm season annual seeds typically begin germinating in early March and grow through the spring and summer months

Least toxic solutions

- Pull or mow before plants seed
- Mulch beds before September to suppress winter annuals early; before March to smother warm season annuals

- Use a string trimmer on more mature growth of broadleaf weeds
- Spot treat young plants with products that contain herbicidal soap or 20% acetic acid (vinegar)
- Post-emergent herbicide is more

If you must use an herbicide...

- effective before weed has flowered or gone to seed
- Pre-emergents that target cool season or winter annuals must be applied in mid-September before their seeds germinate
- Pre-emergents that target warm season or summer annuals must be applied late January before their seeds germinate

Name	Description	Growing Season	Comments/ Growing Conditions	Least Toxic Solutions
ANNUALS, BROADLEAF				
Carpetweed <i>Mollugo verticillata</i>	<ul style="list-style-type: none"> Forms circular mats up to 20" wide Leaves grow in whorls around the stem 	<ul style="list-style-type: none"> Warm season annual Seed germinates in spring 	<ul style="list-style-type: none"> Prolific seeder Shallow taproot Prefers fertile, dry, sandy soil 	<ul style="list-style-type: none"> Easy to remove with hoe
Common Chickweed <i>Stellaria media</i>	<ul style="list-style-type: none"> Grows in thick mats Small white flowers with five petals Shiny, pointed leaves 	<ul style="list-style-type: none"> Emerges in fall; grows very little until late winter 	<ul style="list-style-type: none"> Shallow, fibrous roots Found most often in shady, moist lawn areas 	<ul style="list-style-type: none"> Easy to hand pull
Common Lambsquarters <i>Chenopodium album</i>	<ul style="list-style-type: none"> Low-growing in turf or sprawling and upright Wavy Leaves Green flowers with white mealy powder 	<ul style="list-style-type: none"> Warm season annual Seed germinates in spring 	<ul style="list-style-type: none"> Thrives in rich, fertile soil Edible 	<ul style="list-style-type: none"> Easy to pull by grabbing base of plant
Henbit <i>Lamium amplexicaule</i>	<ul style="list-style-type: none"> Grows upright but can root at the nodes Rounded, serrated leaves Square stems Pale purple flowers 	<ul style="list-style-type: none"> Cool season annual Seed germinates in the fall; grows very little until late winter to early spring 	<ul style="list-style-type: none"> Fibrous shallow roots Prefers good soil with high moisture level Edible 	<ul style="list-style-type: none"> Easy to hand pull
Purslane <i>Portulaca eleracea</i>	<ul style="list-style-type: none"> Prostrate; branches from a central point Shiny, fleshy leaves and purple-red stems Inconspicuous yellow flowers 	<ul style="list-style-type: none"> Warm season annual Seed germinates in late spring 	<ul style="list-style-type: none"> Seed can remain viable up to 40 years Thrives in extremely hot, dry weather Edible 	<ul style="list-style-type: none"> Remove by hand Put plant fragments in trash because they can root
Spotted Spurge <i>Euphorbia maculatacaule</i>	<ul style="list-style-type: none"> Grows in dense mats Reddish green to dark green leaves with purple splotch on top Inconspicuous flowers 	<ul style="list-style-type: none"> Warm season annual Seed germinates in late spring to early summer 	<ul style="list-style-type: none"> Prolific seeder Shallow taproot Stem has milky sap 	<ul style="list-style-type: none"> Easy to hand pull or hoe
ANNUALS, GRASSY				
Annual Bluegrass <i>Poa annua</i>	<ul style="list-style-type: none"> Upright, clumping growth Grows 4"-6" when not mowed Seed heads appear in mid to late spring 	<ul style="list-style-type: none"> Cool season annual Seed germinates in fall Grows very little until late winter 	<ul style="list-style-type: none"> Prefers wet, compacted soils Small clumps growing in lawn makes it look uneven 	<ul style="list-style-type: none"> Insert weed fork into soil at the base of plant, then twist and remove
Large Crabgrass <i>Digitaria sanguinalis</i>	<ul style="list-style-type: none"> Can grow to more than 3' tall Pale, blue-green, sharply pointed leaves 	<ul style="list-style-type: none"> Warm season annual Seed germinates spring to fall 	<ul style="list-style-type: none"> Spreads by seed and by long stems rooting at the nodes Single plant can produce 150,000 seeds/year Thrives in hot, dry conditions 	<ul style="list-style-type: none"> Dig out crown of plant and remove all of the stem with a weed fork
Sandbur <i>Cenchrus longispinus</i>	<ul style="list-style-type: none"> Mat-forming Grows 12" tall Pale green leaf blades Produces seed stalk with sharp burs 	<ul style="list-style-type: none"> Warm season annual Seed germinates in spring 	<ul style="list-style-type: none"> Usually found on poor sandy soils 	<ul style="list-style-type: none"> Dig out crown of plant and remove all of the stem with a weed fork
Smooth Crabgrass <i>Digitaria ischaemum</i>	<ul style="list-style-type: none"> Low-growing 15" or shorter Dull green leaves; some reddish-purple color appears on stems as it ages 	<ul style="list-style-type: none"> Warm season annual Seed germinates spring through fall 	<ul style="list-style-type: none"> Spreads seed and roots from nodes touching soil Most often found in turf; it will tolerate mowing and still produce seed 	<ul style="list-style-type: none"> Dig out crown of plant and remove all of the stem with a weed fork

If you must use an herbicide...

- Use herbicides only as a last resort – they can end up in streams and aquifers. They may also damage desirable turf and landscape plants
- Spot treat existing problems with a selective post-emergent product
- Understand and choose the correct product
 - Pre-emergents: prevent seeds from germinating - in general they are broadcast over a large area, most often used to control annual weeds; must be applied before targeted weed seeds germinate; use only if an area has a history of excessive weeds
 - Post-emergents: kill weeds after they have emerged; most often used on perennial weeds – may require more than one application for stubborn perennials

From
Your Yard



to Our
Creeks



From Left to Right (Korean Hoe, Diamond Hoe, Swan Neck Hoe, Stirrup Oscillating Hoe, Stirrup Hoe, Standard Garden Hoe)

- Non-selective post emergents: will kill or set back almost any plant they come in contact with
- Selective post-emergent herbicides: specifically formulated for certain types of weeds i.e. grassy weeds, broadleaf weeds, sedges and woody vegetation
- Don't use an herbicide right before a rain – it can run off to harm our creeks rather than helping your yard
- Always follow the EPA-approved label directions
- Consult with your Extension Agent or nursery professional for more information
- Apply products at the proper time for effective control or prevention of weeds
- Use a wiper applicator or weed wand designed to apply herbicide directly on the vegetation for post-emergent, non-selective products to minimize drifting
- When using a sprayer, use low pressure and large droplets; apply when it is not windy

Some
garden plants
are invasive weeds
that can escape to
nature preserves and
creeksides

Weeding Tools

Choose a tool that causes the least amount of soil disturbance

- Korean Hoe is shaped like a plow; used to grub out larger weeds or for making a shallow trench
- A Diamond Hoe has a flat diamond shaped blade designed to move just below the soil surface
- A Swan-neck Hoe has a curved neck that positions it to skim just below the soil surface
- The Stirrup or Oscillating Hoe has a double-edged blade that slides back and forth, minimizing soil disturbance
- The Standard Garden Hoe has a large blade that is set at a sharp angle to the ground for chopping through overgrown weeds
- A Collinear hoe has a angled handle and a narrow blade



Weeding fork

product toxicity ratings*

Evaluation of active ingredients only; does not include toxicity information on inert or "other" ingredients

Toxicity/
Threat:

○ low ○ low to moderate ● high ● highest
N/A not applicable ? unknown toxicity
☞ Meets Integrated Pest Management Requirements

Hazards:

target weed human toxicity acute chronic aquatic life birds, bees, pets soil mobility environmental persistence

Pre-emergent

Product Name (active ingredient)

most toxic

☞ Concern® Weed Prevention Plus™ (corn gluten)	all	○	○	●	○	?	?
Green Light® Portrait® Granules (isoxaben)	broadleaf	○	●	●	○	●	○
Hi-Yield® Crabgrass Control (benefin, trifluralin)	grassy	○	●	●	○	○	●
Hi-Yield® Atrazine Weed Killer (atrazine)	broadleaf	○	●	●	○	●	●
Vigoro® Ultra St. Augustine Weed and Feed w/ Atrazine 29-3-5 (atrazine)	broadleaf	○	●	●	○	●	●

Post-emergent

Product Name (active ingredient)

most toxic

☞ Concern® Fast Acting Weed Killer™ (ammoniated soap of fatty acids)	all	○	?	○	○	○	○
☞ BurnOut (acetic acid/horticultural grade vinegar)	all	●	?	○	○	○	○
Green Light® Com-Pleet® Systemic Grass & Weed Killer (glyphosate)	all	○	?	○	○	○	●
Round-Up Weed and Grass Killer (glyphosate)	all	○	?	○	○	○	●
Hi-Yield® POAST® (sethoxydim)	grassy	○	?	●	○	○	○
Scythe® (pelargonic acid)	all	○	●	○	?	?	○
Hi-Yield® MSMA Weed Killer (MSMA)	sedges	○	●	○	○	○	● / ○
Image® Weed and Grass Killer (imazaquin)	grassy	○	?	○	○	●	●
Ortho® Brush-B-Gon® Ready to Use (triclopyr)	woody	○	?	○	○	●	●
Green Light® WIPE-OUT® Broadleaf Weed Killer (mecoprop/MCPP, 2,4-D, dicamba)	broadleaf	○	●	●	○	●	○

Resources

Bio-Integral Resource Center (BIRC): 510-524-2567/ www.birc.org
Texas Cooperative Extension: http://aggie-turf.tamu.edu/answers4you/broadleafweeds.htm

Weeds: Control Without Poison by Charles Walters

The Gardener's Weed Book: Earth-Safe Controls by Barbara Pleasant

Common Weeds of the United States by United States Agricultural Research Service

*Texas Cooperative Extension and the City of Austin provide this information as a comparative reference only. Listing of a specific product trade name does not constitute an endorsement of its use. Many pesticides and pesticide products other than those listed in these tables are available and may be suitable for use.

Research is underway to rate the effectiveness of corn gluten in preventing weeds

Products rated by the Washington Toxics Coalition. Contact Philip Dickey at 206-632-1545 for rating information, or see the Grow Green Products fact sheet.

www.growgreen.org

Grow Green encourages least toxic solutions



854-9600

974-2550

01/07

Central Texas Invasive Plants

Central Texas Invasive Plants



Volunteer Field Guide



**Watershed Protection
Development Review**

Chinaberry	<i>Melia azedarach</i>
Chinese Parasol Tree	<i>Firmiana simplex</i>
Chinese Pistache	<i>Pistacia chinensis</i>
Chinese Tallow	<i>Sapium sebiferum</i>
Common Privet	<i>Ligustrum sinense/L. vulgare</i>
Common Water Hyacinth	<i>Eichhornia crassipes</i>
Elephant Ear	<i>Alocasia spp., Colocasia spp.</i>
Eurasian Watermilfoil	<i>Myriophyllum spicatum</i>
Giant Cane	<i>Arundo donax</i>
Holly Fern	<i>Cyrtomium falcatum</i>
Hydrilla	<i>Hydrilla verticillata</i>
Japanese Honeysuckle	<i>Lonicera japonica</i>
Johnson Grass	<i>Sorghum halepense</i>
Kudzu	<i>Pueraria lobata</i>
Mimosa, Silk Tree	<i>Albizia julbrissin</i>
Nandina	<i>Nandina domestica</i>
Paper Mulberry	<i>Broussonetia papyrifera</i>
Photinia	<i>Photinia spp.</i>
Poison Ivy	<i>Toxicodendron radicans</i>
Pyracantha	<i>Pyracantha spp.</i>
Running Bamboo	<i>Phyllostachys aurea</i>
Russian Olive	<i>Elaeagnus angustifolia</i>
Tamarisk, Salt Cedar	<i>Tamarix spp.</i>
Tree of Heaven	<i>Ailanthus altissima</i>
Vitex	<i>Vitex agnus-castus</i>
Waxleaf Ligustrum	<i>Ligustrum japonicum</i>
White Mulberry	<i>Morus alba</i>
Wisteria	<i>Wisteria sinensis/W. floribunda</i>

Chinaberry

Melia azedarach



Description:

- Deciduous tree
- Multi-trunked with an open crown
- Grows to 50'
- Alternate, musky-smelling dark green leaves
- Stems are glossy greenish-brown with light dots
- Yellow fall foliage



Clusters of lavender flowers in spring



Mature fruit

TOXICITY WARNING
Mature fruits are poisonous

Chinaberry

Melia azedarach



Habitat:

Roadsides, older home sites and floodplains

Least Toxic Removal:

- Pulls out easily when plant is young
- Use Weed Wrench™ for 2.5 diameter and smaller
- Cut trees to stumps – remove sprouts as they appear

Non-Invasive Alternatives:

- Chinquapin Oak
- Texas Red Oak

DO NOT PLANT
Spread by seeds, root sprouts

Chinese Parasol Tree

Firmiana simplex



Description:

- Deciduous, upright tree with a narrow canopy
- Grows 30-40' tall
- Large (12") leaves with 3-5 lobes
- Leaves bright green above, fuzzy underneath
- Yellow fall foliage
- Green Bark



Green Bark



Leaf

Chinese Parasol Tree

Firmiana simplex



Flowers in mid-summer

Habitat:

Prefers moist areas

Least Toxic Removal:

- Remove small plants by hand
- Use Weed Wrench™ for 2.5 diameter and smaller
- Cut trees to stumps – remove sprouts as they appear

Non-Invasive Alternatives:

- Bald Cypress
- Arizona Cypress

DO NOT PLANT

Spread by seeds

Chinese Pistache

Pistacia chinensis



Description:

- Deciduous tree
- Grows to 35'
- Leaves are yellow, orange and red in fall



Red fruit appears
in summer



Leaf

Chinese Pistache

Pistacia chinensis



Habitat:

Woodlands. open space, unmowed areas

Least Toxic Removal:

- Remove small plants by hand
- Use Weed Wrench™ for 2.5 diameter and smaller
- Cut trees to stumps – remove sprouts as they appear

Non-Invasive Alternatives:

- Chinquapin Oak
- Texas Red Oak

DO NOT PLANT
Spread by seeds

Chinese Tallow

Sapium sebiferum



Description:

- Deciduous tree
- Grows up to 60'
- Heart-shaped, alternate leaves



Flowers with long yellow, spike-like branches in fall



Three lobed, small clustered fruit splits to reveal popcorn-like seeds in spring

TOXICITY WARNING

Leaves, fruits and sap toxic to humans and most animals if ingested

Chinese Tallow

Sapium sebiferum



Fall foliage

Habitat:

Wetlands, streambanks and disturbed areas

Least toxic Removal:

- Remove seedlings by hand
- Use a Weed Wrench™ for 2.5 diameter trunks or less
- Cut trees to stumps – remove sprouts as needed

Non-Invasive Alternatives:

- Lacey Oak
- Bigtooth Maple

DO NOT PLANT

Spread by seeds, colonizes by root sprouts

Common Privet

Ligustrum sinense/L. vulgare



Description:

- Semi-evergreen shrub
- Often multi-trunked
- Leafy branches attached at near right angles
- Flowers spring thru summer



Opposite leaves



Fruit present summer through spring

Common Privet

Ligustrum sinense/L. vulgare



Habitat:

Fields and woodland understory

Least Toxic Removal:

- Pull plants by hand when young
- Use Weed Wrench™ for 2.5 diameter and smaller
- Cut trees to stumps – remove sprouts as they appear

Non-Invasive Alternatives:

- Evergreen Yaupon
- Possumhaw Holly

DO NOT PLANT

Spread by seeds, root sprouts

Common Water Hyacinth

Eichhornia crassipes



Description:

- Aquatic plant that floats on water
- Thick, shiny, bright green, kidney-shaped leaves; 1-5" in width



Large lavender flowers
in groups of 8-15



Foliage

Common Water Hyacinth

Eichhornia crassipes



Habitat:

Found in all types of freshwater bodies.
Grows anywhere it can avoid
freezing temperatures

Least Toxic Removal:

- For small infestations, remove plants by hand or with a rake
- Larger areas may need harvester machines

DO NOT PLANT

***Spreads by rhizomes and prolific seeds;
population may double in 6-18 days.***

Elephant Ear

Alocasia spp, Colocasia spp.



Description:

- Terrestrial and aquatic plant
- Green, heart-shaped leaves
- Berries are rare



TOXICITY WARNING

*Can cause irritation if ingested raw;
sap can irritate skin*

Elephant Ear

Alocasia spp, Colocasia spp.

Habitat:

Along creek banks and ponds

Least Toxic Removal:

- Use a shovel or grubbing tool to remove
- When removing, care must be taken to keep plant intact and remove all fragments to discourage spread

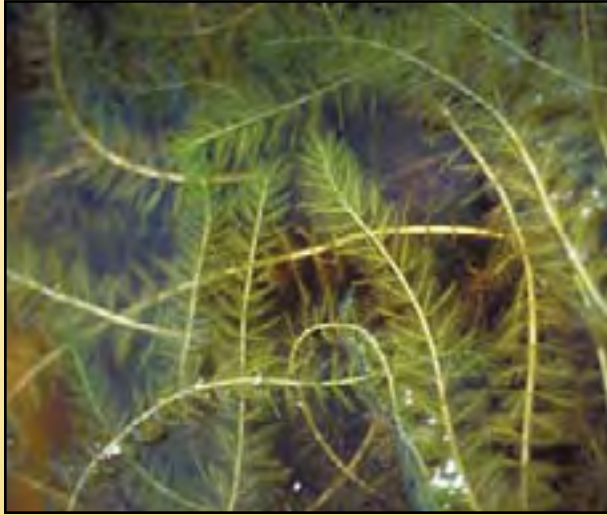
Non-Invasive Alternatives:

- Arrowhead
- Crinum Lily
- Tuckahoe

DO NOT PLANT

Spread by plant fragments

Eurasian Watermilfoil
Myriophyllum spicatum



Description:

- Rooted, submersed, aquatic plant
- Grows in 3-10' of water
- Grayish-green leaves in whorls around stem
- Feathery appearance



Eurasian Watermifoil and Hydrilla

Eurasian Watermilfoil
Myriophyllum spicatum



Habitat:

Spreads into disturbed water areas

Least Toxic Removal:

- For small areas remove by hand or with rake
- For large areas, use mechanical harvester at the peak of biomass in early summer
- Better results with repeated harvesting
- All plant parts must be removed

DO NOT PLANT
Spread by plant fragments

Giant Cane

Arundo donax



Description:

- Perennial grass with woody canes
- Grows to 20'
- Alternate leaves with parallel veins



Plume-like flowers in late summer



Alternate leaves

Giant Cane

Arundo donax



Habitat:

Riparian and floodplain areas

Least Toxic Removal:

- Hand pull small plants
- Hand-dig with a grubbing tool and remove all rootstalks

Non-Invasive Alternatives:

- Evergreen Yaupon
- Roughleaf Dogwood

DO NOT PLANT

Spread by rhizomes (underground stems), plant fragments; produces no viable seed

Holly Fern
Cyrtomium falcatum



Description:

- Evergreen fern
- Grows to 3' tall
- Foliage resembles holly



Spores on bottom of leaf



New growth

Holly Fern
Cyrtomium falcatum



Habitat: Woodlands understory

Least Toxic Removal:

- Dig up plants, getting all of the root system

Non-Invasive Alternatives:

- River Fern

DO NOT PLANT

near creeks and preserves.

Can be an appropriate plant in a managed yard

Hydrilla
Hydrilla verticillata



Description:

- Rooted, submersed aquatic plant
- Forms dense mats in water
- Grows in 1'-20' of water
- $\frac{3}{4}$ " leaves grow in whorls
- Fine teeth on edge of leaves
- Tiny flowers



Foliage



Foliage

Hydrilla
Hydrilla verticillata



Habitat:

Fresh water bodies

Least Toxic Removal:

- Mechanical harvesters
- Herbivorous fish such as grass carp

DO NOT PLANT

Spread by root crowns and plant fragments

Japanese Honeysuckle

Lonicera japonica



Description:

- Semi-evergreen trailing or climbing vine
- Grows up to 80'
- Elongated, opposite leaves



Fragrant white flowers



Small black berries in spring through fall

TOXICITY WARNING
Toxic if eaten in large quantities

Japanese Honeysuckle

Lonicera japonica



Opposite leaves

Habitat:

Disturbed areas, roadsides, woodland edges and abandoned fields

Least Toxic Removal:

- Remove small plants by hand including roots
- Mowing may slow vegetative spread

Non-Invasive Alternatives:

- Coral Honeysuckle

DO NOT PLANT
Spread by seeds, runners and underground rhizomes

Johnson Grass

Sorghum halepense



Description:

- Warm season perennial weed
- Wide leaf blade with white strip down the center
- Can grow up to 6'
- Thick, creeping rhizomes (underground stems)



Young flower



Flower

Johnson Grass

Sorghum halepense



Habitat:

Roadsides and creeksides; tolerates all types of soils (sometimes brought in by soil from off site)

Least Toxic Removal:

- Manually remove as much of the root system as possible
- Persistent so may take several tries

DO NOT PLANT

This weed is spread by rhizomes (underground stems) and seeds

Kudzu

Pueraria lobata

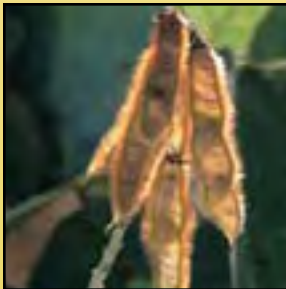


Description:

- Deciduous vine
- Grows up to 100'
- Hairy stems
- Three oval to heart-shaped leaflets
- Very aggressive, can grow up to 1' per day



Purple pea-like clusters;
grape smell



Messy, green or tan
elongated fruit

Kudzu

Pueraria lobata



Habitat:

Roadsides, abandoned lots and along
stream banks

Removal:

- Call 974-2446 immediately if sighted

Non-Invasive Alternatives:

- Virginia Creeper
- Coral Vine

DO NOT PLANT

*Spread by seed, rooting at nodes and
root fragmentation*

Mimosa, Silk Tree

Albizia julibrissin



Description:

- Umbrella-shaped, often multi-trunked deciduous tree
- Grows to 40'
- 20" long leaves on alternate on stems
- Showy pink flowers bloom from spring to summer



Feathery foliage



Fruit ripens in fall

TOXICITY WARNING

Produces a neurotoxin in seed pods that can cause seizures and even death upon ingestion.

Pets especially susceptible

Mimosa, Silk Tree

Albizia julibrissin



Habitat:

Occurs on dry-to-wet sites and along streambanks

Least Toxic Removal:

- Pull plants by hand when young
- Use Weed Wrench™ for 2.5 diameter and smaller
- Cut trees to stumps – remove sprouts as they appear

Non-Invasive Alternatives:

- Desert Willow

DO NOT PLANT

Spread by seeds and root sprouts

Nandina
Nandina domestica



Description:

- Erect, evergreen shrub
- Grows up to 8' tall
- Glossy, bipinnately compound leaves
- Multiple stems that resemble bamboo



White to pinkish flowers
in terminal clusters



Red berries in fall
and winter

Nandina
Nandina domestica



Habitat:

Shady areas of forests and wooded areas

Least Toxic Removal:

- Collect and destroy all fruit to prevent spreading
- Use a Weed Wrench™ to remove roots
- Replace with new varieties that don't produce seeds

Non-Invasive Alternatives:

- Non-berrying Nandinas
- Bush Germander
- Texas Sage
- Barbados Cherry

DO NOT PLANT

Spread by root sprouts and seeds

Paper Mulberry
Broussonetia papyrifera



Description:

- Deciduous tree with broad and spreading branches
- Grows to 50'
- Variable leaf shape
- Leaves fuzzy with serrated edges
- Milky white sap



Male flower in spring



Fruit in summer

Paper Mulberry
Broussonetia papyrifera

Habitat:

Disturbed areas, woodland edges, roadsides

Least Toxic Removal:

- Remove small plants by hand
- Use a Weed Wrench™ for 2.5" diameter trunks and smaller

Non-Invasive Alternatives:

- Cherry Laurel
- Texas Persimmon

DO NOT PLANT

Spread by seed and root sprouts

Photinia
Photinia spp.



Description:

- Evergreen shrub
- Grows up to 20'
- Large, glossy, dark green foliage
- Showy white flowers



New growth is copper-
ish-red color



Fruit clusters in fall

Photinia
Photinia spp.



Habitat:

Woodlands

Least Toxic Removal:

- Pull plants by hand when young
- Use Weed Wrench™ for 2.5 diameter and smaller
- Cut trees to stumps – remove sprouts as they appear

Non-Invasive Alternatives:

- Evergreen Sumac

DO NOT PLANT
Spread by seed

Poison Ivy
Toxicodendron radicans



Description:

- Deciduous perennial
- Young plants are herbaceous and can be 1'-2' tall
- Mature plants can be woody and cover hundreds of square feet
- Can grow to be vine-like, shrubby or a groundcover
- Vine attaches to any object that will support it



New poison ivy growth



Leaflets with lobe variation

Poison Ivy
Toxicodendron radicans



Habitat: Prefers fertile, well-drained soil; most common in shady areas

Least Toxic Removal:

- Wear gloves, long sleeves and pants if removing plant (preventative blockers are also available pre-exposure)
- Pull small plants when soil is moist – grab plants through a plastic bag and turn inside out over the plant to avoid rash
- Smother small plants with mulch
- If vine is growing up a tree, sever vine at ground level
- Use a sharp shovel or grubbing tool to remove established plant roots
- Do not mow or string trim plants
- Bag or bury the vegetation that is removed (do not burn – may cause severe injury if inhaled)

DO NOT PLANT

Spreads by rhizomes and seeds

Pyracantha
Pyracantha spp.



Description:

- Evergreen shrub
- Grows to 20'
- Short, straight side stems end in a point creating a very painful thorn (sometimes called “fire thorn”)



White flowers late spring through summer



Clusters of orange berries in fall through winter

Pyracantha
Pyracantha spp.



Habitat: Edge of wooded areas

Removal:

- Cutback to base of plant with loppers or a tree saw

Non-Invasive Alternatives:

- Evergreen Sumac
- Evergreen Yaupon

DO NOT PLANT

near creeks and preserves.

Can be an appropriate plant in a managed yard

Pyracantha
Pyracantha spp.



Description:

- Evergreen shrub
- Grows to 20'
- Short, straight side stems end in a point creating a very painful thorn (sometimes called “fire thorn”)



White flowers late spring through summer



Clusters of orange berries in fall through winter

Pyracantha
Pyracantha spp.



Habitat: Edge of wooded areas

Removal:

- Cutback to base of plant with loppers or a tree saw

Non-Invasive Alternatives:

- Evergreen Sumac
- Evergreen Yaupon

DO NOT PLANT

near creeks and preserves.

Can be an appropriate plant in a managed yard

Running Bamboo

Phyllostachys aurea



Description:

- Evergreen
- Grows 16'-40' tall
- Long, pointed leaves
- Dense and aggressive - used for screening



Jointed stems



Leaf

Running Bamboo

Phyllostachys aurea



Habitat:

Old home sites and adjacent natural areas

Least Toxic Removal:

- Cut plants as close to ground as possible
- Repeat as plants resprout for several growing seasons until energy reserves of rhizomes are exhausted
- If digging, remove all the roots
- A 3' deep barrier enclosing the plant prevents spread

Non-Invasive Alternatives:

- Evergreen Yaupon
- Bamboo Muhly

DO NOT PLANT

**Spread by aggressive rhizomes
(underground stems)**

Russian Olive
Eleagnus angustifolia



Description:

- Small, deciduous shrub or tree
- Grows up to 30'
- Lance-shaped leaves with greenish-gray color on top
- Thorny



Aromatic creamy yellow flowers in summer



Seeds in fall

Russian Olive
Eleagnus angustifolia



Habitat:

Along creeks and river bottoms

Least Toxic Removal:

- Pull plants by hand when young
- Use Weed Wrench™ for 2.5 diameter and smaller
- Cut trees to stumps – remove sprouts as they appear

Non-Invasive Alternatives:

- Cherry Laurel
- Texas Persimmon

DO NOT PLANT

Spread by seeds, root sprouts

Tamarisk, Salt Cedar

Tamarix spp.



Description:

- Small tree/ large shrub
- 10-15' tall
- Deciduous or evergreen
- Narrow, thin, grey /green alternate leaves
- Forms dense thickets



Scale-like leaves,
reddish-brown stems
and bark



Pink to white flowers
spring through summer

Tamarisk, Salt Cedar

Tamarix spp.



Habitat:

Riparian and wet areas

Least Toxic Removal:

- Hand pull plants under 1" diameter
- Large thickets can be bulldozed by root plowing
- Flooding will kill plants if root crowns are submerged for at least three months

Non-Invasive Alternatives:

- Arizona Cypress
- Bald Cypress

DO NOT PLANT

Spread by seeds, vegetative roots

Tree of Heaven
Ailanthus altissima



Description:

- Deciduous tree
- Grows up to 80' tall
- Alternate leaves with 10-40 leaflets on a 1-3' stem
- Light gray stems and trunk



Cluster of wing-shaped samaras (fruit) in late summer to early spring



Flowers in spring

Tree of Heaven
Ailanthus altissima



Habitat: Along roads and right of ways; cannot tolerate flooding or extreme shade

Least Toxic Removal:

- Remove small plants by hand
- Use Weed Wrench™ for 2.5 diameter and smaller
- Must remove root system to prevent regrowth into dense thickets

Non-Invasive Alternatives:

- Chinquapin Oak
- Lacey Oak

DO NOT PLANT

Spread by seeds, root and stump shoots

Vitex

Vitex agnus-castus



Description:

- Deciduous small tree or large shrub
- Grows to 20'
- Gray-green to dark-green, finger-like, aromatic leaflets in groups of 5-7



Fragrant, purple clusters of flowers in spring through late fall



Black fruit in fall

Vitex

Vitex agnus-castus

Habitat:

Beginning to invade nature preserves, found near water

Least Toxic Removal:

- Pull plants by hand when young
- Use Weed Wrench™ for 2.5 diameter and smaller
- Cut trees to stumps – remove sprouts as they appear

DO NOT PLANT

*near creeks and preserves;
can be an appropriate plant in a managed yard*

Waxleaf Ligustrum

Ligustrum japonicum/Ligustrum lucidum



Description:

- Shrub to small tree
- Grows to 25'
- Thick, glossy, opposite leaves



Fragrant clusters of small, white flowers in spring through summer



Blue berries in late summer through fall

Waxleaf Ligustrum

Ligustrum japonicum/Ligustrum lucidum

Habitat:

Disturbed areas, lowland areas and floodplains

Least Toxic Removal:

- Pull plants by hand when young
- Use Weed Wrench™ for 2.5 diameter and smaller
- Cut trees to stumps – remove sprouts as they appear

Non-Invasive Alternatives:

- Texas Sage
- Barbados Cherry

DO NOT PLANT
Spread by seeds

White Mulberry

Morus alba



Description:

- Can grow to 70'
- Named for the color of its buds (fruit can be white, lavender or black)
- Variable leaf shapes
- Hybridizes with native red mulberry



Fruit in late summer through fall



Variable leaf shapes

White Mulberry

Morus alba



Habitat:

Disturbed areas, roadsides

Least Toxic Removal:

- Seedlings can be pulled
- Use a Weed Wrench™ to remove 2.5" diameter and smaller
- Cut tree and grind stump

Non-Invasive Alternatives:

- Cherry Laurel
- Texas Persimmon

DO NOT PLANT

Spread by seeds

Wisteria

Wisteria sinensis, *W. floribunda*



Description:

- Deciduous, woody vine
- Grows up to 70'
- Showy, abundant flowers



Fragrant white, pink, or lavender clusters of flowers in spring



Vines can strangle other plants

Wisteria

Wisteria sinensis, *W. floribunda*

Habitat:

Disturbed areas, roadsides, forest edges, ditches; escapes near original plantings; can persist in low light settings

Least Toxic Removal:

- Sever vine at base
- Remove vines that are coiling around trunks to prevent girdling.

Non-Invasive Alternatives:

- Passion Vine

DO NOT PLANT

Spread by vegetative growth of stems and stolons; seeds if conditions are favorable