# Appendix D

# Best Management Practices for Riparian Revegetation
# EA-AZ-320-2007-022

# Best Management Practices for Riparian Revegetation

**Invasive Species Prevention**
Vehicles and equipment must be washed prior to entry to the area to ensure new invasive species are not introduced to the site,

All revegetation materials must be tested for noxious weed seed, invasive insects, such as fireants, prior to being used within the site.

**Revegetation Design Concepts**
There are several environmental constraints that should be considered when designing a revegetation project. Prior to implementation, the project proponent will evaluate these factors to determine whether or not the site is suitable for revegetation.

- Salinity and soil type
- Depth to groundwater
- Likelihood of theft or vandalism
- Protection requirements (e.g. caging for beaver or rabbits)
- Supplemental irrigation availability

For cottonwood and willow planting, pole planting may be accomplished where depth to groundwater is less than 5 feet. In locations where depth to groundwater is too great to sustain plant health, an initial period of supplemental irrigation may be required.

Supplemental irrigation can be delivered to young cottonwood, willow and mesquite saplings through PVC tubing and high-volume emitters. The irrigation system must include self cleaning emitters and a filter at the water intake point. It is important that irrigation design does not allow for clogging. It is suggested that the proponent initially bury the PVC tube so that it is not degraded by the sun or destroyed by vehicles. Irrigation water could be supplied by pumping water (where available) from the river or hooking the drip line up to a water truck and delivering at low pressures. Other alternatives are tanks with solar pumps or a series of gravity fed pumps.

**Pruning Protocol**
Pruning should follow standards developed by the Tree Care Industry Association. Standard procedures include not pruning more than 1/3 of the entire biomass of the tree, pruning to a node within each branch and pruning back to but not within the branch collar. Pruning should not occur during the height of neotropical migratory bird use (1 May to 7 Oct).

**Seeding Protocol**
A seed mix of native, drought adapted seeds including grasses, annuals and shrubs could be used to help stabilize the area. Seeds would be applied by tractor mounted broadcast seeder at (time of year). Seeds must to be raked into the soil by heavy equipment. If seeding is used it should be evaluated for likelihood of recruitment success depending on site .suitability. Grasses would need to have supplemental irrigation and be close to water table.

**Integrated Pest Management**

The following is a list of Best Management Practices related to Integrated Pest Management. The following chemical, mechanical, manual, treatment methods would typically be used to achieve vegetation management objectives in the planning area.

*Chemical Treatment*
YFO would use EPA-approved herbicides in accordance with Environmental Protection Agency's Endangered Species Pesticide Program covered in the BLM's *Vegetation Treatment on BLM Lands in Thirteen Western States Final Environmental Impact Statement* (BLM 1991) and further limited to those approved for use by the Arizona Record of Decision. These herbicides are Atrazine; Bromacil; Bromacil + Diuron; Chlorsulfuron; Clopyralid; 2,4-D, Diacamba; Dicamba +2,4_D; Diuon; Glyphosate; Glyphosate + 2,4-D;Hexazinone; Imazapyr; Mefluidide; Metsulfuron Methyl; Picloram; Picloram + 2,4-D; Simazine; Sulfometuron Methyl; Tebuthiuron; and Triclopyr. This list may be amended to accommodate subsequent updates to the herbicide EIS. Appendix C lists herbicides and adjuvants currently approved for BLM lands and sample Pesticide Use Proposals required for application of herbicides and adjuvants.

Treatments would follow Standard Operating Procedures on pages 1-19 through 1-32 and project design features on pages 1-33 through 1-37 of the *Vegetation Treatment on BLM Lands in Thirteen Western States Final Environmental Impact Statement* (BLM 1991). Additionally, project design features, including buffer strips described on page 10 of the Record of Decision, as follows: Buffer zones would be used adjacent to dwellings, domestic water sources, agriculture land, streams, lakes and ponds, except where herbicides are labeled for aquatic use. A minimum buffer zone of 100 feet wide would be provided for aerial application, 25 feet for vehicle application and 10 feet for hand application. Any deviations must be in accordance with the label for the herbicide. Herbicides would be hand wiped on individual plants within 10 feet of water where application is critical. Additionally, in order to protect listed, proposed, and candidate species, these buffer strips would be used.

YFO would work closely with the FWS to ensure that herbicide applications would not affect listed or proposed, threatened, and endangered species on a project-level basis. If adverse effects are anticipated during informal consultation, YFO would formally consult on these projects. If FWS develops herbicide guidance for particular species that improves protection beyond the current BLM design features, YFO would consider and incorporate that guidance as it consults with FWS on a project-level basis. The chemicals can be applied by many different methods, and the selected technique depends on a number of variables. Some of these are (1) the treatment objective (removal or reduction); (2) the accessibility, topography, and size of the treatment area; (3) the characteristics of the target species and the desired vegetation; (4) the location of sensitive areas in the immediate vicinity (potential environmental impacts); (5) the anticipated costs and equipment limitations; and (6) the meteorological and vegetative conditions of the treatment area at the time of treatment.

Herbicides are applied in several ways, depending upon the treatment objective, topography of the treatment area, target species, expected costs, equipment limitations, and potential environmental impacts. Herbicide applications would be timed to have the least impact on non-target plants and animals consistent with the objectives of the vegetation management program.

The chemicals would be applied aerially with helicopters or fixed-wing aircraft, or on the ground using vehicles or manual application devices. Helicopters are more expensive to use than fixed-wing aircraft, but they are more maneuverable and effective in areas with irregular terrain and in treating specific target vegetation in areas with many vegetation types. Manual applications are used only for treating small areas or those inaccessible by vehicle.

Rates of herbicide application would depend on the target species, other vegetation present, soil type, depth of the ground water table, and presence of other water sources. When target species occur in riparian areas, the application rate would be reduced to reduce injury to non-target species.

During aerial applications, nozzles to reduce drift would be used for all liquid applications. Liquid herbicides would not be applied when wind speeds exceed 5 miles per hour, and granular herbicides would not be applied when wind speeds exceed 10 miles per hour (mph). Herbicides would not be applied when conditions stated on the herbicide label cannot be met and when air turbulence significantly affects the desired spray pattern. Buffer zones (see Glossary) to protect water resources would be provided according to individual State regulations and guidelines and herbicide labels.

Vehicle-mounted sprayer (hand gun or boom) applications would be mainly used in open areas that are readily accessible by vehicle. The boom would be used only where feasible to treat concentrated weed infestations. The hand gun would generally be used for spot treatment of weeds and only up to the high water line near water bodies. . Under both hand gun and boom methods, sprays would be applied in a manner that gives the best possible coverage with the least amount of drift, and only when wind velocity is below 8 mph, except in riparian areas where treatment would be applied only at wind velocities below 5 mph. Boom sprayers would not be used within 25 feet of water bodies, unless the herbicide is approved for aquatic applications.

Hand applications could involve backpack spraying, hand wiping application, and cyclone broadcast spreading (granular formulations). Backpack sprayers are operated at low pressure and low volume and release herbicide through a single nozzle held from 0.5 to 2.5 feet above the ground when wind velocities do not exceed 8 mph. Near water, wind velocities cannot exceed 5 mph. Contact systemic herbicides (see glossary), such as glyphosate, wiped on individual plants, would be used up to the existing high water line. Granular formulations would be applied through broadcast spreaders at about 3.5 feet above the ground and no closer than 10 feet from the high water line of streams and other water bodies.

Herbicide applications are scheduled and designed to minimize potential impacts on non-target plants and animals, while remaining consistent with the objective of the vegetation treatment program. The rates of application depend on the target species, presence, and condition of non-target vegetation, soil type, depth to the water table, presence of other water sources, and the requirements of the label.

In many circumstances, the herbicide chosen, time of treatment, and rate of application of the herbicide are different than the most ideal herbicide application for maximum control of the

target plant species in order to minimize damage to the non-target plant species and to ensure minimum risk to human health and safety.

*Mechanical Treatment*
Mechanical methods of vegetation treatment employ several different types of equipment to suppress, inhibit, or control herbaceous and woody vegetation (Vallentine 1980). The goal of mechanical treatments is to kill or reduce the cover of undesirable vegetation and thus encourage the growth of desirable plants. YFO uses wheel tractors, crawler-type tractors, mowers, or specially designed vehicles with attached implements for mechanical vegetation treatments. The use of mechanical equipment to reduce fuel hazards would be conducted in accordance with BLM established procedures. Re-seeding after a mechanical treatment has been applied is important to help ensure that desirable plants would become established on the site and not invasive species. The mechanical treatment and re-seeding should occur at a time to best control the undesirable vegetation and encourage the establishment of desirable vegetation. The best mechanical method for treating undesired plants in a particular location depends on the following factors:

- Characteristics of the undesired species present such as plant density, stem size, woodiness, brittleness, and re-sprouting ability
- Need for seedbed preparation, re-vegetation, and improve water infiltration rates
- Topography and terrain
- Soil characteristics such as type, depth, amount and size of rocks, erosion potential, and susceptibility to compaction
- Climatic and seasonal conditions
- Potential cost of improvement as compared to expected results

Bulldozing is conducted with a wheeled or crawler tractor with a heavy hydraulic controlled blade. Vegetation is pushed over and uprooted, and then left in windrows or piles. Bulldozing is best adapted to removing scattered stands of large brushes or trees. There are several different kinds of blades available depending on the type of vegetation and goals of the project. The disadvantage of bulldozing is soil disturbance and damage to non-target plant species.

Disk plowing in its various forms can be used for removing shallow-rooted herbaceous and woody plants. Disk plows should only be used where all of the vegetation is intended to be killed. There are several different kinds of root plows that are specific for certain types of vegetation. In addition to killing vegetation, disk plowing is effective in loosening the soil surface to prepare it for seeding and to improve the rate of water infiltration. The disadvantage of disk plowing is that it may be expensive and usually kills all species. Also, plowing is usually not practicable on steep slopes (greater than a 35 to 45 percent slope) or rocky soil. Plant species that sprout from roots may survive.

Chaining and cabling is accomplished by dragging heavy anchor chains or steel cables hooked behind tractors in a U-shape, half circle of J-shaped manner. Chaining and cabling is effective on rocky soils and steep slopes. Chaining and cabling is best used to control non-sprouting woody vegetation such as small trees and shrubs. However, desirable shrubs may be damaged in the process. Herbaceous vegetation is normally not injured by this control method. This control

method is cost effective, as large areas can be readily treated. The chains or cables also scarify the soil surface in anticipation of seeding desirable species. The disadvantage is that weedy herbaceous vegetation can survive this treatment.

There are various tractor attachments that are used for mowing, beating, crushing, chopping, or shredding vegetation depending on the nature of the plant stand and goals of the project. The advantage in using this type of equipment is that selective plants may be targeted to achieve specific goals. For example, mowing is effective in reducing plant height to a desirable condition and it usually does not kill vegetation. Mowing is more effective on herbaceous than woody vegetation. On the other hand, a rolling cutter can kill woody non-sprouting vegetation by breaking stems at ground level but leave herbaceous vegetation. Mowing, beating, crushing, chopping, or shredding usually does not disturb the soil. Rocky soil and steep slopes may limit this use of equipment.

Debris management after a mechanical control treatment application is critical in fuel reduction projects.. Herbaceous material is usually not a problem, because it would decompose relatively fast depending on soil moisture, ambient humidity, and temperature. Woody vegetation could be piled and burned under acceptable fire management practices.  Acceptable amounts of debris may also be left onsite to stabilize the soil resources and reduce erosion potential.

Efforts repeated every 21 days during the growing season can deplete the underground food supply of some perennials. This method would be required for at least a 3-year period to attain satisfactory control and would be considered only in areas where slope is less than 10 percent and where a small percentage of the vegetation consists of shrubs. This method would also weaken non-target species in treated areas.

*Manual Treatment*
Hand-operated power tools and hand tools are used in manual vegetation treatment to cut, clear, or prune herbaceous and woody species. In manual treatments, workers would cut plants above ground level; pull, grub, or dig out plant root systems to prevent subsequent sprouting and re-growth; scalp at ground level or remove competing plants around desired vegetation; or place mulch around desired vegetation to limit the growth of competing vegetation. Hand tools such as the handsaw, axe, shovel, rake, machete, grubbing hoe, mattock (combination of axe and grubbing hoe), brush hook, and hand clippers are used in manual treatments. Axes, shovels, grubbing hoes, and mattocks can dig up and cut below the surface to remove the main root of plants such as prickly pear and mesquite that have roots that can quickly resprout in response to surface cutting or clearing. Workers also may use power tools such as chain saws and power brush saws.

Manual methods are highly labor intensive, requiring periodic retreatment, ranging from every three weeks during the growing season to annually, depending on the target species. These methods have been successful in controlling annuals and biennials, but are ineffective in controlling creeping perennials.