

NEW MEXICO OFFICE OF THE STATE ENGINEER
Dam Safety Bureau
Vegetation Management on Dams
August 15, 2011

The contents of this paper on vegetation management on dams are general guidelines. Proper evaluation of the dam's geometry, vegetation species and other field conditions may be required before implementing these guidelines. For additional information and guidance, dam owners are encouraged to review FEMA 534, "Impacts of Plants on Earthen Dams". FEMA 534 is available for download from the OSE website at:

<http://www.ose.state.nm.us/Dams/operations.php>

A dam owner must not allow brush or trees to become established on a dam. This undesirable vegetation can prevent access to the embankment, obscure the embankment slopes and crest from visual inspection, create seepage paths and provide a habitat and food source for burrowing rodents. Under no circumstances is dragging a chain along the slopes of an earthen dam appropriate for removing undesirable vegetation or addressing surface erosion. Dragging a chain removes beneficial vegetation that can help control surface erosion and reduces the cross-section of the embankment over time. Following the procedures in this document will help extend the life of an owner's dam from the damage that can occur due to the impacts of undesirable vegetation.

Emerging Brush and Trees

Emerging brush and trees must be promptly addressed and not allowed to become established by the dam owner. Brush less than 2 feet in height and trees less than 4 feet in height are considered emerging vegetation. Controlling brush and trees can be accomplished by initially applying a herbicide, if appropriate. Contact the local county extension office for assistance with selection of an appropriate herbicide. The dam owner must follow the manufacturer's warnings and instructions when using a herbicide. Once the vegetation is dead, prompt removal of the brush or tree and root systems is required. A dam owner may also directly remove the brush or tree and root system without applying a herbicide. **Aggressive species such as willow must be controlled with a herbicide or by removing the root ball. It is unacceptable to cut a willow and remove the root system at a later date. Aggressive species may require multiple herbicide treatments or removal throughout the growing season.**

Once the brush or tree is removed, the resulting disturbed area must be repaired with compacted material similar to the embankment. The wave protection armoring must be replaced on the upstream slope. The repaired area on the crest or downstream slope must be vegetated with an appropriate native grass seed mix or surface treatment such as a gravel mulch or riprap, as appropriate. Brush greater than or equal to 2 feet in height and trees greater than or equal to 4 feet in height must be addressed in accordance with requirements listed below for established brush and trees. Once the brush is removed, the owner must properly dispose of the vegetation. Dumping of the vegetation debris on the embankment, in the reservoir or spillway or within a distance of ½ the height of the dam from the abutments or downstream toe is unacceptable. Vegetation debris provides a habitat for rodents and prevents visual inspection.

Established Brush and Trees

Brush and trees that a dam owner has allowed to become established on the embankment are more costly to remove and require additional effort. Brush greater than or equal to 2 feet in height or a tree greater than or equal to 4 feet in height is considered established vegetation. Established vegetation shall be addressed in accordance with the location of the vegetation and the treatment options provided below. Zones are numbered from upstream to downstream and are not listed in order of importance. For water storage dams, Zones 3 and 4 are the most critical followed by Zone 1 for dams with a narrow dam crest. Zone 2 is considered the least critical for water storage dams. If resources are limited it is recommended that dam owners prioritize vegetation removal based on the critical zones and the condition of the trees. Trees that are in distress are a higher priority than healthy trees.

PERMANENT WATER STORAGE DAMS

| ZONE | ZONE DESCRIPTION | TRUNK DIAMETER (Inches) | TREATMENT |
|------|---|-------------------------|-----------|
| 1* | Upstream slope to center line of dam crest | All | A |
| 2 | Center line of dam crest to upper third of the downstream slope | < 8 | B |
| | | ≥ 8 | A |
| 3* | Middle third of the downstream slope | < 6 | B |
| | | ≥ 6 | A & C |
| 4* | Lower third of the downstream slope and downstream area for a distance of half the dam height | < 4 | B |
| | | ≥ 4 | A & C |

* Lower the reservoir to a safe level before the repairs begin.

Treatment A:

1. Cut the brush or tree approximately two feet above the ground leaving a well defined stump that can be used in the removal process.
2. Remove the stump and root ball by pulling the stump or extracting with a backhoe after loosening the root ball by pulling on the stump from different locations.
3. Clean the root ball cavity to remove loose soil and the remaining root system (root systems > ½ inch) by excavating the root ball cavity with maximum 1:1 (horizontal to vertical) side slopes and a horizontal bottom.
4. Backfill the excavation with well-compacted soil placed in relatively thin, loose lifts not greater than about 8 inches in lift thickness. Compaction typically requires the use of manually operated compaction equipment or compaction equipment attached to a backhoe. Backfill must consist of appropriate fill material and be compacted to a

minimum of 95% of the maximum dry density in a moisture range of $\pm 2\%$ of optimum moisture content of the fill material as determined by the Standard Proctor compaction test (ASTM D-698).

5. Replace or add a slope protection system to reduce the potential for wave and surface runoff erosion for upstream slopes.
6. Seed all disturbed areas with an appropriate native grass seed mix to minimize surface erosion on downstream slopes.

Treatment B: (This treatment option is not appropriate for aggressive species such as willows. Cutting willows encourages additional root system growth. Treatment A applies to aggressive species. Other species can also be immediately removed in accordance with Treatment A):

1. Cut the brush or tree flush with the ground.
2. Regularly treat the stump with a waterproofing sealant similar to polyurethane that will prolong the decay process.
3. Once the stump has decayed, remove in accordance with Treatment A.

Treatment C:

1. Complete Steps 1 through 3 of Treatment A.
2. If water is encountered in the root ball cavity consultation with a professional engineer regarding the need for a filter drain system is required. A professional engineer must supervise the construction repair. Office of the State Engineer Dam Safety Bureau approval of the filter drain system design and installation is required.
3. If no water is encountered in the root ball cavity complete Steps 4 and 6 of Treatment A.

FLOOD CONTROL DAMS

Implement Zone 2 for dams with no permanent storage. Zone 2 is applicable to all areas of the embankment slope and for a distance of 25 feet downstream of the dam.

MISCELLANEOUS AREAS OF DAMS¹

Maintain 25-foot clearance zone beyond groins and adjacent to all concrete structures.

Maintain 15-foot clearance zone on each side of open channels, pipe conveyance systems and drains (especially perforated pipes).

1 Bureau of Reclamation (USBR). *Water Operation and Maintenance*. Bulletin No. 150, 1989.