

**Texas Parks and Wildlife Department (TPWD) Recommendations on
Herbicide Use to Control Vegetation on Earthen Dams
Updated 5/12/2009**

1.0 Herbicide Application Recommendations

Texas Parks and Wildlife Department recommends utilizing individual plant treatment for the control of trees and shrubs on earthen dams, whenever feasible. The treatment of individual plants would reduce the volume of herbicide required in the control of dam vegetation which could result in lower costs associated with vegetation management. In addition, adverse impacts to beneficial non-target plant species and aquatic species would be minimized due to the avoidance of exposure and the lower potential for drift and runoff.

Application of herbicides on the earthen dams should be delayed if rainfall is expected within 24 hours to further reduce the runoff of herbicides into the adjacent water bodies. Application during periods of high humidity should be avoided since plant uptake is lowest during this period. The herbicides should be mixed and loaded into the spray units at least 50 feet away from the dam locations to ensure that potential spills would not enter the aquatic systems.

Wind direction and speed should be monitored during application of the herbicides to minimize drift into areas of concern. Drift of herbicides into non-target areas is also dependent on the evaporation rate of the pesticide; therefore, TPWD recommends avoiding application of the herbicides during the hottest part of the day, when evaporation is highest. TPWD recommends using the largest droplet size consistent with adequate coverage of the herbicide to further reduce drift. Higher spray volumes typically reduce drift as well. However, the manufacturer's label directions should always be followed to apply the correct amounts and concentrations.

Once an earthen dam has been treated with herbicide, TPWD recommends establishing a maintenance plan to reduce the potential for future large scale herbicide applications. The establishment of a mowing and controlled burn schedule could be beneficial to the establishment of native grasses, forbs, and wildflowers. Grasses are recommended for structural stability of earthen dams by their ability to tightly bind soil with their root systems. The promotion of native grasses through these methods would reduce the invasion of woody vegetation and reduce the need for additional herbicide applications. Should the use of herbicides be required in the future, applications should be made during the early successional stages so that individual plant treatments would be economically and logistically feasible.

2.0 Threatened and Endangered Species Concerns

According to the Federal Insecticide, Fungicide, and Rodenticide Act, the use of herbicides must comply with the Endangered Species Act. Although the measures proposed in this letter should minimize adverse impacts to fish and wildlife resources in

general, special precautions should be taken to ensure that adverse impacts to rare, threatened, and endangered species are avoided. While the protections for federal and state listed plants do not apply to private lands, these listed plants are still in need of conservation efforts when they occur on private lands. Also, TPWD has identified additional rare plants (species of concern) that are in need of conservation measures. TPWD has identified nine rare, threatened, or endangered plant species that could potentially be impacted by the herbicidal control of vegetation on dams in Texas.

2.1 Texas wild-rice (*Zizania texana*)

Texas wild-rice is federally listed as an endangered plant species by the U.S. Fish and Wildlife Service (USFWS) and as a state listed endangered species by TPWD. Texas wild-rice is a perennial, emergent, aquatic grass known only from the upper 2.5 km of the San Marcos River in Hays County. Because of the potential sensitivity of Texas wild-rice to herbicide applications and runoff, TPWD recommends avoiding the application of herbicide on earthen dams on the upper 4 km of the San Marcos River and all tributaries that enter the San Marcos River in the upper 4 km of the river.

2.2 Neches River rose-mallow (*Hibiscus dasycalyx*)

The Neches River rose-mallow is a Federal candidate for listing as a threatened or endangered species by the USFWS. It is also a species of concern for TPWD. The Neches River rose-mallow is endemic to Texas and grows on wet alluvial soils in swamps or open riparian woodlands. It is possible that the Neches River rose-mallow could grow on earthen dams in Cherokee, Harrison, Houston, Jasper, and Trinity Counties. TPWD recommends surveying earthen dams to be chemically treated in these counties during the flowering period between June and August to identify rose-mallow populations that would be at risk. Should Neches River rose-mallow populations be identified, TPWD recommends utilizing mechanical means to remove dense vegetation. TPWD recommends maintaining a 100-foot buffer around Neches River rose-mallow populations when spraying herbicides on dams and when mixing or loading herbicide into applicators.

2.3 Pecos sunflower (*Helianthus paradoxus*)

The Pecos sunflower is federally listed as a threatened species by the USFWS and is a state listed threatened species by TPWD. The Pecos sunflower is found in moist heavy alkaline/saline calcareous silty clays and loams in and around cienegas (desert springs). It is possible that the Pecos sunflower could grow on or around earthen dams associated with the springs in Pecos and Reeves Counties. TPWD recommends surveying earthen dams to be treated in these counties during the flowering period between August and November to identify Pecos sunflower populations that would be at risk. Should Pecos sunflower populations be identified, TPWD recommends utilizing mechanical means to remove dense

vegetation. TPWD recommends maintaining a 100-foot buffer around Pecos sunflower populations when spraying herbicides on dams.

2.4 Little Aguja pondweed (*Potamogeton clystocarpus*)

The Little Aguja pondweed is federally listed as a endangered species by the USFWS and is a state listed endangered species by TPWD. The Little Aguja pondweed is a submersed aquatic plant known to occur in quiet seepage pools in the Little Aguja Creek drainage in the Davis Mountains. It is also known to occur in the Madera and Cherry Creek drainages. The pondweed fruits between May and October. TPWD recommends utilizing mechanical measures or individual plant treatments on dams upstream from known populations of Little Aguja pondweed, ensuring that the herbicide does not enter the water downstream of the dam.

2.5 Correll's false dragon-head (*Physostegia correllii*)

The Correll's false dragon-head has no federal or state protective status, but is a species of concern for TPWD. The Correll's false dragon-head is found on streambanks, in creek beds, and irrigation channels. It is wide-ranging across Texas, but very rare in the counties in which it has been collected, which include Bexar, Galveston, Kinney, Montgomery, Travis, Val Verde, and Zapata counties. TPWD recommends surveying for the Correll's false dragon-head on and around earthen dams during the May through September flowering period to identify populations that would be at risk. TPWD recommends utilizing mechanical measures or individual plant treatments on dams where known populations of Correll's false dragon-head are found in the water or banks. Individual plant treatment will help to ensure that the herbicide does not enter the water up or downstream of the dam and when mixing or loading herbicide into applicators.

2.6 Longstalk heimia (*Nesaea longipes*)

The Longstalk heimia has no federal or state protective status, but is a species of concern for TPWD. The Longstalk heimia could occur along unshaded margins of impounded wetlands, or perennial stream and subirrigated wetlands in Bandera, Brewster, Kerr, Pecos, and Val Verde counties. TPWD recommends surveying for the Longstalk heimia on and around earthen dams to be treated during the May through September flowering period to identify populations that would be at risk. Should Longstalk heimia populations be identified, TPWD recommends utilizing mechanical means to remove dense woody vegetation or individual plant treatments. Individual woody plant treatment will help to ensure that the herbicide does not enter the water up or downstream of the dam.

2.7 Springrun whitehead (*Shinnersia rivularis*)

The Springrun whitehead has no federal or state protective status, but is a submerged aquatic plant species of concern for TPWD. The Springrun whitehead occurs in shallow, slow-moving water in small, usually spring-fed streams and rivers, abandoned river channels fed by a strong perennial stream in Kimble, Kinney, Uvalde, and Val Verde counties. TPWD recommends surveying for the Springrun whitehead in the waters around the earthen dams to be treated during the March through May flowering period to identify populations that would be at risk. Springrun whitehead flowers throughout the year, though more reliably March through May. TPWD recommends utilizing mechanical means to remove dense woody vegetation or individual plant treatments on dams whose associated waters are found to support populations of Springrun whitehead. Individual woody plant treatment will help to ensure that the herbicide does not enter the water up or downstream of the dam.

2.8 Don Richard's spring moss (*Donrichardsia macroneuron*)

The Don Richard's spring moss has no federal or state protective status, but is a species of concern for TPWD. Don Richard's spring moss is a Texas endemic, known to only occur in Edwards County. This plant occurs on shaded limestone rocks partially submerged in rapidly flowing relatively thermally constant water in spring complexes. TPWD recommends surveying for the Don Richard's spring moss in the associated waters near the earthen dams to be treated in Edwards County to identify populations that would be at risk. TPWD recommends utilizing mechanical means to remove dense vegetation or individual woody plant treatments on dams where populations of Don Richard's spring moss is found. Individual woody plant treatment will help to ensure that the herbicide does not enter the water up or downstream of the dam.

2.9 Rough-stem aster (*Symphotrichum puniceum* var. *scabricaule*)

The Rough-stem aster has no federal or state protective status, but is a species of concern for TPWD. The Rough-stem aster has been observed on and around earthen dams. In its natural habitat, this aster is found on relatively open sites in saturated soils associated with seepage areas, marshes, ponds, and drainages on the Queen City, Carrizo, and Sparta sand formations. It has been found in Anderson, Franklin, Freestone, Henderson, Hopkins, Smith, Van Zandt, and Wood counties. TPWD recommends surveying for the Rough-stem aster on and around earthen dams during the late September to early November flowering period to identify populations that would be at risk. TPWD recommends utilizing mechanical measures or individual plant treatments on dams where known populations of Rough-stem aster are found in the water or on the banks. Individual plant treatment will help to ensure that the herbicide does not enter the water up or downstream of the dam and when mixing or loading herbicide into applicators.

3.0 Brush Control Herbicides for Use on Dams

The following list of herbicides contains chemicals and formulations known to be effective in the control of vegetation typically found growing on open and previously disturbed habitats, similar to the vegetation associations expected to be growing on dams. These herbicides are also known to have low toxicity to terrestrial and aquatic organisms and are not known to leach into ground and surface waters. The implementation of the recommendations in this letter during the application of the following herbicides in a manner consistent with the herbicide's label should minimize adverse impacts to fish and wildlife resources on and around the dam. The following list of herbicides is certainly not all inclusive as new herbicides are consistently being introduced.

3.1 2,4-D (American Brand 2,4-D, DMA[®] 4 IVM, Weedar[®] 64)

2,4-D (2,4-Dichlorophenoxyacetic acid) was introduced in 1946 and is the most widely used herbicide in the world. Many different manufacturers produce 2,4-D and the list of formulations above are only included to provide examples. 2,4-D is a selective herbicide that is used to control broadleaf herbaceous plants. The salt formulations of 2,4-D are relatively non-toxic to fish and wildlife species. However, the ester formulations of 2,4-D are toxic to fish. Therefore, TPWD recommends avoiding the use of the ester formulations of 2,4-D in the control of vegetation on dams. The 2,4-D salt formulations are used to control box elder (*Acer nugundo*), willow (*Salix spp.*), thistle (*Cirsium spp.*), morning glory (*Ipomoea spp.*), poison ivy (*Toxicodendron radicans*), wild rose (*Rosa spp.*), Virginia creeper (*Parthenocissus quinquefolia*), ragweed (*Ambrosia spp.*), cocklebur (*Xanthium spp.*), Russian thistle (*Salsola kali*), and sunflower (*Helianthus spp.*).

3.2 Glyphosate (Accord[®], Aquamaster[®], Glypro[®], Pondmaster[®], Rodeo[®])

Glyphosate is a broad-spectrum, non-selective, systemic herbicide used to control grasses, broadleaf weeds, and woody plants. Because glyphosate is a broad spectrum herbicide, care should be taken during applications to minimize adverse impacts to grasses and native vegetation important for erosion control and stabilization of earthen dams. Glyphosate is used to control dogwood (*Cornus spp.*), maple (*Acer spp.*), oak (*Quercus spp.*), giant reed (*Arundo donax*), salt cedar (*Tamarix spp.*) sweet gum (*Liquidambar styraciflua*), sycamore (*Plantanus occidentalis*), willow, cocklebur, sunflower (*Helianthus spp.*), alligatorweed (*Alternanthera philoxeroides*), cattail (*Typha spp.*) blackberry (*Rubus spp.*), kudzu (*Pueraria lobata*), honeysuckle (*Lonicera spp.*), black locust (*Robinia pseudoacacia*), persimmon (*Diospyros spp.*), wild rose, Russian olive (*Elaeagnus angustifolia*), Chinese tallow (*Sapium sebiferum*), wax myrtle (*Morella cerifera*), sumac (*Rhus spp.*).

3.3 Imazapyr (Arsenal[®], Chopper[®], Habitat[®], Stalker[®])

Imazapyr is a broad spectrum, non-selective, systemic herbicide used to control annual and perennial grasses, broadleaf herbaceous plants, woody plants, and riparian and aquatic plants. Because imazapyr is a broad spectrum herbicide, care should be taken during applications to minimize adverse impacts to grasses and native vegetation important for erosion control and stabilization of earthen dams. Imazapyr is used to control giant reed, ragweed, thistle, cocklebur, saltbush (*Atriplex spp.*), greenbriar (*Smilax spp.*), honeysuckle, morning glory, poison ivy, wild rose, kudzu, trumpet creeper (*Campsis radicans*), wild grape (*Vitis spp.*), ash (*Fraxinus spp.*), maple, black locust, box elder, chinaberry (*Melia azedarach*), Chinese tallow, cottonwood (*Populus deltoides*), dogwood, elm (*Ulmus spp.*), hawthorn (*Crataegus spp.*), mulberry (*Morus spp.*), oak, persimmon (*Diospyros spp.*), pine (*Pinus spp.*), privet (*Ligustrum japonicum*), Russian olive, saltcedar, sumac, sweetgum, tree-of-heaven (*Ailanthus altissima*), *Vaccinium spp.*, waxmyrtle, willow, and yaupon (*Ilex vomitoria*).

3.4 Fosamine ammonium (Krenite[®])

Fosamine ammonium is used to control brush along highway rights-of-way, railroad rights-of-way, industrial sites, storage areas, and utility and pipeline rights-of-way. It is used to control woody species such as oak, pine, sumac, sweetgum, Chinese tallow, elm, wild grape, wild rose, sycamore, and tree-of-heaven. It is also used in combination with metasulfuron methyl (**Escort XP[®]**) to control eastern red cedar (*Juniperus virginiana*), tree-of-heaven, ash, elm, and maple. Fosamine ammonium is also used with imazapyr (**Arsenal[®]**) to control American beautyberry (*Callicarpa americana*), baccharis (*Baccharis neglecta*), *Vaccinium spp.*, waxmyrtle, box elder, black locust, dogwood, elm, maple, sassafras (*Sassafras sassafras*) and willow.

3.5 Metsulfuron methyl (Escort XP[®])

Escort XP[®] is a selective pre- and post-emergence herbicide used to control broadleaf herbaceous and woody species. It has been used to control cocklebur, blackberry (*Rubus spp.*), thistle, sunflower, honeysuckle, wild rose, ash, black locust, cottonwood, eastern red cedar, elm, hackberry (*Celtis spp.*), hawthorn, mulberry, wild grape, oak, Osage orange, (*Maclura pomifera*), maple, sweetgum, tree-of-heaven, *Vaccinium spp.*, and willow.

3.6 Diquat (Reward[®])

Diquat is a non-selective contact herbicide used to control aquatic and terrestrial vegetation. Although diquat is toxic to aquatic invertebrates, it is approved for aquatic use because it quickly binds to soil and suspended sediments in the water. However, TPWD recommends using care when applying diquat as many water bodies throughout the State support several species of mollusks which are listed

as Species of Concern. In addition, diquat can be toxic to many grass species and other vegetation that may be beneficial in the control of dam erosion. Diquat should be applied to minimize impacts to desired, beneficial vegetation.

4.0 Brush Control Herbicides to Avoid on Dams

The following list of herbicides contains chemicals and formulations known to be effective in the control of upland vegetation in habitats similar to those found on earthen dams. However, because they are known to leach through the soil and accumulate in ground and surface waters or are known to be toxic to aquatic organisms, their use should be avoided in the control of dam vegetation.

4.1 Clopyralid (Reclaim[®], Stinger[®], and Transline[®])

Although clopyralid exhibits a low toxicity to terrestrial and aquatic organisms, it is highly mobile in the soils and can contaminate surface and groundwater which may be used for irrigation and drinking purposes. Because of the proximity of the dams to water, TPWD recommends avoiding the use of clopyralid in the control of vegetation on dams.

4.2 Clopyralid with 2,4-D or MCPA-EHE (Curtail[®] and Curtail M[®])

Curtail[®] and Curtail M[®] are herbicide formulations which use clopyralid as an active ingredient. Curtail[®] contains clopyralid with 2,4-D while Curtail M[®] contains clopyralid with MCPA-EHE. Because both formulations contain clopyralid, TPWD recommends avoiding the use of Curtail[®] and Curtail M[®] in the control of vegetation on dams.

4.3 Glyphosate

Although glyphosate is practically non-toxic to aquatic organisms, certain surfactants added to some terrestrial formulations of glyphosate have been shown to be highly toxic to aquatic species and amphibians. Non-aquatic formulations of glyphosate (**Accord SP[®]**, **Accord XRT[®]**, **Glyphomax[®]**, **Glypro Plus[®]**, **Honcho[®]**, **Roundup[®]**, **Touchdown[®]**) should be avoided in the control of vegetation on dams. In addition, other formulations containing glyphosate combined with 2,4-D or dicamba (**Campaign[®]**, **Fallowmaster[®]**, **Landmaster II[®]**) should be avoided unless labeled for aquatic use.

4.4 Picloram (Tordon 22K[®], Tordon K[®])

Although picloram exhibits a low toxicity to terrestrial and aquatic organisms, it is highly mobile in the soils and can contaminate surface and groundwater which may be used for irrigation and drinking purposes. Because of the proximity of the

dams to water, TPWD recommends avoiding the use of picloram in the control of vegetation on dams.

4.5 Picloram with 2,4-D (Grazon P+D[®], Pathway[®], Tordon RTU[®], Trodon 101[®])

Because picloram is extremely mobile in the soil profile and is known to leach into surface and ground water, TPWD recommends avoiding the use of Grazon P+D[®], Pathway[®], Tordon RTU[®], and Tordon 101[®] in the control of vegetation on dams.

4.6 Triclopyr (Garlon 3A[®], Garlon 4[®], Pathfinder II[®], Remedy[®])

Although triclopyr exhibits a low toxicity to terrestrial and aquatic organisms, it is highly mobile in the soils and can contaminate surface and groundwater which may be used for irrigation and drinking purposes. Because of the proximity of the dams to water, TPWD recommends avoiding the use of triclopyr in the control of vegetation on dams.

4.7 Triclopyr with 2,4-D (Crossbow[®])

Crossbow[®] is toxic to fish and drift or runoff could adversely impact fish and aquatic plants adjacent to the dams. TPWD recommends avoiding the use of Crossbow[®] in the control of vegetation on dams.

4.8 Triclopyr with clopyralid (Redeem R&P[®])

Because triclopyr and clopyralid are extremely mobile in the soil profile and are known to leach into surface and ground water, TPWD recommends avoiding the use of Redeem R&P[®] in the control of vegetation on dams.

Additional Guidance Obtained on Managing Mesquite Trees:

TCEQ staff has consulted with TPWD regarding effective herbicides for control of vegetation on dam structures (See Appendix titled, “TPWD Recommendations on Herbicide Use to Control Vegetation on Earthen Dams”. This document includes herbicide application recommendations, threatened and endangered species concerns, herbicides recommended for use to control vegetation on dams, and herbicides to avoid using on dams. Extreme care and caution should be used when applying herbicides to vegetation on dam structures.

According to TPWD, the herbicides Triclopyr (Remedy) and Clopyralid (Reclaim) are effective in control of mesquite trees. Although these herbicides are listed in the Appendix as herbicides to avoid on dam structures, they are not considered to be toxic to fish and wildlife. The problems with these herbicides are that they are very mobile in soil

and are a concern from a water quality perspective. Consequently, extreme caution and care should be used when applying these herbicides. Treatments should be localized (applications on individual plants) and every effort should be made to prevent overspray.

The Brush Busters Program is a cooperative program of the Texas Cooperative Extension and the Texas Agricultural Experiment Station for the development of brush management technology. The following web site provides specific guidance on the treatment/spray methods, equipment, equipment preparation, and herbicide mixtures related to the treatment of mesquite trees; <http://texnat.tamu.edu/BrushBusters/Mesquite.htm>.