United States Department of Agriculture

Marketing and Regulatory Programs

Animal and Plant Health Inspection Service

Proposed Program for Control of Saltcedar (*Tamarix* spp.) in Fourteen States

Draft Environmental Assessment
November 2003

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Environmental Assessment
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I. Purpose and Need for Proposed Action

The United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS) is proposing a program for the purpose of controlling saltcedar (*Tamarix* spp.) in 14 western States. There is a need to control saltcedar, a highly invasive, exotic weed, in the western United States. Saltcedar (also known as tamarisk) is a large shrub or small tree that was introduced to North America from Asia in the early 1800's. The plant has been used for windbreaks, ornamentals, and erosion control. By 1850, saltcedar had infested river systems and drainages in the Southwest, often displacing native vegetation. By 1938, infestations were found from Florida to California and as far north as Idaho. Saltcedar continues to spread rapidly and currently infests water drainages and areas throughout the United States. Saltcedar is less desirable than native vegetation for the following reasons:

High use of water – Water use by saltcedar is among the highest of all stream bank species (Johns, 1989). Saltcedar can lower water tables, reduce stream flow, dry up desert springs, and reduce availability of water for agriculture, municipalities, native plants, and wildlife. The cost of water lost to saltcedar is estimated at $133 to 285 million annually (Zavaleta, 2000a).

Increased soil salinity – Saltcedar is capable of utilizing saline groundwater by excreting excess salts through glands in the leaves causing an increase in surface soil salinity. This increase, combined with dense canopy of saltcedar plants and higher likelihood of fires within stands of saltcedar, results in the elimination of native riparian plants.

Low biodiversity – Saltcedar provides poor habitat for many species of native wildlife and reduces the abundance and diversity of plants and animals that occur in riparian habitats (DeLoach, 1997).

Increased fire hazard – The accumulation of heavy litter fall from the leaves of saltcedar greatly increases the incidence of fire. Fire readily kills cottonwoods and several other native plants but kills only the above-ground parts of saltcedar. Saltcedar rapidly resprouts and may regrow up to 10 feet in the first year after burning. Saltcedar quickly gains dominance over many other species after fires.

Saltcedar does have some positive value. It is used as nesting habitat for certain bird species, it is an ornamental plant, it provides pollen for

honeybees, it is used for control of streambank erosion, and it is used as a windbreak.

Saltcedar is a long-lived (50 to 100 years), dense, deciduous shrub or small tree that can grow to 30 feet tall. Approximately 10 species of *Tamarix* are established in the United States and four of those have become major noxious weeds. *T. ramosissima*, *T. chinenesis*, and their hybrids, are the most widespread and damaging. *T. parviflora* is sometimes weedy. *T. aphylla*, known as athel, is a low quality ornamental and has become invasive in only a few areas under special conditions. The remaining species are minor ornamentals. In this environmental assessment (EA), all of these species are referred to collectively as saltcedar.

Before APHIS can implement a program to control saltcedar in 14 States, it needs to analyze the potential effects of this program on the quality of the human environment. This EA was prepared to comply with the National Environmental Policy Act of 1969 (NEPA) (42 United States Code (U.S.C.) 4321, *et seq.*) as prescribed in implementing regulations adopted by the Council on Environmental Quality (40 Code of Federal Regulations (CFR) §§1500–1508), by USDA (7 CFR part 1b), and by APHIS (7 CFR part 372).

II. Alternatives Including the Proposed Action

This EA analyzes potential environmental consequences of a proposal to implement a program to control saltcedar in 14 States. These States include Colorado, North Dakota, South Dakota, Iowa, Nebraska, Nevada, Kansas, Missouri, Montana, Idaho, Oregon, Washington, Utah, and Wyoming. The alternatives considered are no action, biological control (preferred alternative), and integrated pest management.

A. No Action

Under the no action alternative, APHIS would not be involved in any aspect of saltcedar control efforts. State and local authorities and other Federal agencies, such as Bureau of Reclamation and the U.S. Fish and Wildlife Service (FWS), would likely continue to pursue control of saltcedar in infested areas under their purview using available funds and personnel. In addition, private landowners could take action using physical, mechanical, or chemical methods to remove saltcedar.

B. Biological Control (Preferred alternative)

A leaf beetle from central Asia, *Diorhabda elongata* Brullé subspecies *deserticola* Chen, is a potential biological control agent for saltcedar. This insect has been found to completely defoliate large areas of saltcedar. The eggs of *D. e. deserticola* are small, spherical, and laid in masses on saltcedar plants. After the eggs hatch, the insect completes three larval instars. All larval stages feed on saltcedar foliage. When the larva is fully grown, it drops from the plant and forms a pupal cell using leaf litter or loose soil. Pupation lasts for approximately 7 days. Adult beetles are 6 millimeters in length and also feed on saltcedar foliage. Release of this insect into the environment is expected to produce a gradual reduction in the size of saltcedar plants and in foliage cover and density of saltcedar stands (DeLoach and Tracy, 1997; DeLoach *et al.* 2000).

In July 1999, APHIS prepared an EA: Field Release of a Nonindigenous Leaf Beetle, *Diorhabda elongata* (Coleoptera: Chrysomelidae), for Biological Control of Deciduous Saltcedar, *Tamarix* ?*ramosissima* and *T. parviflora* (Tamaraceae) (USDA, APHIS, 1999). The APHIS EA and the associated Finding of No Significant Impact (FONSI) are being incorporated into this EA by reference. The APHIS EA and FONSI were prepared to assess the possible environmental impacts of the release of *D. e. deserticola* in the United States. Although the insect was found to be host specific to saltcedar, FWS raised concerns regarding the discovery that the southwestern willow flycatcher (*Empidonax traillii extimus*), a bird listed as endangered under the Endangered Species Act of 1973, was nesting in saltcedar near the Rio Grande in New Mexico. Therefore, general release of the insect was not permitted until more information was gathered on the behavior of the insect in the field and until a monitoring plan was prepared. As a result, permits for release of *D. e. deserticola* into field cages were issued by APHIS in 1999 in order to collect the required life history information. Field cages were located in Seymour, TX, Pueblo, CO, Lovell, WY, Schurz, NV, Lovelock, NV, Stillwater National Wildlife Refuge, NV, Bishop, CA, Cache Creek, CA, and Fort Hunter Liggett in California. After researchers conducted 2 years of observation in the field cages and prepared a detailed monitoring plan, APHIS issued permits in 2001 to release insects outside of the cages at close proximity to the cage sites. Monitoring has continued at the original research release sites and additional sites have been approved for beetle releases including Pollard, NM, Huey, NM**,** Kingsville, TX, Big Spring, TX, Lake Thomas, TX, Lake Meredith, TX, Zapata, TX, Candelaria, TX, San Jacinto State Park, TX, Malheur County, OR, and Charles M. Russell National Wildlife Refuge, MT. APHIS is now requesting that the insect be generally

released in 14 States to control saltcedar. The beetles proposed for release originate from collections made in Fukang, China, and Chilik, Kazakhstan, and are the same strain that was originally released into field cages in Texas, Colorado, Wyoming, Nevada, and California in 1999 with localized releases in 2001 as described above.

Under this alternative, the program does not expect to eradicate saltcedar in any area. The objective of the release of *D. e. deserticola* is to reduce the abundance of saltcedar to below the level where ecosystem damage occurs. Saltcedar is expected to remain as an uncommon or common, but non-damaging, component of riparian plant communities. It is expected that native vegetation will return rapidly and naturally, at least in areas where remnant native plants exist and soil salinity and water tables permit.

C. Integrated Pest Management

Control of saltcedar using an integrated approach would provide the program with all available tools and control methods, including herbicides, mechanical/physical removal, flooding, burning, and biological control. Depending on the specific site and circumstances, all of these methods could be used individually or in any combination. Although this method affords the program the flexibility to use any method or combination of methods, this alternative is not the preferred program alternative.

Herbicides

The herbicides used for control of saltcedar are listed in table 1. Herbicide treatment recommendations on larger infestations of saltcedar are 3 pints of imazapyr plus 1 quart of glyphosate per acre, with fall applications most effective. Many larger infestations can be controlled with an aerial application. Cut stump treatment or basal bark treatment have resulted in the best control of saltcedar.

Table 1. Herbicides Used for Saltcedar Control.

Chemical name	Trade name(s)
imazapyr	Arsenal®
metsulfuron methyl	Escort®XP
Ammonium salt of fosamine	Krenite®S
triclopyr	Garlon* 4, Remedy*
glyphosate	Rodeo®, Roundup Original™

Mechanical/Physical Removal

Mechanical controls result in cutting down or uprooting entire stands of saltcedar plants. These include mowing, sawing, chaining or ripping, hand pulling, and bulldozing. Uprooting methods are effective in the short-term because uprooted trees do not resprout. For sawing and mowing, chemical treatment may be necessary to prevent resprouting. Immature plants may often be physically removed by hand with care given to complete removal of the root structure and disposal of the plant by burning or deep burial. Hand removal is useful for small-scale (less than 1 acre) infestations.

Flooding

Managed flooding can effectively kill saltcedar on a long-term basis. Repeated flooding is necessary to kill saltcedar seedlings that are rapidly established from windborne seeds. Established saltcedar plants can tolerate flooding for up to 3 months. Conditions suitable for controlled flooding exist in relatively small areas such as highly managed wildlife refuges.

Burning

Prescribed burning alone is not an effective control method for saltcedar because it generally promotes sprouting and flowering. However, burning followed by herbicide application has been shown to be effective (Barranco, 2001).

Biological Control

Methods used for biological control would be the same as those described above under alternative B, Biological Control.

III. Affected Environment

Saltcedar is a deep-rooted plant that obtains its water from the water table or the layer of soil just above it. Its roots may penetrate soil 30 feet or more, but the plant cannot survive if moisture is suddenly removed from the taproot zone. It generally grows where the depth of the water table does not exceed 25 feet and normally where it is less than 15 feet. Dense stands will only grow where the water table is between 5 and 20 feet below the soil surface. If the water table is less than 5 feet from the surface, plants branch profusely and do not form a dense stand. Established plants can tolerate drought, fire, and intermittent flooding. By

shedding leaves and halting growth, saltcedar plants can withstand lengthy drought periods. Additionally, established saltcedar plants can tolerate water innundation for up to 3 months.

Saltcedar commonly occurs along floodplains, riverbanks, stream courses, salt flats, marshes, reservoirs, and irrigation ditches in arid regions. It often forms pure thickets that extend for miles. It can inhabit the following types of ecosystems: oak and hickory, elm-ash-cottonwood, Ponderosa pine, sagebrush, desert shrub, chaparral-mountain shrub, mountain grasslands, Plains grasslands, and prairie, desert grasslands (Barranco, 2001). It is one of the most widely distributed and troublesome weeds along the waterways in the southwestern United States. The reduction in flooding and the shift in the seasonality of flooding downstream from dams and reservoirs, built on many rivers for irrigation and flood control, gives saltcedar a strong competitive advantage over cottonwood and willow. Cottonwood blooms only early in spring and its seeds germinate on new sediment after spring floods; by the time the modified flood flows subside in summer, seed production has ended and the seeds already produced are no longer viable. However, saltcedar blooms from spring into fall, and its seeds are present in abundance during that time. In addition, the seeds of saltcedar germinate very quickly after becoming wet, enabling it to establish quickly after floodwaters recede.

Saltcedar grows well in moist, sandy, sandy loam, loamy, and clayey soil textures. It has a wide range of tolerance to saline and alkaline soil and water. It has been found growing in Death Valley, California, where the ground water contains as much as 5% dissolved solids. It tolerates high concentrations of dissolved solids by absorbing them through its roots and excreting the excess salts through glands in its stems and leaves. Eventually these salts end up on the ground beneath the plant, forming a saline crust.

Saltcedar is highly susceptible to shading. Shaded plants have altered leaf morphology and reduced reproduction. Saltcedar grows from below sea level to more than 7,000 feet elevation. Saltcedar is a colonizing species that establishes on fresh, exposed alluvium (clay, silt, or gravel carried by rushing streams and deposited where the stream slows down), sand and gravel bars, and stream banks or other flood plains after disturbance. A decrease in river fluctuations can rapidly shift sites from habitats dominated by native vegetation to pure stands of saltcedar.

In the proposed program area, saltcedar is found in the Columbia Plateau, Upper and Lower Columbia Basin, Middle Rocky Mountains, Wyoming Basin, Southern Rocky Mountains, Great Plains, Black Hills Uplift, and

Upper Missouri Basin and Broken Lands. In Montana, saltcedar is located from the North Dakota line west to the central part of Montana and south into Wyoming. It is found along the major river drainages of the Yellowstone, Missouri, Tongue, Powder, Musselshell, and Bighorn Rivers. In Wyoming, the Bighorn River drainage is infested all the way to the Montana border. The Powder River drainage has large infestations in its southerly extent in Johnson and Natrona Counties and its northerly extent in Campbell County. The North Platte and Green River are known to have significant saltcedar infestations. In Nevada, saltcedar occupies areas along the Walker River, saltgrass communities or former croplands at Stillwater and the Humboldt Sink, and arroyos of the Stillwater Range at Fence Marker Pass. The Colorado, Muddy, and Virgin Rivers are also heavily infested. In Colorado, infestations occur on every major river drainage except the North Platte. In Utah, saltcedar commonly occurs along floodplains, riverbanks, streams, salt flats, marshes, and irrigation ditches in arid regions of Utah at elevations from 4,200 to 7,000 feet. In North Dakota, it is found on the Yellowstone River and has spread down the Missouri River to Bismarck. In the Great Plains, saltcedar is common along streams, in low undrained areas, and around lakeshores.

IV. Environmental Impacts of the Proposed Action and Alternatives

A. No Action

The no action alternative would be for APHIS to take no control actions. State and local authorities, other Federal agencies, and private landowners would likely continue to pursue control of saltcedar in infested areas under their purview using physical, mechanical, or chemical methods. APHIS has no authority over the measures that others may use to control saltcedar. Therefore, the following section discusses the impact that saltcedar has on the environment.

Impacts to Wildlife and Livestock by Saltcedar

Saltcedar communities are generally less valuable to wildlife than are native riparian plant communities. Riparian zones are long strips of vegetation adjacent to streams, rivers, reservoirs, lakes, and other inland aquatic systems that affect or are affected by the presence of water. In arid and semi-arid regions, there typically is a strong visual contrast between riparian and upland vegetation communities. Riparian vegetation often consists of a lush mixture of trees, shrubs, and other vegetation, while

adjacent upland areas are generally non-forested ecosystems such as grasslands and deserts. Other western riparian zones, such as those in the Rocky Mountains and Pacific Northwest, typically occur along fast-moving systems in deeply incised valleys (Fischer *et al.*, 2001). When saltcedar was cleared from 49 acres along the lower Colorado River and replaced with native vegetation, avian density and diversity increased.

Saltcedar communities have smaller numbers of insects than native riparian communities during most seasons. Most birds feeding on insects and fruit tend to avoid saltcedar communities. Saltcedar does provide nesting sites for white-winged dove, mourning dove, Bell's vireo, black-throated sparrow, and the endangered southwestern willow flycatcher. The southwestern willow flycatcher, which breeds in riparian habitats of the Southwest, is now listed as endangered by FWS because of large-scale loss of riparian habitat (USFWS, 1995; Sogge *et al.*, 1997). Saltcedar can serve as a pollen source for European honeybees. Black-tailed jackrabbits use saltcedar as a major food source. Beaver will eat young saltcedar shoots. The plant is relatively unpalatable to most classes of livestock and wildlife, and it has been rated as poor in energy and protein value. The seeds contain no digestible protein. It provides fair to good cover for cattle and wildlife species such as elk, deer, small mammals, upland game birds, and waterfowl.

Lowered Water Tables

Saltcedar is a heavy water user that can lower water tables and reduce stream flows. As water tables decline, the deep root system of saltcedar enables it to survive when some native species cannot. Saltcedar has a greater leaf area per unit of soil surface and it also occupies larger areas of floodplain than native species, both of which contribute to its greater usage of groundwater.

Damage in Parks and Wildlife Areas

Saltcedar damages State and national parks and recreational areas by limiting access to streamside or lakeside areas by visitors and causing boating hazards. Most of the western national parks and national monuments are infested with saltcedar to varying degrees along rivers, intermittent streams, and springs.

Threatened and Endangered Species

The southwestern subspecies of the willow flycatcher is the only endangered species known to actively utilize saltcedar to any important

degree. The willow flycatcher, *Empidonax traillii*, is a small, neotropical migrant, mid-summer breeding, riparian-obligate bird. The southwestern subspecies, *Empidonax traillii extimus*, was federally listed as endangered on March 25, 1995; the other four subspecies are not threatened or endangered. The range of the southwestern willow flycatcher extends from southern California, through Arizona, to central New Mexico, to the southwestern third of Colorado, to southern Utah, and Nevada. Negative impacts to this species have occurred as a result from riparian habitat loss due to urban and agricultural development, hydraulic modification, fires, invasive plants, increased human population, and overgrazing by domestic livestock.

Common tree and shrub species comprising the nesting habitat of the southwestern willow flycatcher include willows, boxelder, Russian olive, and saltcedar, although historically, it nested primarily in willows, buttonbush, and seepwillow with an overstory of cottonwood. It now nests extensively in saltcedar in mid-elevation areas of central Arizona and in a few locations on the Rio Grande in New Mexico. Sometimes it nests preferentially in saltcedar even though suitable willows are present. In all other areas, it nests only in native vegetation.

Three other federally listed species suffer clear quantifiable negative impacts from saltcedar invasion, including the bald eagle (*Haliaeetus leucocephalus*), the whooping crane (*Grus americana*) and the peninsular bighorn sheep (*Ovis canadensis*) (Zavaleta, 2000b).

Sedimentation, Flooding, and Salinity

Along streams where flooding occurs, a dense growth of saltcedar slows the floodflow causing deposition of silt, narrowing of the channel, and eventually, complete blockage of the channel with debris or loss of channel identity with the water being dispersed into many small, meandering streams. This causes increased height of the flood crest and increased damage when large floods occur.

Windbreaks and Soil Stabilization

Saltcedar has been planted along railroads, irrigation canals, and livestock watering areas to reduce erosion and to prevent deposition of sand.

B. Biological Control

Nontarget Species

Host specificity of *D. e. deserticola* has been published by DeLoach *et al.* (2003a). Literature review and surveys have indicated that this insect is only associated with *Tamarix* species and occasionally with another related plant genus *Myricaria*, but not with two other closely related genera, *Reumaria* or *Frankenia*. In the United States, host-specificity tests were conducted on six species and three hybrids of *Tamarix* and on 58 species of other plants in 15 tests of different types, using 1,852 adults and 3,547 larvae over 10 years (DeLoach *et al.*, 2003a). Survival from larvae to adults averaged 55 to 67% on the *Tamarix* species, 12% on *Myricaria* sp., and only 1.6% on the three *Frankenia* spp. tested (DeLoach *et al.*, 2003a). No larvae completed their development on any of the other remaining plant species. Laboratory and field-cage tests conducted in Temple, Texas, and Albany, California, have demonstrated that *D. e. deserticola* is attracted to and is able to reproduce and complete its lifecycle only on exotic *Tamarix* and to a minimal extent, on native *Frankenia* among plants occurring in North America, and also on *Myricaria* which only occurs in Asia (DeLoach *et al.*, 2003b).

Threatened and Endangered Species

No threatened or endangered species will be adversely affected by the release of *D. e. deserticola* in the 14 States. The strain of *D. e. deserticola* proposed for release (originating from Fukang, China and Chilik, Kazakhstan) exhibits a particular life history trait that will enable its safe release in the 14 proposed States. Many insects enter a diapause in response to daylength and temperature. Diapause is a state of suppressed growth and development caused by genetically programmed internal mechanisms but which may be brought about in response to environmental cues. Diapause is induced prior to the deterioration of environmental conditions. Diapause-associated behaviors include absence of mating, decreased dispersal behavior, decreased rate of feeding, and a movement off of the host plant and into the leaf litter where diapausing adults spend the winter. For *D. e. deserticola* originating from Fukang, China and Chilik, Kazakhstan, most individuals will be reproductive only when daylengths are above 15 hours, which is optimal for rapid population expansion. However, when daylengths fall below 14.5 hours of light most individuals originating from these locations will enter diapause, including adults that have been reproductive. The critical photoperiod for diapause induction in this population ranges from over 14.5 hours when the

temperature is high to a little over 15 hours when the temperature is moderate. These critical daylengths are appropriate for latitudes above 37°N, where the longest days of the year are at least 14 hours and 45 minutes. In regions south of 37°N latitude, *D. e. deserticola* originating from Fukang, China and Chilik, Kazakhstan, does not successfully overwinter due to the induction of diapause in response to short daylength during the summer. At latitudes south of 37°N, insects enter diapause prematurely before laying eggs. In addition, mortality of these insects would be high because they would be "overwintering" during the summer months. For saltcedar control in areas south of 37°N latitude, other strains of *D. elongata* adapted to those daylengths and temperatures are being investigated, but are not proposed for release by this program.

Southwestern willow flycatcher – The southwestern willow flycatcher *Empidonax traillii extimus*, was federally listed as endangered on March 25, 1995. In a letter from FWS to APHIS regarding release of agents for the biological control of saltcedar, dated June 3, 1999, FWS indicated that the southwestern willow flycatcher was nesting in saltcedar near the Rio Grande in New Mexico and was concerned that the nests of flycatchers may be affected by saltcedar control as a result of temperature increases and parasitism by the brown-headed cowbird.

This species is not known to nest in saltcedar in the States included in the proposed program. The southwestern willow flycatcher is nesting in saltcedar in Arizona and New Mexico. In addition, releases in the States included in the proposed program will be north of 37°N latitude. In regions south of 37°N latitude where daylength and temperature induce premature diapause, *D. e. deserticola* originating from Fukang, China, and Chilik, Kazakhstan, fails to overwinter (Lewis *et al.*, 2003a). The areas where southwestern willow flycatchers are nesting in saltcedar is south of 37°N latitude. Even if *D. e. deserticola* were to reach these areas in Arizona and New Mexico, beetles would enter premature diapause and fail to establish. Therefore, there will be no effect on the southwestern willow flycatcher by the implementation of the proposed program in Colorado, North Dakota, South Dakota, Iowa, Nebraska, Nevada, Kansas, Missouri, Montana, Idaho, Oregon, Washington, Utah, and Wyoming.

Johnston's frankenia – Johnston's frankenia (*Frankenia johnstonii*) is a plant that was listed as endangered on August 7, 1984 (49 Federal Register (FR) 31418–31421). This species, once thought to be quite limited in distribution, has now been found at about 30 sites in southern Texas and northern Mexico. A proposed rule to delist this species was published in the FR by FWS on May 22, 2003 (68 FR 27961). Based on host specificity testing, *D. e. deserticola* is not expected to have any effect on

this plant (Lewis *et al.*, 2003b). FWS has concurred with this finding. In addition, the program does not intend to release *D. e. deserticola* in Texas where this plant occurs, and the insect would not establish in Texas since it is not adapted to the daylength/temperature of Texas and Mexico.

C. Integrated Pest Management

Herbicides

In addition to being expensive, control tactics based on the use of herbicides can lead to negative environmental side effects including undesirable chemical residues both in the ecosystem (soil, water), and in commodities (milk, meat), as well as adverse effects on non-target organisms. Herbicides are not always practical in inaccessible areas.

(1) Imazapyr (Arsenal®)

Imazapyr is used to control grasses and broadleaved weeds, brush, vines, and many deciduous trees. It is absorbed by the leaves and roots, and moves rapidly through the plant. Imazapyr and its formulations are low in toxicity to invertebrates and practically nontoxic to fish. Imazapyr is practically nontoxic to mammals and birds. The acute oral median lethal dose (LD_{50}) in birds was greater than 2,150 mg/kg and 4,800 to greater than 5,000 mg/kg for mammals. In tests in rats, the acute oral LD_{50} was greater than 5,000 mg/kg. Imazapyr can remain active in the soil for 6 months to 2 years. Imazapyr may be broken down by exposure to sunlight and soil microorganisms.

(2) Metsulfuron methyl (Escort®XP)

Metsulfuron methyl is a selective herbicide used to control broadleaf weeds and some grasses. The acute oral LD_{50} for metsulfuron methyl was greater than 5,000 mg/kg in male and female rats. It is practically nontoxic to fish, aquatic invertebrates, birds, and mammals. Metsulfuron methyl is not classified as a carcinogen, mutagen, teratogen, or reproductive inhibitor. The half-life of metsulfuron methyl can range from 120 to 180 days (in silt loam soil). It has the potential to contaminate groundwater at very low concentrations. Metsulfuron methyl leaches through silt loam and sand soils. Because it is soluble in water, there is a potential for surface waters to be contaminated if it is applied directly to water or wetlands.

(3) Fosamine ammonium (Krenite®S)

Fosamine ammonium is an herbicide/plant growth regulator. The oral LD_{50} is 24,400 mg/kg in non-fasted male rats and greater than 7,380 mg/kg in guinea pigs. In test dogs fed 10,000 ppm, there was no nutritional, clinical hematological, biochemical, urinary, or gross pathological evidence of toxicity. No reproductive effects were seen at 5,000 ppm, the highest level fed. Fosamine ammonium is not teratogenic or embryotoxic in rats at 10,000 ppm, the highest level fed. It is safe to fish and wildlife. It is rapidly decomposed by soil microorganisms with a soil half-life of about 7 to 10 days.

(4) Triclopyr (Garlon* 4, Remedy*)

Triclopyr is a selective systemic herbicide used for control of woody and broadleaf plants. The oral LD_{50} ranges from 2,000 to 3,000 mg/kg for various formulated triclopyr products. Triclopyr is slightly toxic to birds and practically nontoxic to fish. It has the potential to be mobile in soil and is degraded rapidly by soil microorganisms. Triclopyr is degraded mainly by sunlight when in water.

(5) Glyphosate (Rodeo®, Roundup Original™)

Glyphosate is a broad-spectrum, systemic, General Use herbicide. It is practically nontoxic by ingestion with a reported acute oral LD_{50} of 5,600 mg/kg in rats. It is practically nontoxic by skin exposure with dermal values of greater than 5,000 mg/kg. No chronic toxicity, reproductive, teratogenic, mutagenic, or carcinogenic effects have been observed from glyphosate. It is only slightly toxic to wild birds and aquatic invertebrates and practically nontoxic to fish.

Glyphosate is moderately persistent in soil with an estimated half-life of 47 days. Although it is highly soluble in water, it does not leach appreciably and has low potential for runoff. Microbes are primarily responsible for breakdown of glyphosate; volatilization or photodegradation losses are negligible.

Mechanical/Physical Control

Mechanical and physical methods for controlling saltcedar include mowing, sawing, chaining or ripping, hand pulling, and bulldozing. While all of these methods have been used to manage saltcedar, they have not eradicated saltcedar stands because they do not destroy all of the

subsurface root crowns. Remaining root crowns regrow vigorously and can reach a height of 9 feet or more in one season. Mechanical and physical methods are non-selective, resulting in removal of all plants in an infested area.

Flooding

Older saltcedar plants are more tolerant and survive inundation more readily than many native plant species, though first-year plants are easily killed by flooding.

Fire

Saltcedar is a fire-adapted species and sprouts vigorously after burning; flowering and seed production also increase after fire. However, fire prevents most saltcedar stands from either reaching maturity or persisting as mature communities (Barranco, 2001).

Biological Control

The environmental impacts are the same as those described under alternative B, biological control.

Other Environmental Statutes

Executive Order (EO)12898, "Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations," focuses Federal attention on the environmental and human health conditions of minority and low-income communities and promotes community access to public information and public participation in matters relating to human health or the environment. This EO requires Federal agencies to conduct their programs, policies, and activities that substantially affect human health or the environment in a manner so as not to exclude persons and populations from participation in or benefitting from such programs. It also enforces existing statutes to prevent minority and low-income communities from being subjected to disproportionately high and adverse human health or environmental effects. Each alternative was analyzed in its ability to affect minority and low-income populations. None of the alternatives were found to pose disproportionately high or adverse human health or environmental effects to any specific minority or low-income group.

EO 13045, “Protection of Children from Environmental Health Risks and Safety Risks,” acknowledges that children may suffer disproportionately

from environmental health and safety risks because of their developmental stage, greater metabolic activity levels, and behavior patterns, as compared to adults. The EO (to the extent permitted by law and consistent with the agency's mission) requires each Federal agency to identify, assess, and address environmental health risks and safety risks that may disproportionately affect children. None of the alternatives are expected to have disproportionately high or adverse human health or environmental effects to children.

V. Listing of Agencies and Persons Consulted

Environmental Services
Policy and Program Development
Animal and Plant Health Inspection Service
U.S. Department of Agriculture
4700 River Road, Unit 149
Riverdale, MD 20737

Animal and Plant Health Inspection Service
U.S. Department of Agriculture, Western Region
2150 Centre Ave., Bldg. B, MS 3E10
Fort Collins, CO 80526–8117

Grassland/Soil/Water Research Laboratory
Agricultural Research Service
U.S. Department of Agriculture
808 E. Blackland Rd.
Temple, TX 76502

VI. Literature Cited

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