

A proposal titled:

**Implementing Biological Control of Saltcedar in the  
Upper Colorado River Watershed**

submitted to the

**TEXAS WATER DEVELOPMENT BOARD  
AGRICULTURAL WATER CONSERVATION GRANT PROGRAM**

By

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January, 2005

# Implementing Biological Control of Saltcedar in the Upper Colorado River Watershed.

## I. GENERAL INFORMATION:

### 1. Principle Investigator:

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4. The authority of the applicant to conduct this project, the amount of the requested funding, and the authorized representative is shown on the attached Form Contracts and Grants, AG-105.

5. This project will be conducted in cooperation with the Colorado River Municipal Water Authority and will be implemented in Upper Colorado River Basin, specifically the vicinity of the Lake Thomas reservoir, tributaries above Lake Thomas, and at Big Springs, Texas, along Beals Creek to its headwaters. A map of this area is included on the last page of this proposal.

6. Is the application in response to a Request for Applications in the Texas Register? Yes

7. This proposal responds to a Request for Applications in the Texas Register, Document TRD 200407354, December 15, 2004.

### 8. Brief Summary of Agricultural Water Conservation Activity:

We propose to implement a biological control program to suppress saltcedar infestations in west Texas. Saltcedar is an exotic, invasive shrub that infests some 500,000 acres along waterways in west Texas. Dense stands of saltcedar along stream, rivers and reservoirs consume large amounts of water, deplete surface and ground water resources and aggravate the long term drought in this region. The Texas Invasive Species Task Force has identified saltcedar among the "worst of the worst" invasive species in Texas

The program will focus on establishing and distributing an exotic beetle which consumes the foliage of saltcedar. Feeding damage by this beetle should make saltcedar less competitive

with native plants and lead to a reduction in saltcedar infestations. This proposal builds on some 17 years of research conducted by the USDA Agricultural Research Service at Temple, Texas. This research has demonstrated that the saltcedar leaf beetle feeds only on saltcedar (genus *Tamarix*) and does not attack any plant of economic importance or any endangered species of plant. Release of this beetle in Texas has been approved by the USDA Animal and Plant Health Inspection Service, federal and state offices of the Fish and Wildlife Service and the Texas Department of Agriculture.

The project will be conducted in cooperation with the Colorado River Municipal Water District, Big Spring, TX which supplies water to 450,000 residents of West Texas, including the cities of Midland, Odessa, Big Springs, San Angelo and Abilene. Saltcedar grows along the Colorado River and its tributaries and extensive stands of saltcedar infest the reservoirs at Lake Thomas, Lake Ivie and Lake Spence. The receding water level in these reservoirs, due to the long-term drought in West Texas, has created mud flats which are ideal for establishment of saltcedar seedling. As a result, saltcedar now infests an estimated 22,000 acres in the upper basin of the Colorado River and consumes more district water annually than the city of Odessa. Saltcedar infestations are equally serve along all of the major rivers of West Texas, including the Pecos, Brazos, Red and Canadian Rivers and tributaries.

This beetle was released at three sites near Big Spring, Texas in 2003-2004 and a small populations has established in the field. This proposal seeks funds to increase beetle numbers and re-distribute them along saltcedar infested areas of the Upper Colorado River and its tributaries. This mass rearing and redistribution program is needed to speed the increase and spread of beetles and maximize their potential benefit in reducing saltcedar infestations. Funds will also support research into methods for improving establishment of released beetles.

Project cooperators include Okla Thorton, Natural Resource Manager, Colorado River Municipal Water Authority, Extension Agents in Borden and Howard Counties, Dr. Jack DeLoach, USDA-ARS Research Entomologist at Temple, Natural Resources and Conservation Service staff in Big Spring and cooperating landowners in the Upper Colorado River basin. Beetles will be mass reared in large field cages located in the area and released at selected sites along the Upper Colorado River and its tributaries at Lake Thomas and Beals Creek.. The rate of beetle establishment and increase and damage to saltcedar will be documented at each release site and evaluated to improve establishment success. Program efforts in the Upper Colorado basin will provide the experience and techniques to expand the biological control program state-wide in future years.

## 9. Proposed Budget.

The budget provides for travel (\$700) and wages and fringe (\$8,877) for one part-time field technician to assist with rearing and releasing beetles at selected sites and collecting data on beetle establishment and impact on saltcedar growth and survival. The cost of field cages and additional travel and wages will be supplemented with a federal CSREES grant which provides funding through August, 2005. The total amount requested from the Texas Water Development Board is \$9,577.

## 10. Predicted water conservation benefits expected from this project.

Recent studies by Texas A&M University have shown that along the upper portion of the Pecos River in Texas, an acre of dense saltcedar consumes an estimated 5-7 acre feet of water, or 2.5 million gallons, each year. The high water consumption resulting from extensive stands of saltcedar is especially serious in west Texas where long-term drought conditions have prevailed since 1992. Reduction in saltcedar infestations is a goal of the Colorado Municipal Water Authority. A program to apply herbicides by air is planned in 2005 to reduce saltcedar

infestations in the Upper Colorado River watershed at an estimated cost of \$ 3.2 million. The proposed project to establish saltcedar beetles will compliment this project by potentially suppressing saltcedar regrowth, re-infestation by seedling in the herbicide treated area and by attacking saltcedar in areas where infestations are too limited to justify the high cost of aerial herbicide treatment.

The net amount of water saved by controlling saltcedar is difficult to predict because native trees and shrubs will re-establish and consume water. However, roots of saltcedar can grow deeper than native cottonwoods and willows and as a result saltcedar can extend across more of the river basin, tapping deeper layers of water. This suggests there will be a net water savings in those areas where saltcedar is replaced by native vegetation.

11. Conservation plan, program of work, or other description of the applicant's commitment to water conservation.

The principal investigator has conducted research on saltcedar beetles and saltcedar biological control for six years in cooperation with Dr. Jack DeLoach, Research Entomologist at the USDA-ARS Research Laboratory in Temple, Texas. These efforts have lead to the identification of a strain of saltcedar beetle adapted to the environment of Texas and the release and successful establishment of saltcedar beetles in Texas. This work has been conducted in close cooperation and assistance from the Colorado River Municipal Water Authority.

12. Biological control of saltcedar is a water conservation management strategy consistent with item 8.6 *Brush Management* as identified in the State Water Plan.

## **II. AGRICULTURAL WATER CONSERVATION PROGRAM/PROJECT INFORMATION.**

13. Explanation of why this activity is needed.

Saltcedar is an exotic plant, introduced into the US in the 1800s as an ornamental and later planted along waterways and stream banks for erosion control. Saltcedar soon naturalized and by the 1920 was rapidly spreading throughout water sheds in Texas and adjacent states. Today, saltcedar infests an estimated 500,000 acres of stream bank and water courses in Texas. Saltcedar is an aggressive invader, grows in extensive, uniform stands and displaces native vegetation. The greatest economic impact of saltcedar is the high water use of extensive saltcedar stands. Studies have shown that along the upper portion of the Pecos River in Texas, an acre of dense saltcedar consumes an estimated 5-7 acre feet of water, or 2.5 million gallons, each year. Roots of saltcedar can grow deeper than native cottonwoods and willows and as a result saltcedar can extend across more of the river basin, tapping deeper layers of water.

The high water consumption resulting from extensive stands of saltcedar is especially serious in west Texas where long-term drought conditions have prevailed since 1992. In 2002, the combined capacity of the Colorado River Municipal Water Authority's three reservoirs fell below 25%. These reservoirs provide water to 450,000 citizens in west central Texas, including the cities of Midland, Odessa, Big Spring and Abilene. There is an estimated 16,000 acres of saltcedar in the basins of these reservoirs and an additional 6,000 acres grow along the Colorado River and its tributaries. The Colorado River Municipal Water Authority estimates that saltcedar annually consumes enough water to meet the yearly needs of the city of Odessa.

Area-wide control of saltcedar can be achieved with herbicides applied by helicopter or airplane at a cost of about \$200 per acre. In recent years, 6,300 acres of saltcedar have been treated with herbicide along the Pecos River in Texas. A program planned for 2005 to apply herbicide to the 22,000 acres of saltcedar in the Upper Colorado will cost an estimated \$3.2 million. Also, herbicides are toxic to native trees and plants, limiting their use to areas where

saltcedar dominates.

Biological control uses natural enemies to limit the competitiveness of exotic plants like saltcedar. Biological control programs using imported natural enemies has been used to control rangeland and aquatic weeds for many years in the US and is currently being used to control maleluca in Florida, purple loosestrife in the northern states, leafy spurge in the plains states, and yellow star thistle in California. This approach is closely regulated by state and federal agencies and has a long history of safety and effectiveness.

Saltcedar is an excellent target for biological control as it is widely regarded as a pest species and has no close relatives in North America, reducing the risk that imported natural enemies could damage non-target plants. Saltcedar is a native of Europe and Asia, and was introduced without the many natural enemies which attack it in its native home. The saltcedar beetle will help re-establish the natural enemy complex that is expected to suppress saltcedar survival and reproduction, making it less competitive with native plants. Biological control will not eradicate saltcedar, and it is much slower than the use of herbicides. However, once populations of natural control agents are established, they are self-sustaining and no additional releases are necessary.

Biological control has the potential to provide a low-cost and sustainable compliment and in many areas an alternative to the sole reliance on herbicides for area-wide management of saltcedar in west Texas. Aerial application of herbicides is best suited to extensive, monotypic stands of saltcedar as costs are minimized and there are few or no native trees which are killed by the herbicide. Herbicide programs are not cost-effective when saltcedar stands are small and intermixed with desirable native vegetation. Biological control is well suited to both situations. The saltcedar beetles are highly specific, feeding only on saltcedar, and thus effective where saltcedar is mixed with native trees. Once saltcedar infestations are reduced by herbicides or natural enemies, it is expected that saltcedar beetles will persist at low levels and feed on seedling plants, thus limiting re-invasion of treated areas by saltcedar. In fact, the value of these beetles may be especially significant in the control of seedling plants which invade newly exposed mud flats and regrowth from root pieces which re-infest areas cleared of saltcedar by herbicides, fire or mechanical means.

#### 14. Scope of work, tasks and time schedule.

The objectives of the project are to:

1. Establish nursery sites for rearing large numbers of saltcedar beetles in field cages in west Texas. April-August, 2005.
2. Collect beetles from the nursery cages and release them at selected sites on the upper Colorado River and its tributaries in cooperation with the Colorado River Municipal Water Authority and local landowners. April-August, 2005.
3. Determine the establishment rate and quantify the increase in beetle numbers, their dispersal from the release site and the defoliation of saltcedar trees by beetles. June, 2005-April, 2006.
4. Conduct research to improve establishment rate by optimizing the number of beetles released, timing of release, methods to reduce beetle predators, and cutting back trees to stimulate new growth attractive to egg-laying beetles. June-November, 2005

The project will build on the success of establishing populations of saltcedar beetles in large field cages and at one open field site in west Texas in 2004. These insects will provide the source for increasing the beetle population during 2005-06 so that additional releases can be made at other sites. Additional large cages, 10X10X6 feet, will be placed over saltcedar trees in February, 2005 at protected sites on private land near Big Spring. Trees will be closely

pruned to stimulate new growth in the spring needed to support large numbers of beetle larvae. Beetles overwintering in cages already located at these sites will emerge in mid-April and will be collected from the overwintering cages and distributed among the nursery cages. Ten to 15 nursery cages will be established, depending upon the number of beetles which are collected in the spring. Based upon previous years, the first generation of beetles should emerge as adults in early June in these cages. Each cage should generate about 1,000 adults for a total of 10,000 beetle from the ten cages. These beetles will be packaged and transported to the release sites. Nursery cages will be relocated to new trees and inoculated with 50 adults per cage. A second generation should be completed in about 5-6 weeks, again yielding about 10,000 total beetles. This process will be continued through the summer, generating large numbers of beetles for re-distribution.

Release sites will be selected based aerial photographs showing saltcedar stands along the Upper Colorado River and its tributaries. These photographs are available from the ARS Remote Sensing Laboratory at Mission, Texas. Staff at the Natural Resource Conservation Service in Big Spring will also provide mapping assistance to locate saltcedar. County Extension Agents will assist in identifying and contacting private landowners and the Upper Colorado River Authority will assist with releases on land managed by this agency. We anticipate releasing 500-1000 beetles at each site. Depending upon the number of beetles produced in the nursery cages, beetles will be released at about 30 sites. Three to four trees at each release site will be closely pruned about 8 weeks prior to release to allow abundant regrowth which can maintain large numbers of larvae. Beetles will be released onto these trees and the coordinates of the trees determined by GPS to aid in mapping the sites by GIS.

Following release of beetles, each release site will be monitored once every two weeks through September and once a month in October and November. Monitoring will include a record of the number of beetles and larvae present per tree, the distance beetles have moved from the release site, density of beetle predators (spiders, lady beetles and assassin bugs) and the degree of defoliation resulting from beetle feeding. Results will demonstrate the success of establishing beetles, their rate of increase and dispersal and their feeding damage to saltcedar trees.

Beetles are inactive during the winter and begin feeding when saltcedar buds break in mid-April. Monitoring will resume at this time to determine the success of beetles in overwintering at each site and their increase during the spring. Sites in which beetles are established will be monitored once every four weeks in 2006 to continue to measure beetle dispersal and impact on saltcedar. Nursery cages will again be established in the spring of 2006 to generate adults for release at additional sites in 2006.

These source populations will naturally increase and disperse to adjacent saltcedar infestations and eventually spread throughout the upper basin. These populations will then serve as field nurseries from which beetles can be collected and distributed to other areas throughout west Texas. The subsequent, long-term suppression of saltcedar should have a very positive impact on water resources in west Texas.

A minimum of two public educational meetings and field tours will be conducted each year in cooperation with local Texas Cooperative Extension agents to provide an opportunity for area land owners and managers to learn about biological control of saltcedar. Information on the project will also be posted on the Texas A&M Department of Entomology web site for biological control of weeds at [bc4weeds.tamu.edu](http://bc4weeds.tamu.edu).

## 15. Task and Expense Category Budget.

The budget provides partial support for salary and fringe for one technician during 2005 to assist with rearing saltcedar beetles in large field cage and collecting beetles from field sites where the beetle is established. The technician will also assist in working with the Colorado

River Municipal Water Authority, NRCS staff and County Extension Agents to identify cooperating ranchers and landowners and map saltcedar infestations, and assist with collecting and releasing beetles at release sites, and collecting data on beetle establishment and damage to saltcedar. These activities will be supplemented by a federal CSREES grant which expires August, 2005.

#### TASK BUDGET, 2005

Task Description	\$ Amount
Rearing Saltcedar Beetles in Large Cages and at Field Nursery Sites	\$2,000
Identifying and Mapping Saltcedar Infestations and Cooperating Ranchers	\$1,000
Transporting and Releasing Beetles at Sites along Colorado River	\$1,500
Monitoring Beetle Establishment and Impact on Saltcedar at Release Sites	\$4,500

#### EXPENSE CATEGORY

Salary for one field technician during 2005	\$8,200
Fringe, 8.25%	677
Travel	\$ 700
Total requested from the Texas Water Development Board	\$9,577

#### 16. Products that the TWDB will receive.

A final technical report will be provided annually to TWDB in February, or upon request, detailing the location of each of the ca. 30 release sites, the success of beetle establishment, the impact of beetles on saltcedar growth and survival and the number of ranchers and landowners cooperating in this program. Data collected every two weeks will be summarized to show the number of beetles released, dates of release, the number of beetles and their different stages, extent of saltcedar defoliation resulting from beetle feeding, and dispersal of saltcedar beetles from the original release site. Results will demonstrate the success of establishing beetles, their rate of increase and dispersal and their feeding damage to saltcedar trees and provide the understanding to expand the implementation program to other regions of west Texas.

#### 17. Description of monitoring procedures.

Each of the proposed release sites will be monitored every two weeks from June-September to determine beetle establishment, dispersal and impact on saltcedar. On each sample date following the release of beetles, the number of saltcedar beetles and larvae will be determined by a visual search of the release tree and adjacent trees until no beetles are found in ten consecutive trees. Samples will be collected along eight transects radiating from the central release tree. For trees with beetles, percent defoliation will be estimated visually with a

standard reference. Data on the number of beetle predators (spiders, assassin bugs, ants), soil texture, elevation, tree density, foliage quality (nitrogen and water content) will also be recorded to identify factors related to beetle establishment and population increase.

18. Qualifications and experience of staff directly related to this application.

Dr. Allen Knutson, Professor and Extension Entomologist, Texas A&M Research and Extension Center, Dallas. Dr. Knutson has 24 years experience in integrated pest management in Texas and has worked for six years on the saltcedar beetle and biological control of saltcedar.

Dr. Jack DeLoach is the Research Entomologist at the USDA Laboratory at Temple and an internationally recognized expert in biological control of weeds and particularly saltcedar. He has lead the research effort on biological control of saltcedar for 17 years and conducts research on saltcedar biological control in north-central, west and southwest Texas.

Dr. Okla Thorton is the Natural Resource Manager for the Colorado River Municipal Water District and has provided support and assistance to Drs. DeLoach and Knutson to establish saltcedar beetles for saltcedar control at sites near Big Spring and the Upper Colorado River.

Brady Gotcher has a B. S. degree in biology and is a research technician at Texas A&M Research and Extension Center and worked on the biological control project with Dr. Knutson in 2004. Jeremy Hudgeons is a graduate student in the Entomology Department, Texas A&M and is conducting research on the dispersal and impact of saltcedar beetle on saltcedar in Texas for his Masters program. He worked closely with the biological control project in 2004 and will continue his research and support of this project in 2005.

County Extension Agents in Borden and Howard Counties will assist in identifying local landowners interested in cooperating with the beetle release and evaluation program and the educational outreach regarding the program.

### **III. Written Assurances.**

19. Documentation of supplemental funding from the CSREES grant, effective through August, 2005, is available upon request.

20. This proposed implementation and research program does not duplicate any other program in the Upper Colorado River and compliments the planned aerial herbicide program against saltcedar.

21. The proposed project is designed and dependent upon the involvement of the Colorado River Municipal Water Authority and local ranchers and landowners for its success. Biological control of saltcedar is a water conservation management strategy consistent with item 8.6 *Brush Management* as identified in the State Water Plan.

Figure. Upper Colorado River, TX hydrologic units, saltcedar infestation levels (1982), municipal water district, and saltcedar beetle release sites.

# Colorado-Concho Watersheds of the Colorado River Municipal Water District

