

Management Methods: Physical Methods

PHYSICAL METHODS AS PART OF AN INTEGRATED MANAGEMENT AND RESTORATION PROGRAM: Bosque del Apache NWR, New Mexico

Introduction

Physical methods play an important role in efforts to restore saltcedar-infested sites on the Bosque del Apache NWR in New Mexico. For over two decades, researchers and refuge staff have joined forces to evaluate a variety of combined methods and tactics to control and remove saltcedar plants, and reestablish native riparian vegetation.

The Bosque

Southwestern riparian woodlands, or bosque, provide critical habitat for wildlife in an otherwise arid landscape. Historically, the natural cycles of flood disturbance helped to maintain diverse riparian vegetation communities, such as open cottonwood (*Populus* spp.)-willow (*Salix* spp.) forests and saltgrass (*Distichlis spicata*) meadows.

As with many southwestern river systems, the Rio Grande's riparian zone has irreversibly changed in response to the river's "taming" in the early 20th century. The Rio Grande was historically a braided, meandering river that moved 2,000 to 3,000 feet across the valley floor. After major flood control structures were built in the 1950s, the river was a uniform 600 feet wide with levees and jetty jacks holding it in place. The river channel continues to narrow today.

Invasion

Changes in the annual river flow patterns, damming and diverting off the main stem, and a constricted floodplain altered late spring flooding events, which are vital to the regeneration of native trees and shrubs. As irrigation developments impaired the regeneration process for native bosque plant communities, thickets of saltcedar (*Tamarix* spp.) established in the place of cottonwood stands.

Conversion from open cottonwood-willow forests and saltgrass meadows to dense saltcedar thickets has resulted in altered biological communities and ecological processes. Saltcedar infestations on a site can increase fire frequency, change biological diversity, and increase soil salinity as plants deposit salt-laden leaves onto the soil, creating unfavorable conditions for other plant species.

Saltcedar

Saltcedar, or *tamarisk*, is a small invasive tree introduced from Asia early last century for use in flood control and landscaping. Saltcedar plants may grow from both seed and root fragments. These reproductive mechanisms and the capacity to resprout from root crowns make saltcedar well adapted to survive fire and physical injury.

Managing Invasive Plants: Concepts, Principles, and Practices

Saltcedar is a phreatophyte, meaning that its roots can draw moisture from the saturated zones above the water table and from less saturated soils in areas with deeper water tables. This characteristic enables saltcedar plants to tolerate extreme drought conditions compared to native riparian trees and shrubs. When conditions are good, saltcedar plants can consume great volumes of water.

Strategies

1987 marked the beginning of major restoration efforts to reclaim the riparian woodlands on the Bosque del Apache NWR that were disappearing as saltcedar infestations expanded.

Four general restoration strategies were implemented. While no single management method will accomplish all four strategies, researchers and refuge staff work to identify combinations of management methods and tactics that will.

Physical Methods

Physical methods such as bulldozing, chaining, excavating, and cutting are used to remove the aerial and underground portions of the plant. Root plow blades must be set to cut root crowns at least two feet below the soil surface to limit resprouting. However, unless these methods are repeated or combined with other methods, resprouting may occur from intact saltcedar root crowns or root fragments left in the soil.

Chemical Methods

Chemical methods deliver herbicide by aerial and backpack spraying. While foliar-applied herbicides can effectively kill or defoliate saltcedar top-growth, resprouting may be substantial. In addition, dense thickets of dead standing plants may provide fuels for wildfires and interfere with regeneration of desirable species. Following physical methods, herbicides can be effective in controlling resprouting.

Burning

Used alone on live saltcedar, prescribed burning may be more effective in promoting than suppressing the plant, and may in fact suppress fire-intolerant native vegetation. While prescribed fires rarely burn hot enough to kill saltcedar root crowns, controlled burning can be a cost-effective and efficient method for removing the dead standing plants killed by herbicide application, or to prevent resprouting from bulldozed and root plowed debris that is raked into piles.

Flooding

Even with complete control and removal of saltcedar infestations, without spring floods to create muddy seedbeds for riparian species germination, regeneration of native vegetation is unlikely. Managed flooding and correctly timed draw-down periods are used to reduce saltcedar seedling establishment and promote native plant regeneration. Seeding and planting native plant species is also used in areas where inundation is not feasible.

Managing Invasive Plants: Concepts, Principles, and Practices

Much of the bosque within the refuge is irrigated occasionally to mimic historic flood processes. Since the natural hydrology has been permanently altered, flooding treatments will need to be continued for the long term to maintain a diverse age structure within cottonwood populations. On the historic floodplain, that means irrigation; on the active floodplain, it means environmental flow management.

Success

In general, saltcedar management involves multiple techniques to achieve successful control, including native plant establishment to compete with new saltcedar seedlings. In this example, physical methods provide an important element to integrated management approaches by removing, injuring, and killing target plants, and enhancing growing conditions for desirable plant communities.

Since restoration efforts began in 1987, most of the approximately 8,000 acres of historic floodplain on the refuge have been successfully revegetated or they are presently being restored. Next, the refuge moves to restoration on the active floodplain. Through the planning, monitoring, and implementation process, refuge staff and collaborating researchers identify which combination of methods and tactics are most cost-effective for controlling saltcedar and restoring desirable plant communities.

Continued research and monitoring at Bosque del Apache NWR provides a growing knowledge base upon which future management decisions can be made both on and off refuge lands.

Learn More

Bosque del Apache NWR

<http://www.fws.gov/southwest/refuges/newmex/bosque>

New Mexico State University - Saltcedar Information

<http://agesvr1.nmsu.edu/saltcedar/Index.htm>

Research Needs on the Middle Rio Grande: Management changes in response to a changing environment

http://weedcenter.org/tamarisk_conf_06/powerpoints/dello_russo.pdf

Saltcedar Restoration Research

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