TechLine

Information About Invasive/Exotic Plant Management — Fall 2004

Native Species Respond Better to Integrated Approach

Russian Knapweed Management in Riparian Areas Improves Wildlife Habitat

By Charles Henry
TechLine Editor

"The land ethic simply enlarges the boundaries of the community to include not only people, but also soils, waters, plants, and animals, or collectively: the land."

... Aldo Leopold

A Montana State University graduate student's research project in eastern Montana reveals solid management strategies for controlling invasive species in riparian areas. Steve Laufenberg, working under USDA-ARS ecologist Roger Sheley and MSU ecologist and researcher Jim Jacobs, examined various herbicide and revegetation treatments to control Russian knapweed [*Acroptilon repens* (L.) DC.]

"We conducted two concurrent studies along the Missouri River in the Charles M. Russell National Wildlife Refuge north of Lewistown," Jacobs explains. In the first, the researchers compared two herbicide treatments and four seeding methods. In the second, they compared three herbicides at three different rates and three different application timings **(***The second study "Comparative Herbicide Study in Riparian Area" will appear in the next TechLine***).**

Jacobs says that two years after treatment there is clear evidence that Russian knapweed can be controlled in riparian areas and that native plant species can be re-established successfully, however, there is a "the rest of the story" aspect to their research.


Jim Jacobs, MSU Ecologist, Bozeman, MT.

"If you have a good grass understory, you can control Russian knapweed and restore the grass with Curtail® herbicide to improve the habitat. We increased

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Habitat Critical to Many Species

"Because of its location along the Missouri River within the CMR National Wildlife Refuge, Knox Bottom provides critical wildlife habitat and continues to be managed for wildlife conservation," says Steve Henry, ecologist with the U.S. Fish & Wildlife Service that manages the refuge. "This study was conducted in a river bottom that represents one of the last, intact cottonwood-willow riparian reaches along the upper Missouri River. This bottom provided critical winter range for elk, mule deer, and to a lesser degree, white-tailed deer. The site is used extensively by migratory song birds as well as by wading birds such as great blue heron and is one of the most biodiverse habitats on the refuge. Leafy surge infests nearby sites, but was not present in the study area. The Russian knapweed was mixed with western wheatgrass (*Pascopyrum smithii*) and snowberry (*Symphoricarpos occidentalis*) as well as non-native species such as quackgrass (*Elytrigia repens*), bluegrass (*Poa pratensis*), and annual mustards (*Brassicaceae* family).

Henry says invasive species, especially Russian knapweed, are converting this important native habitat back into non-native monocultures that have significantly reduced habitat value. If these areas are lost, big game will move elsewhere, perhaps onto surrounding agricultural lands, which can cause problems for our neighbors, he explains. "Our goal is to keep the wildlife on the refuge."

As much as 80-90% of upper Missouri River bottomlands have already been lost to noxious weeds, he explains. "As land managers, we can get rid of the weeds, but we want to find ways to keep weeds out after re-establishment of native species. Ideally, we would like to 'weed-proof' native plant communities to the greatest extent possible."

"The Montana State have provided the refuge with management techniques to accomplish these goals and our future management decisions will have a solid theoretical foundation thanks to this work," Henry says. "I also believe that what we are learning here will be readily transferable to other refuges and riparian sites. The particular species may be different, but the functional group theory underlying management will be the same," he concludes.

"Riparian Revegetation"

Continued from page 1

native grass production by 40% with Curtail regardless of the application rate we tested," he explained. "We increased the non-native grasses by 20% and they may be more competitive with the knapweed than the natives because the non-natives occupy more niches and use more resources than the natives."

When do you need to go in and reseed? "If native grasses have to compete with non-natives after the Russian knapweed is controlled, then we think you should reseed. If the native species predominate after the knapweed is controlled, then the expense of reseeding is not justified," Jacobs says.

Jacobs says the study was located on two sites on a floodplain known as Knox Bottom along the Missouri River, near the western boundary of the refuge. The site's aspect was negligible with 0% slope at 2,260 feet elevation; with an average precipitation of 11.8 inches and an average annual temperature of 44 degrees F. Soil at the sight was a Kobar silty clay loam (fine, montmorillonitic Borollic Camborthid).

The study site was located within the silver sage/western wheatgrass (*Artemisia cana/Agropyron smithii*) habitat type. This habitat type, common in central and eastern Montana, represents one of the driest extremes of the riparian zone. The plant community consists of native and non-native grasses and forbs. The non-native invader Russian knapweed was abundant at the study area and had displaced desirable plant species.

The silver sage/western wheatgrass habitat type typically occurs as a result of disturbance, where site potential has changed, possibly due to agricultural activity, according to Jacobs. Land use at this area over the past century (approximately 1920s - 1980s) has included crop production and cattle grazing. Throughout that period, cattle were moved from upland summer pastures to the river bottoms for winter grazing. In addition, flooding from the Missouri River occurs with varying frequency and intensity (***see "Habitat Critical to Many Species"***).

In a split plot design, Curtail herbicide and Rodeo herbicide were applied and the plots were seeded in October with ten native species (***see sidebar "Experimental Design"***). Applications were applied based on herbicide label rates and in accordance with CMR National Wildlife Refuge and U.S. Fish & Wildlife Service restrictions. Herbicides were chosen because of their low environmental risk in areas near water and wildlife.

"Some sort of tilling before seeding did yield good results with this weed, so it would be practical to revegetate sites where some tillage is possible. The herbicide versus no herbicide factor was also critical. Without the herbicide treatments before seeding, we had very poor native species establishment."

Results

The goal of this study was to restore native grass species and increase diversity of forbs, grasses and shrubs in a site dominated with Russian knapweed and quackgrass, according to Jacobs. "We wanted to determine the best and most economical seeding methods in combination with different herbicides to achieve the stated goal. Four seeding methods (broadcast, imprint, no-till drill, and till and drill) plus a control were employed. In the split plot design, the seeding methods were the whole plots and the herbicide treatments were the subplots. We applied Rodeo herbicide at a rate of 2 qt./acre, Curtail herbicide at a rate of 2 qt./acre, plus a no herbicide control. The herbicides were applied the day before the plots were seeded."

Jacobs explains that the seeding was designed to fill in functional groups of species, filling as many niches

See "Riparian Revegetation" on page 12

Experimental Design

In a split-plot design, 15 treatments (4 seeding methods with an unseeded control, and 2 herbicides with an untreated control) were applied in 2001, where the five seeding methods were the whole plots and the three herbicide treatments were the sub-plots. The 15 treatments were replicated six times at one site for a total of 90 plots. Both Curtail and Rodeo were applied at rates of 2.0 qt./acre in August 2001 (flowering stage of Russian knapweed).

Plots were seeded in October 2001 with an equal mixture of ten native species at a seeding rate of 20 lb./acre. Species consisted of Sandberg's bluegrass (*Poa secunda Presl.*), 'Mandan' Canada wildrye (*Elymus canadensis L.*), 'Lodorm' green needlegrass [*Nassella viridula (Trin.)* Barkworth], 'Secar' bluebunch wheatgrass [*Pseudoroegneria spicata* (Pursh) A. Love], 'Rosana' western wheatgrass (*Pascopyrum smithii* P.A. Love), 'Critana' thickspike wheatgrass [*Elymus lanceolatus* (Scrib. & Smith) Gould], 'Birds eye' blue grama [*Bouteloua gracilis* (Willd. ex Kunth) Lag. ex Griffiths], 'Texoka' buffalo grass [*Buchloe dactyloides* (Nutt.) Engelm.], western snowberry (*Symphoricarpos occidentalis* Hook.), and silver sage (*Artemisia cana* Pursh). Seeded native species were chosen based on adaptability to regional climatic and soil characteristics of the study area. Although this study investigated short-term (i.e. establishment) effects, seeded species were selected based on long-term goals of sustainable structure and function of the plant community. The ten seeded species represent some diversity of physiological and morphological parameters, and were subjectively classified into five different functional groups of species.

Species were seeded using four different seeding methods: broadcast, imprint, no-till drill, or till and drill. Due to abundant litter and post-herbicide aboveground biomass, plots receiving seeding method treatments were initially mowed and harrowed. The broadcast method included rototilling the upper 3-4 inches of soil surface, hand broadcasting seeds uniformly throughout the plot, and gently raking the soil surface to ensure sufficient seed-to-soil contact. The imprint method represents small depressions (imprints) in the soil surface designed to provide "pools" of water and nutrients that will potentially enhance seedling germination. In plots receiving this seeding method, an AerWay® was pulled behind a tractor. Seeds were then hand broadcast uniformly throughout the plot without bias to the location of the divots, and the soil surface was lightly raked. The no-till drill method consisted of drill seeding the species mixture after plots had been mowed and harrowed. The till and drill method was similar to the no-till drill method except that the upper 3-4 inches of the soil surface was rototilled prior to drill seeding.

Landowners Band Together to Fight Riparian Invasive Species

Coordination, Cooperation Make Difficult Projects Possible

By Charles Henry
TechLine Editor

Managing invasive species along rivers and other riparian zones is a challenge under the best of circumstances. When these riparian areas stretch along 146 miles of two Blue Ribbon trout streams through four counties, then the obstacles mount. Stir in hundreds of separate landowners, many of whom are absentee owners, add thousands of visits annually from fly fishermen and other recreational users and the test mounts.

Sixty-two miles of Montana's Beaverhead River and 84 miles of the Big Hole River are now under two cooperative and integrated weed management projects. There are dozens of cooperating agencies and organizations (***see "River Project Cooperators" on page 5)***, however coordination falls to Butte Silver Bow County weed supervisor John Moodry, Butte, and Beaverhead County supervisor Jack Eddie, Dillon. These two counties did much of the initial organization and weed control initially, but now the Big Hole work is contracted to Tom and Kelly Leo with TKO Invasive Weed Management in Ennis and the Beaverhead work is done by Todd Maki, Dillon.

"Ninety percent of the battle with riparian weed management is lack of access, either human-caused or natural," Tom Leo explains. "There are approximately 400 separate landowners along these two rivers that cooperate in these projects, so access from human causes is pretty much solved. We still struggle with the steep cliffs, narrow river channels, and natural river vegetation that make access difficult. There are portions of these rivers where we have access from only one side and even that can be marginal. We have developed special equipment including a raft and other tools to overcome these obstacles," Leo explains **(*see "River Raft Provides Access" on page 6).***

(L. to R.) Jack Eddie, Beaverhead County, Dillon, Tom and Kelly Leo, TKO Invasive Weed Management, Ennis, and John Moodry, Butte Silver Bow County, Butte. These four, plus Todd Maki, Dillon are the key weed managers and applicators working on the Big Hole and Beaverhead Rivers to assist hundreds of landowners control invasive species in the the riparian zones of these critical watersheds in Montana.

"Landowners have driven these projects from the beginning," Moodry says. "They had a

philosophy of 'tear down the fences and control the invasives and without that attitude these rivers would still be heavily infested."

Eddie says the two rivers are critical to the region. "Sixty percent of Butte's water supply comes from the Big Hole. The rivers contain populations of the T&E species Artic Grayling and provide habitat for countless other species including bald eagles, deer, elk and wolves."

The four counties had completed mapping and species inventory work prior to formation of the two projects, so the invasive weed problem was well documented. On the Beaverhead, leafy spurge, spotted knapweed, Canada thistle, oxeye daisy, yellow toadflax, and an escaped ornamental, field scabious, are the problems. The Big Hole has many of the same species plus purple loosestrife, with leafy spurge the priority species on the lower reaches and spotted knapweed on the upper portions. The Beaverhead River project began at the top of that watershed in 1997, while the Big Hole project targeted the middle portions first because they obtained access there first. Portions of the upper Big Hole are not as infested as the middle and lower portions so this strategy makes sense.

"The two projects are fully integrated with biological, chemical, cultural, and preventive measures employed where each tool fits best or in combination when needed," Moodry explains. "Public education plays a huge role since these rivers are used by so many interest groups."

Prevention and Public Awareness

Project coordinators target sport groups such as fishing, archery, and bird watching clubs plus recreational user groups and private landowners, since they are key stakeholders along the rivers. For five years, interns from The Nature Conservancy, funded by a Pulling Together Initiative (PTI) grant have gone door to door talking to private landowners and soliciting their involvement. "Spray Days" are used to gather 50-60 landowners at a time and cooperatively treat their own properties along with their neighbor's. These events are targeted to select reaches of the rivers and are made as social as possible with potluck dinners and other activities to make the work as enjoyable as possible.

Other groups participate in volunteer "hand-pulling days". "Kids on the Big Hole" is a one-day educational and work event that pulls as many as 235 kids to the river for day-long activities. Car washes are also held in nearby communities to teach people the importance of cleaning their on- and off-road vehicles of weeds after traveling in areas that may be infested.

Biological Control

The counties have distributed *Cyphocleonus achates* and *Agapoeta zoegana* weevils for spotted knapweed control and *Apthona nigriscutis*, *A. lacertosa*, and *A. Cyprissae* beetles for leafy spurge control along both rivers. Revegetation is employed as needed on a site-by-site basis.

Herbicide Control

All herbicide work is conducted only at low water times. "Even though we would prefer high flows, drought the past five years has actually accelerated our progress since we have so many low water days," Leo

See "Montana River Projects" on page 6

"River Project Cooperators"

Cooperators and Contributors to the Big Hole and Beaverhead Cooperative Weed Management Projects:

- Anaconda Sportsmen Club
- Anglers Against Weeds
- Beaverhead County
- Beaverhead Watershed Group
- Big Hole Watershed Group
- BLM
- Butte Silver Bow County
- Headwaters RC&D
- Jefferson County
- Madison County
- Montana Association of Counties
- Montana Department of Natural Resources
- Montana Noxious Weed Trust Fund
- National Fish & Wildlife Foundation (PTI Grants)
- NRCS
- Private Landowners
- Skyline Sportsmen Club
- Soil Conservation Districts in project counties
- The Nature Conservancy
- Trout Unlimited
- U.S. Forest Service

River Raft Provides Access

A 13-ft. Momentum Osprey Expedition raft was converted to serve as a nurse platform for ground crews working at low water on portions of the river riparian zone where other access is not possible. A heavy-duty pack frame that is beefier than normal rowing platforms holds a 55-gallon tank although no more than 15 gallons of herbicide mixture is ever prepared at one time. All plumbing was double and triple "leak proofed" and a heavy plastic liner wraps under all equipment to contain any potential leaks or spills.

A 50-ft. hose and 300-ft. hose are fed with a 5.5 hp Honda motor and centrifugal pump. The raft is used with 1-2 persons on board at all times, feeding 1-2 person spray crews on land. Applications are only made when the raft is stationary and spraying is not allowed from the raft. Water is pulled from the river in buckets so back siphoning can never occur during herbicide mixing. Dry bags contain herbicide and only aquatic 2,4-D is used in the raft. GPS points direct the applicators when to put ashore and begin work.

"Montana River Projects"

Continued from page 6

explains. "We target each herbicide to the most appropriate portions of a 300-ft zone on each side of the rivers, which defines the riparian target area."

Curtail® herbicide is used in open grass meadows containing Canada thistle and spotted knapweed. Transline®herbicide is the product of choice in shelter belts, heavily treed areas and recreational sites such as boat launches and fishermen access points. Krenite S herbicide is used on leafy spurge around trees, Rodeo herbicide in aquatic areas and Opti-amine, a federally approved aquatic 2,4-D in the most sensitive riparian areas.

Most herbicide applications are made from ATVs with 25-gallon Jackrabbit saddle tanks. Each unit contains 50-ft. of handline and broadjet nozzles. These units also serve as nurse tanks to backpack sprayers who can work closer to the water's edge and in heavy brush cover than mechanical equipment.

Progress

The entire length of both projects has been covered at least once. As crews worked, they used GPS units to mark their progress, mark infestations of specific species, and also record infestations to be controlled at later dates. This has made crews more efficient as they can find infestations quickly year after year.

"Landowners are very pleased with our progress to date. We see a marked reduction in all major infestations each year," Eddie summarizes. "Since we cannot use certain residual herbicides in many areas, we do have to go back each year. And we are dealing with weed seedbanks that were built up for years before the projects began."

"More important is that we don't hear the phrase 'Whose property is this?' much anymore," Moodry concludes. "Landowners and the public are more focused on the weed problem than on whose problem the weeds are. Everyone realizes we are in this together and each has a role to play in the solution."

AAW Reaches Out to Outdoor Enthusiasts and Anglers

By Charles Henry
TechLine Editor

Anglers Against Weeds (AAW) is a one-of-a-kind program developed by the 11,000 member Federation of Fly Fishers at the Fly Fishing Discovery Center in Livingston, Montana. AAW's target audience is anglers and outdoor enthusiasts, a group that before the inception of AAW was not reached regarding noxious weed education. In the past, noxious weeds were often considered agricultural or landowners' issue.

"AAW stresses that noxious weeds are everyone's problem, including outdoor enthusiasts and anglers. Through educational presentations and hands-on conservation projects, these groups learn how not to contribute to the spread of noxious weeds and learn methods to control the spread of weeds," says Matt Wilhelm, national education coordinator. "Since it began in 1997 the AAW program has educated thousands of anglers, outdoor enthusiasts, and children about the harmful impacts noxious weeds cause to fragile riparian ecosystems and fisheries. The response to the AAW program from anglers and other outdoor groups has been incredible."

How does AAW gain the attention of its members? "Our members are focused on the most delicate portion of most riparian environments – the water's edge. By delicate, I mean this is the area where weed control is most difficult. It must be done by hand in many cases. So we thought why not educate fly fishers about the weeds and then solicit their help in controlling the problem," Wilhelm explains.

He says once anglers understood that there was a two to three hundred percent increase in sediment run-off from weed-infested areas next to streams, it was fairly easy to solicit their involvement. "Excess sediment negatively impacts spawning habitat for bull trout, west slope cut throat trout and grayling – all threatened species. And it certainly impacts other fish species that rely on clear water for spawning. These species need water free of silt so the eggs settle. Once anglers link the impacts to the weed problem, they want to become involved."

According to Wilhelm, angler involvement now takes several forms. Fly fishers help with prevention in that once they have identified an invasive species, they don't spread it. They volunteer to pull weeds on property owned by ranchers that allow fishing access. This tactic improves angler-rancher relationships since anglers are giving back for the privilege of access. They also involve anglers in fishing access site education days, biocontrol distributions, and herbicide backpack spraying in appropriate areas. Fishing clubs often adopt an area and then monitor it on a regular basis. Thirty-six sites are under club adoption in Montana so far.

Matt Wihelm, national education coordinator for the Federation of Fly Fishers says once anglers understand how noxious weeds like knapweed (left along the Yellowstone River) impact fisheries, they are eager to help.

"We have focused on Montana initially, but now the demand for involvement from anglers in other states is also growing," Wilhelm explains. "We developed a facilitator training program and currently have 10 graduates of this course. We created a binder with a CD-ROM presentation and slide set so facilitators can conduct meetings and hold field days. We speak to 4-H and FFA chapters and elementary classrooms as well. This year we have 18-22 fishing club weed pulls scheduled already."

Wilhelm developed a noxious weed game that illustrates to students how noxious weeds spread and their negative effects on wildlife, agriculture, and recreational opportunities.

More information about Anglers Against Weeds and the noxious weed game may be found at www.fedflyfishers.org.

River Corridors Provide Valuable Wildlife Habitat

By Charles Henry
TechLine Editor

When the dams on the lower Snake River were built, they created some of the most concentrated and valuable wildlife habitat in the region. This high value habitat is home to dozens of species of birds and mammals, but now this habitat is threatened with destruction from invasive plant species. Yellow starthistle, purple loosestrife, scotch thistle, cheatgrass, Dalmatian toadflax, Canada thistle, Rush skeletonweed, and diffuse knapweed can all out-compete native species and ruin an area as a diverse habitat. When diversity declines, so do wildlife values.

"When the dams were created, much of the native vegetation was already in a degraded state due to over-grazing and cheatgrass and yellow starthistle invasion. When the dams were completed, we fenced the shoreline mitigation areas and began management," says Mike Butler, Corps of Engineers wildlife biologist who works with fellow biologist, George Harrington, out of the Clarkston, WA office. They manage the Lower Snake River Corridor that runs for 70 miles from Asotin to the Joso Ferry Bridge in eastern Washington. The river corridor is comprised of nearly 18,000 acres of riparian habitat.

Butler says they are restoring this habitat with the cooperation of the Tri-State Weed Demonstration Area comprised of the Corps, Washington, Oregon, and Idaho Fish & Game Departments, private landowners, the BLM, The Nature Conservancy, Nez Perce Tribe and several county weed boards that border the Snake River. As they build a GIS-GPS based inventory system, they are controlling weed infestations where they find them. An annual helicopter weed and fence line survey of the river corridor allows them to measure progress and monitor control efforts. However, until their GIS inventory is complete, they depend on public awareness kiosks at river access sites to enlist the public's assistance in finding and reporting invasive weeds. In addition, they work closely with local county weed programs that border the Snake River. If a county reports a new infestation on Corps-managed property, they respond as rapidly as possible, Harrington says.

Their program includes biocontrol, cultural controls, and selected herbicide treatments. Biocontrol releases are made on purple loosestrife sites and yellow starthistle sites by the Nez Perce tribe on two wildlife habitat management units.

Mike Butler, (left) and George Harrington, Corps of Engineers wildlife biologists.

They generally do not use burning as a weed control tool due to smoke issues. Some hand pulling is utilized in shrub and tree plots to rouge weeds out of new plantings.

Their herbicide work is contracted out, although Butler and Harrington maintain commercial applicator licenses and accreditation so they can manage and track effectiveness of the contract crews. Backpack, boom sprayers, and aerial applications with helicopters are all employed matched to specific sites and weed species. Yellow starthistle is treated with Tordon® 22K herbicide at a rate of 0.5 qt. to 1 qt./acre depending on location and infestation. Transline® herbicide, Curtail® herbicide, or Redeem® herbicide are also used depending on the site characteristics and surrounding off-target vegetation. Rodeo herbicide is used for aquatic treatments.

And a non-native species of phragmites has been found in the Lower Goose Lock and Dam pool. High flow conditions in 1995 and 1996 brought seeds down the river, we believe," Butler concludes. "We must catch the pool at low water to treat and have to consider the salmon resource – so it is a real challenge. We have planted test plots of native species, but they are not as aggressive as phragmites. However, we have found the infestation early, which I wish we had with some of the other weed species we manage. Early detection and eradication are keys to success.

(Note: Mention of specific brands or products should not be construed as endorsement by the U.S. Army Corps of Engineers.)

Yellowstone Pit Survey Builds Partnerships with Operators

By Charles Henry
TechLine Editor

It is well known that the least expensive method of weed management is preventing invasive species from establishing in the first place.

Towards this end, Yellowstone National Park (YNP) resource managers have instituted a gravel pit survey system to identify and then provide incentives to gravel suppliers to the park to prevent weeds from spreading into the park.

Craig McClure, Yellowstone National Park resource management coordinator says road materials can be a major source of noxious weeds unless they come from pits such as Brogan Pit near Gardiner, MT that has been maintained weed-free and is inspected regularly for noxious weeds.

"In 26 pits in the Greater Yellowstone Area (GYA), we found 11 invasive species of concern to Yellowstone National Park," Craig McClure explains. McClure is the West District Resource Management Coordinator for YNP. "Spotted knapweed, Canada thistle, common Mullein, Musk thistle, and key invaders such as tamarisk, oxeye daisy and scentless chamomile were all found in gravel pits that supply material to area users in the past."

Before the weed-free gravel program began, spotted knapweed, yellow sweet clover, St. Johnswort, oxeye daisy were inadvertently introduced into the park from weed seed-infested pit material or construction equipment, according to McClure. "Years ago, in one shoulder maintenance operation, we unknowingly introduced yellow sweet clover to 20 miles of park road shoulder. We bought this material for a chip-sealing operation, but it was too fine, so we used it on the shoulders instead and it was contaminated. And road material is not the only problem. Before the program, we inadvertently introduced oxeye daisy into the Madison Junction area during the construction of the sewage treatment plant and we have been chasing down oxeye daisy in that area for over twenty years."

McClure says pit operators benefit when they maintain weed-free material because YNP builds incentives into their contracts in that they will only buy from inspected and approved pits, unless the material is heat treated to 300 degrees F. to kill weed seeds, which adds significantly to pit operating expenses.

Local Pit Weed-free

Brogan Sand & Gravel, located at the north entrance to Yellowstone in Gardiner, MT, has been supplying the park with material since 1938. Manager Mark Richey says their pit is located right along the highway and in a windy area that makes it a prime target for vehicle-spread weeds or wind-blown seeds, respectively. "We obtained weed-free status six years ago and we monitor our pit constantly. We maintain the mindset that whenever you are in the pit area, you should be looking for weeds," Richey explains.

See "Pit Survey" on page 11

Researchers, Land Managers Seek Effective Solutions

By Charles Henry
TechLine Editor

In the Colorado River drainages and in river systems of the Southwest, land managers are struggling with one species of salt cedar or tamarisk (*Tamorix ramosissima)*. However, on the Big Horn River, Yellowstone River, and other northern drainages, another hybrid species of tamarisk is the challenge – *Tamorix chinease*. Researchers found the hybrid as they explored biological control options.

(L. to R.) Alex Ogg and Steve Christy view invasions of tamarisk and Russian olive along Big Horn River riparian zones in Wyoming.

The northern tamarisk is more a bush than a tree with trunk diameters less than on tamarisk species found further south. The northern tamarisk only reaches heights of 12-14 feet and winter kills each year back to the crown. However, these crowns overwinter (although dormant) so re-sprouting occurs every spring. Some crowns may be 20-30 years old.

"Another challenge for us in the north is that our native species are less dense with only 20-30 trees per acre along the rivers. Tamarisk quickly out-competes native species and creates 100% cover," says Steve Christy, natural resource specialist for the BLM in Worland, WY.

"Tamarisk and Russian olive, *Elaeagnus angustifolia*, now infest 40,000 acres of the Big Horn River in the Basin and Russian olive may infest another 80,000 of Big Horn Basin land," Christy says. "A 1999 BLM survey of 340 water impoundments found tamarisk on every one."

"Not only does tamarisk rob water from natives, but monocultures of the plant force wildlife away from waterholes, eliminate duck habitats, and curtail recreational access to rivers and lakes," Alex Ogg states. Ogg is a semi-retired USDA/ARS weed scientist working on projects for the Big Horn Basin Exotic Plant Steering Committee near Worland. "I think an even bigger problem might be the Russian olive that infests land almost everywhere tamarisk does. The Russian olive is more invasive, more shade tolerant, and will invade grassland. Tamarisk is more aggressive than Russian olive if moisture is available, but together they are eliminating our native cottonwoods, willows, and grasses along waterways."

"Our question is whether the published data applies to the species of tamarisk in Wyoming and Montana. We know the hybrid's seed has different dormancy characteristics, but we don't if that means we will need different control methods," Ogg explains. "We have dozens of plots out to find the answers."

The BLM, local counties, and the Steering Committee are experimenting with mechanical control with brush rakes followed by mowing, followed by herbicide treatment of re-sprouts. They tried goat grazing, but the tamarisk came back just as thick three years after grazing was stopped. And they tried burning, which eliminated the canopy biomass and made treating re-sprouts easier, but burning left too many tall stumps that made re-vegetation difficult.

"Imazapyr provides excellent control as a foliar treatment when tamarisk is fully leafed, but has the disadvantage of killing other vegetation as well. However, it is well suited to areas where the tamarisk stands are large and dense. We are also using Garlon®3 herbicide and Remedy® herbicide as basal bark treatments on scattered infestations, but these treatments can be more labor intensive than foliar treatments. However, they have the advantage of being selective and not killing desired understory plants," Ogg says. "Success will depend on matching the right product to the right site."

One problem compounding the difficulty of all their treatments has been an ongoing drought in the area for the past five years, according to Christy. They have tried pole planting, container planting, supplemental

irrigation, and planting drought-tolerant species of cottonwood, willows, and grasses. However, restorations have all been less than successful due to the drought.

"Restoration is the goal, not just tamarisk and Russian olive removal. If we remove these invasives, but create a positive environment for Russian knapweed or other exotics, or just leave erodible bare ground, we are no further ahead," Ogg concludes. Control methods need to be used that increase the chances for native restoration."

Russian Olive and tamarisk are killing mature cottonwoods (note dead branches at upper right) along the Big Horn River in central Wyoming. Northern species of tamarisk differ from other species in that are more winter-hardy with smaller trunks.

"Pit Survey"

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The gravel operation has their own spray rig and several times each year, they use Tordon®22K herbicide, Roundup herbicide, or 2,4-D, targeted to appropriate species, to keep their pit free of invasive species. Richey says correct herbicide application timing is one critical factor that saves money and increases control. They also work with neighbors to control weeds on adjoining properties so that weeds don't spread into the sand and gravel piles.

Richey says they contract with a mobile crusher to process material and that they inspect these rigs before and after they work the Brogan pit for weeds that may "hitchhike" on equipment. "The key is to be consistent and stay after it. Once your weeds are under control, it really does not take much effort to maintain that control if you monitor carefully and then act."

Survey Builds Cooperation

With several million dollars currently being spent in the GYA on locating and controlling noxious weeds, one of the major sources of new noxious weed infestation continues to be the distribution of sand and gravel contaminated with weed seeds. In 2003, the Greater Yellowstone Coordinating Committee, comprised of federal land managers in the GYA funded a cooperative pilot project working with pit operators, county, state and federal weed managers in Montana, Wyoming and Idaho to assess noxious weed infestations at various active pits in the GYA.

Systematic survey methods were developed to record weed species, their location and relative numbers. Weed locations were identified on a map of the pit and representative photographs were taken. Working with county weed supervisors, a biological technician from Yellowstone National Park surveyed 26 pits in 2003 between July 16 and July 24 in Montana (13 pits) Wyoming (7 pits) and Idaho (6 pits). The surveyor used a ranking protocol that has been used in YNP since 1995 as a test system. Pits were scored by types of weeds present, relative number of weeds, weed locations and history of past weed management efforts (i.e. do pits have a weed management plan, is it being implemented). Pits were arranged by total scores for use as a comparative tool. Comparisons showed that some pits were of more concern than others in potentially contributing to the spread of noxious weeds.

"Although this pilot project involved surveying only a small percentage of the pits being used in the GYA, it was helpful in increasing communication with pit operators regarding weed concerns. Some pit operators were very active in managing their weeds, however, a number of operators expressed interest in working harder to eliminate the noxious weed infestations on their property," McClure concludes. "With minimum costs of several treatments per year, most pits surveyed, particularly the newest pits and those with smaller acreages, have the potential of becoming noxious weed-free pits within several years. Availability of weed-free pits would provide land managers, including transportation departments and private property owners, with a cost effective tool to better manage their lands. By helping to prevent the introduction on new weeds and the long-term cost associated with locating and controlling weeds over large acreages we would all benefit."

"Riparian Revegetation"

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as possible. The plots were measured for cover, density, and biomass by species. The broadcast treatment included a shallow rototilling prior to seeding and the plots were raked after seeding to insure seed to soil contact. There was sufficient knapweed and quackgrass litter buildup to require that it be removed before seeding.

"Because of the litter, these treatments could be advisable after a wildfire, although results may vary due to nutrient release and other variables resulting from a burn," he says. "When all species combined were measured, we achieved 80 plants per 11 square feet with Rodeo, 35 plants with Curtail herbicide and 18 plants in the no herbicide check. Cover and biomass results were about the same. There was no statistical difference between the broadcast seeding and the tilled and drilled seeding, which were our best seeding methods and both included tillage. The no-till drill and imprint drilling methods produced very poor stands."

"In summary, there are many factors to consider when controlling invasive species and revegetating a habitat," Jacobs concludes. Litter biomass, weed density, seeding methods, and using the right herbicide at the best rate all play into the results. Costs for all treatments that worked were about the same. No-till seeding would be least expensive, but it did not produce satisfactory results. Some sort of tilling before seeding did yield good results with this weed, so it would be practical to revegetate sites where some tillage is possible. The herbicide versus no herbicide factor was also critical. Without the herbicide treatments before seeding, we had very poor native species establishment. Herbicides are a key component of achieving success."

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