TechLine

FALL Newsletter 2012

Sharing innovative research, success stories, and tips with invasive plant managers.

Photo courtesy of Dave Wedum

A MODEL OF COOPERATION

Rocky Mountain Front Weed Roundtable

by Celestine Duncan, Editor

Montana's Rocky Mountain Front is one of the "last best places" to hunt, fish, watch wildlife, and raise livestock. It is also the place where you find ranchers laboring next to college students, hunters, anglers, hikers and public land managers, united under a common goal to help rid the Rocky Mountain Front of noxious weeds.

The Rocky Mountain Front (RMF) is an expansive landscape of about three million acres in north central Montana that encompasses the interface between the Rocky Mountains and the Great Plains. The area transitions from alpine and forested ecosystems on the western boundary, to grasslands and agricultural lands on the east that include a variety of wetland and riparian habitats. It is internationally recognized for its recreational opportunities and wildlife resources including elk (*Cervus elaphus*), grizzly bear (*Ursus arctos horriblis*), and bighorn sheep (*Ovis canadensis*).

Today about one percent of the RMF, or 32,000 acres are infested with noxious weeds. Spotted and diffuse knapweed (*Centaurea stoebe* and *C. diffusa*), leafy spurge (*Euphorbia esula*), Canada thistle (*Cirsium arvense*) and houndstongue (*Cynoglossum officinale*) are well established along the RMF with other more recent invaders such as Russian knapweed (*Acroptilon repens*) and yellow toadflax (*Linaria vulgaris*). "We knew we were facing some real hurdles with noxious weeds on the Front," explains Alan Rollo, Teton River Watershed Coordinator and one of the original advocates of coordinated weed management along the RMF. "We also recognized that if we could organize our efforts we had a chance to save the landscape from large-scale noxious weed invasion."

Early partnerships and teamwork on invasive weeds formalized in 2002, creating the Rocky Mountain Front Weed Roundtable (**Figure 1**). "The RMF Weed Roundtable is a

["ROUNDTABLE" continued on page 2]

IN THIS ISSUE

["ROUNDTABLE" continued from page 1]

Figure 1. The Rocky Mountain Front Weed Roundtable project area encompasses about three million acres from the South Fork of the Dearborn River to the Canadian border.

BOX 1

PARTNERS IN THE RMF WEED ROUNDTABLE

- Blackfeet Nation
- Lewis and Clark, Teton, Pondera, and Glacier County Extension
- Lewis and Clark, Teton, Pondera, and Glacier County Weed Districts
- Lewis and Clark Conservation District
- Montana Department Natural Resources and Conservation
- Montana Fish, Wildlife and Parks
- Montana Land Reliance
- Montana Wilderness Association
- Sun and Teton River Watershed Groups
- The Nature Conservancy
- The Wilderness Society
- USDA Forest Service
- USDA Natural Resources Conservation Service
- USDI Bureau of Land Management
- USDI Fish and Wildlife Service
- USDI National Park Service, Glacier National Park
- Many gracious and hard-working private landowners, ranchers, land stewards and local businesses.

non-profit corporation that brings together more than 230 landowners, public agencies, the Blackfeet Tribal Government, conservation organizations, county weed districts, watershed groups, and a host of volunteers," explained Paul Wick, Teton County Weed Coordinator and president of the Weed Roundtable (**Box 1**). The purpose of the group is to better manage noxious weeds through consistent management goals and more efficient use of resources.

WEED ROUNDTABLE HIGHLIGHTS

Management Strategies

Hundreds of weed fighters gather each year to spray, pull, collect biological agents, and learn about noxious weeds within eight major drainages along the RMF. "Our management focus has always been on where the weeds naturally (and un-naturally) move, and the best way to stop their spread," explains Kate Fink, RMF Weed Roundtable executive director. "The drainages on the RMF are the best place to focus because of high risk of spread both by water and human travel."

Mark Korte, Preserve Steward at The Nature Conservancy (TNC) Pine Butte Swamp, is on the board of directors of the RMF Weed Roundtable. From 2006 through 2011, TNC staff partnered with the Weed Roundtable and ESSA Technologies Ltd. to conduct research that would help evaluate, refine, and direct weed management activities along the RMF. TELSA (Tool for Exploratory Landscape Scenario Analysis) computer models and programs were used to simulate weed spread under different types of management actions. Results from the model indicated that the RMF was in a unique position to prevent this landscape from being dominated by noxious invasive plants (**Box 2**). "The model showed that we won't completely eliminate weeds on the Front, but with a persistent, strategic effort we could keep most of this landscape weed free," explains Korte.

Weed Prevention Areas

Slightly more than one percent of the RMF is infested with noxious weeds, so control efforts concentrate on protecting non-infested landscapes. Each year, portions of the RMF are surveyed within watershed areas. Montana Conservation Corp, ranchers, volunteers, and agencies work together on inventory and control efforts. Landscapes are searched and locations of invasive plants recorded so control measures can be implemented.

Detecting new infestations early and monitoring existing weed locations, including previously treated patches, is an important component of the program and helps protect non-infested landscapes. "Prevention is the most cost effective way to manage weeds," says Korte. "Educating landowners, recreationists and the general public about inexpensive, simple and easy methods of weed prevention will allow everyone to play a role in keeping a landscape weed-free and productive for the widest range of uses. This empowers the public and gives all a stake in the health of the landscape."

Weed Whacker Rodeos and "Pulling Together" Events

Cooperative weed pulls are annual events in the Sun and Teton Canyon watersheds. "The first Sun Canyon Weed Whacker Rodeo started in 1998 with volunteers pulling 500 pounds of spotted knapweed," says Alan Rollo, one of the original organizers of the event. Since that time, 830 people have pulled a total of almost 15,000 pounds of spotted knapweed from Sun Canyon. The weed pull combined with spraying and biological control insects resulted in a significant decline in spotted knapweed populations. "One of the most important side benefits of the Sun Canyon weed pull was that it served as a springboard for the Forest Service to increase weed control efforts in the drainage," explains Rollo. "The weed-pull event really galvanized teamwork along the RMF."

The Teton Canyon weed pull started in 2005 and is a similar success with 433 volunteers pulling more than 6,300 pounds of spotted knapweed the past seven years. Hand pulling efforts are more strategic than in the past and concentrate on cleaning up previously treated patches along spread vectors such as roads, trailheads and campgrounds, and using biological control insects on large infestations.

Photo courtesy of Alan Rollo

Since the Sun Canyon and Teton County weed pulls started, a combined 1,263 volunteers have pulled more than 21,300 pounds of spotted knapweed. Volunteers of all ages, like these Sun River weed pullers, come together during Weed Whacker Rodeos and Pulling Together events.

["ROUNDTABLE" continued on page 4]

BOX 2

EVALUATING THE COSTS AND BENEFITS OF ALTERNATIVE WEED MANAGEMENT STRATEGIES FOR THREE MONTANA LANDSCAPES - ROCKY MOUNTAIN FRONT SUMMARY

TELSA logo, ESSA Technologies, Ltd.

Summarized from the 2011 "Evaluating the costs and benefits of alternative weed management strategies for three Montana landscapes" by Leonardo Frid[1], David Hanna[2], Nathan Korb[2], Brad Bauer[2], Katy Bryan[1], Brian Martin[2], and Brett Holzer[3]. [1]ESSA Technologies Ltd., [2]The Nature Conservancy in Montana, [3]Private.

http://conserveonline.org/workspaces/montanaweedmodel/documents/landscape-summary-rocky-mountain-front/view.html

TELSA (Tool for Exploratory Landscape Scenario Analysis) is a toolbox of models and programs. Together, the tools help users: prepare spatial and other model input data, define various management and natural disturbance scenarios, simulate these scenarios, and analyze compare and display simulation results. TELSA computer models and programs were used to simulate the spread of leafy spurge and spotted knapweed, and the effects of management actions on weed infestations on the Rocky Mountain Front. Several management strategies were compared under a variety of budget constraints to evaluate the long-term benefits of different approaches, and determine costs and benefits of various strategies. The computer simulations ranged from no management (zero budget) to unlimited management (unlimited budget), with four additional intermediate budget levels. Management scenarios included: improving control success rates, treating new infestations when they first appear, prioritizing large infestations instead of small infestations, and conversely -- treating only a portion of the landscape each year, and delaying the onset of management.

Results of the 40-year computer simulations showed the following management implications for the RMF:

- Prevention is important to reduce spread rates.
- Prioritizing treatment of small patches (early detection-rapid response) is more effective than focusing on large patches.
- Efforts to increase treatment success (applicator education, GPS use, etc.) should be a priority.
- Effective management has net positive economic outcome, even when only accounting for grazing revenue.
- Biocontrol is important for treating unmanageable infestations and reducing overall costs.
- Detecting new infestations early and tracking existing weed locations, including previously treated patches, is important for consistent and effective control efforts.
- Regularly managing only a portion of weed infestations or waiting to manage until patches become a noticeable problem is costly in the long-run and results in significantly higher levels of future invasion, which will be more difficult to manage.
- At a broad scale, relatively un-invaded areas should be prioritized over heavily invaded areas.

["ROUNDTABLE" continued from page 3]

Cooperative Spray Days

Spray days are organized annually that involve private land managers, agencies and other partners. "We average about 20 private and public land managers at each of our watershed spray days," explains Paul Wick. Cost-share incentives from grants help reduce the cost of herbicide application on private lands along the RMF. In Teton County control efforts target county roadsides and newly established infestations of weeds to protect non-infested lands. "With the help of our partners we find new infestations and control weeds on about 1,200 miles of county road rights-of-way in addition to our state roads. Spray days in other watersheds such as Sun River, target trailheads, fishing access sites, and campgrounds."

Spotted knapweed is the most abundant noxious weed on the RMF, and about 70% of resources are expended to control the weed. "We apply Milestone® at 7 fluid ounces per acre and get very good knapweed control," says Wick. "The biggest advantage to using Milestone is that we can control thistles and knapweeds, including Russian knapweed, with the same herbicide and rate. It saves us a lot of time and effort when we don't have to switch herbicide treatments."

Leafy spurge is also a priority within the RMF Weed Roundtable area, and although it isn't spreading as quickly as spotted knapweed it's more difficult to control. "We concentrate our herbicide efforts on small, newly established infestations of leafy spurge and use biological agents on large infestations," explains Wick. Tordon® 22K at 1 quart per acre plus 1 quart per acre (1 pound active ingredient) of 2,4-D is applied to leafy spurge at the full-flower growth stage.

> CONSERVING BOTH PUBLIC AND PRIVATE LANDS IS CRITICAL TO MAINTAINING THE CHARACTER OF THE ROCKY MOUNTAIN FRONT.

Biological Control and the Buzzy Breen Memorial Bug Day

Elizabeth (Buzzy) Breen, a Teton County rancher, piloted the initial collection and distribution efforts for biological control of leafy spurge along the RMF. "When Buzzy became ill and wasn't able to monitor her biological control release sites she called me to help," says Wick. "Her eyes just lit up when I reported that her insects were established. She was so excited to learn that her hard work and dedication paid off." Since her passing, Buzzy's pioneering efforts are memorialized each year during Buzzy Breen Memorial Bug Day.

Other Weed Roundtable partners have expanded Buzzy's efforts. Sue McNeal, field biologist with the Partners for Fish and Wildlife Program has been instrumental in pursuing funds and helping to further use of biological control agents along the RMF. "Since 2004, the cooperative effort by Roundtable members has resulted in collection and release of 2.8 million leafy spurge flea beetles (*Aphthona* sp.), and purchase and release of 125,500 root boring weevils (*Cyphocleonus achates*) on spotted knapweed within the RMF landscape," McNeal explains. "We also purchased and released about 6,000 knapweed seed head weevils (*Larinus minutus*). The leafy spurge flea beetle and the knapweed seed head weevil are well established and thriving along the Front." About 40 private ranches along the RMF have been provided biological control insects as a result of the Roundtable's efforts. The insects are reducing density and seed production of leafy spurge and spotted and diffuse knapweed at many release sites.

Ty Steinbach, a rancher in the southern portion of the RMF

Volunteers check in during Swift Dam Spray Day on Birch Creek in Pondera County.

Ty Steinbach, Steinbach Ranch near Wolf Creek Montana.

Photos courtesy of Sue McNeal

Photos showing impact of *Aphthona* flea beetles on leafy spurge over time at the Steinbach Ranch, Rocky Mountain Front: July 2004 (LEFT) and July 2011 (RIGHT).

has been receiving insects from McNeal each year since 2003 and is a strong supporter of the biological control effort. "We had over 100 acres of leafy spurge and we couldn't stop the weed from spreading," says Steinbach. "We've released thousands of flea beetles on our leafy spurge infestation the last nine years." Today the insects are controlling the largest infestation, and Steinbach concentrates herbicide applications on newly invading patches of leafy spurge and on sites where the insect does not establish. "We feel confident that we have a good strategy in place to contain and control leafy spurge on our ranch," says Steinbach.

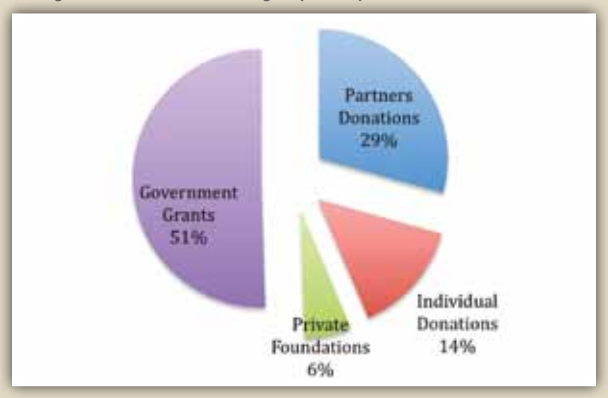
Conserving both public and private lands is critical to maintaining the character of the Rocky Mountain Front. Kate Fink sums up the success of the Weed Roundtable and hope for the future. "We feel that maintaining and strengthening our partnership commitments and increasing resources to control weeds is important to continue protecting family ranches, wildlife habitat, and public lands from noxious weed invasion. The Rocky Mountain Front Weed Roundtable has given diverse groups of people an opportunity to collaborate in a way they never have before. The uniting force behind this group is their dedication to the natural resources of the Rocky Mountain Front, a place we deeply care about."

BOX 3

ROCKY MOUNTAIN FRONT WEED ROUNDTABLE FUNDING

Public agencies, private organizations and landowners spend about $1.1 million each year on noxious weed projects on RMF. In fiscal year 2009 agencies treated more than 20,000 acres of public land and 2,500 acres of private lands with biological control, manual methods and herbicide treatments.

Figure 2. SOURCE OF FUNDS. Funding for the RMF Weed Roundtable projects is provided by private, county, state and federal partners along with grants from conservation groups and private foundations.



Special grant funding provided by:

- Rocky Mountain Elk Foundation
- Montana State University's Weed Prevention Area Pilot Program
- USDA Natural Resources Conservation Service - Noxious Weed Control Special Initiative
- Upper Missouri River RAC Grant
- USDI Fish and Wildlife Service - Challenge Cost Share, and Youth in Natural Resources Grants
- The Cinnabar Foundation
- The Nature Conservancy's Priscilla Bullitt Collins Trust
- Front Range Conservation Education Group
- Private landowner donor challenge

Protecting and enhancing critical habitat in the Mountain-Prairie Region

by Celestine Duncan, Editor

The Partners for Fish and Wildlife Program is recognized as a leader in cooperative conservation. Established by the US Fish and Wildlife Service (USFWS) 25 years ago, the Partners Program has worked with over 45,000 private landowners and restored or enhanced about 1.1 million wetland acres, 3.4 million upland acres and 9,700 miles of stream habitat nationwide. These conservation projects were possible through voluntary agreements with landowners and over 3,100 partnering organizations.

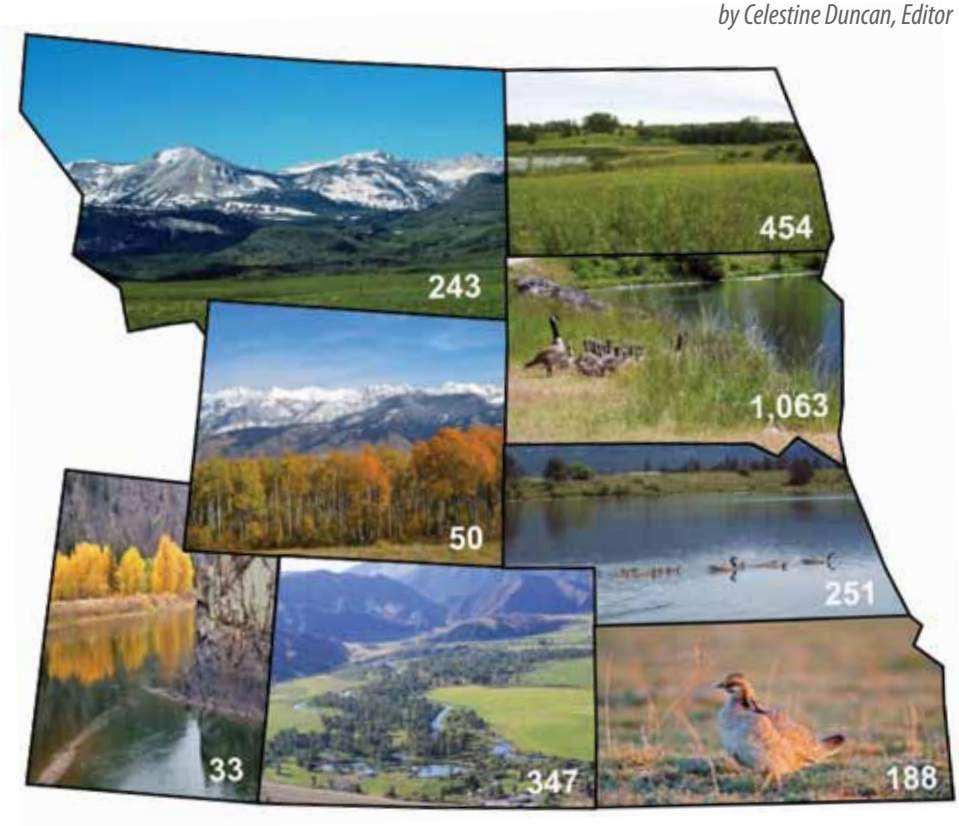


Figure 1. The Partners for Fish and Wildlife Program has completed 2,629 projects in the Mountain-Prairie Region between 2007 and 2011: 243 in Montana, 454 in North Dakota, 50 in Wyoming, 1,063 in South Dakota, 251 in Nebraska, 33 in Utah, 347 in Colorado, and 188 in Kansas.

In the eight-state Mountain-Prairie Region (**Figure 1**), the Partners for Fish and Wildlife Program works with hundreds of landowners to develop projects on private land that benefit fish and wildlife species, while also helping ranchers and farmers increase their bottom-line. "We can help private landowners control invasive plants that compete with range production and animal health, and support other projects that enhance or restore grassland, and improve water quality," explains Heather Johnson, Mountain-Prairie Regional Coordinator for the Partners for Fish and Wildlife Program. "It's a win-win situation for both the rancher and Partners Program."

About 70 percent of the land in the United States is privately owned, and the Partners Program recognizes that successful long-term conservation of fish, wildlife, plants and their habitats rests in the hands of private landowners. "Helping private land owners control invasive plants through the Partners Program will protect wildlife habitat along with improving rangeland for livestock," says Johnson.

BOX 1

PARTNERS FOR FISH AND WILDLIFE PROGRAM HISTORY

The Partners for Fish and Wildlife Program evolved from early-1970s concerns about low waterfowl breeding populations and annual production in the northcentral United States and southern prairies of Canada. A formal attempt to define and develop a solution to the waterfowl production problem occurred at an International meeting in Manitoba, Canada in 1974. As a result of that meeting, the US Fish and Wildlife Service started the "Partners for Wildlife Program," a small collaborative effort in North Dakota in 1987 with the vision of restoring waterfowl habitat on privately owned land in the midwestern United States. Since that time, the program's scope and size expanded into what is now known as the Partners for Fish and Wildlife Program with an annual budget of about $50 million dollars. The 109th Congress unanimously authorized funding for the program in the 2006 Partners for Fish and Wildlife Act.

www.fws.gov/partners

HOW THE PROGRAM WORKS

The Partners for Fish and Wildlife Program provides technical guidance and financial assistance for voluntary habitat improvement projects on private land that benefit federal trust species. These include threatened and endangered fish and wildlife such as grizzly bear (*Ursus arctos horribilis*) and bull trout (*Salvelinus confluentus*), as well as other native fish, migratory waterfowl, wading birds, shorebirds, neotropical migratory songbirds, and state-listed species of concern.

Invasive plant projects supported by the Partners Program are often part of larger cooperative weed management areas that include private landowners, conservation organizations, and county, state, and federal partners. Cost-share funding can be used for herbicide application, manual and mechanical control, prescribed burns, collection and release of biological control agents, and restoration of disturbed sites.

The Partners Program will contribute up to $25,000 per project on a 50:50 cost-share basis. "This simplifies the process compared to a grant program since private landowners don't need to send in proposals or grant applications," explains Johnson. The Partners Program works in established conservation focus areas and will cost-share with landowners to help finance habitat improvement projects. Cost-share funding can be "in-kind" services as well as cash.

INVASIVE PLANT PROJECTS

Within the Mountain-Prairie Region, the Partners Program has supported invasive plant control efforts on about 390,000 upland acres and 120 river miles. Target species range from tamarisk (*Tamarix* sp.) in Utah and Colorado, to Eastern red cedar (*Juniperus virginiana*) in Kansas, and noxious weeds such as knapweed (*Centaurea* sp.), thistle (*Carduus* and *Cirsium* sp.) and leafy spurge (*Euphorbia esula*) in Montana, Wyoming, and the Dakotas.

Montana

Field biologists for the Partners for Fish and Wildlife Program play an active role in weed management projects in Montana's Centennial Valley, Big Hole Valley, Blackfoot Valley, Phillips County, Rocky Mountain Front, and Kootenai River Watershed.

Sue McNeal, field biologist with the Partners Program works with over 60 public and private land managers along the Rocky Mountain Front. "Sue is a great asset to our weed management efforts along the Front," says Paul Wick, Teton County Weed Coordinator. "She helps support and coordinate weed pulls, spray days, and collection and distribution of biological control agents with private landowners." Sue serves on the board of directors for the Rocky Mountain Front Weed Roundtable and brings additional support from the USFWS Invasive Species Strike team for various weed projects along the Front (**Box 2**).

"Noxious weed management is an important tool in conserving native grasslands for federal trust species and for successful livestock production," explains McNeal. "In Montana, we recognize that many multi-generational, traditional ranching operations are the very reason that we have the diversity of wildlife and habitat along the Front." Highlights from the Rocky Mountain Front Weed Roundtable are included as a companion article in this issue (page 1).

Kansas

The largest remnant blocks of native prairie are located in Kansas; however, these critical landscapes are being compromised by invasive woody plants such as Eastern red cedar. Although this plant is native to the United States, red cedar has become invasive in Midwestern states like Oklahoma, Nebraska, and Kansas. Decades of fire suppression, windbreak plantings and seed spread by birds has accelerated invasion. During the 40-year period from 1965 to 2005, the increase in Eastern red cedar in Kansas prairie ecosystems was estimated at 23,000 percent.

The Kansas Prairies Initiative is a partnership between the Kansas Partners for Fish and Wildlife Program and the Kansas Grazing Lands Coalition. Aron Flanders, field biologist for the Partners Program, works with private landowners on Eastern red cedar removal projects in the Red Hills region of south central

Heather Johnson, Regional Coordinator for the Partners for Fish and Wildlife Program.

Sue McNeal and Middle Fork of the Dearborn landowners, Ron Ingersoll and John Paul discuss treatment strategy during the 2012 Upper Dearborn Community Spray Day.

Partners Program biologist Aron Flanders observes results of a burn project on Eastern red cedar.

["PARTNERS" continued on page 8]

["PARTNERS" continued from page 7]

Eastern red cedar is having a significant impact on grassland birds such as lesser prairie chicken (*Tympanuchus pallidicinctus*).

Kansas. "Private lands comprise roughly 95 percent of Kansas, so projects that support sustainable working landscapes will benefit wildlife, water quality, groundwater recharge, and grassland based industries," explains Flanders.

The Red Hills physiographic region encompasses about three million acres in the Southwest Prairies and Playas Conservation Focus Area with about 1.7 million acres of mixed-grass prairie in private ownership. "Eastern red cedar is having a significant impact on grassland birds such as lesser prairie chicken (*Tympanuchus pallidicinctus*) and grasshopper sparrow (*Ammodramus savannarum*) as well as livestock forage production. "Red cedar removal projects are a win-win situation for wildlife and for ranchers because we increase grass production for livestock and protect habitat for grassland nesting birds," says Flanders. "The Partners Program has provided technical assistance and cost-share funding to about 30 cooperators on 55 projects in the Red Hills region, positively impacting 126,878 acres."

Controlling Eastern red cedar includes either burning alone when trees are under five-foot height with suitable fuels and other parameters, or cutting followed by burning or chipping. Private landowner in-kind "funding match" often includes follow-up burning of the cut acreage. "We partner with other agencies, such as the Natural Resource Conservation Service and Kansas Department of Wildlife, to strategically implement numerous cedar control projects in locations that connect individual properties to create expansive landscapes, making the sum truly greater than our individual contributions," explains Flanders.

To help slow reinvasion of Eastern red cedar and enhance wildlife habitat, the Partners Program works with private land managers to develop a grazing management plan. Maintaining proper livestock stocking rate, distribution, and duration of grazing sustains grassland resources. This provides residual grass cover for winter habitat and nesting sites for grassland birds and reduces tree reinvasion. Flanders summarizes his commitment, "Our work on red cedar benefits landowners whose goals are sustainable livestock production, wildlife habitat enhancement, soil and water conservation, or preserving the prairie for future generations. Additionally, the broader public gains from the ecosystem services that improve air, water and soil, along with their public wildlife resources."

The Mountain-Prairie Region of Partners for Fish and Wildlife Program is committed to providing technical assistance and cost-share funding for invasive plant management. "One of our highest priorities for the Partners for Fish and Wildlife Program in the Mountain-Prairie Region is to manage invasive plants on private land," says Johnson. "These efforts are going to benefit high priority species of fish and wildlife, while also helping cattle ranchers increase their bottom-line. Ultimately, this helps us reach our conservation goal while maintaining rural lifestyles and sustainable agriculture."

BOX 2

NVASIVE SPECIES STRIKE TEAM

The US Fish and Wildlife Service Invasive Species Strike Teams are an important component of weed management efforts on National Wildlife Refuge System (NWRS) lands including refuges and waterfowl production areas. "The Strike Teams complement a refuge's efforts by expanding the number of acres they can treat or concentrating on priority weeds that are invading the refuge," explains Lindy Garner, USFWS Mountain-Prairie Regional Invasive Species Coordinator.

Although the mandate of the Strike Teams is on NWRS lands, they also assist other weed management efforts to protect refuge and waterfowl production areas. The Missouri, Yellowstone, Columbia (MOYOCO) Strike Team, which covers Montana and northwestern Wyoming supports Partner for Fish and Wildlife Projects including weed pulls, spray days, collection and distribution of biological control agents, and invasive plant inventories.

In 2011 the MOYOCO Invasive Species Strike Team conducted 60 weed management projects on almost 21,000 acres of land in Montana and Wyoming. Through their efforts, a total of 586 acres of invasive plants were treated through an integrated program with herbicides, hand removal, and release of biological control agents.

CONTROLLING INVASIVE PLANTS IN FALL AND EARLY WINTER

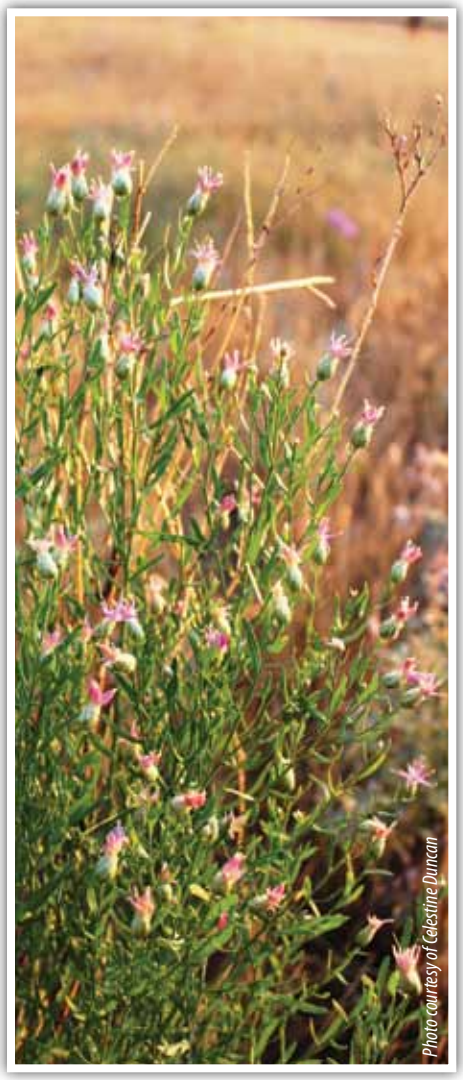


Photo courtesy of Celestine Duncan

Find recommendations for other species in the ***Invasive Plant Management with Milestone and Other Herbicides: A Practical Guide for Natural Area Managers***
techlinenews.com/2012IPguide.pdf

View herbicide labels in the ***Resource Library*** at techlinenews.com

Fall is an excellent time to control invasive weeds with herbicides. Late summer and fall rains provide land managers with a good opportunity to extend their application season.

RUSSIAN KNAPWEED

Milestone® at 5 or 7 fluid ounces per acre (fl oz/A) is highly effective for controlling Russian knapweed. Applications of Milestone can be made on Russian knapweed until after the foliage has died back (leaves are brown and dead!) until the soil freezes or is covered with snow. Milestone will provide residual control of plants that try to re-grow and emerge after the initial application[1].
techlinenews.com/ACRRE_FallAppTips.pdf

SPOTTED AND DIFFUSE KNAPWEED

The application window for treating spotted and diffuse knapweed with Milestone is wider than many other herbicide options. Milestone® at 5 or 7 fl oz/A applied to spotted knapweed in fall gave excellent control (>95%) of both established plants and seedlings for up to 2 years after treatment in Montana. Applications can be made until the soil freezes[1].
techlinenews.com/CENMA_FallAppTips.pdf

CANADA THISTLE

Field research has shown that fall applications are extremely effective with Milestone at labeled rates of 5 to 7 fl oz/A. Tank mixing with another herbicide is not necessary; Milestone alone will control Canada thistle. Applications can be made in the fall as long as there is live Canada thistle foliage. Even though Canada thistle leaves will begin to senesce, generally there is still excellent efficacy up to late October as long as there is some green foliage[1].
techlinenews.com/CIRAR_FallAppTips.pdf

BIENNIAL THISTLES

Fall application of Milestone at 3 to 5 fl oz/A provides excellent control of biennial thistle (e.g., musk, bull, and plumeless thistle). Fall herbicide treatments may be applied to rosettes over a longer period in the fall than in the spring. An additional advantage is that fall treatments reduce the potential of injury from spray drift to foliage of nearby desirable plants since sensitive crops have been harvested or desirable plants are dormant.
techlinenews.com/BIENN_FallAppTips.pdf

BLACKBERRY

Fall is an excellent time to control blackberry. Opensight at 3.3 ounces product/acre (oz/A)/A, or Milestone plus Garlon® 4 Ultra (5 fl oz/A+2 pt/A) provide optimal control of blackberry when applied after bloom and before frost. It is recommend that after mowing, shredding, or burning, applications should be delayed until the next season and enough re-growth has occurred for good uptake and translocation.

OTHER WOODY SPECIES

Basal bark applications with Garlon 4 Ultra or Pathfinder® II can control undesirable or invasive brush species year round, extending your vegetation management program. For detailed information on application methods and rates go to:
tinyurl.com/tln2010-fallbrush

[1] Opensight® at 2.5 to 3.3 ounces of product per acre can be applied in fall if other weed species such as whitetop, poison hemlock, common tansy, or annual or biennial mustards are present.

Resources for Addressing Post-fire Weed Invasion and Expansion

Land managers of the 7,037,373 acres* (nifc.gov) that are burned and burning this fire season will soon be faced with addressing the aftermath of wildfire; including a surge of invasive plants.

Catastrophic fire seasons of recent decades prompted a number of agencies and researchers to synthesize and expand upon the knowledge-base related to invasive plant issues following wildfires. The following short list of literature reviews, handbooks, and recently published research provides a starting point for exploring issues and developing management guidelines related to invasive plants following wildfires.

If you know of other important resources on this topic, please let us know! Share your comments for this article online at: www.tinyurl.com/tln_fireresources2012.

HANDBOOKS AND GUIDES

Fire Management and Invasive Plants—A Handbook

USDI Fish and Wildlife Service. 2008.

This manual provides practical guidelines for fire managers to effectively integrate invasive plant management activities into their fire management programs. Focuses on controlled burns, but also includes some information that may be useful for wildland fires. http://tinyurl.com/tln2012fireresources1

Integrated Noxious Weed Management After Wildfires

Natural Resources Conservation Service. 2001. All U.S. Government Documents (Utah Regional Depository). Paper 587.

This 46-page publication describes practical and proven weed management methods that may be incorporated into a successful burned-area noxious weed management plan. Such a plan helps the land manager prevent weed establishment, mitigate the reestablishment of noxious weeds in burned areas and establish and maintain healthy plant communities.
http://tinyurl.com/tln2012fireresources2

LITERATURE REVIEWS ON INVASIVE PLANT RESPONSE TO WILDFIRE

Reviewing the Role of Wildfire on the Occurrence and Spread of Invasive Plant Species in Wildland Areas of the Intermountain Western United States

Rew LJ and Johnson MP. 2010. Invasive Plant Science and Management 3(4):347-364.

Authors evaluate the state of knowledge concerning how nonnative plant species establish, survive, and spread following wildfire in wildland areas for the main vegetation types of the Intermountain West.
http://tinyurl.com/tln2012fireresources3

Wildland fire in ecosystems: fire and nonnative invasive plants

Zouhar K, Smith JK, Sutherland S, Brooks ML. 2008. Gen. Tech. Rep. RMRS-GTR-42-vol. 6. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 355 p.

This state-of-knowledge review of information on relationships between wildland fire and nonnative invasive plants can assist fire managers and other land managers concerned with prevention, detection, and eradication or control of nonnative invasive plants. The 16 chapters in this volume synthesize ecological and botanical principles regarding relationships between wildland fire and nonnative invasive plants, identify the nonnative invasive species currently of greatest concern in major bioregions of the United States, and describe emerging fire-invasive issues in each bioregion and throughout the nation.
http://tinyurl.com/tln2012fireresources4

Find links to these and other invasive plant management resources on the "Resource Library" page at

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EXTENSION PUBLICATIONS AND PRESENTATIONS

Integrated Noxious Weed Management After Wildfires

Goodwin K, Sheley R, and Clarke J. 2002.

This extension bulletin from Montana State University describes site evaluation, revegetation, and integrated weed management after wildfire. The purpose of this publication is to describe practical and proven weed management methods that may be incorporated into a successful burned-area noxious weed management plan. http://tinyurl.com/tln2012fireresources10

Weed Management after Wildfire—It's Necessary!

(presentation slides)

Mangold J. 2011. Northern Rockies Great Basin. Prevention Workshop. April 20, 2011.

More than 40 slides presenting a science-based summary of why invasive plants can increase after fires and why it is important to manage them.
http://tinyurl.com/tln2012fireresources11

RECENT RESEARCH ON INVASIVE PLANTS AND WILDFIRE (PUBLISHED 2010-2012)

Economic and Social Impacts of Wildfires and Invasive Plants in American Deserts: Lessons From the Great Basin

Brunson MW and Tanaka J. 2011. *Rangeland Ecology & Management* 64(5):463-470.

Authors offer a synthetic perspective on economic and social aspects of wildfire and invasive plants in American deserts, focusing on the Great Basin because greater research attention has been given to the effects of cheatgrass expansion than to other desert wildfire/invasion cycles.
http://tinyurl.com/tln2012fireresources5

Wildfire promotes dominance of invasive giant reed (*Arundo donax*) in riparian ecosystems

Coffman GC, Ambrose RF and Rundel PW. 2010. *Biological Invasions*. Volume 12, Number 8, Pages 2723-2734.

This study evaluates the influence of wildfire on *Arundo donax* invasion by investigating its relative rate of reestablishment versus native riparian species after wildfire burned riparian woodlands along the Santa Clara River in southern California in October 2003.
http://tinyurl.com/tln2012fireresources6

*FIRE FACTS 2012

So far this year (as of August 21), a total of 42,927 fires have burned or are burning 7,037,373 acres, mostly in the western United States. According to the National Interagency Fire Center (nifc.gov), the 2.01 million acres that were burned by wildfires was the 4th most on record.

Response of six non-native plant species to wildfires in the northern Rocky Mountains, USA.

Ferguson DE, Craig CL. 2010. Res. Pap. RMRSRP-78 Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 12 p.

This paper presents early results on the response of six non-native invasive plant species to eight wildfires on six National Forests (NFs) in the northern Rocky Mountains, USA.
http://tinyurl.com/tln2012fireresources7

Managing Spotted Knapweed (*Centaurea stoebe*)–Infested Rangeland after Wildfire

Pokorny ML, Mangold JM, Hafer J and Denny MK. 2010. *Invasive Plant Science and Management* 3(2):182-189.

In this study, three herbicide application treatments (broadcast application, spot application, and no herbicide) and three seed mixture treatments (grass-only seed mix, a grass and forb seed mix, no seeding) were tested to determine the ability of herbicide and revegetation treatments to restore spotted knapweed–infested areas to desired plant communities after wildfire.
http://tinyurl.com/tln2012fireresources8

Post-Fire Control of Invasive Plants Promotes Native Recovery in a Burned Desert Shrubland

Steers RJ and Allen EB. 2010. *Restoration Ecology*, 18: 334–343.

Three treatments to control invasive annual grasses and forbs were implemented in the first 3 years following a fire in creosote bush scrub vegetation.
http://tinyurl.com/tln2012fireresources9

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TechLine is a suite of print and online resources that provides invasive plant professionals access to new, innovative, and proven science-based information that supports their management programs. TechLine aims to connect researchers with invasive plant managers of federal, state, county, and private lands so they may share the successes of their programs, techniques, and methods and learn from one another.

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