TechLine

Information About Invasive/Exotic Plant Management — Fall 2007

Boomless Nozzles Require New Thinking for Correct Use

Boomless Nozzles Evaluation for Weed Control in Pastures, Rangelands, and on Roadsides

By Charles Henry, TechLine Editor
This article summarizes recent research by Robert Wolf, Dallas Peterson, and Walter Fick at Kansas State University, Manhattan
Jeffery Davidson, Kansas State University Research and Extension, Eureka; and Gary Kilgore, Kansas State University Research and Extension, Chanute

Nozzle and tank setup used in KSU boomless nozzle trials.

In recent years the use of four-wheelers equipped with small capacity spray tanks and boomless nozzle systems has become popular. These systems are better adapted to uneven terrains and have potential to spray 25 tp 30 foot swaths using a centrally located single or dual nozzle arrangement. Recently there have been several nozzle designs introduced for this purpose. The adoption of these nozzle types is occurring without a clear understanding of correct operating parameters. Indications are that these nozzle types may not be as effective for weed control as hoped.

"A user of these nozzles should have two concerns – the effective width of the pattern and the control achieved over that width," Wolf explains. "We found that with the current pumps and nozzle configurations commonly in use, ATV-type sprayers are not meeting these two parameters and thus not achieving the best weed control."

Wolf also says users of these systems need to know the mode of action of the herbicide being sprayed. The contact herbicide (paraquat) used in the trials did not achieve the same level of control as the translocated herbicide

"Facts do not cease to exist because they are ignored."
...Aldous Huxley

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(glyphosate). While the uniformity of control with all nozzles tested and with both herbicides was relatively the same (Chart 2), the actual percent control varied between nozzles with the contact herbicide (Chart 3) from 60% to 77%. As would be expected, the percent control was 100% with the translocated herbicide for all nozzles since contact with the plant is not the mode of action involved.

Multiple water sensitive papers (WSP) were used to collect spray droplets across the swath width for each treatment.

"This means that coverage is more critical with contact herbicides when using boomless nozzles than if an operator is applying a translocated herbicide. Thus, when using these nozzles, know the mode of action of your herbicide," Wolf explains.

Pattern width also varied between the nozzles when compared to their manufacturer's rated widths and also the type of vegetation being treated, according to Wolf. When treating short vegetation, these nozzles came close to achieving the pattern width rating stated by the manufacturer. But in taller vegetation, the nozzles could not practically be mounted high enough to achieve the rated widths (Chart 1).

"We tested each nozzle with a 12-volt, 45 psi, 3.6 gpm pump that would commonly be found on an ATV-type sprayer setup," Wolf explains. "In the short wheat (4-5 inches tall) we achieved the rated width with only two of the nozzles (Chart 1). In the taller wheat (24-30 inches) the vegetation was tall enough to interfere with the pattern and limit the width with all the nozzles in the test and with both herbicides (Chart 1). We would have had to mount the nozzles almost six feet high to achieve the rated width and that is certainly not practical for ATV sprayers."

Wolf is always concerned with minimizing spray drift and drift potential increases with higher release points. Therefore, mounting nozzles higher is not practical on ATVs and can potentially increase the chances of drift and should be avoided.

Considerations When Using Boomless Nozzles

1. Pick the nozzle that best fits the mode of action of the herbicide used.
2. Consider coverage over the pattern width.
3. Match travel swath width to achieve effective coverage.
4. Increased height of vegetation sprayed will reduce pattern width.
5. Wind direction relative to direction of travel affects pattern width.
6. Adequate pressures need to be maintained to insure coverage over pattern width.
7. A different pump may be required to achieve rated widths relative to vegetation height and herbicide used.

"This is the second lesson learned in this trial," Wolf states. "These nozzles will not achieve their rated pattern widths in tall weeds or where there is other tall vegetation that can disrupt the pattern. The operator needs to adjust the swath width under these conditions when using these nozzles with this pump setup."

Wolf explains that the basic problem is that these nozzles achieve their widths by throwing a fairly large droplet. And depending on the mode of action of the herbicide, this large droplet size may not put enough herbicide on the target weed leaf surface to achieve satisfactory control.

"We measured the VMD (volume median diameter) of each nozzle and found that with both herbicides, the VMD was very high (Chart 4). Previous research indicates that a VMD of 300-500 microns is optimum. These nozzles had VMD levels from 684 to 799. They all throw large droplets, which means they put less opportunity for full coverage out there," Wolf explains. "Better coverage is almost always associated with smaller droplets. If an operator is relying on contact for control (herbicide selection), then these nozzles will yield less control unless their management is modified to compensate." (Chart 5)

"This is the third lesson gleaned from this study – large orifice nozzles like these boomless nozzles are harder to pressurize with the types of pumps found on most ATV-type sprayers," Wolf says. "Thus, a different pump system such as a tractor-type roller pump should be used, or the working width compensated for as you spray."

In all trials the following abbreviations and notes apply:

XT = Hypro Boom Extender
XP = TeeJet BoomJet
BB = Evergreen Boom Buster
WC-J = Wilger Combo-Jet
Small wheat height was 4-5 inches.
Tall wheat height was 24-30 inches.

Chart 1: Rated versus Actual Swath Width (from one nozzle directed to right side of sprayer)

Nozzle	XT		XP		BB		WC-J	
Rated Width	18 ft		14 ft		18 ft		18 ft	
Wheat Height	**Small**	**Tall**	**Small**	**Tall**	**Small**	**Tall**	**Small**	**Tall**
Paraquat	16.0 ft	09.9 ft	15.6 ft	07.8 ft	14.8 ft	09.6 ft	15.1 ft	08.7 ft
Glyphosate	15.6 ft	10.0 ft	11.2 ft	10.5 ft	13.5 ft	10.5 ft	12.2 ft	10.9 ft

Chart 2: Uniformity of Control Tall Wheat

Subjective measure of level of control achieved
Scale 1-10 (10 is highest level of control)

Nozzle	XT	XP	BB	WC-J
Paraquat	8.0	5.0	8.0	7.0
Glyphosate	7.0	7.0	7.0	8.0

Chart 3: Percent Control Tall Wheat

Nozzle	XT	XP	BB	WC-J
Paraquat	77	60	73	67
Glyphosate	100	100	100	100

Chart 4: Volume Median Diameter of Droplets

300-500 microns is recommended VMD for optimum control.

Nozzle	XT	XP	BB	WC-J
Paraquat	751	799	684	701
Glyphosate	693	743	711	782

Chart 5: Percent Coverage

Nozzle	XT	XP	BB	WC-J
Paraquat	27.0	37.5	32.3	35.9
Glyphosate	23.0	21.3	22.7	28.0

See sidebar:
Boomless Nozzle Study Parameters
on page 12

Editor's Note:

The new invasive plant herbicide aminopyralid (trade name Milestone® herbicide) has been evaluated extensively in university research trials and demonstration plots across the United States in the past seven years.

The results of these trials on a species by species basis will be presented in this and coming issues of TechLine.

Previous species covered and the TechLine issues in which they appeared include:

- **Spotted knapweed, Russian knapweed, and orange hawkweed – Winter 2005-2006**
- **Canada thistle – Spring 2006**
- **Yellow starthistle – Late Summer 2006**
- **Absinth Wormwood – Early Winter 2006**
- **Scotch Thistle – Spring 2007**

Hawkweed Research

Efficacy and Application Timing of Milestone® herbicide on Hawkweeds

By Charles Henry
TechLine Editor

A complex of hawkweed species threatens habitats in an ever-widening distribution in the western states, according to Linda Wilson, Invasive Plant Ecologist at the University of Idaho in Moscow. Wilson states that eight species of weedy hawkweeds are in the United States and Canada. Two species are easily recognized. Orange hawkweed (*Hieracium aurantiacum*) has bright orange flowers, and mouse-ear hawkweed (*Hieracium pilosella*) has a single, yellow flower. Mouse-ear hawkweed is found in coastal Washington and Oregon, and recently was found in southeastern British Columbia. Other hawkweeds have multiple, yellow flowers and can be tricky to distinguish from one another. They are known as meadow hawkweed (*H. caespitosum*), yellowdevil hawkweed (*H. praealtum*), king-devil hawkweed (*H. floriundum*), queen-devil hawkweed (*H. glomeratum*), whiplash hawkweed (*H. flagellare*), and tall hawkweed (*H. piloselloides*). **See sidebar, "Biology and Impacts of Hawkweeds" on page 7.**

Dr. Linda Wilson
Invasive Plant Ecologist
University of Idaho
Moscow, Idaho

"Hawkweeds are notorious for their complex and confusing classification. Studies are underway by the University of Idaho, University of Montana and the USDA to determine the extent to which invasive hawkweeds hybridize among themselves, and with native hawkweeds," Wilson says. "Hawkweeds can pose a serious threat to native plant diversity. Once established, hawkweed quickly develops into a patch that continues to expand until it covers the site with a solid mat of rosettes. One 350-acre site changed from being completely empty of hawkweed to 100% infested in just three years. Hawkweeds can grow from seed to seed in just 63 days and seed viability lasts up to three years in the soil."

Wilson also says that the range of hawkweeds is moving south and east from the Pacific Northwest. Infestations are now found in Yellowstone National Park and down the Rockies into the Front Range of Colorado. To the north they range in coastal Alaska and further inland in northern BC to above 56° latitude. Invasive hawkweeds are considered the fastest spreading, most troublesome weeds throughout much of British Columbia.

"Currently herbicides remain the primary tool for controlling hawkweeds as we have no approved bio-

Orange hawkweed with stiff, glandular hairs.
(Photo Courtesy of BC Ministry of Agriculture)

Chart 1

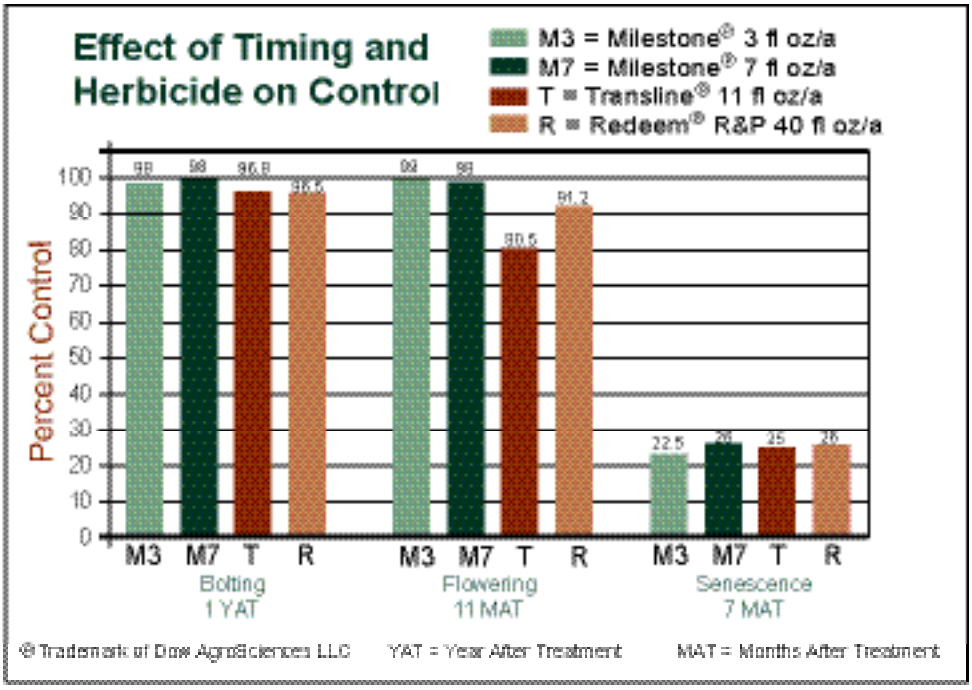
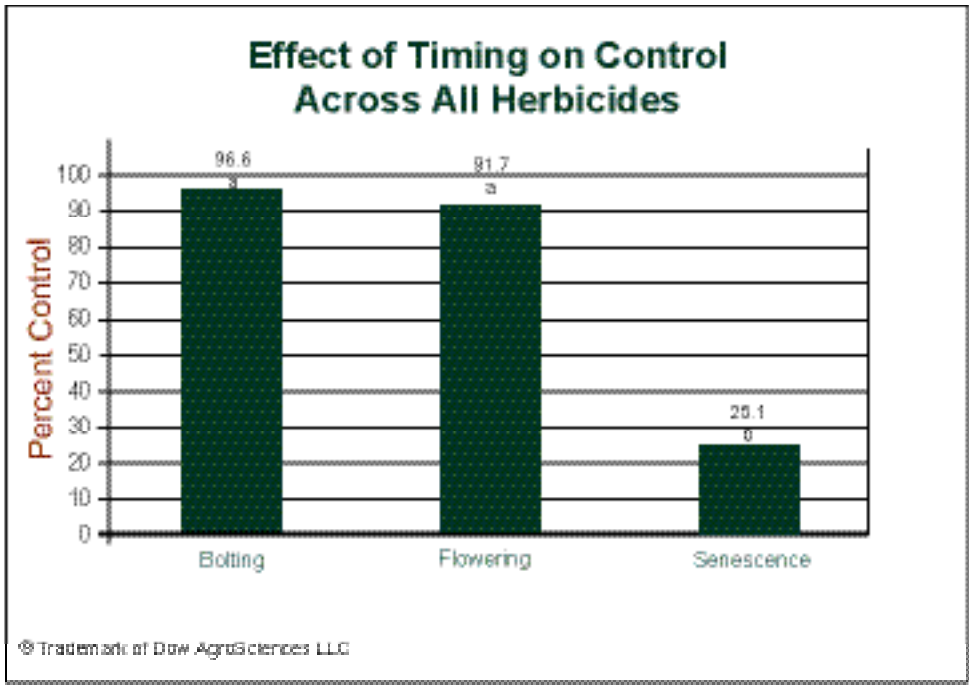


Chart 2



logical control insects. Biological control research is ongoing, but is proving to be challenging because we have 38 species of native hawkweeds and we need to be sure risk to these species is minimized," Wilson explains. "New Zealand has released five species of control insects for their non-native hawkweeds."

"We have evaluated Milestone herbicide for several years and it offers a valuable new tool in managing the hawkweed complex because of its wide application timing window and selectivity," Wilson says. "Maintaining existing grasses and forbs or re-seeding with grasses combined with the correct herbicide application timing are key strategies for successful control of hawkweeds," Wilson explains.

"Hawkweeds are poor competitors on sites with good nutrient soils, good grass cover, and no disturbance.

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"Hawkweeds"

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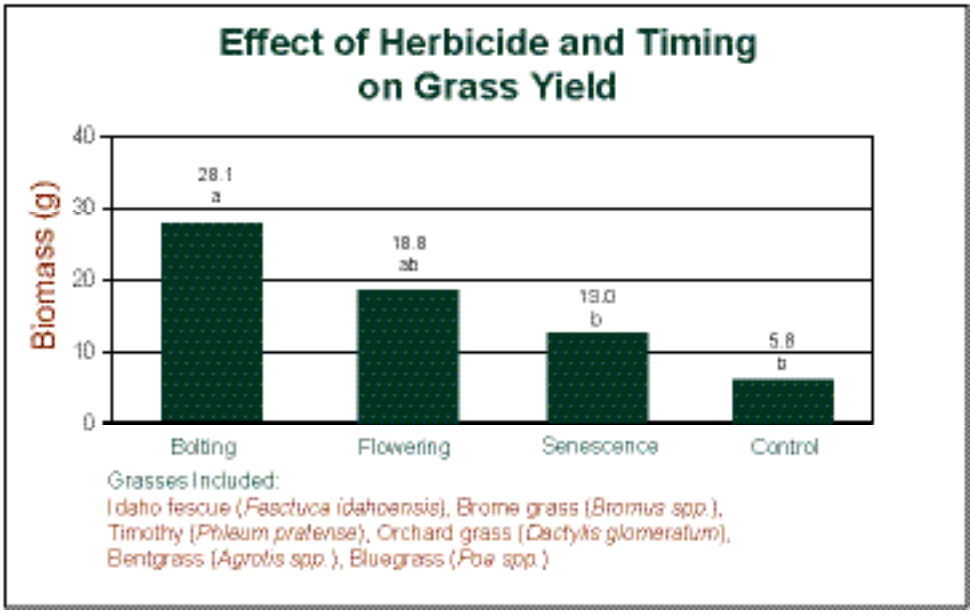
Chart 3



Conversely, they are real bulldogs when opposite conditions exist. So establishing or maintaining existing grass cover, possible with the use of fertilizers, is important after herbicide applications," Wilson states. "The earlier a hawkweed infestation is sprayed, the greater grass response we see the rest of the growing season, and the greater hawkweed control we achieve."

In University of Idaho trials, two herbicide standards, Transline® herbicide and Redeem® R&P herbicide, were compared to Milestone® herbicide applied at two different rates. Each treatment was applied at bolting – May 24th, flowering - June 24th, and senescence – October 21. Applications were made in 10x30-ft plots with four replications with a CO2-pressurized backpack sprayer at 15 gpa. Visual evaluations were made 30 and 60 days after treatment (DAT) and one year after treatment (YAT).

In addition, biomass measurements were collected one year after treatment in single, random quarter-meter squared quadrates per plot. Hawkweeds, grass, and forbs were separated, dried, and weighed.

"We achieved excellent control of hawkweed with all three herbicides applied at bolting, and good control at flowering with the exception of Transline at flowering," Wilson explains (Chart 1). "However, control drops off drastically when these herbicides were applied to hawkweed in the fall (senescence) when the plants are dry (Chart 2). The grass biomass measurements also show that we achieve better control when we maintain grass competition as we remove the hawkweeds (Chart 3). If we maintain a 25% to 30% cover of other vegetation, a site has a better chance to bounce back after suppressing the hawkweed."

"We see that the earlier we spray hawkweed, the better grass flush we achieve and this might be key to keeping the hawkweed from re-infesting sites. Milestone herbicide does an excellent job of removing the hawkweed, but we keep it out if we can encourage the grasses. Milestone does not affect grasses and has minimal effect on other forbs, so it meets the best management criteria for controlling the weeds and leaving behind competitive species that can help keep hawkweeds out," she concludes.

Yellow hawkweed flower
Photo Courtesy of BC Ministry of Agriculture

Biology and Impacts of Hawkweeds

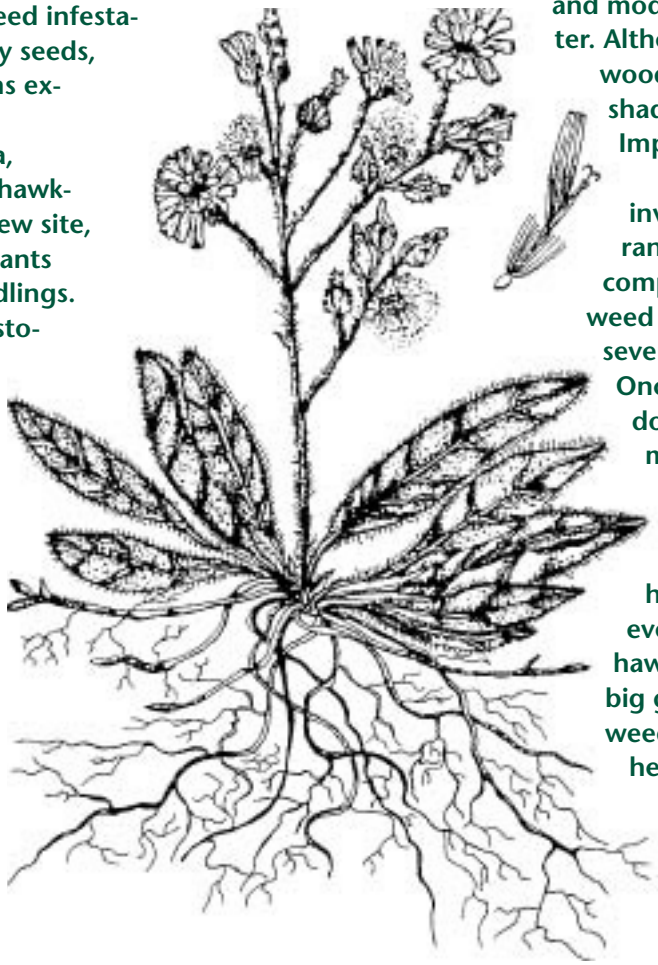
By Robert H. Callihan, Linda M. Wilson, Joseph P. McCaffrey, and Timothy W. Miller

Hawkweeds are perennial herbs with fibrous (not tap) roots, that reproduce by seeds, stolons, rhizomes, and, in some cases, buds on the roots. Seeds can be produced either with pollen (sexually) or without pollen (asexually). Although most new hawkweed infestations are probably started by seeds, most established populations expand vegetatively.

Studies in Ontario, Canada, showed that once meadow hawkweed gains a toehold at a new site, less than 2 percent of the plants in the patch come from seedlings. Once established, vigorous stolon growth quickly expands the colony, forming dense patches that can have as many as 3,200 plants per square yard. The slender, leafy stolons elongate through the summer and form daughter rosettes at their tips. As roots anchor these young rosettes, the stolons die and the young plants become independent of the mother plant. Hawkweeds regrow each year from short, belowground rhizomes, which actually look like small root crowns.

Plants require a certain number of daylight hours per day in order to flower. At lower elevations this occurs around mid-June. Seeds ripen by early August. Fall-germinated seeds generally perish during the first winter, so most seedlings establish in the spring. Studies in eastern Canada showed that seeds are not carried far by the wind. Minute barbs along ribs on the seeds enable them to stick to hair, fur, feathers, clothing, and vehicles and be carried long distances.

Hawkweeds live predominantly in permanent pastures and hayfields, mountain meadows, clearings in forest zones, roadsides, and abandoned farmland at elevations of 2,100 to 5,400 feet. Introduced hawkweeds are not expected to become a problem in any dry habitat usually associated with Intermountain West rangelands. Hawkweeds prefer soils that are well drained, coarse-textured, and moderately low in organic matter. Although they can grow in open woodlands, they do not tolerate shade very well.



Impacts:

Hawkweeds can quickly invade and dominate a wide range of habitats. They outcompete native species of hawkweed easily and are threatening several of these native species. Once non-native hawkweeds dominate a site they form monocultures that exclude most other vegetation. Some insects and rodents may co-exist and utilize hawkweed stands, however larger mammals avoid hawkweed-infested sites and big game does not utilize hawkweeds. Cattle will graze flower heads, but the stems and leaves are not desirable to livestock.

Ninety percent of humans have an allergic reaction to hawkweed contact with skin.

Invasive hawkweed species have substantial impacts on ecosystem attributes. For example, long-term site and soil characteristics can be modified by hawkweed infestation. Soil factors affected include soil pH, nutrients, moisture, organic material, and mycorrhizal fungi.

Drawing Courtesy of Montana State University

By Charles Henry
TechLine Editor

Strike Teams Bring Timely Weed Control to Wildlife Refuges

Modeled after the National Park Service's Exotic Plant Management Teams, The US Fish & Wildlife Service's (USFWS) Invasive Species Strike Teams are designed to increase the efficiency and effectiveness of invasive species management on refuge lands, according to Lindy Garner. Garner is the Mountain Zone (MT, WY, CO, UT) Regional Invasive Species Coordinator based at Benton Lakes National Wildlife Refuge (NWR) near Great Falls, MT. She also leads the Missouri, Yellowstone, Columbia (MOYOCO) strike team. There are 40 national wildlife refuges in the Mountain Zone.

Montana has 22 National Wildlife Refuges (NWR) and 23 Waterfowl Production Areas (WPA) and many conservation easements that total more than 1,343,000 acres.

"By using full-time, trained and equipped invasive species management personnel, we conduct focused refuge invasive species operations. The wildland fire fighting approach enables rapid response to satellite infestations while allowing for the provision of directed technical assistance to refuges," Garner says. Only five USFWS strike teams are currently funded for work in priority geographic locations:

1. Lower Colorado River in the Southwest
2. Upper Missouri/Yellowstone/Upper Columbia River basins (MOYOCO)
3. Everglades

Lindy Garner. Garner is the Mountain Zone Regional Invasive Species Coordinator based at Benton Lakes National Wildlife Refuge (NWR) near Great Falls, MT.

Strike team efforts center on preventing the introduction of and detecting and responding rapidly to new invaders and new infestations as born from the Executive Order 13112 (1999). Strike teams focus on maintaining habitat conditions for biological communities to flourish through control and management of invasive species, including rapid response to infestations, integrated management techniques and programs implemented through partnerships on networked lands.

The MOYOCO team is comprised of three crews of four individuals. Each team is equipped with two trucks, an enclosed trailer, four ATVs with jackrabbit sprayers, backpack sprayers, and support parts and accessories, according to Garner. The first season, the crews devoted most of their time providing weed identification and mapping services to refuges that requested their assistance. In 2006 the Strike Teams treated just over 1,300 acres of weed infestations with herbicide, 200 acres by hand,

Each team is equipped with two trucks, an enclosed trailer (above), four ATVs with jackrabbit sprayers, backpack sprayers, and support parts and accessories.

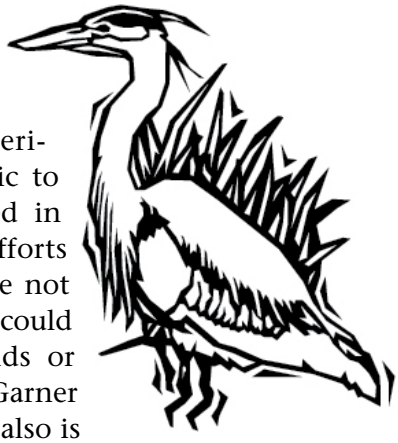
and 200 acres mechanically. Montana refuges overall were only funded enough to get approximately 5,000 acres treated which was barely 15% of infested acres. Of that effort, 30% of treatment on refuges was completed by the Strike Team. In 2007, Garner has received 38 proposals for Strike Team assistance from 10 NWRs and 12 WPAs. Garner says most refuges simply do not have the staff or funding to perform all the weed control work that needs to be accomplished. They always try to complement a refuge's own efforts, but in many cases if there was not a Strike Team, the work would not be done.

She describes the Lost Trail NWR in northwest Montana as an example of their importance. The refuge is comprised of 9,000 acres in an intermountain valley. It is a wetland comprised of Dahl Lake and is critical habitat for migrating and resident waterfowl such as black terns, sandhill cranes, geese and many duck species. Wolves have denned just off the refuge and it is also habitat for black bears and elk. The refuge was a ranch before it was purchased for a refuge. Areas that were not wetlands were comprised of rough fescue ranges that were in fairly good condition until spotted knapweed invaded.

Initially the refuge controlled the knapweed with an aerial application of Tordon® 22K herbicide. But in 2000, a Threatened and Endangered Species was found – the Spalding's campion (*Silene spaldingii*). Spalding's campion was once found throughout the Palouse prairie and canyon grasslands of the Pacific Northwest bunchgrass habitat type in southeastern Washington, northwestern Montana, adjacent portions of Idaho and Oregon, and British Columbia. Today, Spalding's campion is known from 52 small, scattered populations in west-central Idaho, northeastern Oregon, western Montana (9 of the 52 populations), eastern Washington, and British Columbia.

"This species does not come up until August, which created timing problems for controlling knapweed without injuring this plant," Garner explains. "The Strike Team went in last August to help map locations of Spalding's campion and then back in with backpack sprayers to control the knapweed around the Spalding's campion. We applied Milestone® herbicide at the labeled rate of 7.0 fl oz/acre. The refuge did not have the staff to do this application at that time of year and their volunteers are not trained to apply herbicides so the Strike Team was the ideal solution."

"In addition to our herbicide application work, we also collect and distribute biological control insects and attend community weed events such as spray days, weed pulls, and weed rodeos. We bring our trailer to these events along with printed weed awareness materials.We want the public to know we are involved in weed management efforts on our refuges. We are not ignoring problems that could spread to private lands or other public lands," Garner says. "The strike team also is a funded avenue for developing partnerships with our neighbors to conduct weed management within the landscape."



"With Strike Team resources, refuges are becoming more active partners in cooperative weed management areas. We are controlling weeds on more travel corridors and can even work on private lands surrounding refuges when needed as part of cooperative efforts. This makes us better neighbors and partners," Garner explains.

The Strike Teams are aiding refuges in another significant area, according to Garner, and that is in helping them update their GIS data information.

"Our crews all carry GPS systems that feed data into software that is a component with the Refuge Lands Geographic Information System database (RL-GIS). Many refuges need help in building their databases and our crews often provide the impetuous to collect this data," Garner concludes. "We believe we are 'state-of-the-art' in this regard and our teams can help refuges jump-start their data sets while we are controlling weeds."

Booming Energy Development Brings Threat from Expanding Noxious Weed Infestations

By Charles Henry
TechLine Editor

When Adrianne Peterson thinks about what makes the Sublette County, Wyoming program unique, she states, "We are one of the most weed-free, cleanest counties in the west, and program goal, simply stated, is to keep us that way." But now that goal is under assault by rapidly expanding energy development on public lands in the county.

Peterson is one of only two weed supervisors that Sublette County Weed & Pest has employed since they first formed their weed program in 1973. She says they are working doubly hard to prevent weed spread or introduction. They realize the most severe impact from the energy activity will occur 10-20 years from now when the drilling rigs leave behind disturbed sites and hundreds of new roads.

Southwest Wyoming's natural gas fields are among the most active in the nation. Nearly 3,000 wells, averaging 18,000 feet in depth, have already been drilled in the Jonah, Pinedale Anticline and LaBarge fields in the past four years. And there are plans for thousands more. The Bureau of Land Management Pinedale Resource Area's management plan forecasts the number of gas wells could reach 11,000 to 12,000 by 2020. Most of this expected development would occur in the Jonah and Pinedale Anticline fields, but other areas would be open to drilling as well.

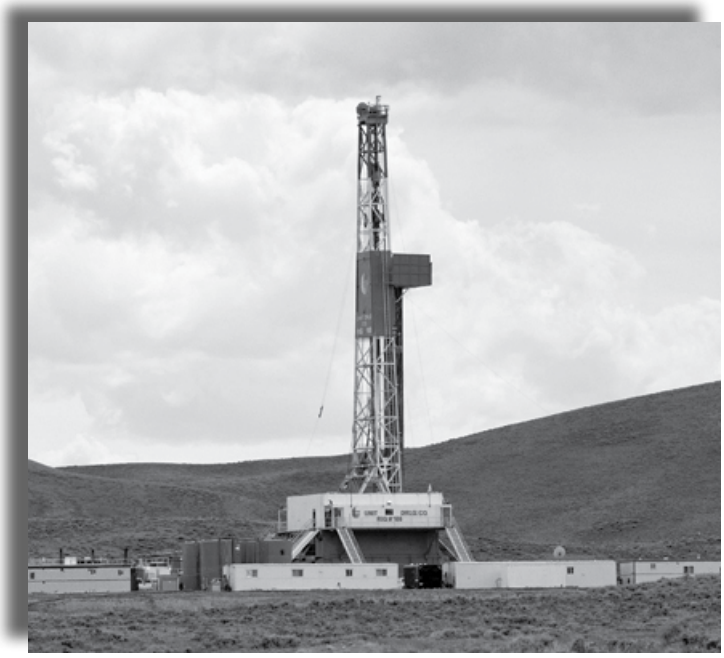
"The energy companies are doing a good job of protecting resources as drilling activity increases. There are concerns among wildlife biologists that habitat is being impacted, and that some mitigation is not occurring. There will be ten times as many road miles in the county when energy activity ends,"she says.

"We cannot afford to get behind. The energy companies are responsible for weed control and reclaiming all well sites. The Bureau of Land Management (which manages the public land where most of the drilling is located) must insure that the companies comply with the reclamation guidelines. However, everyone is short-staffed and once activity ceases, we are the residents who will be still here and we don't want to inherit a noxious weed program that we cannot manage," she says.

Adrianne Peterson, Sublette County, Pinedale, Wyoming

Sublette County is comprised of 3.5 million acres that are mostly high elevation sagebrush steppe in the 7,000 to 8,000 ft elevation range. Prior to energy development the economy was based on ranching and recreation as the Wind River mountains form the northern county boundary. Eighty-five percent of the county is public land, either BLM, US Forest Service, or Wyoming state lands.

Energy activity has nearly doubled the population of the county. Two energy "man camps" exist in the county that each house 350 energy field workers. As more roads are created, vehicle traffic has exploded and the potential for spreading weeds has increased. Canada thistle, perennial pepperweed (*Lepidium latifolium*),



and small infestations of spotted knapweed (*Centaurea stoebe L. ssp. Micranthos* – formerly *C. maculosa*), diffuse knapweed (*Centaurea diffusa*), leafy spurge (*Euphorbia esula L.*), oxeye daisy (*Chrysanthemum maximum*), and yellow toadflax (*Linaria vulgaris*) have also been identified in the county.

As the county's population increases, more subdivisions and ranchette properties are springing up. All create more soil disturbance and vehicle activity that promotes weed spread. "When someone calls with a weed problem, we do more than just tell them what to do on the phone," Peterson says. "We visit each landowner, walk their property with them, help them decide on a plan and leave them with additional weed education materials. Education is the cornerstone of our program. We want our residents to be knowledgeable about weeds. The more 'eyes' we have looking out there, the faster we can get on a new problem and keep it contained or eradicate it."

County sprayers have carried a tank mix comprised of Tordon® 22K herbicide and Telar herbicide with nonionic surfactant included. This combination controls their primary targets of thistle, knapweeds, hoary cress, and perennial pepperweed. However landowners are moving more to Milestone® herbicide because it can be applied up to water's edge and is not a federally Restricted Use pesticide so does not require special certification to apply.

"Ranchers and small landowners are simply not taking the time to become certified, so Milestone really fits better for them. As more of our landowners switch, we will begin to include more Milestone in our work as well," Peterson says. The weed district serves as the principle source of herbicides in the county as they are a retail outlet and also cost share with landowners. They also furnish backpack sprayers and ATV spray tanks and have one 200-gallon pickup sprayer available for loan. At the end of each season they sell the backpacks and the ATV tanks to local landowners and then buy new ones. This increases the number of folks working on weeds and also cuts down on equipment maintenance costs for the county.

The county is also part of the Green River Basin Weed Management Area (WMA) that runs from LaBarge to Bondurant. The BLM, US Forest Service, Lincoln County, Wyoming Game & Fish, NRCS, and local landowners are all part of this WMA, according to Peterson. The WMA was begun by Diamond H Ranch owner Corby McGinnis at LaBarge. She began organizing work days and doing all the leg work to bring people together.

"These work days are now a large part of our total effort. Each agency and landowner brings their sprayers to a designated area and we treat the entire area at once. Then we have a great lunch to thank everyone for coming," Peterson says. "We have expanded these work days to include biological insect control work where we gather to collect or release insects on a particular site. These work days also include mapping and identifying new infestations as well as control work. The work days might also include fence repair, sprayer calibrations, and educational programs. We had two state legislators attend one of our work days, which always helps."

"We see our role as monitors of the monitors as we patrol new roads and keep an eye on the BLM as they work with the energy companies," Peterson concludes. "We need to work together with all the public land agencies to find new weed invaders as early as possible to make sure we are still one of the cleanest counties in the west when all this activity is over. Our assessed valuation is providing excellent funding now, but when the boom is over, we will have more limited resources and we don't want to be faced with a huge problem then."

Boomless Nozzle Study Parameters

(Continued from Page 3)

Field trials were initiated using a four-wheeler spray system to evaluate boomless nozzles. The trials evaluated pattern quality, swath width, droplet spectra, and efficacy. Replicated studies were conducted in a manner consistent with recommended practice for boomless nozzle systems.

The nozzle types compared were the TeeJet BoomJet (XP), Hypro Boom Extender (XT), Wilger Combo-Jet (WC-J), and the Evergreen Boom Buster (BB). Tank mix treatments containing glyphosate and paraquat were applied to a growing wheat crop planted in 20-foot wide strips for comparing each nozzle treatment.

Visual ratings for efficacy, uniformity of control, and measurements for width of control at four weeks after treatment are reported. Two trials were completed, one with new growth wheat (4-5 inches tall) and the other in a later growth stage (24-30 inches tall). Three replications were evaluated for each treatment. Multiple water sensitive papers (WSP) were used to collect spray droplets across the swath width for each treatment. DropletScan® software, a computer, and a flat-bed scanner were used to calculate critical droplet statistics for all treatments.

The spray system was calibrated to deliver 18 GPA at a spray speed of 3.5 MPH and a spray pressure between 35 and 40 PSI for all treatments. The nozzles for each treatment were configured according to manufacturer's recommendations to deliver the desired swath width.

Need More Information?

Call *TechLine* at 970-887-1228 or Email: agwest@rkymtnhi.com

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