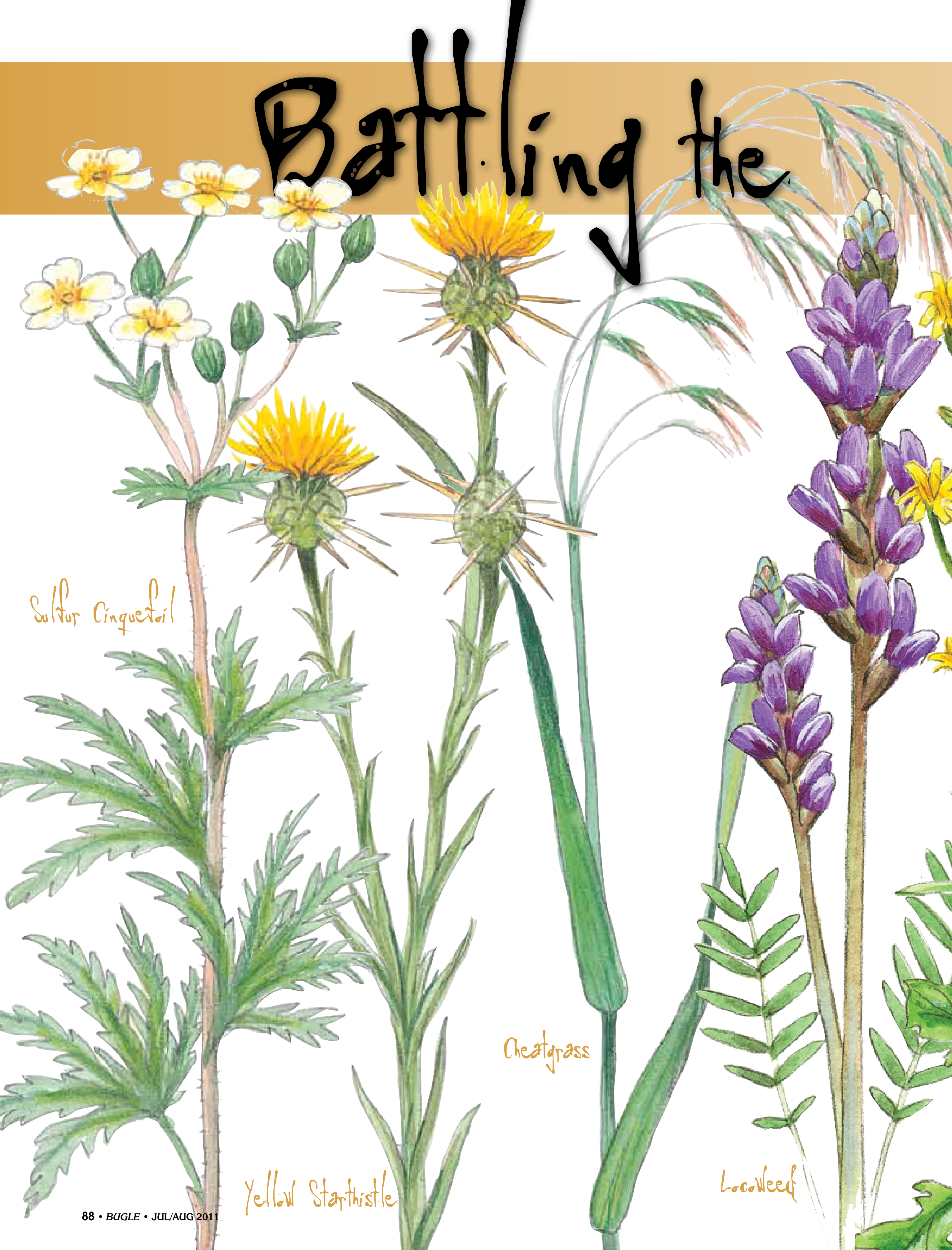
Battling the



Bad Seeds

by Bugle staff
illustrations by Cynthie Fisher

Noxious weeds now infest 100 million acres of America—an area roughly the size of Montana. They invade another 6 square miles every day. But we're fighting back with everything from bugs to goats to Tordon.

Every now and then, elk get hooked on weed. It begins innocently enough. Say it's a dry spring. New green forage is scarce. A hungry young bull nibbles one of perhaps a dozen native plants known collectively as locoweed. Perhaps the effects feel good. Maybe the silky, grayish-white leaves are just tasty. The elk seeks more. And more. Soon he becomes weak and emaciated. Muscles trembling, senses jumbled, the "locoed" elk may panic and run, aimlessly crashing into trees and fences. Eventually, he'll die.

Luckily, locoed elk are rare. Certainly locoweed holds a grim fate for hapless individuals. But it poses no threat to the health of herds. The real threat to elk are the plants they can't eat. Aggressive exotics like leafy spurge, spotted knapweed and Dalmatian toadflax have infested millions of acres of wildlife habitat and ranchlands, undermining plant diversity and leaving the cupboard bare for large herbivores such as elk, deer, pronghorn and cattle.

Tom Toman, veteran wildlife biologist and director of conservation for RMEF, says weeds are one of the greatest threats to elk, other wildlife and ranching. "That's why so many people have come together to declare a war on noxious weeds," he says.

If "war on weeds" seems a bit hyperbolic, consider this: noxious weeds conquer more than 3 million acres of elk country each year. When weeds take over, they eliminate the rich diversity of grasses and forbs on which elk and other wildlife depend. Deteriorating habitat also threatens ranchers and farmers whose lands

help sustain not only cattle but wildlife. Consider a study by University of Montana researchers examining the impacts of spotted knapweed on western Montana cattle ranches. On one ranch, after ranchers killed knapweed with herbicide, grass production increased from 48 pounds per acre to 1,620 pounds.

Ob-noxious Exotics

Noxious weed is a legal term used by state and federal agencies to denote non-native plants that pose serious threats to agriculture and wildlife. Four thousand exotic plants are recognized as "pests" by the U.S. government, 90 are federal noxious weeds. Some came to America by accident. Others were deliberately imported. All wreak ecological and economic havoc. Even that most western icon, the tumbleweed, turns out to be a troublesome newcomer. Otherwise known as Russian thistle, this rambling exotic grows, dies and dislodges from its roots, blowing wherever the wind takes it, sowing seeds along the way.

Plants have traveled back and forth across oceans and continents since long before Captain Bligh's crew mutinied on the *Bounty* in 1787 while carrying breadfruit trees from Tahiti to the British West Indies. Bligh's ill-fated journey was part of a scheme concocted by Sir Joseph Banks, a prominent English botanist who launched what's been called the "antipodean exchange," blithely moving plants around the world to suit people's whims. The Americas gave Europe tomatoes, corn and chile peppers. In return came cheatgrass, knapweed and leafy spurge.

Of course, that's not quite fair. We fill our pantries and bellies with delectable, nonnative plants now grown locally. Who doesn't savor a good ale made from hops and barley? And we can thank Johnny Appleseed for spreading the crisp, tart flavor of McIntosh. Even okra, the plant that puts the gum in gumbo, was brought to the South by enslaved Ethiopians. Thousands of exotic plants now grow in the United States. Most add spice to life. Some are a bit annoying. A few are nothing short of ecological time bombs.

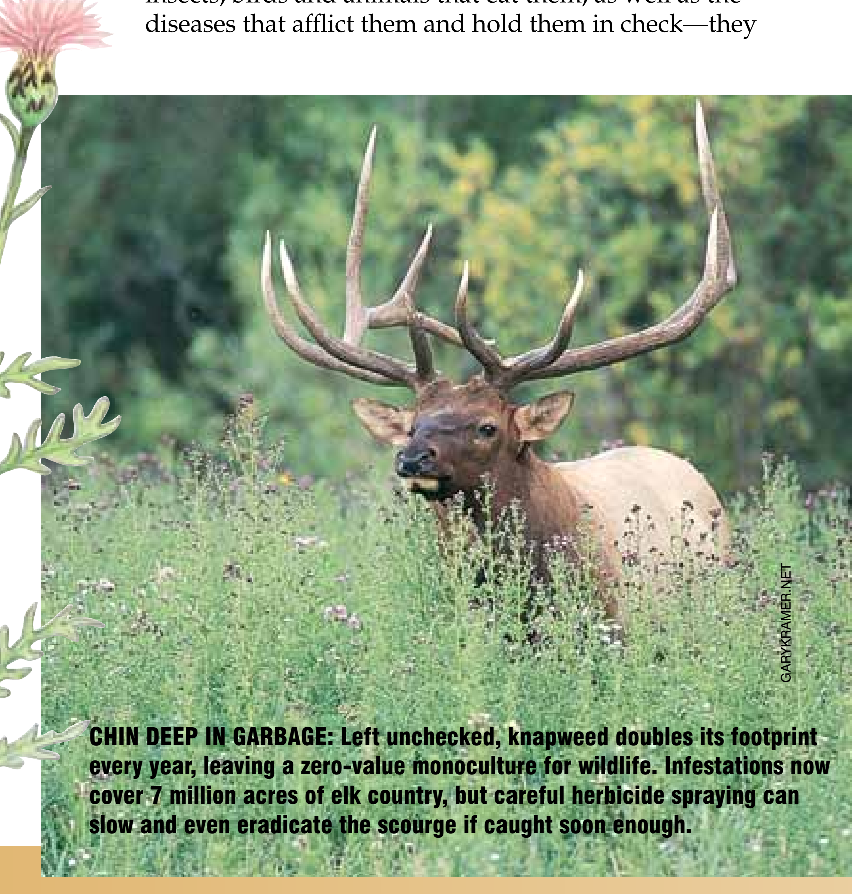
Eating Up Habitat

Many exotic plants arrive in North America as stowaways, seeds inadvertently hidden among shipments of grain. Others are brought over by well-meaning folks to grace gardens or help control erosion. Once here, plants and their seeds hitch rides aboard elk, magpies, wool pants, horses, all-terrain vehicles, trucks and trains. Some simply fly with the wind or ride on river currents.

Since most of these plants left behind the natural predators they evolved with in their homelands—the insects, birds and animals that eat them, as well as the diseases that afflict them and hold them in check—they

Spotted Knapweed

Gorse



CHIN DEEP IN GARBAGE: Left unchecked, knapweed doubles its footprint every year, leaving a zero-value monoculture for wildlife. Infestations now cover 7 million acres of elk country, but careful herbicide spraying can slow and even eradicate the scourge if caught soon enough.

have a competitive advantage over native plants. Many noxious weeds also have means to spread rapidly in new environments. Some produce staggering volumes of seeds that can remain viable for up to 20 years, others send out root systems like tentacles that reach deep and wide, and some actually excrete compounds that stymie the growth of other plants.

Spotted knapweed immigrated to the United States from central Europe, mixed in with shipments of alfalfa and clover seeds. Now, knapweed has crowded out native plants on over 7 million acres across nine western states and two Canadian provinces. By sending down stout taproots, knapweed gets the jump on other plants with its early spring growth and snatches up most of the available space, sun, water and nutrients. Each plant produces more than a thousand seeds and can often be found in densities of up to 2 million plants per acre. Infestations frequently reduce native grasses and forbs by as much as 90 percent.

Spotted knapweed now blankets many low-elevation, south-facing slopes in Idaho, Montana, Oregon, Washington and British Columbia—the very places elk and deer rely on in winter and cattle graze in the summer. British Columbia's Knapweed Action Committee reports, "Protection from knapweed encroachment is absolutely essential to maintain the forage base for wild mammals ... Knapweed takeover of fall, winter and spring range would result in a significant decline in deer and elk numbers and a marked change in distribution."

Spotted knapweed is hardly the only threat. Diffuse knapweed, Russian knapweed and yellow starthistle have consumed more than 11 million acres in 10 states and two Canadian provinces; leafy spurge has infested 2.5 million acres in 30 states, and cheatgrass has overrun more than 100 million acres throughout the United States. Noxious weeds not only negatively impact the wildlife we hunt and eat, but everything up and down the food chain. Simply put, loss of native plants equates to a loss of all creatures that depend on grasses and forbs for food, cover and nesting—from voles and larkspurs to the coyotes and Cooper's hawks that eat them. Since most weeds do not hold soil as well as native vegetation, erosion often increases dramatically where weeds dominate. Earth sloughs into streams and fouls critical spawning and rearing habitat for trout, salmon and other native fish, further unraveling the health of the land.

Fire-Breathing Weeds

Invasive weeds can alter entire ecosystems, changing the temperature of soils and flow of nutrients. Weeds can even resemble fire-breathing dragons. Cheatgrass, thought to have come to North America amid a shipment of wheat in the mid-19th century, now sprawls across the Great Basin of Nevada, Idaho and Utah, displacing bunchgrass communities that support populations of trophy elk and mule deer. Scattered bunchgrasses, surrounded by bare soil coated with what biologists call "cryptogamic lichens," once defined this arid basin. The lichens hold moisture, shield soil from erosion and help prevent the rapid spread of fires.

All that changed when cheatgrass moved in. It hits the ground running in spring, outgrowing and overshadowing native bunchgrasses and spreading in a continuous swath across the countryside. After growing and spewing seeds everywhere, cheatgrass dies by midsummer, leaving a sea of tinder-dry fuel. The plant has accelerated the occurrence of fire in the Great Basin from once or twice per century to every 3 to 5 years. And the fires burn much hotter, annihilating native bunchgrasses and forbs and creating ideal conditions for more cheatgrass.

Tamarisk, commonly called saltcedar, was introduced to the United States from Eurasia in the 1800s as a source of wood, shade and erosion control. The tree spread wildly out of control, muscling into more than 1.5 million acres across the West. Crowding along streams, canals and reservoirs, all those tamarisk guzzle about 5 million acre-feet of water a year—enough to supply more than 20 million people with water for one year or irrigate 1 million acres. As if that's not enough, tamarisk exudes salt, making soil inhospitable to native vegetation.

And so it goes across elk country, a rogue's gallery of noxious weeds assaults the health of wild plants and the wildlife they sustain

"It's easy to get depressed about noxious weeds," says Jim Olivarez, who recently retired after a long stint as weed program manager for the U.S. Forest Service's northern region. "But I try to look at it this way: about 95 percent of our public lands are *not* affected by weeds, and we can keep it that way. I refuse to let these plants dominate the landscape. It changes our lives and it changes the land, and I don't want that to happen. These lands are national treasures and we need to protect them."

But how?

Noxious Weed Danger HIGH

Steven Dewey, a weed specialist at Utah State University, suggests attacking weed invasions with the same fervor, funding and tactics applied to battling wildfires. He sees the long-term effect of weeds as a far greater threat to ecosystems than fire. Noxious weeds hardly ever make the evening news, yet their damage is extensive and lasting. While Dewey hardly expects to see Smokey Bear-like campground signs warning, "Noxious Weed Danger HIGH Today," he does believe weed managers have a lot to learn from firefighters.

"The key four areas of emphasis are the same for fires and weeds: prevention, detection, control and rehabilitation."

Dewey believes the most important parallel with fire management lies in making people aware of what's at stake, how weeds spread, and what they can do to help. As Smokey the Bear might say: Only you can prevent the spread of noxious weeds.

"If you're hunting in your favorite spot and you see a noxious weed, let us know," Olivarez says. "It will help. The biggest bang for our dollar is in prevention. Once weeds get out of control, they are difficult and expensive to contain."

Chemical Warfare

Plant-killing chemicals have been used for well over a century, and they have come a long way, selectively killing unwanted plants while sparing others, if carefully applied. Still, they offer no panacea. Herbicides, fungicides and pesticides can kill all up and down the food chain, from single-cell organisms to people. And they're often quite deadly to native plants. In North Dakota's Sheyenne National Grasslands, the rare prairie fringed orchid may be as threatened by the use of herbicides used to control leafy spurge as it is by the spurge itself.

"The chemical war is never won, and all life is caught in its violent crossfire," wrote Rachel Carson in her 1965 classic, *Silent Spring*. Thirty years later in *Grasslands*, an excellent examination of North America's most altered ecosystem, Richard Manning wrote: "*Silent Spring* was the gospel to a generation of environmentalists, and we came to hate the chemical plague. Then some of us came to hate the plague of exotics even more, and we learned to spray Tordon."

After watching weeds gallop out of control across elk country, a great many people have come to agree that the risk of allowing weeds to keep spreading is greater than the risk of limited, spot application of herbicide. Fortunately, both the chemicals and the technology for applying them continue to evolve and have less impact on native plants and wildlife. For Hal Pearce and Tom McClure, innovative weed managers for Colorado's White River National Forest, that evolution took the form of a pair of customized Pepsi canisters.

In cooperation with Dale Vance of Champion Box, Pearce and McClure designed "Saddle Light," consisting of two 5-gallon aluminum Pepsi canisters strapped to a mule with specially designed panniers, a carbon dioxide tank and a hose with a spray nozzle. The system allows them to travel farther and lighter, so they can carefully pinpoint herbicide on yellow toadflax and other weeds in the Flat Tops Wilderness—home to the world's largest elk herd—where motor vehicles and mechanized equipment are prohibited. The Elk Foundation has helped fund and distribute instructions for others to replicate and use Saddle Lights across elk country.

Weed-Eaters

In 1856, insects were shipped from India to Sri Lanka to control the spread of a prickly-pear cactus introduced from India. The United States, for good reason, has been reluctant to introduce nonnative bugs to attack nonnative plants, for fear the bugs might develop a taste for native plants and valuable agricultural crops. Nevertheless, in 1944, three species of European beetles were released in California in a last-ditch effort to control a seemingly insurmountable invasion of Klamath weed. The beetles did their job, reducing Klamath weed by 99 percent and allowing native bunchgrasses and clover to return. Biological control, as it is called, soon caught on, and the United States and Canada developed research sites to test the use of exotic insects to fight exotic plants.

After researchers set loose seed-eating flies in 1970 near Kamloops, British Columbia, they measured up to a 95 percent reduction in knapweed seed germination. But then they noticed plants began producing more seeds to compensate. So they released root eaters to attack from below. The Canadian researchers predict it may take six or seven different insects eating various parts of the plant to effectively control some noxious weeds. Even then, the best that can be hoped for is that the insects stress the exotics enough to put them on equal footing with native plants—allowing the natives to compete with the invaders.

"When we talk about biological controls, we're talking about a natural phenomenon," says Jim Story, a research entomologist with Montana State University. "In nature, you don't see a predator or parasite eliminating its host. Typically what happens is, if you have a high population of pests and you introduce a predator, that predator will knock the pest population down. Then the predator population may drop, and there will be some cycling there, until an equilibrium is reached where a certain level of predator maintains a certain level of pest."

But what's to stop the predator from becoming a pest? Before exotic insects can be released in the United States or Canada to control exotic weeds, they must pass what Story calls a "starvation test." The bugs are placed in enclosures with plants closely related to the targeted weed species, other plants associated with the weed, rare plants of special concern, and important agricultural crops. If the bugs starve before eating the test plants, they pass.

"There's no guarantee," Story says, "but generally speaking, if they pass these tests satisfactorily, it's safe. We only release insects that feed [exclusively] on the targeted pest."

Introduced predators of a larger kind also play a pivotal role in the battle. Spanish goats and domestic sheep have proven highly effective in knocking back infestations of leafy spurge and knapweed. Since cattle eat grass and not spurge, grazing cows only encourage

further expansion of the weed. Now, some ranchers are rotating sheep and goats among their cows to cut back the spurge and give grass a chance. These animals devour anything and relish weeds, chomping them down before they have a chance to grow and cast seeds.

Shoulder to Shoulder

"One of the blessings of weeds is that we see a lot more collaborative efforts than we've ever seen before. More people seem conscientious about weeds and are out looking for them," says the RMEF's Toman. "Counties, states, the Forest Service, the Bureau of Land Management and ranchers are coming together. That's the only way it can really work—to have all the landowners participating and pulling together."

The Wallowa Canyonlands in Oregon's Blue Mountains is a prime example. The area encompasses the canyon grasslands of the lower Grande Ronde and Imnaha rivers, which provide critical winter range, migratory corridors, calving habitat and

Dalmatian Toadflax

Russian Knapweed

The Full Quiver

No single weapon is enough to win the war on weeds. The best approach is a full quiver of methods—aka integrated management. The key tactics and tools are:

1) **Prevention** — keep weeds out in the first place

2) **Early Detection, Rapid Response** — identify and attack early invasions before they have a chance to spread

3) **Chemical Controls** — target herbicides to retard or eliminate the growth and spread of weeds

4) **Mechanical Controls** — plow, mow or chop infestations of weeds

5) **Biological Controls** — release beetles, weevils and other insects from a weed's homeland that evolved feeding avidly on the weed

6) **Grazing** — unleash sheep or goats to graze on weed infestations

7) **Burning** — attack weed outbreaks with fire in a carefully controlled way

8) **Hand-Pulling** — remove individual plants or small outbreaks of weeds before they spread

9) **Replanting** — reseed disturbed sites with native plants (or benign exotics) to replace and repel noxious weeds

COLA WARS: With help from old Pepsi canisters and the RMEF, Colorado weed managers created a mule-mounted weed spraying rig to treat outbreaks in the Flat Tops Wilderness. The design is now used in backcountry habitat up and down the Rockies.

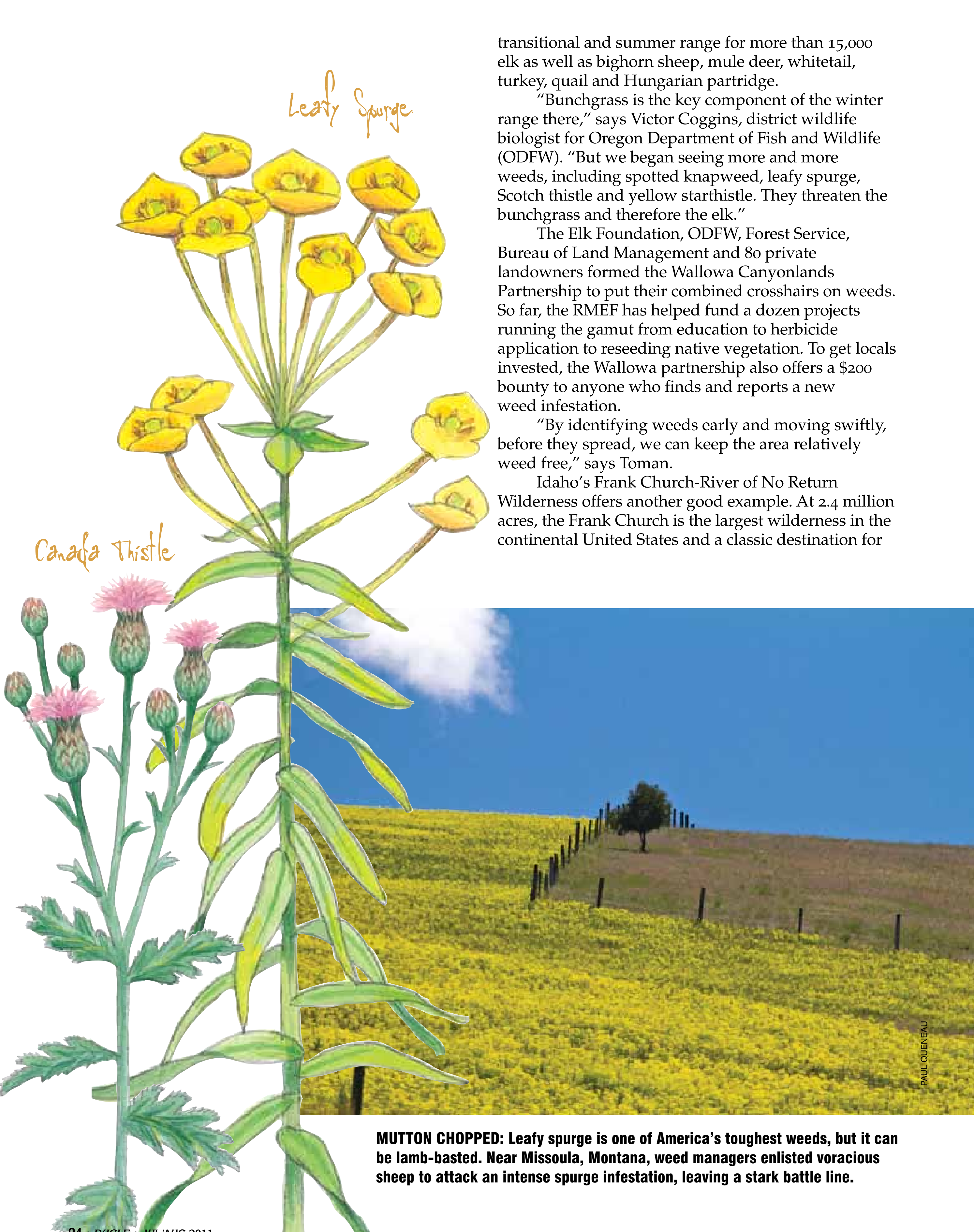
transitional and summer range for more than 15,000 elk as well as bighorn sheep, mule deer, whitetail, turkey, quail and Hungarian partridge.

"Bunchgrass is the key component of the winter range there," says Victor Coggins, district wildlife biologist for Oregon Department of Fish and Wildlife (ODFW). "But we began seeing more and more weeds, including spotted knapweed, leafy spurge, Scotch thistle and yellow starthistle. They threaten the bunchgrass and therefore the elk."

The Elk Foundation, ODFW, Forest Service, Bureau of Land Management and 80 private landowners formed the Wallowa Canyonlands Partnership to put their combined crosshairs on weeds. So far, the RMEF has helped fund a dozen projects running the gamut from education to herbicide application to reseeding native vegetation. To get locals invested, the Wallowa partnership also offers a $200 bounty to anyone who finds and reports a new weed infestation.

"By identifying weeds early and moving swiftly, before they spread, we can keep the area relatively weed free," says Toman.

Idaho's Frank Church-River of No Return Wilderness offers another good example. At 2.4 million acres, the Frank Church is the largest wilderness in the continental United States and a classic destination for



MUTTON CHOPPED: Leafy spurge is one of America's toughest weeds, but it can be lamb-basted. Near Missoula, Montana, weed managers enlisted voracious sheep to attack an intense spurge infestation, leaving a stark battle line.

What RMEF is Doing

Since 1984, the Rocky Mountain Elk Foundation has invested more than $4.3 million to control and eradicate noxious weeds. Through matching grants, that leveraged an impressive $20.8 million from our partners. All told, we've enlisted a huge range of public and private partners and brought more than $25 million to the fight so far. That has funded 536 projects in 24 states, directly impacting 375,000 acres of prime elk country.

Ecologists figure that for every acre directly treated, at least two more acres remain weed-free. So by battling weeds, the RMEF has helped keep more than a million acres as healthy and productive native grasses and forbs. Weeds never let up and the Elk Foundation doesn't aim to either. With your help, we'll keep pushing to sustain and improve the habitat crucial to elk and other wildlife.

IF WEEDS COULD SCREAM: Howard Lyman (above) spearheaded years of assaults on weeds in the Frank Church-River of No Return Wilderness—the largest block of unbroken elk country anywhere. Before retiring from the Forest Service last year, he said the RMEF was his best partner in the fight.

AIR BRAKES: Idaho's 160,000-acre Craig Mountain Wildlife Management Area (below) is enormously popular with elk, mule deer, upland game birds and hunters. So far, RMEF has helped treat 14,000 acres to keep this public-land wildlife stronghold healthy.

Diffuse Knapweed

elk hunters seeking a true backcountry experience.

"The canyon grasslands, shrublands and breaks of this country sustain a lot of elk, bighorn sheep, mule deer, black bears, mountain goats and other wildlife," Toman says, "and hundreds of thousands of acres are at risk, particularly along the main Salmon and Middle Fork rivers."

The primary culprits: rush skeletonweed, spotted knapweed, sulphur cinquefoil, common tansy and Scotch thistle. Weeds have expanded throughout the area by 25 percent since 1998, affecting more than 300 different sites. By inventorying and identifying these sites, managers can concentrate their efforts to prevent further spread, quickly eradicate weeds within infestations less than 5 acres, and contain those that are 6 to 25 acres in size.

"Right now about 2,000 acres out of 400,000 acres of highly susceptible habitat is infested," Toman says. "If we let those weed populations expand, they will quickly displace native plant communities vital to big game. But we can still hold the line if we implement aggressive treatments."

Such treatments are underway, uniting the combined force of the Elk Foundation, Wild Sheep Foundation, Mule Deer Foundation, Safari Club International, Backcountry Pilots, Idaho Fish and Game, five national forests, private landowners, outfitters and others.

"This project has not only brought a diversity of people, organizations and agencies together, it's been a great chance for volunteers to get out along the rivers and learn to identify and hand-pull weeds, and do something important for the land and wildlife," Toman says.

The Forest Service makes amphibious assaults on weed infestations along the river corridors by rafting the Salmon and the Middle Fork, and they hire the Frank Church's hunting outfitters to bring their pack strings up into the high country during the spring to spray weeds that are far out of reach of Forest Service rafts. This gets wilderness outfitters personally invested in spotting new weed outbreaks. Few people spend more time in the wilderness or cover more ground there. As outfitters see what's at stake and learn what to look for, many have become huge assets in the fight.

In neighboring Montana, the state passed its first legislation to control noxious weeds in 1895. Weeds paid no heed to such laws. By the 1920s they had infested all 56 counties, and they continued to multiply for the next 70 years. In 2000 Montana crafted a comprehensive, statewide weed management plan and got serious. While most states are losing ground, Montana has actually reduced the amount of land infested by noxious weeds by nearly a half million acres over the last decade—from almost 8

How You Can Help Fight Weeds

You can't stop the wind from blowing or rivers from flowing, but there are a lot of common-sense steps you can take to avoid spreading weeds and take the fight to them:

- Learn to identify plants common to your area and favorite hunting and fishing country so you can recognize potential invaders.
- If you find noxious weeds, mark them on your GPS or map, take pictures and report them to land and wildlife managers.
- Pull and pack out weeds, placing the plants in sealed containers.
- If you travel with pack animals, carry only certified weed-seed-free forage (pellets, hay, alfalfa) into the backcountry.
- Feed pack animals only weed-seed-free forage for several days before heading into the backcountry.
- Thoroughly clean vehicles and livestock before entering the backcountry to ensure they are free of weed seeds.
- Avoid traveling through weed-infested areas so as not to pick up and spread seeds.
- Camp only in weed-free areas.
- Do not pick and transport pretty flowers you can't identify—you may inadvertently spread seeds of an attractive noxious weed.
- Be aware of what you sow in your yard and gardens and avoid inadvertently planting invasive exotics. (Purple loosestrife, for example, an invasive plant that is altering riparian habitat throughout Montana, is still sold as an ornamental at many nurseries.)
- Support county, state and federal efforts to control and eradicate noxious weeds.
- Get involved in local weed-control projects.
- Spread the word about the dangers of noxious weeds and what people can do to help.

million to 7.5 million. According to Dave Burch, state weed coordinator with the Montana Department of Agriculture, spotted knapweed infestations have declined from 4.5 million acres in 1985 to about 2.8 million acres today.

Education and greater awareness pays off. Burch tells of a retired Forest Service employee who discovered yellow starthistle while out hiking near Dillon, Montana. The state quickly treated the area with herbicide and will continue monitoring the site to ensure the noxious weed does not take hold and spread.

"It's a weed that is not prevalent in the state," Burch says, "and we want to keep it that way. It shows how important it is for people to be able to identify weeds and report them to us when they see them."

Montana Fish Wildlife and Parks (FWP) oversees more than 350,000 acres of prime wildlife habitat and public hunting grounds, and takes that stewardship seriously.

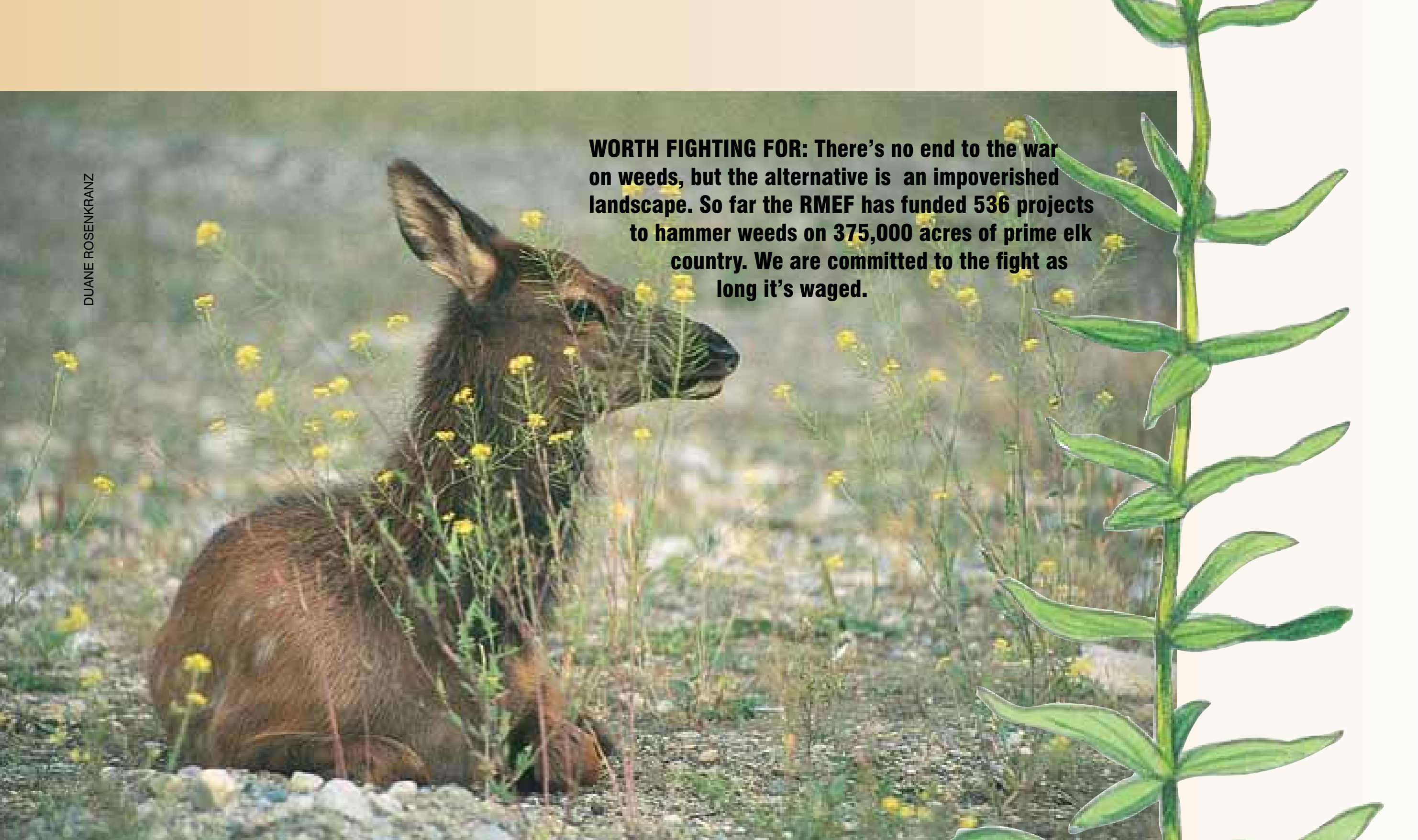
"We use everything in the tool box," says Joe Weigand, FWP's private lands wildlife specialist and statewide weed coordinator. "We've made tremendous progress and have brought together private landowners, state and federal agencies, universities and others in a unified, cooperative and effective manner."

Weigand says FWP also abides by a "good neighbor policy," ensuring weeds on Fish, Wildlife and Parks lands do not spread onto private lands. "Simply put: if our neighbors are doing their part, we need to do our part," he says.

And that's what it all comes down to. Noxious weeds will always be with us, but if everyone who values elk country steps up, we can turn the tide. In the clash against exotic weeds, people need to be as pugnacious and persistent as the invaders. Elk and other wildlife depend on it.

A version of this story first appeared in the July-August 1998 Bugle, *and more than 170,000 copies of that article have been reprinted and distributed. In the 13 years since, weeds have continued to gobble up prime elk country, but people have grown more adept at fighting them, too. We thought it was time* Bugle *revisited the issue.*

Common St. Johnswort



DUANE ROSENKRANZ

WORTH FIGHTING FOR: There's no end to the war on weeds, but the alternative is an impoverished landscape. So far the RMEF has funded 536 projects to hammer weeds on 375,000 acres of prime elk country. We are committed to the fight as long it's waged.