



Prairie & Grasslands  
Edition

FALL 2014

# TechLine

## INVASIVE PLANT NEWS

INNOVATIVE RESEARCH, SUCCESS STORIES, AND TIPS FOR INVASIVE PLANT MANAGERS



<sup>04</sup> Species to treat  
and NOT to treat  
in the fall

<sup>05</sup> Fall herbicide  
application  
timing improves  
crown vetch  
control

<sup>06</sup> Tree of Heaven: A  
Devil in Disguise

### Conservation Practice Enhances Habitat for Eastern Collared Lizard <sup>Page 9</sup>

<sup>03</sup> "Smart" Spray Wand and Weed Treatment Time Prediction Model

<sup>12</sup> Protecting Chippewa Prairie: Cooperative Project Manages Siberian Elm

## BRIEFS

### New training video highlights prevention BMPs

A supplement to the California Invasive Plant Council's prevention Best Management Practices (BMP) manuals for land, transportation, and utility managers (2013) is available. This 42-minute training video covers the basics of cleaning, disturbance, planning and awareness. The video can be used in training settings to start a discussion about weed prevention practices in your organization.

**Learn more at:** <http://bit.ly/dvdpreventionbmp>

### 10th Edition Herbicide Handbook Now Available

The 10th edition of the Weed Science Society of America Herbicide Handbook is completely revised and updated in a new easy-to-use alphabetical format. It contains detailed information on more than 230 herbicides currently in commercial production and includes a handy reference glossary of technical terms and listings of adjuvants. It is a perfect resource for teachers, students, researchers, industry representatives, government officials, and weed control specialists. **Purchase the book at:** <http://bit.ly/wssahandbook10>

### Invasives: Plants on the Move Curriculum

This curriculum from the Oregon Natural Resources Education Program (Corvallis) is designed for teachers who want to integrate the topic of invasive weeds in the classroom, develop weed awareness, and provide students in grades K-12 with an understanding of the serious problem of invasive weeds.

**Explore the site at:** <http://weedinvasion.org>

## UPCOMING EVENTS

### NAISMA 2014 Conference

(North American Invasive Species Management Association)  
September 29th-October 1st, 2014  
The Holiday Inn of Fargo; Fargo, North Dakota  
<http://www.naisma.org/>

### Upper Midwest Invasive Species Conference

October 20-22, 2014  
Duluth Entertainment and Convention Center; Duluth, MN  
<http://www.umisc2014.org/>

### The 8th International IPM Symposium

March 23-26, 2015  
Salt Palace Convention Center; Salt Lake City, UT.  
<http://www.ipmcenters.org/>

## READER'S CORNER

### READERS Ask Questions AND Suggest Solutions

#### Is there a list of Milestone®-tolerant grass species available?

*"In your TechLine Article dated February 01, 2012 Technical Facts and Answers to Frequently Asked Questions About Milestone Herbicide question 'Will Milestone Herbicide Harm Grasses?' it reads that there was research conducted on 33 grass species that showed tolerance to this herbicide. Can I get a list of these grass species?"*

-- CHRIS OVERBAUGH, NATIONAL PARK SERVICE

*Information from Dow AgroSciences on grass tolerance to Milestone herbicide is available at:*

<http://bit.ly/milestonegrasslist1>

#### Readers Review the ATV/UTV Herbicide Sprayer Platform Equipment

<http://bit.ly/atvutvreview>

#### Readers Recommend Apps for Mapping, Monitoring, and More

<http://bit.ly/readerapps1>

### DID YOU KNOW?

We use email to send exclusive on-line articles on invasive plant management to readers? To avoid missing out on timely control recommendations and management tips SUBSCRIBE TO THE TECHLINE EMAIL LIST. You can expect to receive about one email per month. We will not share your email address. Use this link to update your subscription to include email delivery:

<http://techlinenews.com/subscribe/>

Follow us on Facebook or Twitter

### ABOUT TECHLINE

Invasive Plant News aims to provide an objective communication tool for on-the-ground natural resource managers who face common management challenges so they may share the successes of their programs and learn from one another.

Print newsletters are published twice per year and delivered free of charge. This and past issues can be downloaded from [www.techlinenews.com](http://www.techlinenews.com).

© TechLine Invasive Plant News, 2014  
Sponsored by DowAgroSciences, LLC  
Editor, Celestine Duncan  
Copy Editor/Design, Melissa Munson  
Circulation, Darby Bramble  
Learn more: [www.techlinenews.com](http://www.techlinenews.com)  
Contact: [techlinenews@gmail.com](mailto:techlinenews@gmail.com)



PHOTOS BY BRYAN DAYTON, PMG ENVIRONMENTAL



**THE “SMART” SPRAY WAND** records GPS location, herbicide flow, application time and other desired data. It can simplify invasive weed management and has provided the necessary data capture for the development of a weed treatment cost model.

# “Smart” Spray Wand and Weed Treatment Time Prediction Model

## TWO NEW WEED CONTROL TOOLS FOR WILD LAND MANAGERS

By Bryan Dayton <sup>PMG Environmental</sup>, Ralph Whitesides <sup>Utah State University</sup> and Scott Pratt <sup>PMG Environmental</sup>

### “SMART” SPRAY WAND

Millions of dollars are spent managing invasive weeds on public and private lands each year. Although new weed management tools and technology have advanced for precision agriculture, those for wild land (grazing land or natural areas) have lagged. In 2013, Jardyne Technologies developed the “Smart” spray wand, a precision tool for treating invasive plants on wild land sites.

The “Smart” spray wand technology has a GIS<sup>1</sup>/computer/flow meter and a quick connect for use with any type of spray system including back pack, ATV/UTV, or truck reel. The wand records the GPS<sup>2</sup> location, herbicide flow, application time, and associated data of each treatment spray point. Addition of the “Smart” wand technology adds only 6.5 ounces of weight to a traditional spray wand.

This new technology can simplify invasive weed management by:

- Saving inventory time and money
- Increasing ecological, treatment, and funding accountability
- Justifying funding requests
- Streamlining data flow for cooperative management
- Increasing information for planning and management
- Expanding research possibilities in wildland weed control

### TREATMENT TIME MODEL DEVELOPED TO SUPPORT WEED MANAGEMENT PLANNING

Wild land invasive weed treatment bids are based primarily on acreage or hours but can be influenced by variables that increase treatment time and cost. Often neither the land manager contracting the treatment nor the contractor has a clear idea

of the amount of time that will be involved in a weed control project. This makes it difficult to develop an accurate budget or bid for invasive weed control projects.

The “Smart” spray wand’s ability to collect valuable application information led to a partnership between the Department of Plants, Soils, and Climate at Utah State University, Providia Management Group (PMG) and Jardyne Technologies. The purpose of the partnership was to determine if a treatment cost model could: 1) establish an accurate standard for contractors and land managers, 2) assist in planning and managing limited treatment resources, and 3) justify funding requests and expenditures.

A study was designed to collect and evaluate invasive weed treatment data over multiple locations, weed species, and terrains to develop a treatment time calculation model.

<sup>1</sup> Geographic Information System (GIS); <sup>2</sup> Global Positioning System (GPS)

The model is based on four primary variables: 1) weed density, 2) slope, 3) land cover, and 4) weed visibility. Other variables were also evaluated in the model development.

In 2013, PMG's backpack crews treated invasive weeds on hundreds of acres in Utah and Idaho. Using "Smart" spray wands and backpack equipment, PMG gathered millions of data points including a GPS point each time a weed was sprayed. Each data point included the GPS location, herbicide flow, and application time. Slope, treatment time per area, and weed density were determined to create the model.

Field data were used to develop a treatment time model based on weed density and other variables (slope, land cover, and weed visibility). See examples in the table and figure below. The complete model and findings from the field data are scheduled to be published spring of 2015.

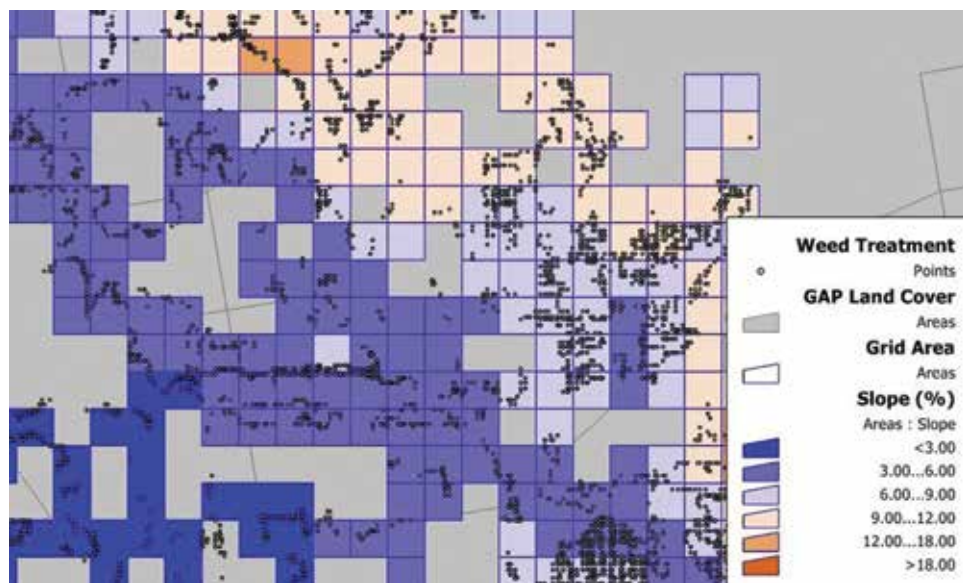
For additional information regarding the treatment time model and the Jardyne "Smart" spray wand go to [Jardyne.com](http://Jardyne.com). (Website will be available soon).

**TREATMENT TIME MODELS IN RESPONSE TO WEED DENSITY.** Calculation examples include the average and minimum treatment times (hours) at various weed densities. For example: if weed density is 5% of the area to be treated, the average treatment time in hours per acre can be calculated using the formula  $y=2.7(0.05[\text{density}]) + 0.36$ ; where 2.7 and 0.36 are standards. To calculate the minimum treatment time per acre with ideal land cover, slope and weed visibility use the equation listed under minimum treatment time. Treatment times shown below do not include the response to other variables including slope, land cover and weed visibility.

#### Treatment Time Calculations per Acre Due to Density

Density (x) %	Average Treatment Time (y=hours)	Minimum Treatment Time (y=hours)
	$y=2.7(x)+0.36$	$y=1.6(x)+0.02$
1	0.39	0.04
5	0.50	0.10
25	1.04	0.42
50	1.71	0.82
75	2.39	1.22
95	2.93	1.54

**GPS DATA POINTS** were obtained using a Jardyne "Smart" spray wand. The slope of invasive weed treatment area was obtained from the U.S. Geological Survey.



## Fall is an excellent time to control invasive weeds

Fall rain and cooler temperatures provide good conditions for extending the herbicide application season. The following species and many others can be effectively controlled in the fall. Follow the links for control recommendations for each species.

### SPOTTED & DIFFUSE KNAPWEED

<http://bit.ly/spottedknapweed>

### CANADA THISTLE

<http://bit.ly/canadathistle>

### LEAFY SPURGE

<http://bit.ly/leafyspurge>

### BIENNIAL THISTLES

<http://bit.ly/biennialthistle>

### CROWN VETCH

<http://bit.ly/crownvetch>

(and see page 5)

### BIRDSFOOT TREFOIL

<http://bit.ly/birdsfoottrefoil>

### SWEETCLOVER

<http://bit.ly/sweetclover>

### TEASEL

<http://bit.ly/teasel2014>

### WOODY PLANTS

Foliar herbicide application to woody plants can be made in fall until the first sign of color change in the leaves.

<http://bit.ly/woodyplantcontrol>

### SOME SPECIES ARE NOT EFFECTIVELY CONTROLLED IN FALL.

For example: Hawkweeds (*Hieracium* spp.), and annual weeds such as pigweeds (*Amaranthus* spp.), buffalobur (*Solanum rostratum*), and kochia (*Kochia scoparia*).

# Fall Herbicide Application Timing Improves Crown Vetch (*Securigera varia*) Control

By Celestine Duncan

**C**ROWN VETCH IS A NON-NATIVE PERENNIAL PLANT IN THE LEGUME FAMILY. It was introduced into the United States in the 1950s primarily for erosion control along roads and waterways. Crown vetch is currently found in all U.S. states except Alaska and North Dakota (USDA Plants Database 2014). The invasion of crown vetch into natural areas, such as prairie grasslands, barrens and dunes in Midwestern states, is having a significant impact on native plant diversity. The plant is a prolific seed producer and spreads by seed and vegetatively by rhizomes. Crown vetch is capable of covering small trees, shrubs, and grasslands eventually forming large single-species stands that modify soil nutrient levels and alter fuel loads in fire-adapted ecosystems. The plant tolerates a wide range of environmental conditions, but grows best in areas with 18 inches or more precipitation.

## IDENTIFICATION

Crown vetch has diffuse stems that spread to about six feet in length and three feet tall. Leaves are dark green and odd-pinnately-compound, with 9 to 25 leaflets per leaf. Roots are multi-branched with fleshy rhizomes. The plant flowers from late spring through summer; individual flowers are pea-like and vary from pinkish-white to deep pink in color. Seeds are produced in slender, linear, jointed pods (loments) that may reach two inches in length. The length of time seed remain viable in soil is unknown, but high soil seed banks have been reported.

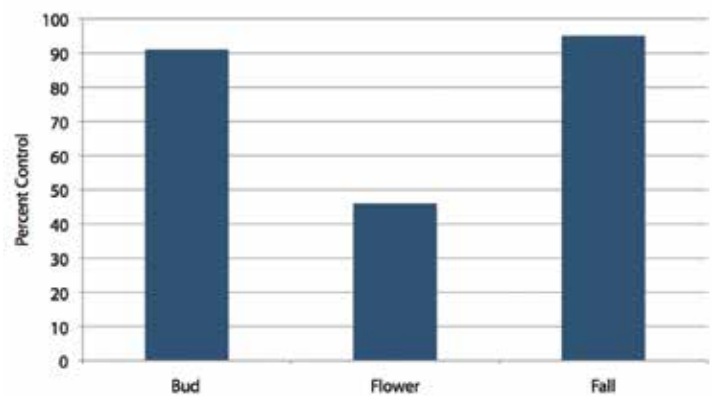
## MANAGEMENT

Dr. Mark Renz of the University of Wisconsin conducted field trials near Barneveld, Wisconsin to study efficacy of Milestone® herbicide applied to crown vetch at three growth stages. Milestone was applied at a spot treatment rate of 9 fluid ounces per acre (fl oz/A) to crown vetch at the bud (June), flower (July), and fall (October) growth stages in 2012. Individual plot size was 10 by 30 feet, with four replications of each treatment. Evaluations included visual percent control and cover of crown vetch, and percent visual injury to grasses at one to two years following treatment.

Results of the study showed that Milestone applied at either bud or fall growth stage provided excellent control one year after treatment (see Figure). However, only the fall herbicide application continued to provide good crown vetch control in July 2014 (two growing seasons following treatment). There was no grass injury noted in plots resulting from the herbicide treatment.

These results indicate that fall is an excellent time

**FIGURE. PERCENT CONTROL OF CROWN VETCH** one year after treatment with Milestone® herbicide applied at bud, flower and fall growth stage.



to control crown vetch with Milestone herbicide. Follow-up herbicide application may be necessary to control seedlings emerging from the soil seed bank or mature plants that survive treatment. Disturbed sites or areas without desirable understory vegetation may require restoration to create a competitive desirable plant community and improve the potential for long-term control. For broadcast applications, the Milestone maximum label rate is 7 fl oz/A. Rates up to 14 fl oz/A may be applied to weed infestations; however, not more than 50 percent of an acre may be treated at that rate. In areas with residual desirable vegetation, post-treatment restoration efforts may not be necessary.

## LEARN MORE

<http://bit.ly/crownvetch>

### MANAGEMENT RECOMMENDATIONS FROM THE WESTERN RANGE & WILDLANDS EDITION

#### Rush Skeletonweed Management: Challenges and Solutions

<http://bit.ly/rushskeletonweed>

#### Effect of Milestone® Herbicide on Medusahead Rye

<http://bit.ly/medusahead>

Label precautions apply to forage treated with Milestone and to manure from animals that have consumed treated forage within the last three days. Consult the label for full details. ©Trademark of The Dow Chemical Company ("Dow") or an affiliated company of Dow. Milestone is not registered for sale or use in all states. Contact your state pesticide regulatory agency to determine if a product is registered for sale or use in your state. Always read and follow label directions.





**TREE OF HEAVEN IN BLOOM.**  
Male and female flowers occur on separate plants.



**OCCURRENCE IN THE UNITED STATES AND CANADA.** Tree of heaven is naturalized throughout much of the United States.

# TREE OF HEAVEN: A Devil in Disguise

By Celestine Duncan (Article Updated in 2016)

**T**ree-of-heaven (*Ailanthus altissima*), also called stinking sumac or Chinese sumac is naturalized throughout much of the United States. It was first introduced into the eastern United States in the late 1700s from China. Ease of establishment, rapid growth and absence of insect or disease problems resulted in tree of heaven being extensively planted in U.S. towns and cities during the 1800s. Today this invasive tree threatens to overwhelm natural areas, agricultural fields and roadsides in many states.

Tree-of-heaven is adapted to a wide variety of ecological sites ranging from urban areas, saline soils, surface-mined lands and natural areas. High seed production (325,000 seeds per female tree) and viability, and vegetative sprouting from the roots increase this plant's invasiveness.

## DESCRIPTION

Tree-of-heaven can reach 80 feet in height, with smooth pale gray bark and light chestnut brown twigs. Leaves are compound, one to four feet in length, alternate, and composed of 10 to 41 smaller leaflets. Each leaflet has one or more glandular teeth along the lower margin. The leaf margins are otherwise entire or lacking teeth. Male and female flowers occur on separate plants. Flowers occur in large terminal clusters and are small and pale yellow to greenish. Flat, twisted, winged fruits each containing a single central seed are produced on female trees in late summer to early fall and may remain on the trees for long periods of time. All parts of the tree, especially the leaves and flowers, have a distinct burned-nut odor.

## MANAGEMENT OPTIONS

### MANUAL & MECHANICAL CONTROL

Early detection and removal of tree-of-heaven seedlings before the tap root develops is the most effective control strategy. Pulling or digging must remove the entire root system, including all roots and root fragments, to prevent regrowth. Suckers from a pre-existing lateral root are nearly

impossible to remove by manual methods.

Cutting or mulching without a follow-up herbicide treatment is not effective since tree-of-heaven produces sprouts and root suckers from a cut stump. Continued removal of above ground growth may exhaust root reserves under heavily shaded canopy.

### BIOLOGICAL CONTROL

Limited work on biological control insects for tree-of-heaven has been conducted overseas but no agents are available for release in the United States (R. Hanson, personal communication). Field and laboratory research has also been conducted on the indigenous, soil-borne fungus *Verticillium albo-atrum* and *Verticillium nonalfalfae*. The fungus has been observed to cause wilting and death of tree-of-heaven in forest habitats. Two additional fungi, *Verticillium dahliae* and *Fusarium oxysporum*, have been isolated from dead and dying tree-of-heaven in New York and in southern and western Virginia. No fungal agents are approved for biological control at this time.

### HERBICIDE

Several herbicides and application techniques can provide tree-of-heaven control. Remember, the root system must be killed

**TABLE 1. PERCENT TREE-OF-HEAVEN WITH SPROUTS** two years following CUT STUMP treatments. (DiTomaso and Kyser 2007)

Within each treatment group, values followed by different letters are different at 0.05 level (analysis of variance, Student-Newman-Keuls test).

Herbicide	Rate	% of trees with sprouts (2 years after treatment)
Triclopyr (Garlon® 4 Ultra)	20% (mixed with oil)	6.7 c
Imazapyr	20% (mixed with oil)	9.8 c
Glyphosate	50% (mixed with water)	40.8 b
Cut; Non-treated		85.7 a



LESLIE MEHRHOFF, UNIV OF CONNECTICUT, BUGWOOD.ORG

JAN SAMANIK, STATE PHOTOSHOP, ADMIN., BUGWOOD.ORG

ANNE MARIE SMITH, CONDIV OF FORESTRY, BUGWOOD.ORG

**PLANT DETAILS.**  
Foliage and flowers, left. Flowers, top-right. Seed pods, bottom-right.

**INTERESTING FACTS ABOUT TREE-OF-HEAVEN**

- Clonal stems can grow 100 feet from parent tree.
- Dense thickets exclude other species.
- Roots are shallow and extensive, surviving extended periods of drought.
- Clones attached to parent trees can persist in low light conditions for at least 20 years.

**ROAD SURVEY OF THE INVASIVE TREE-OF-HEAVEN IN VIRGINIA**

The invasive nonnative tree-of-heaven invades newly disturbed areas and forms large monospecific stands. The mean density of tree-of-heaven throughout 5,175 km of roads surveyed in Virginia was 39 km<sup>-1</sup> with mean infestation of 58% of 1.6-km road segments.

<http://wssajournals.org/doi/abs/10.1614/IPSM-D-12-00039.1>

in order to control the plant and prevent sprouting from the stump or suckering from the root. The following methods were found to be effective in field research trials and operational treatments.

**FOLIAR APPLICATION**

Broadcast foliar applications are typically the most cost-effective treatment in dense tree-of-heaven infestations. Foliar herbicide application with Vastlan™, Garlon 4 Ultra, Capstone®, or glyphosate (Accord®XRT and others) will provide good control where tree-of-heaven size and distribution allow for effective foliar coverage. Capstone, Vastlan, and Garlon 4 Ultra are selective for broadleaf and woody plants and will not kill desirable grasses contacted by the spray. Glyphosate is non-selective and will kill or cause injury to herbaceous or woody plants contacted by over-spray during the foliar canopy application. Apply Capstone and Vastlan at a 2% solution and Garlon® 4 Ultra at a 1.5% solution from June through early September. Glyphosate can be applied at a 2% solution.

**CUT STUMP APPLICATIONS**

Research trials conducted at University of California at Davis looked at effectiveness of glyphosate, Garlon 4 Ultra and

imazapyr applied as cut stump or basal bark applications on tree-of-heaven control compared to mechanical cutting only (DiTomaso and Kyser 2007). Results showed that manual cutting alone did not provide tree-of-heaven control. Garlon 4 Ultra (20% v/v in oil) applied as a cut-stump application resulted in more than 90% reduction in both vigor ratings and re-sprouting of single stems and stem-clusters and provided similar control to imazapyr, but significantly better control than glyphosate (Table 1). Although control was excellent in research trials, some invasive plant managers have reported significant re-sprouting following cut stump herbicide treatment (Law and Evans, personal communication).

**BASAL BARK APPLICATION**

This treatment method is generally used for trees that are less than six inches in diameter and is preferred by many operational field managers. In the California study, basal bark applications with Garlon 4 Ultra and imazapyr provided excellent tree-of-heaven control (Table 2). Researchers concluded that although both Garlon 4 Ultra and imazapyr provided similar control results, imazapyr is a broad-spectrum herbicide and applications often result in a “dead vegetation zone”

Herbicide	Rate	Tree diameter at application	% reduction in tree canopy (2 years after treatment)
Triclopyr (Garlon® 4 Ultra)	20% (mixed with oil)	<1.6 inches	86.7a
Triclopyr (Garlon 4 Ultra)	20% (mixed with oil)	>1.6 inches	100.0a
Imazapyr	20% (mixed with oil)	<1.6 inches	100.0a
Imazapyr	20% (mixed with oil)	>1.6 inches	100.0a
Non-cut control			27.1b

**TABLE 2. PERCENT REDUCTION IN TREE-OF-HEAVEN CANOPY**

two years following BASAL BARK applications. (DiTomaso and Kyser 2007)

*Within each treatment group, values followed by different letters are different at 0.05% level (analysis of variance, Student-Newman-Keuls test).*

## METHODOLOGY

### CUT STUMP



Cut the stem about six inches above ground level. Apply the herbicide to the sides of the stump, including the root collar area, and outer portion of the cut surface until thoroughly wet but not to the point of runoff. Apply herbicide as soon as possible after cutting, but no later than one hour after cutting. Do not use this method if there is heavy sap flow or if snow covers the cut surface.

### BASAL BARK



Apply herbicide in a band around the entire stem. Applications should be made from the base of the woody stem to a height of 12 to 15 inches above the groundline. Ideal for stems less than six inches in diameter. Do not use this method if there is heavy sap flow or if snow or vegetation block the target area.

### STEM INJECTION [HACK AND SQUIRT]



Using a hand axe, make cuts every 3 to 4 inches around the trunk at 6 to 18 inches above the ground. Cuts should be at the same level around the trunk, and herbicide applied uniformly to cover the cut area. Do not use this method if there is heavy sap flow.

around the treated trunk. Garlon® 4 Ultra is a selective herbicide and less phytotoxic to non-target desirable vegetation. Field studies on other tree species have also shown that Garlon 4 Ultra is a better choice for basal bark application when desirable vegetation surrounds the target tree.

Based on research results and field observations, the optimum application timing for basal bark and cut stump treatments is a late summer or fall application timing when carbohydrates are translocating to below-ground tissues.

### STEM INJECTION [HACK AND SQUIRT] APPLICATION

The stem injection technique can provide effective control of individual tree-of-heaven stems or stem-clusters. Recommended herbicides include undiluted Vastlan, Garlon 4 Ultra,

imazapyr or glyphosate injected into cuts. Stem cuts should be spaced so that a minimum of 1 to 2 inches of uncut living tissue remains between each cut. Although DiTomaso and Kyser (2007) found that imazapyr provided the most effective control as a stem injection treatment, observations from field managers also report good control with Vastlan and Garlon® 4 Ultra in stem injection treatments. A slightly different application method, drill and squirt, has been reported to kill above-ground portion of the tree, but tree-of-heaven roots continued to resprout with this technique (Tony Summers, personal communication). Overall, reports from invasive plant managers indicate basal bark treatments provide more effective control than stem injection methods.

## KEY POINTS

- Tree size and site conditions dictate the management method selected for tree-of-heaven control.
- An advantage of using a stem injection, basal bark, or cut stump application methods, rather than foliar treatment, is the low risk of off-site movement through spray drift.
- A cut stump technique would be most appropriate with very large trees or stem-clusters having well-developed bark. The bark of these plants would be difficult to penetrate with the stem injection method and would not likely absorb herbicide using a basal bark treatment.
- Late summer or fall herbicide application timing for basal bark and cut stump treatments is more effective at reducing sprouting compared to applications made in late spring and summer.
- Early fall herbicide applications followed by periodic evaluations the following spring with follow-up retreatment of sprouts was reported to provide the best long-term control of an infestation.
- Manual removal can be effective on small, newly established populations but all root fragments must be removed to be effective.
- Mechanical cutting or burning without herbicide application will not control tree-of-heaven and may increase density.

## REFERENCES

- Boyd E, J Rebbeck, D Apsley. 2013. Biology and control of *Ailanthus*. MIPN Invasive Plant Symposium presentation. Online. <http://www.mipn.org/2013Symposium.html>.
- DiTomaso JM, GB Kyser. 2007. Control of *Ailanthus altissima* Using Stem Herbicide Application Techniques. *Arboriculture and Urban Forestry*. 3(1):1-9.
- Evans, Chris. Southern Illinois. Personal Communication.
- Hansen, Richard. USDA APHIS. Personal Communication.
- Kelly M. 2001. Results of basal bark applications of Garlon 4 on *Ailanthus altissima* (tree-of-heaven). *In Proc., California Exotic Pest Plant Council Sym.* 6:105-107.
- Law, James. Inland Empire Resource Conservation District. Personal communication.
- Panke B and M Renz. 2013. Management of Invasive Plants in Wisconsin: Tree-of-heaven (*Ailanthus altissima*). Univ. of Wisconsin. Coop. Ext. Bulletin. No. A3924-33.
- Rebbeck J, J Jolliff, D Davis, E O'Neal. 2013. *Ailanthus* Wilt, a Potential Biocontrol Agent in Ohio Forests. MIPN Invasive Plant Symposium. Online. <http://www.mipn.org/2013Symposium.html>.
- Summers, Tony. University of Wisconsin-Madison. Personal Communication.

®™Trademarks of The Dow Chemical Company ("Dow") or an affiliated company of Dow. State restrictions on the sale and use of Garlon 4 Ultra apply. Consult the label before purchase or use for full details. Always read and follow label directions.



# Conservation Practice Enhances Habitat for Eastern Collared Lizard

By Celestine Duncan



LARRY RIZZO, MISSOURI DEPT. OF CONSERVATION



WIKIPEDIA.ORG



BEGETOFS.COM

**THE COLLARED LIZARD** (above) can reach up to a foot in length including the tail. The name comes from the lizards' distinct coloration, which includes bands of black around the neck and shoulders that look like a collar. Jackson County, Missouri (far left) is the northeastern tip of the collared lizard range (left).

**A** COLORFUL, CHARISMATIC SPECIES—THE EASTERN COLLARED LIZARD (*Crotaphytus collaris*)—IS CENTER-STAGE IN A WOODY PLANT MANAGEMENT PROJECT NEAR KANSAS CITY, MISSOURI. Critical habitat for the collared lizard and other unique species are Missouri glades, scattered outcrops of exposed bedrock embedded in open woodland. These hot, dry, desert-like microclimates support a variety of species including tarantulas, scorpions, prickly pear, and reptiles.

“The collared lizard is a key indicator species on glades; when their numbers decline we know something is wrong with their habitat,” explains Larry Rizzo, Natural History Biologist with Missouri Department of Conservation in Kansas City, Missouri. “Jackson County is the northeastern tip of the collared lizard range, which includes much of northern Mexico and the southwestern United States.”

A Species of Conservation Concern, eastern collared lizard populations have shown a decline in Missouri due to loss of

their glade habitat. Rizzo is working with U.S. Army Corps of Engineers and Jackson County Parks and Recreation to improve habitat for this species in Jackson County.

Rizzo explains that fire suppression beginning more than 50 years ago allowed Eastern red cedar (*Juniperus virginiana*) trees that were once confined to steep cliffs, river bluffs, and rock outcrops, to invade glades. The resulting tree canopy completely altered glade habitats and the species that depend on them for survival. Cooler, more shaded habitats caused



## MISSOURI IS HOME TO 13 SPECIES OF

**LIZARDS**, all of which are harmless and non-venomous. Like other reptiles, lizards thermoregulate or adjust their body temperature by moving to different areas of their environment to warm up or cool down. This external means of keeping warm is called *ectothermy*, or external heating and is the reason open, desert-like, sunlit glades are critical habitat for lizards.

The collared lizard (*Crotaphytus collaris*) can reach up to a foot in length including the tail. The name comes from the lizards' distinct coloration, which includes bands of black around the neck and shoulders that look like a collar. Like some other lizard species, collared lizards are capable of running on their hind legs for short distances, looking like small theropod dinosaurs. Male collared lizards are much more brightly colored than females, ranging from dark to light green to a beautiful cobalt blue in some areas. Females are typically varying shades of brown with red markings during the breeding season. Collared lizards are the official state reptile of Oklahoma.

### LEARN MORE

**Missouri Department of Conservation Field Guide: Eastern Collared Lizard**

<http://mdc.mo.gov/discover-nature/field-guide/eastern-collared-lizard>

**COLLARED LIZARDS ARE MONITORED CLOSELY** in the study area, and isolated populations are reconnected by opening the tree canopy in corridors.

a decline in lizard reproduction, and dense woodlands formed a barrier to lizard dispersal between glades.

“Well into the 1960s there were collared lizards in Jackson County, but those populations gradually declined as tree canopy increased,” says Rizzo. In the mid-1980s a dam was built in the eastern part of the county, and limestone riprap placed on the face of the dam. The riprap and associated limestone quarry provided safe habitat for a small population of collared lizards that migrated to the disturbed area. A third isolated population of lizards was also found in a nearby glade.

*Gene flow*<sup>1</sup> is an important source of genetic variation and critical for maintaining healthy collared lizard populations. “Our problem at this site was that collared lizards on the glade couldn’t disperse and interact with either the quarry or the dam populations because of dense tree canopy,” explains Rizzo. “The lizard will tolerate about 20 to 30 percent canopy, but anything more than that becomes a



**50 YEARS OF FIRE SUPPRESSION** allowed Eastern red cedar trees to invade glades.

significant barrier to their movement.”

To connect the three populations of collared lizards and improve their habitat, Rizzo and others began removing some of the trees in the project area. The goal is to remove all woody shrubs and trees except native post oak (*Quercus stellata*) and chinkapin oak (*Quercus muehlenbergii*) from the glade and within a 50-foot wide connecting corridor between the glade and limestone quarry. An open canopy allows sunlight to warm the soil surface making it easier for lizards to disperse from the glade.

Woody vegetation control methods include mechanical removal with chainsaws and basal bark herbicide application. “We use chainsaws to cut large eastern red cedar and use a basal bark application of Garlon® 4 Ultra herbicide (1 quart) plus Bark Oil Blue (2 quarts) to treat smaller cedar trees,” explains Rizzo. “Red cedar doesn’t resprout after cutting, so we don’t have to apply herbicides to the cut surface.” Some of the other woody vegetation such as redbud (*Cercis Canadensis*), red oak (*Quercus*

<sup>1</sup>*Gene flow*—also called migration—is any movement of genes from one population to another. If genes are carried to a population where those genes previously did not exist, gene flow can be a very important source of genetic variation.



YERIN WILKINS, INDIANA UNIVERSITY, BUGWOOD.ORG

**EXCEPT FOR NATIVE POST OAK** (above) and chinkapin oak, all woody shrubs and trees are removed within a 50-foot wide corridor to connect the glade and limestone quarry.

*rubra*), hackberry (*Celtis occidentalis*), elm (*Ulmus Americana*), honey locust (*Gleditsia triacanthos*) and exotic honeysuckle (*Lonicera maackii*) resprout following cutting, so a basal bark or cut surface treatment with Garlon 4 Ultra and Bark Oil Blue is applied. Control averages about 80 percent depending on the tree species, size, and thickness of the bark.

Ultimately Rizzo would like to include fire in the control program to periodically remove the woody understory, duff and litter, help control prickly pear cactus (*Opuntia* sp.), and other invasive species like exotic honeysuckle. “If we could get approval to use fire to mimic historical burns in this area we could expand our ability to enhance the habit for collared



LARRY RIZZO, MISSOURI DEPT. OF CONSERVATION

**EXPOSED ROCKS ARE KEY HABITAT FOR THE LIZARDS** since they offer basking sites as well as crevices for shelter and escape. Removing the woody canopy in specific sites increases the amount of habitat available to the lizards AND allows them to disperse and mix with the other populations of lizards.

lizards and other species relying on glade and open woodland habitat.”

Conservation measures taken in Jackson County to reduce the woody canopy have benefited a variety of wildlife including other lizard species and snakes, and reduced invasion of exotic honeysuckle. Future plans for the project area include reintroduction of native forbs and grasses such as scaly blazing star (*Liatrix squarrosa*), purple coneflower (*Echinacea purpurea*), and sideoats grama (*Bouteloua curtipendula*) to enhance glade diversity.

.....  
®Trademark of The Dow Chemical Company (“Dow”) or an affiliated company of Dow. State restrictions on the sale and use of Garlon 4 Ultra apply. Consult the label before purchase or use for full details. Always read and follow the label directions.

## SAVANNAS, GLADES, AND WOODLANDS

in Missouri are distributed in a landscape mosaic based on soil depth and bedrock type. Glades are treeless or sparsely wooded openings with bedrock at or near the surface. In pre-European settlement, glades sustained small herds of bison, elk, and deer along with other endemic species uniquely adapted to these particular habitats. Savannas or woodlands with a canopy cover of 10 to 50 percent and herbaceous groundcover often surround glades. Savannas, woodlands and glades are strongly influenced by the frequency, intensity, and seasonal variation in fire occurrence.

### LEARN MORE

#### Missouri’s Savannas and Woodlands

*Missouri Conservationist*, 2000  
<http://mdc.mo.gov/conmag/2000/08/missouris-savannas-and-woodlands>

#### Uncovering a Gem (Missouri’s Glades)

*Missouri Conservationist*, 2006  
<http://mdc.mo.gov/conmag/2006/10/uncovering-gem>

### LEARN MORE

#### Missouri Species and Communities of Conservation Concern

[http://mdc.mo.gov/sites/default/files/resources/2010/04/2014\\_species\\_concern.pdf](http://mdc.mo.gov/sites/default/files/resources/2010/04/2014_species_concern.pdf)

#### Woody Plant Control in Northern Prairies

<http://bit.ly/woodyplantcontrol>

LOUANE BROOKS, DOW AGROSCIENCES



# Protecting Chippewa Prairie: Cooperative Project Manages Siberian Elm

by Celestine Duncan

**C**HIPPEWA PRAIRIE IN WESTERN MINNESOTA IS A PLACE WHERE A PERSON CAN SENSE THE CHARACTER OF THE ONCE VAST TALLGRASS PRAIRIE. Flanking the Lac qui Parle Reservoir on the Upper Minnesota River, this 2,866-acre remnant prairie provides critical habitat to migratory waterfowl, grassland birds, rare butterflies, and other wildlife. The natural area also serves as a vital link to Big Stone National Wildlife Refuge and Lac qui Parle Wildlife Management Area.

The Nature Conservancy (TNC) and Minnesota Department of Natural Resources (DNR) jointly own and manage Chippewa Prairie Preserve. In 2012, 240 acres of grassland were added to The Nature Conservancy preserve affording a higher level of protection for native plants and wildlife in the adjoining natural area, and increasing the preserve’s size by nearly 20 percent.

“The 240-acre addition was established as part of the Conservation Reserve Program,” explains Joe Blastick, Land Steward with The Nature Conservancy. Although grasses were well established there were few forbs, and Siberian elm (*Ulmus pumila*) infested most of the 240-acre parcel.

“Our goal is to improve the overall condition of this new parcel, but to

accomplish this we knew we had to first remove the elm,” Blastick says. In 2012, TNC partnered with Dow AgroSciences LLC to develop and implement an integrated management strategy for Siberian elm, and measure plant community response following tree removal on the newly acquired parcel.



PHIL DELPHEY, ISTVS

THE CHIPPEWA PRAIRIE COMPLEX IS SOON TO BE LISTED AS CRITICAL HABITAT FOR THE POWESHIEK SKIPPERLING (*Oarisma poweshiek*) AND DAKOTA SKIPPER (*Hesperia dacotae*), SMALL BUTTERFLIES MOST OFTEN FOUND IN UNDISTURBED NATIVE PRAIRIE REMNANTS.

**LEARN MORE:** [HTTP://WWW.FWS.GOV/ENDANGERED/WHAT-WE-DO/LISTING-OVERVIEW.HTML](http://www.fws.gov/endangered/what-we-do/listing-overview.html)

LOUANNE BROOKS, DOW AGROSCIENCES



PAUL BOCKENSTEDT, STANTEC CONSULTING SERVICES, INC.



**LARGE SIBERIAN ELM TREES** were effectively controlled by cutting and treating the cut surface with Garlon® 4 Ultra with basal oil. Photo was taken in June, one year following removal.

**PLANT COMMUNITY RESPONSE** to herbicide treatments is measured before and after the herbicide application.

## MANAGEMENT METHODS

Siberian elm was introduced to the area in windbreak plantings and from windblown seed. The oldest trees were up to 24 inches in diameter and 50 feet tall, with elm seedlings invading the grassland within several hundred yards of mature trees. The infestation was too large for backpack herbicide treatments or hand removal so a combined strategy was developed that included prescribed fire, cutting followed by cut-surface herbicide treatments on large elm, and aerial herbicide application on smaller trees and seedlings.

Dow AgroSciences LLC provided Milestone® and Garlon® 4 Ultra herbicides for the aerial application, and TNC provided project oversight, physical removal and cut stump treatment of larger Siberian elm, and paid for the aerial application. Baseline plant community

data including percent cover of grass, forbs (wildflowers), and woody vegetation were collected along six permanent transects by Paul Bockenstedt, Ecologist with Stantec Consulting Services Inc., the summer of 2013 prior to herbicide application. The mean percent vegetative cover before treatment was 59 percent (%) grass, 18% Siberian elm, 1% non-native forbs, and 12% native forbs. Goldenrods (*Solidago* sp.) comprised about 80% of the desirable forb component, the vast majority of which was Canada goldenrod (*Solidago Canadensis*).

Blastick explains that timing various management activities was critical to the success of the project. The 240-acre unit was burned in May 2013 to remove accumulated duff and litter, rejuvenate warm-season grasses, and stress Siberian elm trees. Small Siberian elm were allowed to grow and develop leaves during the summer before the fall herbicide treatment.



Protecting nature. Preserving life.™

The mission of The Nature Conservancy is to conserve the lands and waters on which all life depends. Founded in 1951, The Nature Conservancy is the world's leading conservation organization working in all 50 U.S. states and 35 different countries. Through the dedicated efforts of more than 600 scientists and over one million members, The Conservancy has protected more than 119 million acres of land and 5,000 miles of rivers, and operates more than 100 marine conservation projects globally. The Nature Conservancy is the largest environmental nonprofit both by assets and revenue in the Americas.

**LEARN MORE**  
[www.nature.org](http://www.nature.org)

## RECOMMENDED APPLICATION

To ensure maximum uptake and translocation of herbicide in target trees Dow AgroSciences LLC recommends herbicide application to woody vegetation PRIOR to burning. Recommended application rate for controlling elm is Garlon® 4 Ultra at 4 qt/A plus Milestone® at 7 fl oz/A. A higher rate was used in this study because the site was burned prior to herbicide application. Dow AgroSciences field specialists are available for field visits to help with choosing the right herbicide and rate for brush control projects.

**LEARN MORE**  
**Woody Plant Control in Northern Prairies**  
<http://bit.ly/woodyplantcontrol>

## DRIFT CONTROL TECHNOLOGY

Scotts Helicopter Services in Le Sueur, Minnesota applied the aerial herbicide treatment. Equipment was selected to minimize off-site drift during application, and GPS mapping was used to precisely deposit the herbicide within the treatment area. Application equipment was a Bell 37-Soloy helicopter with a 100-gallon spray tank. The 30-foot spray boom was equipped with 28 Bishop Accu-Flo™ nozzles (1.4 gallon per minute output/nozzle) with a total pattern width of 48 feet. This lightweight nozzle produces a high percentage of large, uniform size droplets to reduce drift during application. Total application volume was 10 gallons per acre and the application time for the 240-acre project was about two hours.



**HERBICIDES WERE BROADCAST APPLIED AERIALY** with a helicopter to smaller trees in September 2013.



**VISUAL RESULTS** nine months following aerial application of Garlon® 4 Ultra on small elm (top) compared to a non-treated control plot (bottom).

Larger trees were cut, piled and a 25 percent solution (v/v) of Garlon® 4 Ultra and basal oil was applied as a cut-surface treatment in June 2013. Herbicides were broadcast applied aerially with a helicopter to smaller trees in September 2013.

Two different herbicide rates were used:

1. **AREA 1** (120 acres) received Garlon 4 Ultra at 5 quarts per acre (qt/A) plus Milestone® at 7 fluid ounces per acre (fl oz/A).
2. **AREA 2** (88 acres) was treated with Garlon 4 Ultra at 3 qt/A plus Milestone at 5 fl oz/A.
3. **AREA 3** (0.5 acre) was the non-treated control.

Managers realized that fire alone would not kill the elms, but they felt that a combination of stress from the fire and proven effectiveness of the herbicides should provide good control.

## RESULTS

Data collected by Bockenstedt nine months after herbicide application and one year post burn indicate that the combination of herbicide and fire provided 100% control of Siberian elm trees and seedlings within transects. Grass cover increased to a mean of 93% across the six transects in the higher rate treatment (Area 1). Visual observations taken in the lower treatment rate (Area 2) indicates similar control. The area will need to be monitored another year to determine if there is a difference in long term control between the two herbicide application rates. “Compared to treated areas, the non-treated control plot had a lot of seedling Siberian elm, Canada thistle and other weedy species,” explains Bockenstedt.

Joe Blastick with TNC agrees. “Siberian elm and Canada thistle control looks excellent, so we are very pleased with results. The aerial broadcast application



SUCCESS STORIES FROM THE WESTERN RANGE & WILDLANDS EDITION

Protecting The Upper Ruby Watershed from Invasive Plants: <http://bit.ly/protectingruby>



**CANADA THISTLE** and other weedy species were also controlled in the treated plot (left) compared to the non-treated control (right).

was conducted on an old Conservation Reserve Program field that provided good wildlife habitat, but had a low diversity mix of Indian grass (*Sorghastrum nutans*), little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardi*), and switchgrass (*Panicum virgatum*) along with undesirable grasses including Kentucky bluegrass (*Poa pratensis*) and smooth brome (*Bromus inermis*). This was an efficient way to make an application to reach our objectives of removing the Siberian elm,” says Blastick.

## LONG-TERM OBJECTIVES

Blastick explains that their long term goal is to showcase the site for habitat improvement. “Getting rid of the large Siberian elm trees and encroaching seedlings was critical for opening up the landscape for grassland birds. We are hoping the herbicide application hit the ‘reset button’ and the combination of patch-

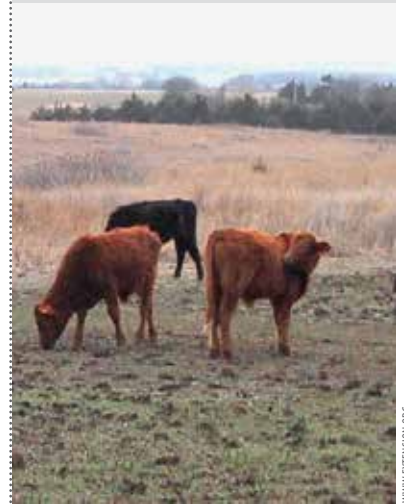
burn grazing and haying will keep future tree encroachment at bay. We realize that some manual cutting of trees will have to be done in the future, but by integrating fire, rest, grazing and haying we hope to achieve structural heterogeneity across the site. We know that various wildlife species require different habitat so with this project in conjunction with the adjoining natural areas we are maximizing habitat for more species.”

Label precautions apply to forage treated with Milestone and to manure from animals that have consumed treated forage within the last three days. Consult the label for full details.

\*Trademark of The Dow Chemical Company (“Dow”) or an affiliated company of Dow. Milestone is not registered for sale or use in all states. Contact your state pesticide regulatory agency to determine if a product is registered for sale or use in your state. State restrictions on the sale and use of Garlon 4 Ultra apply. Consult the label before purchase or use for full details. Always read and follow label directions.

## PATCH-BURN GRAZING

Patch-burn grazing is a grassland management strategy designed to improve wildlife habitat by increasing grassland structure and diversity. With this grazing system, a portion of prairie is burned to attract grazing livestock. Animals concentrate their grazing in the burned “patch” even though they have access to the entire prairie. As new patches are burned, cattle shift their grazing to the most recent burned patch, allowing previously-burned areas to recover. Cattle have a strong grazing preference for grasses, as opposed to forbs (wildflowers), which further increases plant diversity in recently grazed portions of grasslands.



## LEARN MORE

**Patch-burn Grazing Video**

<http://bit.ly/patchburnvideo>

**Patch-burn Grazing for Biodiversity**

<http://bit.ly/patchburnpdf>

## INCORPORATING NATURE'S VALUE AND BUSINESS

In 2011, The Dow Chemical Company and The Nature Conservancy embarked on a novel collaboration to help Dow and the business community recognize and incorporate nature into business decisions, strategies and goals. **Read more:** [http://bit.ly/das\\_tnc](http://bit.ly/das_tnc)

READ MORE ARTICLES LIKE THESE

Click on the **SUCCESS STORIES** category at <http://techlinenews.com>





**TechLine Invasive Plant News**  
 c/o Weed Management Services  
 PO Box 1385  
 Helena, MT 59624

Presort Standard  
 U.S. Postage  
**PAID**  
 Helena, MT 59601  
 Permit No. 221



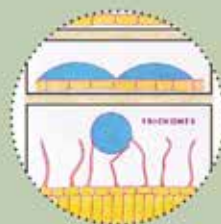
**EFFECTIVE HERBICIDE USE  
 STARTS WITH THE LABEL**



**INTRODUCTION TO  
 HERBICIDE FORMULATIONS**



**FACTORS AFFECTING  
 HERBICIDE PERFORMANCE**



**INTRODUCTION TO  
 ADJUVANTS**

<http://bit.ly/understandinglabels>

<http://bit.ly/herbicideformulations>

<http://bit.ly/herbicideperformance>

<http://bit.ly/adjuvants>

**NEW SERIES:  
 UNDERSTANDING HERBICIDES**



*Articles exploring the science and skill behind effective herbicide use.*

For more articles like these, visit the **HERBICIDE INFORMATION** page at <http://techlinenews.com>

Visit the **SURVEYS** page at  
<http://techlinenews.com>  
 to participate in fun weed  
 games and surveys for a  
 chance to enter techline's  
 annual \$200 drawing!



**WEED FACTS & FABLES**



**READER SATISFACTION  
 SURVEY**



**WEED PICTIIONARY**

**Are You Missing Out?**

**GET MORE FROM YOUR TECHLINE SUBSCRIPTION BY UPGRADING TO EMAIL**

Many articles about invasive plant management success stories, tips, and new research and technology are published **EXCLUSIVELY ONLINE**.

Upgrade your subscription today at <http://techlinenews.com/subscribe>.  
 It's **FREE!**

