Poison cont. from page 1

Cooperative Extension and the Virginia Tech Pesticide Programs office lead most of the educational training and recertification efforts in Virginia.

While most of this two-part article has focused on using herbicides to control plants, herbicide use should be put into the context of Integrated Pest Management (IPM). In this case, the pest is a plant. Integrated management of pest plants is more than just killing them with a chemical. Integrated management considers timing, application methods, products, and alternatives to adequately treat the situation with minimal risk. Integrated management also considers the site after herbicide treatment. Would the site benefit from management inputs to help desirable plants grow, such as an understory burn to encourage oak regeneration? IPM considers all the tools and possible combinations of tools to meet your goals.

Some of the items in your Integrated Pest Management kit may include an identification manual, hatchets, chemicals, and spray rigs. Photo by: Lynn Davis, Virginia Tech.

In lieu of herbicides, mechanical and physical control of some plants is possible. Perhaps you have a relatively small path or just scattered plants, such as garlic mustard. Pulling these before they go to seed is faster and easier than, and just as effective as, using herbicide. A multiflora rose bush can also be pulled out of the ground, but because of its root structure, the soil disturbance may be significant. IPM considers the pros and cons of both options. Biological control is another approach. An exciting development in this realm is happening right here in Virginia. Virginia Tech researchers are studying a fungus that kills tree-of-heaven. If this biological control becomes commercially available, not only does it have an advantage of very low risk, but it will also spread naturally, making repeated control efforts less likely.

Goats can even be part of an IPM approach. They are a mechanical control option, like hand-pulling plants. The special thing about goats is that they are more persistent than most humans. But, just like the other control options, there are risks to consider. If the goats are left in an area too long, damage can occur. Furthermore, they are not very discriminatory and will browse native plants as well as the exotic invasives.

Prevention of problems is another part of IPM and a reason why you may want to volunteer your services beyond your property boundaries. This was one of the primary motivators of the formation of Virginia's first Cooperative Weed Management Area, the Blue Ridge PRISM (Partnership for Regional Invasive Species Management). The PRISM, among other things, aims to create community-wide action to cooperatively knock back invasive species populations across property lines.

Effectively controlling pests is both more complicated than most people think AND more important. Thankfully, we have many tools at our disposal and pesticides, i.e. poisons, are one tool in the box. Poison can be profitable.

Adam Downing is the Northern District Forestry and Natural Resources Agent; 540-948-6771; adowning@vt.edu.

Disclaimer: Commercial products are named in this publication for informational purposes only. Virginia Cooperative Extension does not endorse these products and does not intend discrimination against other products which also may be suitable.

Resources for Learning More About Exotic Invasive Species and Control

- Accomplishing Forest Stewardship with Hand-Applied Herbicides: https://content.ces.ncsu.edu/accomplishing-forest-stewardship-with-hand-applied-herbicides
- Blue Ridge PRISM: https://blueridgeprism.org/
- Early Detection & Distribution Mapping System (EDDMapS): http://www.eddmaps.org/
- Environmental Safety of Forestry Herbicides: http://www.cof.orst.edu/cof/fs/kpuettmann/FS%20533/Vegetation%20Management/Environmental%20safety.htm
- eXtension: https://www.extension.org
- Herbicides and Forest Vegetation Management: https://extension.psu.edu/herbicides-and-forest-vegetation-management
- Invasive and Exotic Species of North America: invasive.org
- Non-native Invasive Plant Species Control Treatments: http://www.dof.virginia.gov/infopubs/_forestry-topics/FT0031_Nonnative-Invasive-Plant-Species-Control-Treatments_pub.pdf
- Nonnative Invasive Plants of Southern Forests: A Field Guide for Identification and Control: https://www.srs.fs.usda.gov/pubs/gtr/gtr_srs062/
- Plant Invaders of Mid-Atlantic Natural Areas: https://www.invasive.org/eastern/midatlantic/
- Southern Regional Extension Forestry Forest Health: southernforesthealth.net
- Southeast Exotic Pest Plant Council (SEPPC): https://www.se-eppc.org/weeds.cfm
- USDA PLANTS Database: https://plants.usda.gov/java/
- Virginia Tech Pesticide Programs: https://sites.google.com/a/vt.edu/virginia-tech-pesticide-programs/
- Virginia Invasive Species: http://www.vainvasivespecies.org/species

VIRGINIA FOREST LANDOWNER UPDATE

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Department of Forest Resources & Environmental Conservation (0324)
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VIRGINIA FOREST LANDOWNER UPDATE

Events, news, and information promoting the stewardship of Virginia's forest resources.

VIRGINIA FOREST LANDOWNER EDUCATION PROGRAM

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When Poison is Profitable – Part II

By: Adam Downing, Virginia Cooperative Extension

When it comes to pesticides, you've probably heard it before: "The label is the law." This is more than a mantra, it is federal code. Information with regards to where, what, how, and why pesticides can be used is on the label. Information on personal protective equipment (PPE) necessary for mixing and applying pesticides is on the label. Application methods, concentrations, mixing instructions, and toxicity are also on the label. Pesticide labels contain not only a myriad of valuable information, but they are also (literally) the law.

For example if I am using an herbicide with the active ingredient glyphosate, to kill weeds in my driveway, I can't just double the concentration of the chemical and kill with bravado. While I may use the full-strength product on a cut stump of a tree, doing so on weeds in my driveway is off-label and makes me a non-label-following lawbreaker. On the other hand, if the label says I can use a 2% concentration of a chemical to kill weeds in my woods, but I know that a lower concentration of 0.5% is all I need to kill Japanese stiltgrass, I can use the lower concentration and not break the law. In other words, I can't increase the chemical concentration beyond what the label says, but I may decrease it as needed. Sort of like driving - I am a lawbreaker if I exceed the speed limit, but (generally) not if I stay below it.

For anyone who's ever purchased an herbicide, one of your first thoughts may be something like "Okay, the label is the law but it's so small I can't read it." While this is true, it is not an adequate defense in a court of law. Fortunately, if you have internet access, it's very easy to find pesticide labels and print them off in a larger font.

Let's discuss a few key aspects of what you will see on the front of an herbicide label. One of the biggest words will be the signal word, either Caution, Warning, or Danger. The signal word conveys the acute toxicity of the product's ingredients to humans based on physical contact and exposure possibilities (touch, consumption, breathing, etc.). "Caution" is found on the least harmful chemicals, and is the word used most often on products we apply for forestry practices. "Danger" is found on the most harmful chemicals. Chemicals with this word are generally restricted-use pesticides not available for purchase without a license. "Warning" is found on chemicals that fall somewhere between the others in terms of toxicity. All herbicide labels include the statement, "Keep out of reach of children."

The ingredient list is also important, especially when you are looking for something specific. The big name is the brand or trade name and means very little except to those in marketing. The real meaning of what's inside is listed in the ingredients, specifically the active ingredients. Glyphosate is a great example. According to the National Pesticide Information Center, there are over 750 products that contain glyphosate as an active ingredient. In some cases, these are simply different brands angling for your purchase; in other cases, there may be additional active ingredients; or the product may be labeled for different uses (such as aquatic versus terrestrial). The point is, it's important to read the active ingredient list to find what you are looking for rather than looking for a particular brand name.

Who can apply herbicides? In forestry we rarely use restricted-use herbicides. But it should be noted that anyone who wants to apply restricted-use herbicides anywhere for any reason needs to be certified in the appropriate category (such as forestry). For non-restricted-use pesticides, it gets a little more nuanced. On your own land (or on land you lease), you may apply non-restricted use herbicides. If, however, you want to apply the same herbicide on land you do not own or lease, you need a commercial applicator license in the appropriate category. Now, if you want to apply (with permission) a non-restricted-use herbicide on your neighbor's (private) property simply to help the environment or to be neighborly (i.e., no compensation), you probably don't need to be certified.

Having said this, receiving training and certification may serve you well as it keeps you current on relevant laws, the latest research, and issues. The Virginia Department of Agriculture and Consumer Services has regulatory authority in the use and application of pesticides in Virginia. Virginia

Poison cont. on page 5

EVENTS CALENDAR

For the most complete listing of natural resource education events, visit the on-line events calendar at https://forestupdate.frec.vt.edu

Contact	Date	Location	Event	Time	Fee
DCR	Jan., Feb., & March	Virginia's State Parks	**A variety of events and activities** For a complete list, visit: www.dcr.virginia.gov/parks	Varies	Varies
MP	Year-round	State-wide	**Virginia Master Naturalist Volunteer Basic Training** www.virginiamasternaturalist.org/chapters.html	Varies	Varies
WWF	Jan. 25-27	Virginia Beach	**Winter Wildlife Festival** Learn what it takes to properly observe and identify wildlife in their natural settings.	All week-end	Varies
FHP	Jan. 28-29	Blacksburg	**27th Annual Forest Health Professionals Conference** Conference topics will include: spotted lanternfly, *ailanthus* biological control, genetically engineered trees, fire and long-term forest health, Asian longhorned beetle, southern pine beetle, tree health diagnosis, ash treatment, feral pigs, herbicides, and hemlock conservation.	Varies	$125*
DW	Feb. 21	St. Stephens Church	**Tree Farm Dinner** A field tour and dinner presentation will focus on ways to improve wildlife habitat for game and non-game species on private land. An update on federal and state cost-share programs available to private landowners, including the new Working Lands for Wildlife Program, will be provided.	3:00	$10*
AD/JG	Feb. 23	Culpeper and Roanoke	**Annual Woods & Wildlife Conferences** Join Virginia Cooperative Extension and partners for a full day of presentations and workshops geared towards helping both large and small acreage landowners become better stewards.	8:30 - 4:30	$45/person; $80/couple
JG	March 4 - May 24	On-line	**On-line Woodland Options for Landowners** This 12-week, on-line, self-paced class will teach you the basics of woodland management. Topics include: tree ID, woodland ecology, sustainability, soils, mapping, and silviculture. Registration includes a hands-on field trip and 3 books.	NA	$45/family
JG	March 14-16	Appomattox	**Central Virginia Beginning Landowner Weekend Retreat** Is woodland management a new concept for you? If so, come spend the weekend with fellow forest owners and natural resource professionals and learn how to get started. A combination of classroom talks, field tours, and hands-on experiences will provide you with the basics.	All day Saturday & Sunday	**No Lodging:** Individual - $50* Couple - $90* **Lodging:** Individual - $100* Couple - $190*
BEF	March 26	Boyce	**Coyotes in Virginia: Here Today and Here to Stay** An overview of the history, biology, and ecology of coyotes, including an update on coyote research. Suggestions for reducing coyote-human conflicts will be discussed.	7 - 8:30	$15

*meal(s) included

EVENT CONTACTS

Contact	Name/Affiliation	Phone	e-mail/website
DCR	Virginia Department of Conservation & Recreation	804-786-1712	www.dcr.virginia.gov
MP	Michelle Prysby	434-872-4580	www.virginiamasternaturalist.org
WWF	Winter Wildlife Festival	757-385-2990	VBGov.com/winterwildlife
FHP	Forest Health Professionals	https://www.vafhp.org/	
DW	Dan Wilson	434-531-0456	dan@trfva.com
AD	Adam Downing	540-948-6881	adowning@vt.edu
JG	Jennifer Gagnon	540-231-6391	jgagnon@vt.edu
BEF	Blandy Experimental Farm	540-834-1758 x 224	http://blandy.virginia.edu/

You Ain't From Around Here! The Trouble with Tribbles

By: Jennifer Gagnon, Virginia Tech

The tribbles are too much - even for the great Starfleet Captain James T. Kirk. Image from Star Trek: The Original Series.

I'm certain all my readers who are hard-core Trekkies instantly appreciated my title reference. For the rest of you, let me explain. On Star Date 4523.3, the Starship Enterprise, captained by none other than the great James T. Kirk, arrives at Deep Space Station K7. It is here, at K7, that Lieutenant Uhura is given a small, charming, furry, alien life form known as a tribble. And that's when the trouble begins. You see, once aboard the starship, the tribble begins to reproduce rapidly. Tribbles inundate the Enterprise and their population quickly reaches over one million. Doctor McCoy determines that over 50% of a tribble's metabolism is dedicated to reproduction. And the more they eat, the more they reproduce. As a result, the sustainability of the crew's food supply is soon threatened. This just goes to show that exotic invasives are able to wheedle their way into anything, including pop culture!

Since information on the biology/ecology of tribbles is rather spotty, and they don't seem to be an issue in Virginia at this time, I won't be writing this article solely about them. In fact, after writing about specific exotic invasives for 13 years, I decided it was time to go back to the beginning and spend some time discussing exactly what they are and what makes them problematic.

Exotic invasive species have negative ecological and economic impacts. Negative ecological impacts may include:

1. **Altered ecosystem function.** Exotic invasives change how our native ecosystems function. For example, the exotic invasive insect, the hemlock woolly adelgid, kills hemlocks growing along streams. These hemlocks have historically deeply-shaded streams, maintaining cool water temperatures. As the hemlocks die, the forest canopy opens, allowing more sunlight to reach the water, increasing water temperatures. This reduces the suitability of the habitat for cold water fish, such as trout.
2. **Reduction of native species.** Because of certain characteristics described below, exotic invasive species can out-compete slower-growing, less prolific, native species. And sometimes they get help from an opportunistic native species, the white-tailed deer. Deer will selectively browse on our native plants, while leaving the non-natives alone. This gives the exotics an additional advantage.
3. **Altered forest structure.** Heathy forests have a vertical structure that includes ground cover vegetation, shrubs and young trees, and an overstory canopy. This vertical structure is important for diversity of both plants and animals. An exotic invasive like kudzu can eliminate this vertical structure by covering up and pulling over shrubs and trees, resulting in a mat of vines with little vertical structure.
4. **Decreased productivity.** Timber and native wildlife production on sites overtaken by exotic invasive species will decrease, as native species often do not compete well with exotic invasives.
5. **Decreased biodiversity.** In areas inundated with exotic invasives, we typically see a significant diversity loss as natives are pushed out.

Economically, exotic invasives cost the United States over $120 billion annually (Pimentel et al. 2005). Costs arise from decreased productivity and expenses associated with control efforts. Virginia alone has over 90 species of exotic invasive plants.

So, what makes exotic invasives, well, exotic and invasive? In general, they are organisms introduced (intentionally or unintentionally) from somewhere else that flourish in their new environment. Exotic invasives come in all shapes, sizes, and kingdoms. There are exotic invasive mammals, fish, insects, crustaceans, mollusks, bacteria, fungi, plants, and viruses. But they all tend to share certain characteristics that help them excel at being exotic and invasive. These include:

1. **They have no natural predators in their new environment.** Most species that are invasive in their introduced location are not invasive in their native range. There is something in their native range that keeps them in check. This might be competition with other plants, soil conditions, weather, an insect or disease, or likely a combination of factors. Unfortunately, when exotic invasives are brought here, the controlling agents typically are not.
2. **They have prolific reproduction.** Exotic invasives tend to be extremely good at reproducing. An example is ailanthus or tree-of-heaven. A single female tree can produce over 300,000 seeds a year.
3. **They have multiple means of reproduction.** Some species are able to reproduce in more than one way. For example, the aquatic invasive plant, hydrilla, has four means of reproducing. New plants come from fragments of mature plants, tubers, turions (detachable buds), and seeds.
4. **They are excellent at spreading their progeny.** A key element of being an invader is the ability to spread across the landscape. An exotic invasive disease, such as chestnut blight, is able to spread effectively across the landscape by tiny wind-borne fungal spores.
5. **They aren't fussy about where they live.** Many exotic invasives are generalists and are able to grow and live under a wide

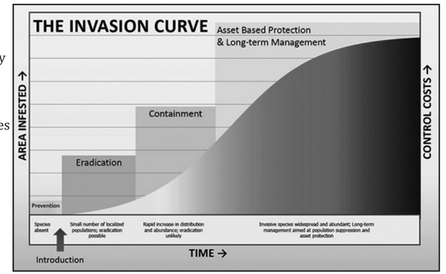
Tribbles cont. on page 4

Tribbles cont. from page 3

variety of site conditions. Exceptions include species like the emerald ash borer, which only feeds on ash and fringetree (at least that we know of).

6. **They are the first to arrive after a disturbance.** Exotic invasive plants tend to be pioneer species. They quickly occupy sites that have been recently disturbed. Japanese stiltgrass is a good example of an invader that fills in on disturbed soils along hiking trails, rights-of-way, and logging roads. As parcelization and fragmentation (land use change) occur across Virginia, these disturbed areas increase.

My best advice for woodland owners is to know how to identify common exotic invasive species in their necks of the woods. Then, you should walk your property regularly looking for signs of these species. If you find a problem, a plan of attack should be formed as soon as possible. The earlier exotic invasive problems are addressed, the less expensive and time-consuming control will be, and chances of successful eradication (or at least containment) will improve.



As exotic invasive invasions progress, control costs escalate to the point where eradication and containment are no longer cost-effective. Graphic from LeRoy Rodgers, South Florida Water Management District.

How do you know what to look for? I've provided some useful resources on page 5 of this newsletter. To help you narrow down what problems could be lurking in your woods, talk to neighbors and seek the advice of your local service forester (http://www.dof.virginia.gov/aboutus/contact-us.htm) or other natural resource professional. Most natural resource professionals are all too familiar with exotic invasive species.

And what should you do if you find a problem? Learn about the species. Knowing how your species of concern grows, spreads, reproduces, etc., will help you formulate an effective plan of attack that (hopefully) fits your budget. Some of the tools available for exotic invasive plant control can be found in the accompanying article ("When Poisons are Profitable Part II") in this newsletter. One important aspect of exotic invasive control is reclaiming the site afterwards. Once an exotic invasive is removed (or at least under control) it's important to reestablish native species to claim the site. Otherwise, the area will be ripe for a new invasion.

Finally, stay positive. You are not alone in your fight against exotic invasives. They are an international problem. In fact, I often hear people make disparaging remarks about Asia sending us all of these exotic invasive species. And while it is true that many of our problematic species do come from Asia, a country like China is getting back far more trouble than it is giving. Back in 2009, China already had more than 283 exotic invasive species, more than any other country. Of the International Union for Conservation of Nature's 100 worst invasive species in the world, China has 50. This is a result, in part, of its large area and numerous ecosystems; and in part because of its global economy. Exotic invasive species occur world-wide. Fortunately, because of the scale of the problem, there are many organizations willing and able to help with this issue.

Now, you may be wondering, perhaps even worried, about our intergalactic invaders and the fate of the Starship Enterprise. Did the tribbles take over? Did the crew starve? Alas, all turned out well. In the end, Scotty beams all the tribbles into a Klingon ship's engine room – where, he says, "they will be no tribble at all." Unfortunately for those of us in Virginia in the 21st century, beaming our invasives into outer space is not currently an option and may not be for another 300 years. And even then, won't we be simply passing the problem on to someone else?

Citation

Pimentel, D., R. Zuniga, and D. Morrison. 2005. Update on the environmental and economic costs associated with alien-invasive species in the United States. Ecological Economics. V 52: 276-288.

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Definitions Related to Exotic Invasive Species
Adapted from USDA Plants database

Invasive: An organism that is both non-native and able to establish on many sites, grow quickly, and spread to the point of disrupting plant communities or ecosystems.

Native: An organism that is a part of the balance of nature that has developed over hundreds or thousands of years in a particular region or ecosystem. Only plants found in this country before European settlement are considered to be native to the United States.

Non-native/exotic: An organism introduced with human help (intentionally or accidentally) to a new place or new type of habitat where it was not previously found. Note: Not all non-native plants are invasive. In fact, when many non-native plants are introduced to new places, they cannot reproduce or spread readily without continued human help.

Noxious: An organism that is particularly troublesome. It is illegal to import federally listed noxious weeds or transport them across state lines.

Opportunistic native: A native organism that is able to take advantage of disturbance to the soil or existing vegetation to spread quickly and out-compete the other organisms on the disturbed site.