

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

By: Jennifer Gagnon, Virginia Tech

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, a tribble begins to reproduce rapidly. Tribbles inundate the Enterprise and their population quickly reaches over one million. Doctor McCoy determines that over 50% of the 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!



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

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.** Healthy 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.

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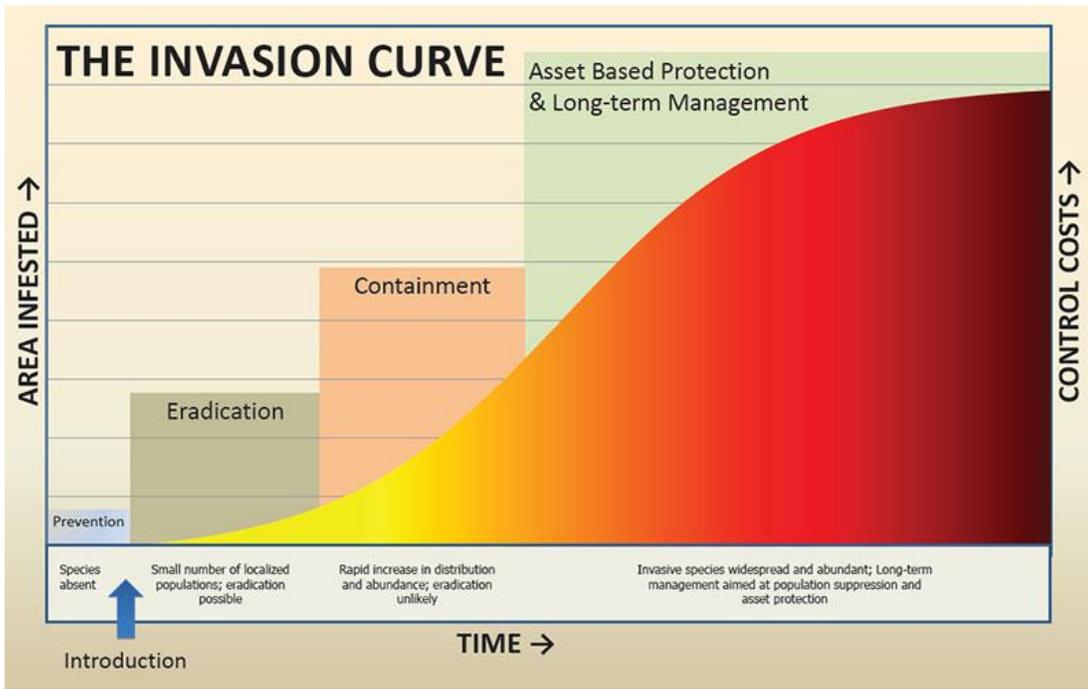
2. **They have prolific reproduction.** Exotic invasives tend to be extremely good at reproducing. An example is ailanthus or tree-of-heaven. A single female tree can produce over 300,000 seeds a year.
3. **They have multiple means of reproduction.** Some species are able to reproduce in more than one 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 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.

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.



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.

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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