The Effect of Invasive Species on the Ecosystems of Virginia

Daniel Alvarez

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Dr. Ruday

 Introduction

Invasive species are a grave threat to ecosystem stability and are the second greatest threat to biodiversity after habitat loss (Callahan 2015). Invasive plant and animal species are brought into new environments through many different pathways. Often plant species, such as Kudzu, are considered decorative and brought on purpose, then spread rapidly when they are planted. Non-native species such as fish are often brought in as pets or to create new sources of food in an area but populate rapidly after being introduced to the new environment. Some other species invade foreign areas accidentally when they are brought via human transportation.

 Background Information

Annual economic losses due to invasive species in the U.S. are estimated to be more than $120 billion and losses due to invasive species in Virginia may be as high as $1 billion annually (Pimentel et al. 2005). Ecological damage caused by invasive species can cause near or complete extirpation, which is a local extinction, of native species in a region or cause the alteration of natural ecosystems. The case of the Chestnut blight and the Hemlock Wooly Adelgid are examples of extirpation and the Zebra Mussel and Phragmites are examples of ecosystem alteration (VISAC 2018). Nearly 80 percent of 1,421 endangered or federally listed species were found to be directly threatened by competition with or predation by invasive species (Evans et al. 2016). The Virginia Department of Game and Inland Fisheries identifies the management of invasive species as one of four major actions, along with habitat protection, habitat restoration, and pollution reduction, required to prevent further species loss (VDGIF 2015).

 Although extensive research has been done on specific species and their impact on varying ecosystems, a long-term study must be conducted on the effect of invasive species on biodiversity in different areas. Currently, research is being done concerning events that have occurred in the geologic past when species that evolve within an ecosystem later disperse into a formerly isolated ecosystem (Stigall 2016). These ancient invasions provide researchers the opportunity to examine the long-term impact of invasive species over the period of hundreds or thousands of years, rather than merely a few years or decades, which is what research on current invasions is limited to.

 There are some efforts already being conducted by federal agencies and non-profit organizations, as well as private citizens and landowners. Several species, such as the spotted lanternfly, which is a pest that destroys crops and timber, are being monitored by state agencies in addition to a push towards educating the public on the damage these invaders can have (VISAC 2018). Other efforts include a partnership between state agencies and the general public to obtain funds to control the spread of wavyleaf grass on national parklands; health officials monitoring exotic mosquitoes capable of transmitting pathogens, such as West Nile Virus, that harm humans; wildlife biologists tracking the spread of feral hogs; foresters suppressing gypsy moth infestations and natural area stewards working to control Phragmites, species of invasive marsh grass, in hundreds of acres of coastal plain marshes (VISAC 2018).

 Hypothesis

Based on what is currently known about the effects of invasive species on biodiversity, I hypothesize that if the destruction of invasive species is not limited or eliminated, then our earth will suffer mass extinctions and extirpations that will destroy our already decreasing biodiversity and fragile ecosystems. The extinction of many species of amphibians and trees are an indication that invasive species are at the root of the destruction of biodiversity in many areas and that this problem will only worsen if measures are not taken to prevent their spread. I predict that biodiversity will only lessen in the coming years if drastic efforts are not taken against invasive species and that increasingly homogenous ecosystems will have long-term repercussions for not only the native organisms that live in those ecosystems but for humans as well. Foods that were once readily available and varied will become increasingly sparse as the ecosystems that those food sources thrive in decline. Research must be done to protect our earth and to secure our future as healthy and plentiful.

Some far-reaching effects of this research plan will be the education of the public on the dangers of invasive species and what steps can be taken on a small scale to prevent the spread of these species. Another effect will be the minimization of damage that these invaders cause from both an economical and ecological standpoint, as well as reducing physical harm to humans. This research will hopefully change the practices of travelers who hope to bring invasive species into foreign areas, as well as human transportation such as cargo vessels. Education is the main focus, which will help to prevent both the spread of these species and in the cases of invasive species that are already established, control the spread and damage that is caused. My research wholly deserves funding because the economic harm that is caused by invasive species is far greater than the cost of conducting research on these species.

Methods

 This strategy of invasive species management and research will hopefully help control all forms of invaders, from microscopic microbes to large mammals. A focus on minimizing ecological and economical damage caused by these invasive species is also key to this research. Research concerning species such as the Northern Snakehead fish that have already established themselves will revolve around management and the limitation of their spread. Catching these fish in areas they are known to populate and killing them once caught will be an effective solution, and it is one that has already been implemented to a degree in areas these fish live. However, an effective addition to this solution would be to offer fishermen a bounty on each fish that is caught, enough to incentivize their catching and make it worthwhile to hunt these fish. I believe this method would severely decrease the population of these fish if they are caught on purpose and killed rather than only killed when they are caught accidentally. The Potomac, a river in which Snakehead are found, will serve as the initial test site and will establish the process by which other waterways are tested. Ten-mile long segments, equally spaced, will be fished for Snakehead and once caught these fish will be measured, photographed, and determined to be either adult or juvenile before being put down. Research conducted on species that are not yet completely established will focus on prevention methods and assessing the risk and control of those species. The method for doing this will initially focus on early detection of invasive threats and once detected, these threats will be studied in their native environments to learn of the ramifications of that species establishing itself as well as how best to prevent the spread of it based on that species natural predators in its natural habitat. The equipment needed for the study of established invasive species and the study of invasive species that are possible threats isn’t expensive or extreme. pH testing kits for water and soil, tagging and tracking tools, and plant sampling technology will be most of what is needed for the testing of species in both their native and non-native environments. Boats, nets, buckets, and tools for photographing Volunteers will be willing to help with some of the fieldwork as well, lessening the burden on state departments and special interest groups, although a large amount of manpower will be needed still to thoroughly and accurately investigate and record observations and findings. This data will be collected every two months for at least ten years to study the long-term ramifications of invasive species on biodiversity, although a study over a period of time longer than ten years would be preferable if it is feasible.

 Studying the effects of invasive species on biodiversity and the environment is important because, like all environmental issues, it affects all of us and many aspects of our lives. Our health, well-being, and homes may be threatened if the spread of these invaders are not dealt with in a timely manner.

References

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