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Teaching the Public and Schoolchildren about Invasive Species

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## Introduction

In an increasingly global community, species are no longer limited to their original home ranges. They are subject to interference from many outside sources, triggered by human movement throughout the world. Species evolved over thousands and millions of years based upon a specific set of conditions that have been drastically altered in just a few hundred years. Such changes have been exacerbated even more in just the past few decades by human modification of the environment and increasingly easy and swift travel around the globe. Humans have introduced many species to regions from which they had historically been isolated, and while most of these exotic species do not become established in new ranges due to unfavorable conditions, many do thrive (Primack, 2006). These invasive species increase in abundance over time, as they outcompete and/or destroy native species which are not adapted to respond to the new intruder (Primack, 2006).

Invasive species are impacting environments around the world at an increasingly alarming rate, as the growing population of humans becomes increasingly mobile (Mooney and Cleland, 2000). Few areas of the world have not currently become affected by introduced species, and nearly every area is vulnerable to the threat of human introduced species (Mack, et. al., 2000). As humans interact with the environment and settle in new areas, they simultaneously either intentionally releases species into the new locations in which they settle or unintentionally transport hearty hitchhikers to new ranges (Primack, 2006). Newly established invasive species can cause a host of problems to the environment, such as dramatic alteration of the ecosystem, decreased economic viability of the region, competition with and predation upon native species, including endangered species, the introduction and spread of diseases, and irreversible

evolutionary impacts upon species and ecosystems (Primack, 2006; McIntosh, Shogren, and Finnoff, 2010; Mooney and Cleland, 2001).

While many invasive species were accidentally introduced, even the species that were purposely released in a new area were not intended to cause harm to the environment. In most cases, the introduction of an invasive species was the result of ignorance of the species' ability to adapt to the new environment, the lack of biological controls of the species in the new area, or the lack of knowledge of what factors can lead to a species becoming invasive, such as the ability to thrive in areas disturbed by humans (Primack, 2006). Because human ignorance has been one of the most important factors in the establishment of invasive species throughout history, education is the means to preventing future introductions and addressing the species that have already become problems in environments around the world. Effective education about invasive species can take two forms: public education programs and programs in school classrooms.

There has been a renewed emphasis on general sciences in schools, and in environmental science in particular, over the past few years, as educators around the world have begun to realize that children have become further removed from nature in recent decades (Huxham, Welsh, Berry, and Templeton, 2006). In addition, environmental challenges have become increasingly urgent with the globalization and industrialization of the world. As children learn about other environmental issues, such as endangered species, deforestation, and climate change, invasive species should definitely become part of the dialogue, as it is a topic that reaches all ends of the globe and pervades all of the aforementioned environmental concerns, as well. In fact, Allendorf and Lundquist (2003) suggest that management and control of invasive species may become the principal challenge for conservation biologists over the next few decades.

Therefore, students of today must learn about the problems that they will be facing as they get older.

As schools begin to improve their environmental science curriculums, some educators have recognized the importance of teaching children about invasive species. This review paper will first investigate and discuss the ways in which public education and involvement plans have been approached, and then, it will detail many of the ways in which schools and educators have begun to engage students in addressing the problem of invasive species in their local areas and around the world. The goal of this paper is to show that it is both important and possible to educate and engage students of all ages in the topic of invasive species, and I hope to give educators ideas about ways to broach the topic with their own students.

#### Invasive Species and Public Involvement

One of the largest challenges to the prevention and eradication of invasive species is public support. In some cases, people actually are fond of the invasive species in an area, and in other cases, they fear that attending to the problem could negatively impact the economics of the region or cost too much to address. Tweit (2008) tells the story of popular invasive species in the Grand Canyon and other national parks, as she discusses the destruction caused by feral burros and horses. While removing such species from parks is not a popular choice, as the general public enjoys seeing such animals, and though it is an incredibly expensive undertaking, it is a necessary action if the ecosystem of the parks is to be protected for future visitors and generations. The key to invasive species management in this case is rather than making unpopular decisions without the public's input, conservationists and park management have decided to educate the public as to the damage caused by the invasive species and to take the people's preferences into consideration in an effort to bring them on board for the process of

managing the invasive species with the protection of the ecosystem as the primary goal (Tweit 2008). The decision to remove exotic species may face opposition from the public, as they may possess perceptions of nature and its component species that differ from scientists and conservationists; however, a mix of communication strategies that combine direct action involving local biodiversity with public education improves people's awareness and has the potential to alter people's behavior with respect to introduced species (Teillac-Deschamps, et. al., 2009).

Another way to engage the public is by administering a survey to those economically impacted by the invasive species. McIntosh, Shogren, and Finnoff (2010) decided to measure public support for policies that battle invasive species invasions by determining whether people value protection of natural ecosystems through a survey; by assuming that because trade will be impossible to completely eliminate, and thus, invasions by exotic species are inevitable, they wanted to know what people are willing to pay to maintain an acceptable level of environmental quality. The authors found that people were, in fact, very willing to pay to protect the natural ecosystem, and they would even pay an increased amount of money to prevent higher impacts on the ecosystem or to support longer-term efforts (McIntosh, Shogren and Finnoff, 2010).

The above studies suggest that people are very willing to compromise or to support efforts to combat invasive species, as long as they are educated and consulted when decisions are being made. During class discussions, much was made of the politicians in the Great Lakes regions not willing to compromise when it came to protecting the lakes from invasion by the northern snakehead. However, the studies cited above suggest that the constituents from the regions represented by the politicians may fully support management of the invasive species problem. Perhaps, then, conservationists should appeal to the public and to the politicians for

more education and for compromise, especially if they stress the fact that invasion prevention is much less expensive than controlling a species after it has invaded (Mack, et. al., 2000; Allendorf and Lundquist, 2003).

Education and public awareness are the keys to effective management plans for invasive species. Efforts have been made in recent years to give more exposure to invasive species, and the environmental hazards they are causing. In recent years, the northern snakehead, mentioned above, has received much press after it was first found in the United States. Because it was already somewhat familiar to the average American due to its notoriety, government and conservationists alike have used the fish as a 'poster child' in the fight against invasive species by banning the import of other exotic species that have the potential to become invasive (Goldman, 2002). The northern snakehead example shows that media can educate the public and encourage action to protect local ecosystems. If people feel invested in conservation, they will be more likely to work for, pay for, or simply support the means necessary to either prevent invasion or eradicate a harmful invasive species from the local area.

#### Educating and Involving Children in Invasive Species Efforts

Environmental education is increasingly important to today's youth. Children are more removed from nature now than ever before due to increased urbanization and the decrease of wild spaces and wild life. Huxham, Walsh, Berry, and Templeton (2006) discuss that modern children have less direct knowledge about wildlife than past generations, and in fact, kids were better able to identify Pokémon characters than real, native animals. This discussion rang very true to me, as well, as during my field expedition last summer to Belize, the children we met cited rabbits, horses, and dogs as their favorite animals, though they had jaguars, kinkajous, and howler monkeys literally in their backyards. Similarly, children in the United States are more

likely to be found indoors watching television, playing video games, or playing on a computer than playing outside or exploring nature.

Because of the growing disconnect between kids and nature, teachers have begun designing lessons to engage their students in nature, even by incorporating a wide range of subjects into the lessons. For example, students use math skills and social studies skills, in addition to science skills, when they investigate such information about the Great Lakes as geography, lake surface area, fish resources, and threats, including pollution and invasive species (Fortner, Swan, and Munson, 2007). Through such lessons, kids form a connection with an ecosystem, whether or not they ever actually visit it, and therefore, they will be much more likely to work for its preservation in the future. Ideally, they may even support invasive species prevention and eradication efforts in their adult lives, such as the ones needed to prevent the northern snakehead from entering the Great Lakes waterways.

The average person is typically unaware of, or unsure about, the problems caused by invasive species, even though scientists express increasing concern about the issues; this is likely due to lack of education on the subject (Boorse, 2004). Therefore, environmental ethics and topics should be taught at all levels of school. Because invasive species are such a problem the world over, not only for the environment, but also for economic and human health reasons, children should be educated as to the problem and to potential solutions that they will be addressing throughout their adult lives, whether they end up in the government, as scientists, or simply concerned citizens.

When discussing invasive species with students, an effort should be made to make the discussion as personal and thoughtful as possible. Students could be engaged by asking them to think about whether they had moved before, how animals and plants move from place to place,

and how new species are likely to affect an area to which they are not native (Lightbody, 2008). They can also actively research which invasive species can be found in their local area, and perhaps, they can be encouraged to find a sample from an invasive plant to share with the class. Students can also be exposed to scientists currently battling invasive species through a fun, colorful book by Sneed B. Collard III (2008). Kids can see the invasive species, such as brown tree snakes or red fire ants, in full color, view the effects the invasive has on the environment, and meet the people who spend their lives protecting the environment from such species, which may make those professions more appealing to kids (Collard, 2008).

The lesson and activity outlined by Beck and Czerniak (2005) is a fantastic example that can be used by teachers to engage students, of all age levels, in learning about invasive species, while allowing them to understand the way the species affect the ecosystem in a fun and appealing way. In the zebra mussels mock trial, students are required to learn about the zebra mussel and the ways it is affecting the Great Lakes ecosystem in order to role play a trial against the zebra mussel. Students investigate the complex issues surrounding the mussels through a mock court case and through active research and role-playing (Beck and Czerniak, 2005). The best feature of the lesson, in my opinion, is the way in which it can be modified for use in elementary school, middle school, and high school classrooms, and it requires students take ownership of the lesson, rather than serving as passive learners, which will more directly engage the students in the issue.

#### Discussion of Invasive Species Lesson with KidScience Students

I, personally, became interested in the topic of invasive species and the education of children when we decided to teach about the issue in our bi-monthly and summer classes with KidScience students. Several years ago, as a way to get the kids outside and making a hands-on

impact in and around the Zoo, my supervisor at the time and I decided to educate the students about invasive species that can be found in our local area and have them help to remove them from the area around one of the on-grounds ponds.

At the beginning of the lesson and activity, the kids, who primarily were in 7<sup>th</sup> through 9<sup>th</sup> grade at the time, were not particularly interested in learning about invasive species, were not interested in learning to identify plants, and had almost no prior knowledge about the topic. However, as the summer went on, and the kids directly worked at the pond by identifying and removing invasive plant species, they became far more enthusiastic about the project. Before we knew it, the kids were pointing out invasive species in other areas of the Zoo, and coming to class telling us about the invasive plants they saw on their drive in to the Zoo or the plants they found and removed from their backyards.

It was incredibly heartening and encouraging that the kids, who initially did not show much interest in the project, were the same kids who would be the first to volunteer to work at the pond or to ask if they could do extra work at the pond on their own. Even years later, the kids who did the invasive species removal at the pond still discuss how much they learned, can point out invasive plants in and around the Zoo, and ask about working back at the pond to this day.

The above story about my own students' experiences learning about and acting to remove invasive species from their local area is why the article by Bertulfo (2009), which details the efforts in Chicago of teenage Keystoneers (a group of teen leaders from Boys and Girls Clubs) to remove invasive species from a local forest preserve, struck a chord with me. The kids discuss that they, in fact, would likely be indoors watching TV if they were not participating in the effort, and they tell of how much fun they are having, despite all of the hard work they are doing.

This account rang very true to me, as I have been fortunate enough to see first-hand the enthusiasm of teens undertaking such a project.

### Conclusion

Invasive species are a problem the world over, and they only will cause more problems with increased globalization, human disturbance, and climate change. The only way such a daunting problem can be addressed effectively will be through education and public awareness for all people. Conservation biologists can only do so much to raise awareness about the problems associated with exotic, introduced species that become invasive, and they need help from many different outlets to ensure that the average citizen is aware of the issues. They can reach the public through the media, and the people who manage wild spaces and trade routes can appeal to the public for help in creating policies that will protect the important native resources that currently still exist for many generations to come. It is also up to the school systems to incorporate lessons and activities addressing invasive species into science curriculums, especially as they increase a focus on environmental sciences in all grade levels.

Much has been done to create awareness about major invasive species threats, such as zebra mussels and the northern snakehead, but much more can still be done to ensure that the average citizen can recognize what an invasive species is, why they can be harmful, and the ways in which they can work to prevent invasion. As with many other types of environmental issues, perhaps the best way to reach the public is to directly appeal to children. One of the most effective conservation messages of recent decades is the importance of recycling, and typically, most education on the issue was done at the school level. When children learn the importance of conservation, they share their concerns with their parents, and it becomes more likely for the adults to adopt the cause. Otherwise, many adults can be set in their ways and not open to

change. In addition, those kids are going to be the ones making the decisions in just a few decades, so the earlier they are educated and the earlier they form a connection with nature, the more likely they will be to place importance on environmental protection and conservation.

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