Invasive Species

How people's activities affect their knowledge

Chris Radek-Environmental Stewardship

Abstract

Invasive species are spreading throughout the United States. In Illinois alone we are dealing with species like the Asian Carp, Garlic Mustard, Buckthorn, and Zebra Mussels just to name a few. They cause many problems including; habitat destruction, loss of biodiversity, inconvenience to humans, and cost millions of dollars to control. With many of these species being introduced by humans do they deserve the negative opinion that they receive? What affect does the language used to describe invasive species have on public opinion? People that participate in gardening, fishing, or boating have an opportunity to come in close contact with invasive species and this affects their knowledge and attitudes towards invasive species. What can zoos and aquariums do to better educate their guests on invasive species and help create better public policy?

A ten-question survey was created to help answer these questions. A majority of people had little knowledge of invasive species, but a surprising number of people could name many invasive species. A majority of people participated in gardening, fishing, or boating and thought that those activities helped their knowledge of invasive species. Most survey takers thought that humans introduced invasive species on accident and interestingly almost the same percent of people thought that the biggest problems caused by invasive species were habitat destruction and inconvenience to humans. Most survey takers lived in suburban areas and were between 20-29 years old. Zoos and aquariums have the opportunity to use the knowledge of their guests to create relevant and meaningful invasive species education and management programs. But they need to be careful how they frame invasive species to the public so that they do not create negative views on conservation and the environment. Zoo, aquariums, and policy makers need to use objective language and definitions that will help the public take the middle ground on invasives and look at each on a case-by-case basis.

Introduction

The term invader conjures pictures of aliens coming down from space or thousands of soldiers coming from another land. Does this properly describe non-native species to the general public? Over 20 different definitions of non-native species have been identified by researchers (Falk-Petersen, Bohn, & Sandlund, 2005). The naturalness of invasive species is highly controversial and definitions can change depending on the length of time in natural history discussed (Lodge & Shrader-Frechette, 2003). But there are other factors that need to be considered when looking at how natural a species is. First is that humans are the most influential species on earth and have dramatically increased the rate of species invasions around the globe, second is that it needs to be decided how long a species has to be established to be considered native, and the last factor that needs to be considered is an ethical one, many native species can be considered pests just like non-native species so which should get managed (Lodge & Shrader-Frechette, 2003)? Research has been done to track the use of the term invasive and of 14 references 11 of those classified invasive species as non-native and 8 defined invasives as having a negative influence on the natural habitat, it has been proposed that the term invasive be used only with non-native species that spread on their own (Falk-Petersen, Bohn, & Sandlund, 2005). There are almost 50,000 recognized non-native species in the United States, but specific species vary by geographical location (Pimentel, Lach, Zuniga, & Morrison, 2000).

Some of the invasive species heavy hitters in the Great Lakes region include; Asian Carp, Sea Lamprey, Zebra Mussel, Purple Loosestrife, Round Goby, Buckthorn, Garlic Mustard, Emerald Ash Borer, and Rusty Crayfish just to name a very slight few. So why should we get the public to care about invasive species? There are numerous reasons to care about invasives; damages caused to habitat and food crops, loss of biodiversity, species extinction, economic costs to deal with them, and the inconvenience to humans that they cause. How can the public be better informed about invasives? Many people participate in activities that bring them closer to invasive species, activities such as gardening, boating and fishing. Will these activities frame people's opinions of invasives and can zoos and aquariums use that knowledge to better inform the public and create better methods of dealing with invasives in the Great Lakes region? This paper seeks to discover if people who participate in gardening, boating, and fishing will have a greater knowledge of invasive species then those people who do not participate in these activities. It was predicted that people who participate in these activities will have an increased

knowledge of invasives and data collection happened at Brookfield Zoo and online to test this hypothesis. It will be examined in this paper if the current terminology and methods used with invasive species proper is the proper course to follow and how these practices might create a negative view of the environment with zoo and aquarium guests because invasive species is of utmost importance because once a species is established they are almost impossible to manage (Lodge & Shrader-Frechette, 2003).

Methods

To answer the question "Will people who participate in gardening, fishing, or boating have a greater knowledge of invasive species compared to those people that do not participate in those activities?" a survey on invasive species was created with the assistance of Jennifer Matiasek at Brookfield Zoo. The survey consists of ten questions (See Appendix). Questions ranged from peoples knowledge of invasive species, to their participation in various activities, to their thoughts on how invasive species were introduced into Illinois and what should be done about them, along with questions on what people viewed as the most serious problems caused by invasive species and the demographic data of the survey takers. Surveys were given at Brookfield Zoo on September 15th, 23rd, and October 7th at Great Bear Wilderness, Living Coast, and Habitat Africa. This was done by being stationed at the locations at the zoo and asking people for their participation and reading them the survey and recording their answers. The same survey was also created in SurveyMonkey and distributed online via Facebook and email. Variables could of included the different locations at the zoo the survey was given, different days the survey was given, online surveys versus in person surveys, and the in-person surveys being read to respondents. Raw data from the zoo surveys was entered into Excel and combined with raw data from the online surveys to create the graphs that are used throughout this paper.

Results

The survey consisted of ten questions. For the question "How would you describe your knowledge of invasive species?" 35 people said they had little knowledge of invasive species, 22 people had moderate knowledge, 17 had no knowledge, 3 people had great knowledge, and 2 people could not describe their knowledge. 44 people participated in gardening while 20 participated in boating and 24 fished while 27 people surveyed did not partake in any of those activities. 31 people thought that those activities increased their knowledge of invasive species while 13 did not and for 27 people the question was not applicable (See Figure 1). 59 people

surveyed believed that most invasive species were introduced by humans on accident while 18 people thought it was on purpose by humans. 14 people thought other living things introduced most invasives while 5 people did not know. It was very close on what people think should be done with invasive species, 33 people thought we should remove them, 32 thought we should contain them, and 1 person thought we should do nothing.

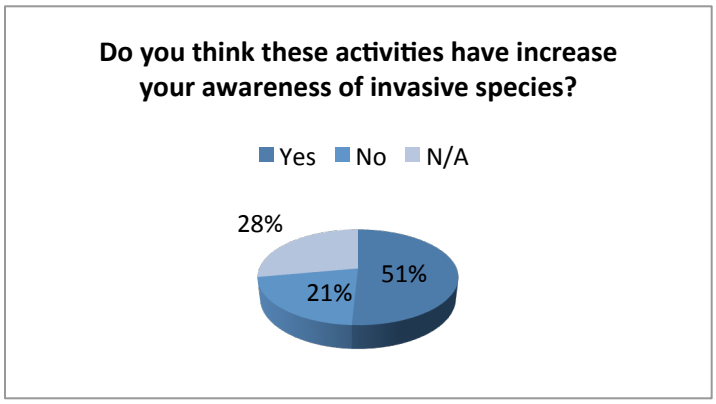

Figure 1: Percent of people who believe participation in the activities listed increased their invasive species knowledge

Interestingly 25 people thought habitat destruction was the most severe problem caused by humans while 26 people thought that inconvenience caused to humans was the biggest problem. 80% of survey takers at the zoo thought that inconvenience to humans was the least severe problem while 50% of those online thought it was the least severe problem. 48 people lived in suburban areas, 27 in urban areas, and 3 people came from rural areas. 26 of the survey respondents were male and 52 were female and 4 were under the age of 18, 27 were 20-29 years old, 12 were 30-39 years old, 11 were 40-49, 9 were 50-59, and 14 were 60-69.

Discussion

The results of this survey have shown that people think they do not know a lot of about invasive species with 52 people out of 79 surveys completed saying that they had little or no knowledge of invasives. It seems that some people know more than they would think with many people being able to name an invasive species, from Asian Carp to Garlic Mustard to Emerald Ash Borer (see Appendix for full list). That being said, simply knowing the names of invasive species may not equate to invasive species knowledge. How can a problem that creates $137 billion a year in damages be unknown to most of the public (Pimentel, Lach, Zuniga, & Morrison, 2000)? Many scientists disagree on the definition of an invasive species so the public cannot be expected to have a strong knowledge of the differences between native species and non-native invasive species and may not be able to tell the difference if they do come in contact with them.

How do people begin to gain knowledge of invasives? What types of activities might increase general knowledge of mammal, aquatic, and plant based invasives? This survey found that 51% people that took this survey who participate in gardening, boating and fishing thought they had an increased knowledge of invasives. This idea was strengthened with the fact that many people could name invasive species that you would come in contact with while participating in these activities; Asian Carp, Zebra Mussel, Garlic Mustard, Buckthorn, Sea Lamprey just to name a few. Increased knowledge of invasives did not seem to alter people's views on what to do about them with almost an even split of people saying that we should contain them versus removing (see Figure 2) them this is why some argue for neutral terminology in the discussion of invasive species and management (Larson, 2007). Though zoos and aquariums can use this increased knowledge of people who participate in these activities to help educate guests about invasive species.

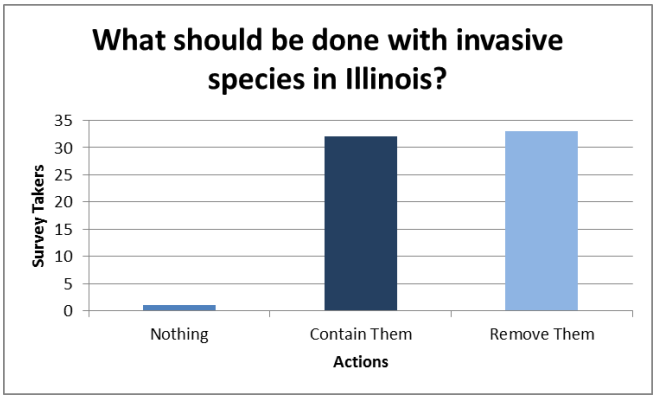

Figure 2: What should be done with invasive species?

In a 2007 study the Association of Zoos and Aquariums (AZA) discovered the power of a zoo visit with guests. In the study it was found that visitors come with much greater biological knowledge than expected based on these results it was decided that zoos need to focus on more specific conservation efforts and the issue of invasive species is a great place to start (Falk, Reinhard, Vernon, Bronnenkant, Heimlich, & Deans, 2007). Zoo and aquarium guests understand that they have a role to play want to use that knowledge that they possess to become more greatly involved in conservation issues and they look at the zoo or aquarium to show them how they can become more involved through experiences that appeal to a broad variety of visitor motivations (Falk, Reinhard, Vernon, Bronnenkant, Heimlich, & Deans, 2007). The issue of invasive species is global and local all at the same time; species are expanding into new habitats all over the world, but each region has its own specific problem species. This localization will assist zoos and aquariums in creating messages that appeal to their visitors and getting them involved in the advocacy that they are seeking. The AZA report described 5 different types of zoo visitors, two of which can really be used to focus invasive species interpretative and citizen

science programs on. One type was called explorers, these guests are curious and want to learn more about what they encounter on their visit and invasive species programming could be developed to meet the needs of these people especially if the institution knows some background information about this group. The other group that invasive species programming could be developed around are called facilitators. These people come to the zoo or aquarium to help the experience and learning of other people in their group making learning a social situation (Falk, Reinhard, Vernon, Bronnenkant, Heimlich, & Deans, 2007). If any of these zoo guest facilitators have participated in the activities listed in this survey they could help their other group members learn more about invasive species using their knowledge combined with programs and interpretatives available during their visit. These guests combined with the efforts of informal education institutions and other stakeholders can create these social learning situations that will provide educational programs that are suited for the biological, physical, and social conditions of their particular location (Krasny & Lee, 2002). Brookfield Zoo is collaborating with the United States Geological Survey and U.S. Army Corp of Engineers on study where the zoo fed Asian Carp to cormorants and pelicans to see if Asian Carp DNA will transfer through fecal matter (Society, 2012). As Asian Carp was the most named invasive species during this survey this is a great opportunity to implement interpretative signage about programs connecting invasive species, conservation efforts, and the zoo mission similar to the example in Figure 3 from the Field Museum.

Figure 3: Invasive Species signage at Field Museum Photo Courtesy of Chris Radek

An important message lies within the results of this survey for informal education institutions. When people do not regularly come in contact with something, they will have little knowledge of it. When people participate in activities that bring them in contact with things like invasives, they will have a better knowledge of those things. The majority of people who took this survey said that invasive species were introduced into Illinois on accident while in reality most plants and vertebrate animals were actually introduced by humans while most invertebrate animals and microbes were introduced on accident (Pimentel, Lach, Zuniga, & Morrison, 2000). This is also where their might have been bias in the survey, for the question on which problem

caused by invasive species was the worst 15 people at the zoo said that habitat destruction was the worst, 6 people said economic cost, and no one said inconvenience to humans. The online surveys produced 26 people saying habitat destruction was the worst problem and 28 people said inconvenience to humans was the greatest problem caused by invasives. The difference could be in survey takers, zoo guests often have strong views on conservation and the surveys were being read to them while a wider audience took the survey online and read the survey on their own. Future studies could examine if people can identify native species through pictures and it could also be examined when people participate in the activities listed in the survey how best to use that knowledge to great more effective education and management programs.

Overall this data shows that invasive species need to be looked at not by how much they cost but how we can prevent further damage being done by invasives (Pimentel, Lach, Zuniga, & Morrison, 2000). Societal values can be used to engage the public by incorporating how invasive species will change the day to day activities of the public or discussing how much money invasives will cost but these subjective concepts come with the risk of confusing scientific process and theory (Colautti & Richardson, 2009).

Some avenues to get that message across include; invasive species fact sheets, newsletters, websites, classes, or informational videos (Connelly, Brown, & Smallidge, 2007). Groups in Illinois like the Illinois/Indiana Sea Grant and the Illinois DNR offer many such educational programs free to the public (see links in Appendix). Programs that are created at zoos, aquariums, and through other institutions need to carefully choose the terminology they use when describing invasive species to the public as the words that are used can greatly affect people's views of the environment and conservation efforts. Terminology like invader, invasion, invasive, and alien are used always when describing non-native species and the issues that they bring. Terms like these come with huge subjectivity and values attached to them that can greatly affect the outcomes of any program and even people's views of nature. Invasion biology is a relatively new branch of science that deals with non-native species but with over 20 separate definitions of the term non-native it is hard to put forth a consistent message to the

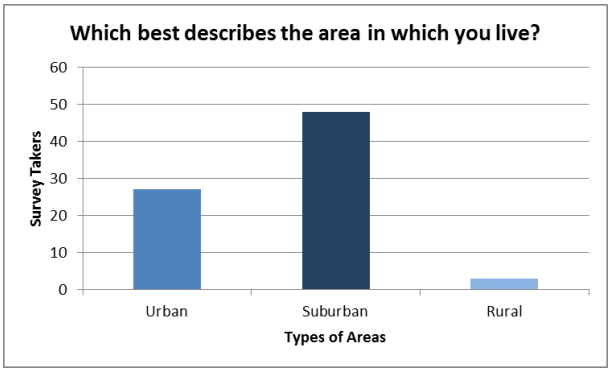

Figure 4: Areas where survey respondents lived

public (Falk-Petersen, Bohn, & Sandlund, 2005). It has been argued that these terms come connected to values that can alter public perceptions of the environment of the public when these non-native species are called things like aliens, pests, and invaders. A common definition for invasives has been suggested as "alien organisms that have established in a new area and are expanding their range" this singular definition will help to better differentiate invasives from native species (Falk-Petersen, Bohn, & Sandlund, 2005). These multiple terms help to confuse the public in trying to educate them to the problems caused by invasives, so colorful military based metaphors are often used to focus attention on the problem. Much of the literature discusses the need to battle, kill and eradicate invasives. This language is used to generate action about invasives with the public that has little knowledge of the magnitude of the problem, but this language in turn creates its own problem. War implies a battle of opposing sides (good vs. evil) that can eventually be won by one side. For economic reasons we will never be able to return the environment to the state it existed in before the human introduction of invasive species and there is a blurry line between what makes a native species and a non-native invader (Larson, 2005). The use of these metaphors gives the public an inaccurate view of nature and the conservation movement.

In some reports it has been shown that there are differences on what to do about invasive species when comparing urban and rural citizens (Bremner & Park, 2007). Only three survey respondents in this study noted that they lived in rural areas so that is something that cannot be measured with this data. With a greater percentage of the population living in suburban and urban environments and having a lower connection to the environment invasive species may be the first interaction with nature that many people have (See Figure 4). Is it right to give the public the perception that any part of nature that we deem a pest we can eliminate at our convenience? As was discussed earlier there was almost an equal split between people thinking that we should remove invasives versus containing them, this split could come from the public using this language and terminology to form their views.

There are also social issues that come with the use of this terminology and militaristic metaphors mentioned to describe invasive species. First being that invasive species management programs often benefit members of a higher socio-economic class leading many to think of invasive species programs as class and race based. The second problem being this language contributes to people equating invasives species programs with literal war and this can create

negative feelings amongst those who have experienced war and who are opposed to war leading to a loss of scientific credibility (Larson, 2005). Science needs to exclude values and morals within its research. Non-natives are often bad and come with many problems, but science and conservation cannot tell the public that what is good and acceptable is what is natural and anything bad is unnatural and needs to be eliminated (Larson, 2007). Facts need to be presented and integrated in invasive species programs, most people want scientists to be involved in interpreting data and research and play a role in policy decisions, they do not want scientists to suggest specific management options (Larson, 2007). A fine line needs to be drawn when creating the terminology used in invasive species programs. It is a problem that costs huge sums of money, contributes to species extinction, loss of biodiversity, and affects a variety of people in many different ways. Science along with the value judgments from those stakeholders need to be taken into account when planning invasive species educational programming and management strategies (Lodge & Shrader-Frechette, 2003). The signage shown in Figure 5 shows a great example of objective science. It provides definitions of invasive species, examples of specific problems that they can create, and places that guests can go to that will help assist in forming their values and opinions of invasive species. This provides an opportunity for zoo guests to create their own experience about invasives both during and after their visit which should be a goal of all interpretation.

Figure 5: Invasive Species Signage at Brookfield Zoo (Photo courtesy of Chris Radek)

Conclusions

This study implemented a ten question survey seeking to find out peoples knowledge of invasive species and if participation in certain activities increased that knowledge. The prediction was that these activities would lead to increased knowledge of invasives, and that was proven to be accurate with 51% of those asked saying that they had an increased knowledge of invasives because of those activities and where able to name many invasive species. Looking

beyond this survey we can see that public programs and interpretative programs need to be adapted this fit this knowledge. According to survey data there was almost an equal split in people saying that we should remove invasives and contain them. But with over 50,000 classified non-native species across the country there really cannot be one set management option, which could also have been a response on the survey. Humans continue to transport species around the world and provide situations for those species to survive including elimination of natural enemies, the ability of predators to adapt to new environments, and habitats which are continually disturbed by humans which provide an easy entry point for invasives (Pimentel, Lach, Zuniga, & Morrison, 2000). Invasive species vary greatly by location and that will affect management options with public support varying due to species and management option (i.e. containment vs. removal) (Bremner & Park, 2007).

Invasion biology is still filled with the inaccurate use of concepts with terms used varying in definition, scientific, social and cultural contexts, and filled with the values of those designing the programs (Falk-Petersen, Bohn, & Sandlund, 2005). These inaccurate concepts affect public knowledge and public belief of what should or can be done with invasives and have the possibility to negatively affect the views of the environment and conservation by both adults and children. The use of these concepts and metaphors help people to forget that many management programs will involve the killing of a species, either the invasive species or the native species that is at risk. The knowledge that people have can be used to help design better invasive species education and management programs that meet the needs of numerous stakeholders and helps prevent further damage. Brendan Larsen argues that we cannot have extreme viewpoints on invasives whether they be activism or disconnected objectivity, we need to take each species on a case by case basis and zoos and aquariums can use the knowledge that their guests bring from the activities that they participate in (Larson, 2007).

Reflections

I choose this inquiry because I am interested in interpretation and how to create better interpretative materials and programs and I have some knowledge and experience with invasive species. I feel like good invasive species programs have been lacking at zoos and aquariums and wanted to try and discover what information would help in the creation of better programs and materials to connect with guests and the public. My prediction was that survey respondents who participated in gardening, boating, or fishing would have a greater knowledge of invasives then

those that did not partake in those activities. That prediction was proven to be true. 72% of those who took the survey said that they participated in those activities, and 51% of those people said that those activities increased their knowledge of invasive species. I think that prediction was further proven with the amount of people able to name a variety of invasive species including aquatic invasives, insect invasives, and plant invasives. Interestingly no one was able to name a mammalian invasives species.

I felt pretty good about this project and what it accomplished. The survey was well designed and thorough and showed that people who participate in activities that bring them in contact with invasives have better knowledge of them then others and I think that is a huge thing for interpretative programs at zoos and aquariums to consider. There were not too many problems with this project with the exception of some minor design issues with the survey that I noticed and corrected after implementation. My goals were met for this project as the question I set out to answer was answered, but I think my surveys should of went further and asked more questions. But that could have led to less surveys being answered due to length. Also 67% of those who took this survey were female that could of created bias in survey answers it would be interesting to see if the data changed with a more 50/50 ratio of males and females. Bias in the survey could also have come from surveying people at the zoo. Zoo guests are more likely to participate in outdoor activities and have a greater knowledge of conservation issues.

Hopefully the greatest conservation connection that was made was being that the people who took this survey began connecting activities that they participate in with invasive species, because boaters, gardeners and fishermen are often times the first line of defense against these species. This study has shown that these people have greater knowledge of invasives then others now zoos and aquariums need to capitalize on that knowledge and provide interpretative signage and programs that will create better connections between guests and invasives and will let them use that knowledge for greater conservation action in the future. I will also be submitting the results of this survey to the Illinois-Indiana Sea Grant, a group run through the University of Illinois that is committed to educating the public about invasive species in Illinois. Hopefully the results of this survey can help them create materials that will hopefully further their mission.

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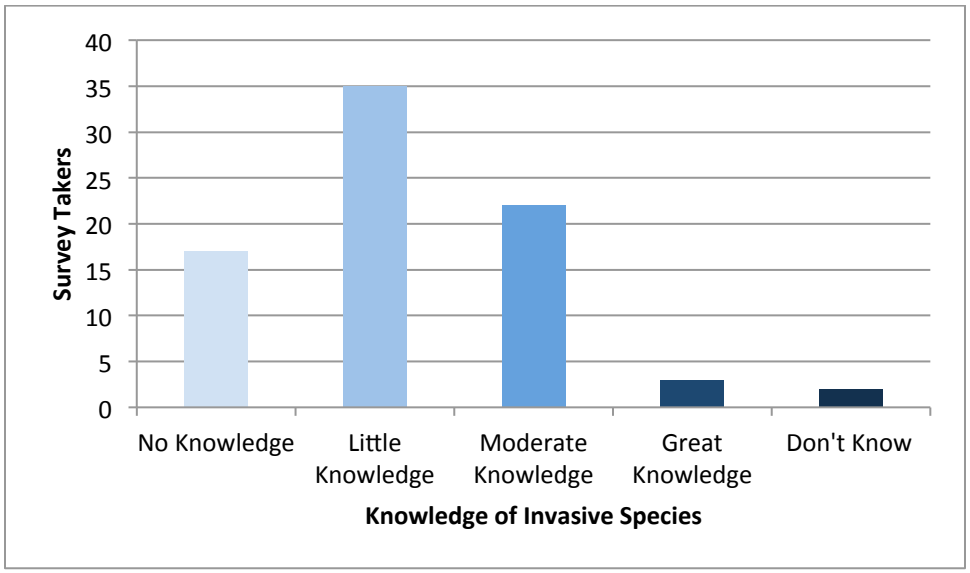
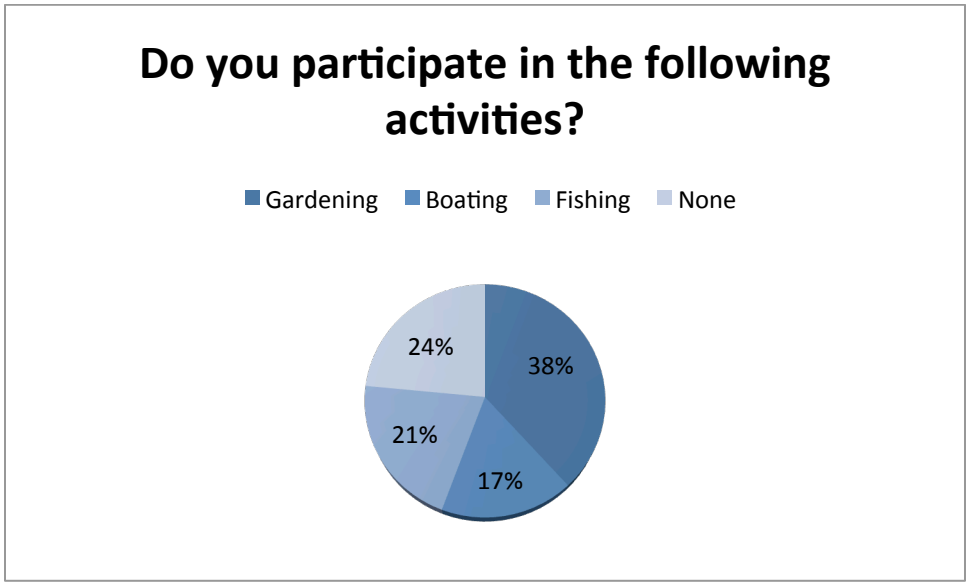
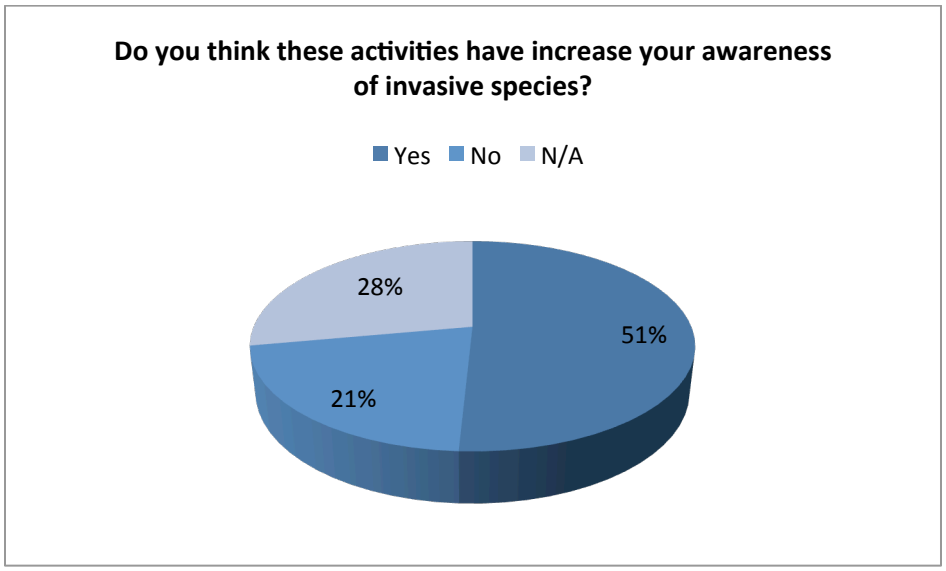
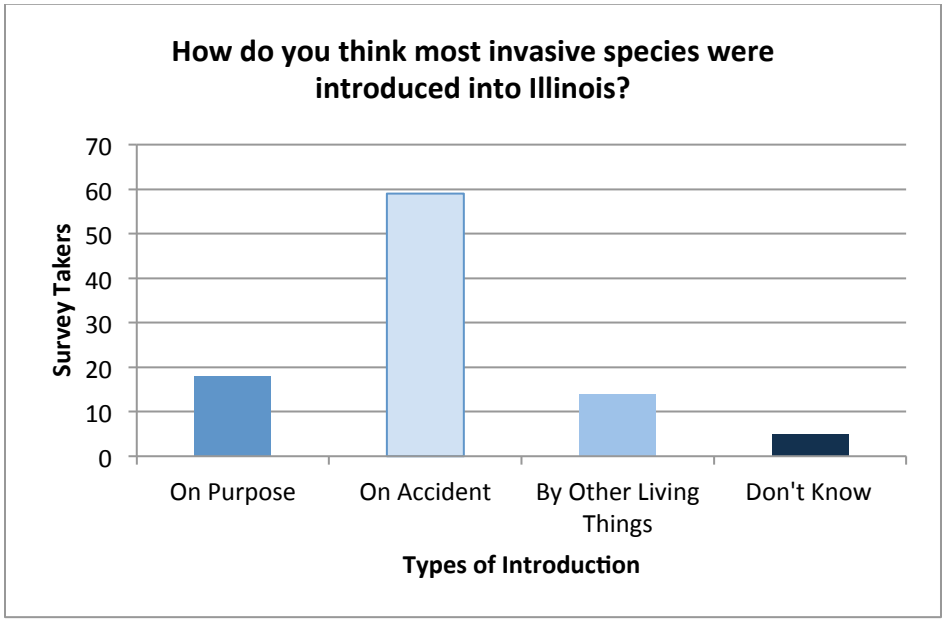
Appendix:

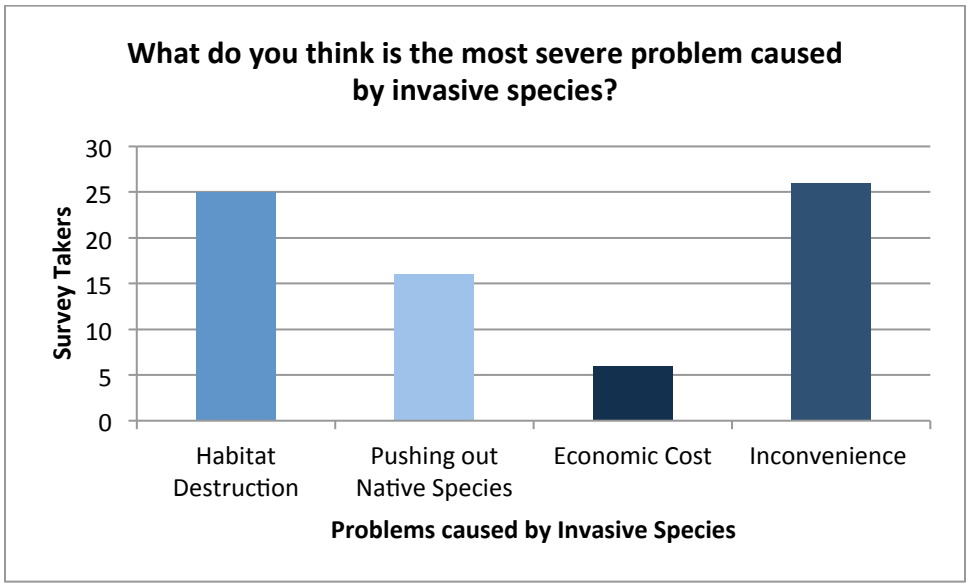
Data Graphs combining results of zoo and online surveys

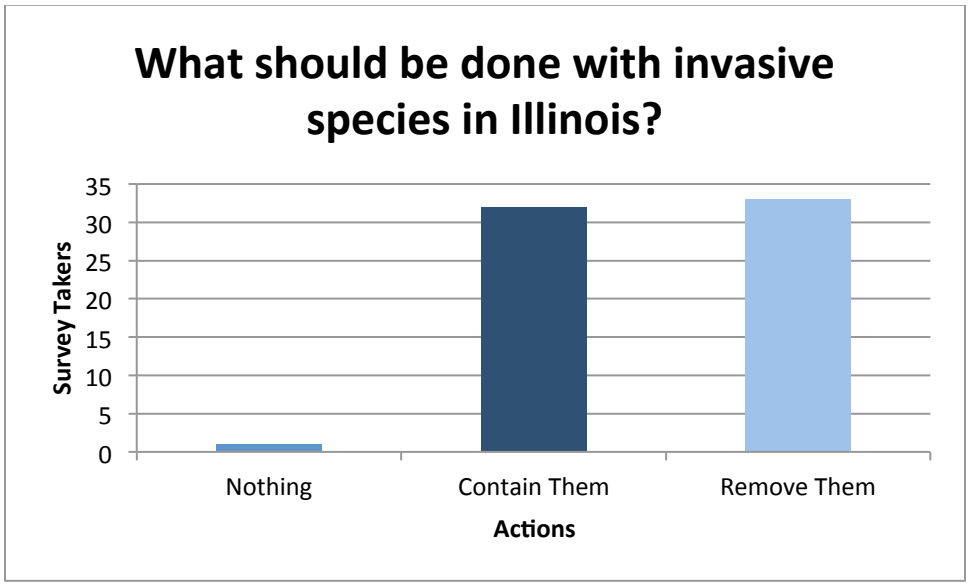


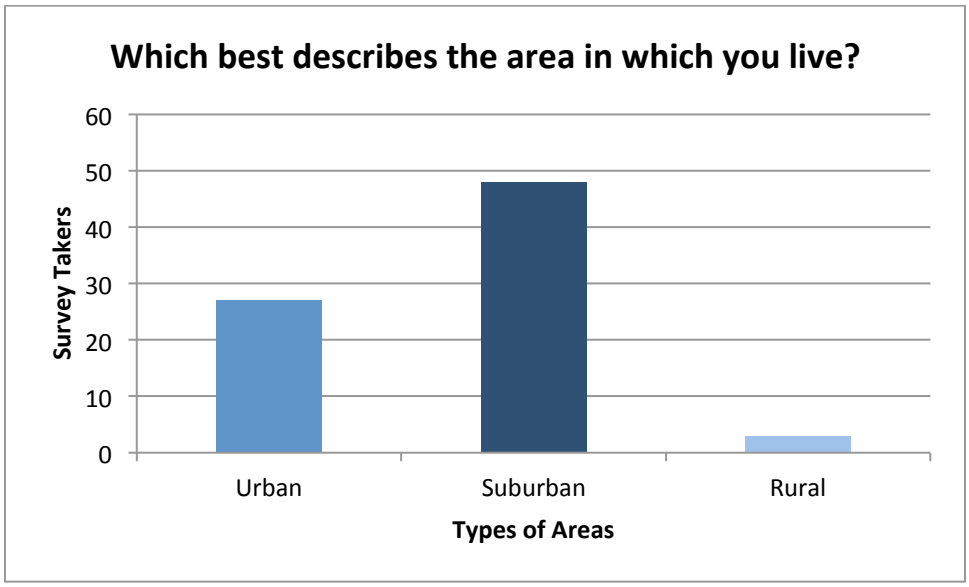


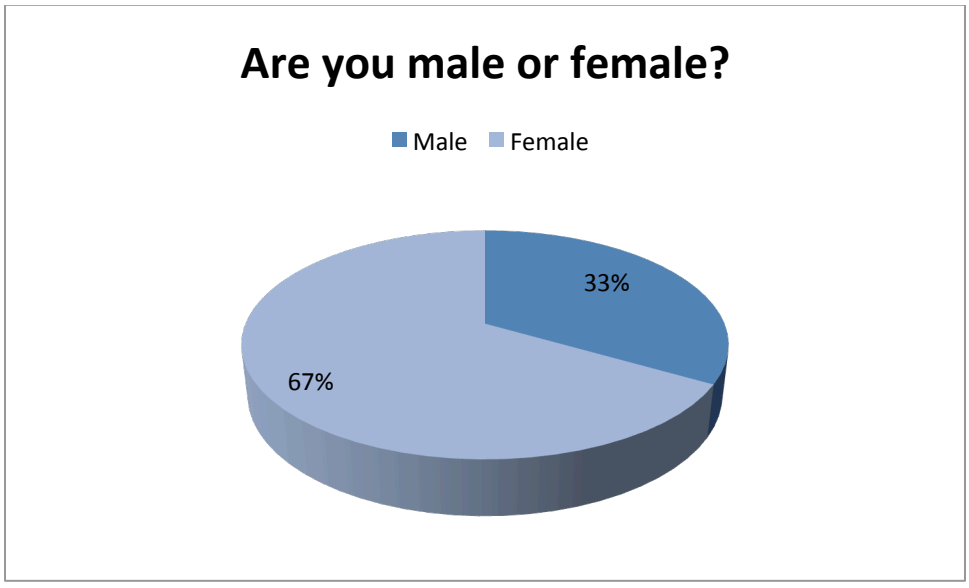

Do you think these activities have increase your awareness of invasive species?
Yes
No
N/A
28%
51%
21%

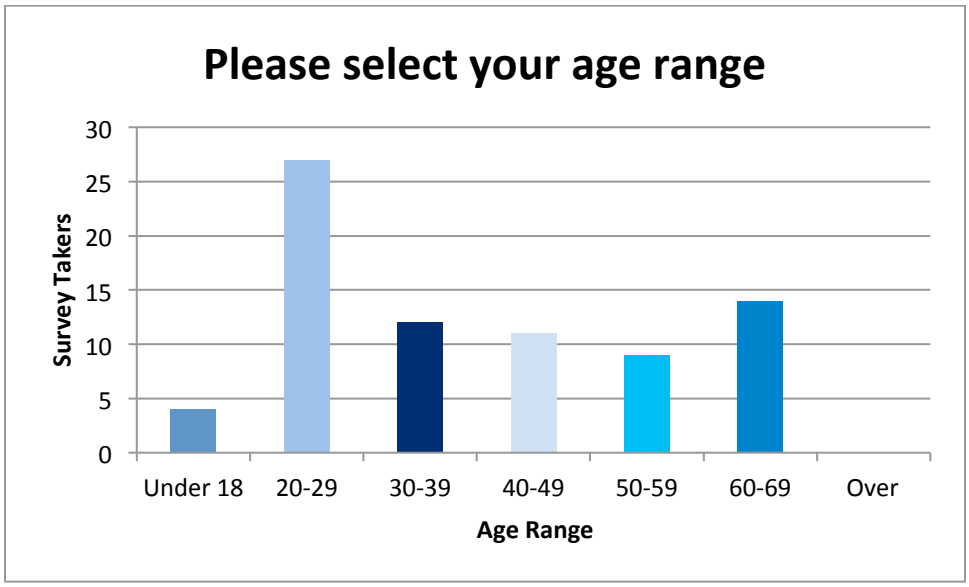

How do you think most invasive species were introduced into Illinois?
70
60
50
40
30
20
10
0
Survey Takers
On Purpose
On Accident
By Other Living Things
Don't Know
Types of Introduction


What do you think is the most severe problem caused by invasive species?
Survey Takers
30
25
20
15
10
5
0
Habitat Destruction
Pushing out Native Species
Economic Cost
Inconvenience
Problems caused by Invasive Species


What should be done with invasive species in Illinois?
Survey Takers
35
30
25
20
15
10
5
0
Nothing
Contain Them
Remove Them
Actions


Which best describes the area in which you live?
60
50
40
30
20
10
0
Survey Takers
Urban
Suburban
Rural
Types of Areas


Are you male or female?
Male
Female
33%
67%



1: Invasive Species Signage at Brookfield Zoo


SMALL WORLD NEWS
Weather HOT & SUNNY
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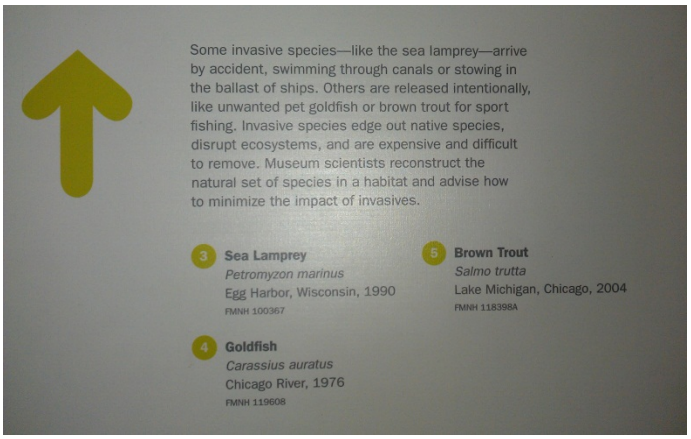
The Not-So-Comic Truth About the Great Lakes
Here in the Midwest, the Great Lakes are one of our most valued resources, yet they are in trouble in various ways.
By Chris Howes • Staff Reporter
With additional reporting by Andy Murashige and Ann Roth
Invasive Species
Water Supply
Water Quality
Habitat Destruction
Groups like the Illinois Environmental Protection Agency have enjoyed success stories throughout the state as they have worked to clean up waterways.
Inside:
What You Can Do
Here are some Web sites you can visit to learn more about ways to help the Great Lakes:
Chicago Zoological Society—www.CZS.org
Environmental Protection Agency—www.epa.gov
Alliance for the Great Lakes—www.greatlakes.org
Great Lakes Forever—www.greatlakesforever.org

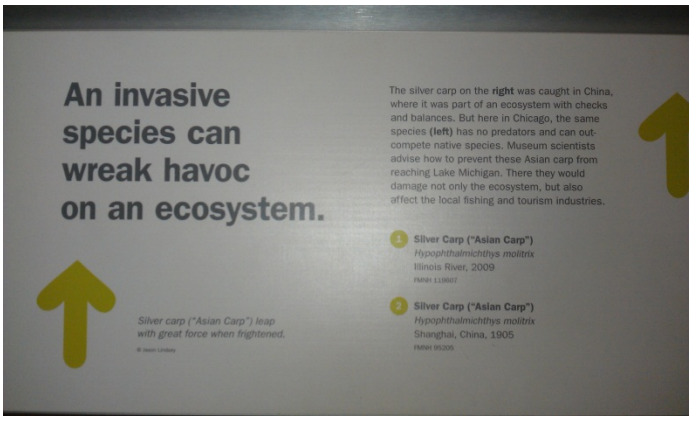

Water Action Super Heroes
RANGER RAIN Monthly
VS.
MR. MUSSELS
THEIR GREATEST BATTLE OVER THE GREAT LAKES!
I'm here in the Great Lakes and there's nothing you can do!
I'm down but not out! My Water Action Super Hero pals and I have the power to fight invasive species!
As a WATER HERO, how can YOU help Ranger Rain keep the Great Lakes safe from invasive species?
Learn more! Go to www.CZS.org.


RANGER RAIN needs help against the invaders MR. MUSSELS and his henchmen, Lord Lamprey and Al the Alewife. What will he do? What can YOU do?
Soon, Ranger Rain, I will overrun the habitats of lake trout, just as I have done with sunfish.
And perch, too.
You came here in ballast water from overseas ships and took over native species' resources. I won't let you do more damage!
Won't you? You barely stopped us when we ate native species' food and destroyed plants that keep water clean!
Mmmm! Tasty!
And the plants that act as nurseries for native species, too.
Grrrr!
You evil invaders! I call upon all Water Heroes To help keep intruders out of the Great Lakes!
As a WATER HERO, how can YOU help Ranger Rain keep the Great Lakes safe from invasive species?
•Don't transport water, animals, or plants from one lake to another.
You may inadvertantly introduce an invasive plant or animal into that lake.
•Keep an eye out for invasive species.
Inform the Illinois Department of Natural Resources (www.dnr.state.il.us) about invasive species.
Learn more!
Go to www.CZS.org.


Goldfish
Carassius auratus
Invasive Species
Invasive Species
Round Goby
Neogobius melanostomus

2: Invasive Species Signage at Field Museum





Survey Instrument

Invasive Species Survey

Date:

1. How would you describe your knowledge of invasive species in Illinois? (Circle one)

No Knowledge	Little Knowledge	Moderate Knowledge	Great Knowledge	Don't know

2. Can you name any plants or animals that would be considered invasive in Illinois?

_____

3. Do you participate in any of the following activities? (Circle all that apply)

Gardening	Boating	Fishing	None of these

4. If you garden, boat or fish, do you think these activities have increased your awareness of invasive species?

Yes	No	Don't know	N/A

5. How do you think most invasive species were introduced into Illinois? (Circle one)

On Purpose by Humans	On Accident By Humans	By other Living Things	Don't know

6. What do you think should be done in response to invasive species in Illinois?

Nothing	Contain Them	Remove Them

7. Rank the issues caused by invasive species from 1 (least severe) to 4 (most severe).

a. Habitat Destruction	
b. Pushing out Native Species	
c. Economic Cost to Remove/Contain	
d. Inconvenience to Humans	

8. Which best describes the area in which you live? (Circle one)

Urban	Suburban	Rural

9. Are you? Male Female

10. Please select your age category

❑ Under 18	❑ 20 – 29	❑ 30 – 39	❑ 40 – 49
❑ 50 – 59	❑ 60 – 69	❑ 70 or over	

Links

Illinois-Indiana Sea Grant Education Programs

http://www.iisgcp.org/education/topics_education.html

Illinois DNR Invasive Species Education

http://dnr.state.il.us/education/ExoticSpecies/exoticspintro.htm

Invasive Species Named in Surveys (submitted by respondents)

Green Ash Borer, garlic mjustard, thistle, goldenrod, Buckthorn

Asian carp, zebra mussels, typical lawn grass, rats, honey bees

Asian carp

Not specifically. I know there's a fish in Lake Michigan.

I'm afraid I cannot

Garlic mustard Asian carp zebra mussels

Quagga mussels

purple loosestrife, vetch, some mussels, asian carp, emerald ash borer, gypsy moth, japanese beetle (I think).

Buckthorn Asian Carp

Ash Borer?

asian carp, snakefish, goby, zebra mussels, buckthorn, teasel, euro locust, stiltgrass, mimosa, emerald borer

Asian Carp

Purple Loosestrife ,Monk parakeet, Zebra Mussel, Ash bore beetle, Garlic mustard plant, Mute Swan, I know I am misspelling this tall plant found in wetlands -phlagmitty

pine boor beetle

purple loose strife - i'm sure spelling is way off

Milkweed

wild strawberry, and thistle plants

Buckthorn, thistle, garlic mustard

buckthorn, carp

Skunks,poison Ivy,oak,sumac

Purple loostrife

Goldfish, Goby, Lamprey Eel, Zebra Mussels, pig

round goby, asian carp, zebra mussel, quagga mussel, spiny water flea, purple loosestrife, garlic mustard

Asian carp. Red Lew stife. Buch thorn.

garlic mustard zebra muscle

asian carp, zebra mussels, kudzu vines,emerald ash bore

buckthorn, honeysuckle

Ash Borer Beetle?

Cane Toad

wild mustard , wild garlic , ragweed aka the devil . i know some others but can not remember them off hand .

buckthorn, garlic mustard, zebra mollusks

Deer, RATS, pigeons, Asian carp?

Asian Carp, Zebra Mussels, Round Goby

Asian carp, zebra mussels

asian carp, longhorn beetle

some fish taking over the other fish, asian beetles, hog problem in the south?

Asian carp; zebra mussels

Asian Carp

Purple Loosestrife, Water Lettuce, Water Hyacinth, Reed Manna Grass, Teasel, Reed Canary Grass, Buckthorn, Honeysuckle, Garlic Mustard, Asian Carp, Zebra Mussels, Emerald Ash Borer, Round Goby, Asian Longhorned Beetle, Gypsy Moth

Japanese plants?

Garlic Mustard

Queen Annes Lace

water hyacinth, purple loosestrife, zebra mussels, garlic mustard, lamprey, asian carp

Asian carp