Durango Nature Studies Habitat Assessment

2013

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Executive Summary

Established in 1994, Durango Nature Studies is a non-profit organization where people can learn about the nature around them and can enhance their respect for nature. The Durango Nature Studies (DNS) property is 140 acres where you can experience nature through hiking, workshops, service projects, and more. Because DNS conducts many activities involving people interacting with natural ecosystems, they need to make sure their ecosystem is in tip-top shape.

Bullfrogs at Durango Nature Studies have been spotted and DNS has asked the 10th grade biology class at Animas High School to come and evaluate the property. Bullfrogs are a very competitive and invasive species, so DNS is worried that they will out-compete the northern leopard frogs currently inhabited there. The 10th grade class conducted a visual encounter survey of bullfrogs and leopard frogs to see where the population of each species stands now. They also conducted studies on water quality and land vegetation. Using the data they collected, the students will assess the property and evaluate whether or not actions need to be taken to remove the bullfrog population.

Durango Nature Studies is willing to spend $2,000 on property management. DNS wanted to find out how much money, if any, is needed to be set aside to remove the bullfrog population (Durango, 2011).

Species Overview

The northern leopard frog *(Rana pipiens)* is known for its prominent dorsolateral ridge and is on the verge of becoming an endangered species. It is 5.1 to 9.0 cm in length and is native to the Central Plains; although now it is most commonly found in the lower Midwestern states. This species requires three different habitats: a winter habitat, a summer habitat, and a breeding

habitat. In the winter, leopard frogs hibernate under debris in lakes. In the summer, adult leopard frogs need upland areas to stay. In mid-March to early May these frogs breed in shallow breeding ponds where females can lay between 2,000 to 6,000 eggs. Like the bullfrog, (*Rana catesbeiana)* leopard frogs are generalist predators, meaning they will eat anything they can fit into their mouths (Species, 2000). The difference between these two frogs is that the bullfrog is far more aggressive than the leopard frog. The bullfrog is one of the most invasive species and is one of the main factors as to why leopard frogs are becoming endangered. The bullfrog is known for its extra skin around the eardrum. They are a species 10-18 cm in length and are native to eastern North America. Since then, they have migrated to western North America, Europe, Asia, and eastern South America. They breed in June and July where females can lay up to 20,000 eggs. In the winter time they hibernate underwater in ponds.

Bullfrogs are immune to the disease Chytridiomycosis but are a vector for the disease. When they invade other territories, they spread the disease and kill or deform others while not harming themselves. All stages of bullfrogs are aggressive, even bullfrog tadpoles are aggressive and territorial. Bullfrogs will go to the middle of a pond and push all the leopard frogs to the edge, where the bluegill fish will then eat them. For these reasons, the goal is to get rid of the invasive bullfrogs and preserve the leopard frogs. The leopard frogs can be preserved by increased protection of breeding sites, overwintering sites, water quality, and migratory pathways. In addition, precautions such as more control over introduced predacious fish, introduced infectious disease, and over-collection need to be taken (Literature, 2010).

Results

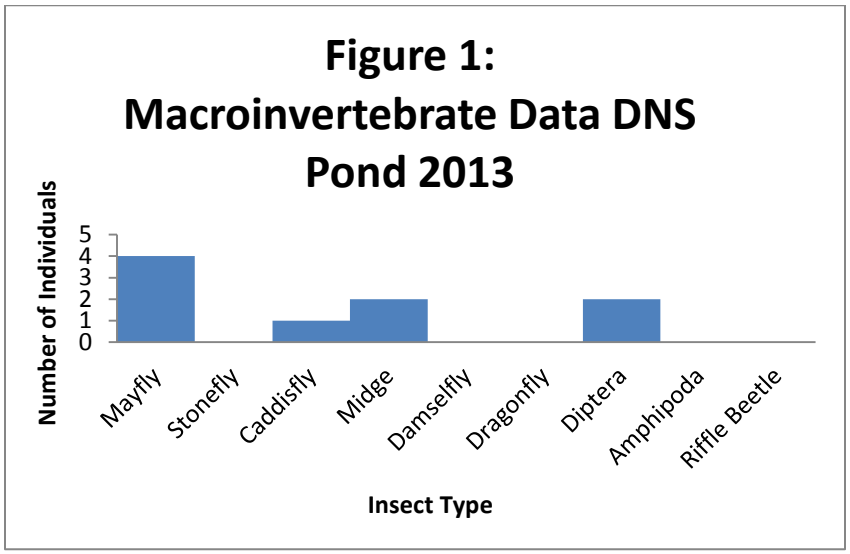


Figure 1:
Macroinvertebrate Data DNS
Pond 2013
Number of Individuals
5
4
3
2
1
0
Mayfly
Stonefly
Caddisfly
Midge
Damselfly
Dragonfly
Diptera
Amphipoda
Riffle Beetle
Insect Type

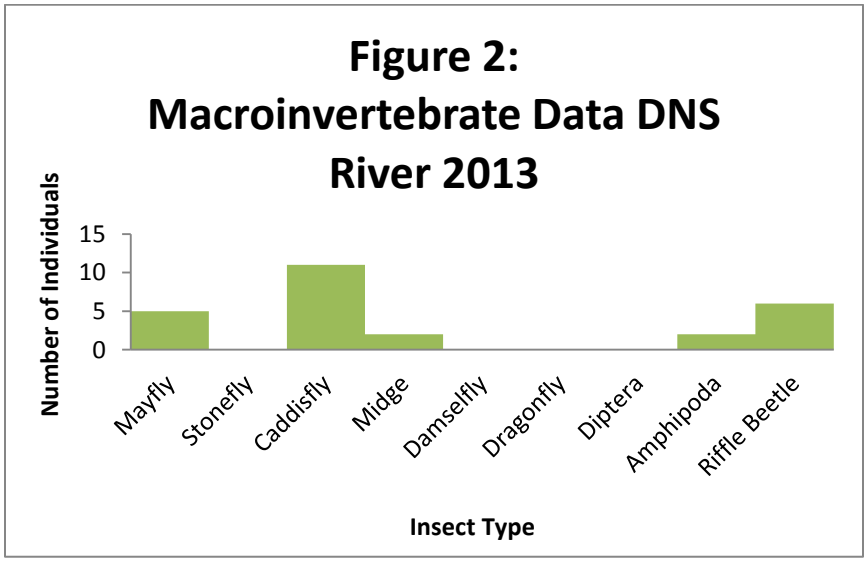
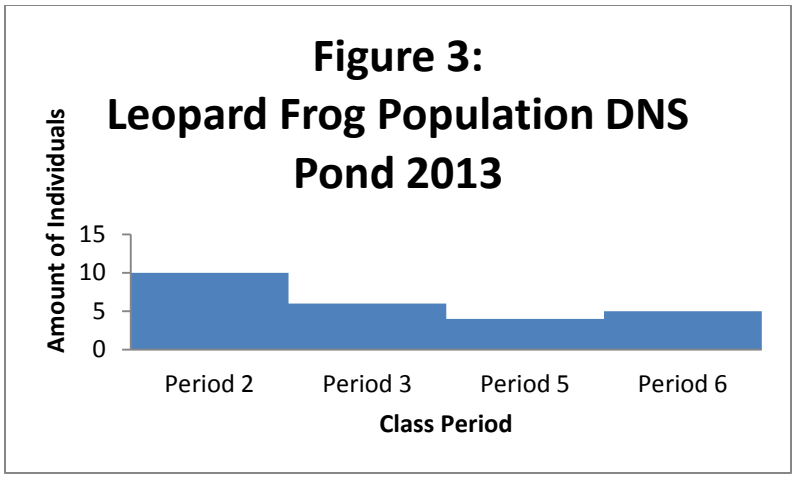


Figure 2:
Macroinvertebrate Data DNS
River 2013
Number of Individuals
15
10
5
0
Mayfly
Stonefly
Caddisfly
Midge
Damselfly
Dragonfly
Diptera
Amphipoda
Riffle Beetle
Insect Type



Animas High school conducted water quality tests on both the Florida River and the Durango Nature studies (DNS) pond. A test on the phosphate levels was administered and the results were that the pond contain five ppm (Parts per million), and the river with four ppm. This is a high amount of phosphates and leads to an increased risk for algal bloom. The dissolved oxygen test came back as inconclusive for the river (due to the water being too muddy from recent rainfall to see the color), and 7.5mg/L for the pond. These levels are good for amphibians and make for a healthier ecosystem. A test for pH levels came back as eight ppm for both the pond and the river. This is considered an alkaline environment. Northern Leopard Frogs thrive in pH levels of 6-7.5, so these levels are sufficient. Nitrate levels of water less than four ppm are considered to be unpolluted. The pond contained one ppm and the river contained two ppm. These levels are considered normal and unpolluted. Finally, a coliform test was performed and both the DNS pond and the Florida River tested positive. Coliform comes from fecal matter in the environment, warm-blooded animals, and humans (Coliform, 2012). High levels of coliform can cause deformities in amphibians. However, this positive result does not reveal the magnitude of coliform present. Seven macroinvertebrates were found in the DNS pond with a Shannon-

Weiner Diversity Index of 1.27. 26 macro invertebrates were found in the Florida River with a Shannon-Weiner Diversity Index of 1.41. These are normal amounts of diversity for this type of geographic range. The data from eight veg-plot surveys averaged the diversity of the land was 1.3. This is considered adequate. No bullfrogs were spotted and twenty leopard frogs were captured and marked.

Comparative Data Analysis

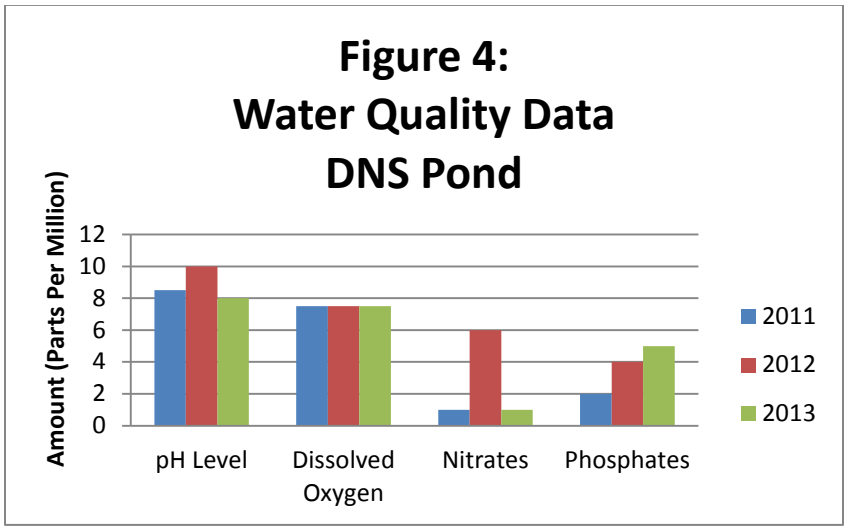


Figure 4 displays that over the past three years the dissolved oxygen levels have plateaued at a safe level. The nitrate level had a sudden spike in 2012 but calmed down in 2013 to a nontoxic level. There is no obvious reason for this spike. The pH level had a slight increase in 2012 from 2011, but dropped to a comfortable level in 2013. A worrying fact is that the phosphate levels have been steadily increasing each year and are reaching uncomfortably high amounts. The reason for this is because nothing has been done to eliminate the phosphates. Therefore, all the phosphorus has been building up in the pond with no means of escaping.

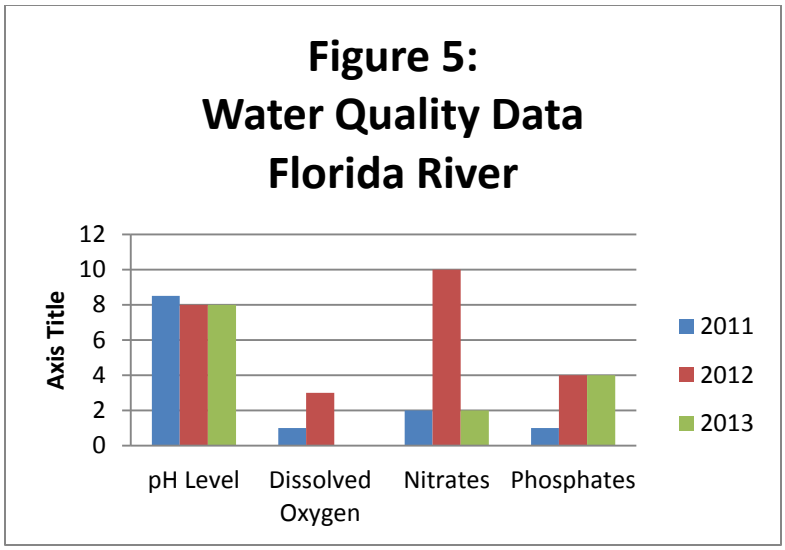
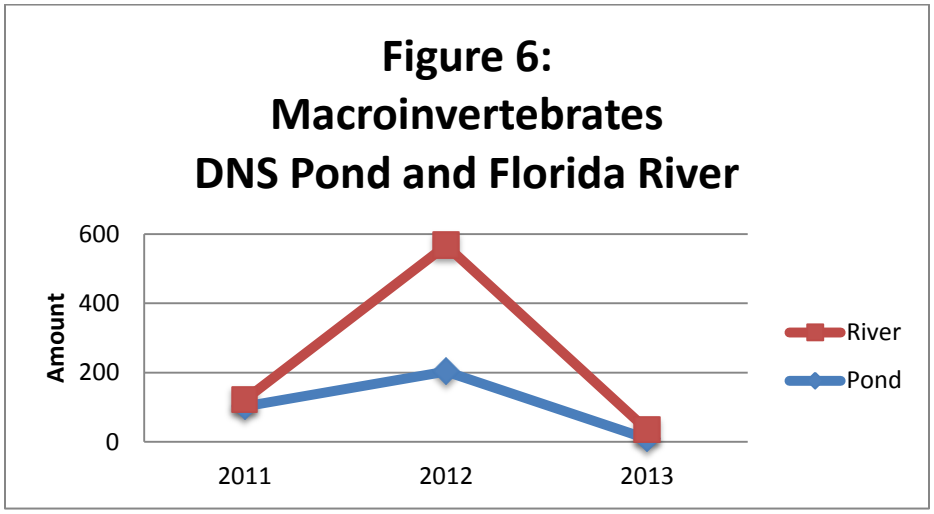


Figure 5 indicates that in the Florida River the pH level has remained fairly the same at a harmless level. In 2011 the phosphates were at a benign level and then hit a sudden spike in 2012 that carried over into 2013. Again, this is because nothing has been done to eliminate the source of the phosphates. Similar to the pond, the nitrates had a sudden spike in 2012 then lowered to a normal level in 2013. The dissolved oxygen level was at a relatively low and safe level in 2011, then began an increase in 2012, and was inconclusive in 2013 due to heavy rainfall.



In the pond, 2011 had roughly 102 macroinvertebrates found. 2012 had nearly double that amount with 203. 2013 held a macroinvertebrate population significantly lower than both years before with a mere 9. This could be because of the recent rainfall. The river had a relatively low amount of macroinvertebrates in 2011 containing 20, and had a vastly different amount in 2012 carrying 364, then dropped back down to 26 in 2013. The lack of aquatic invertebrates is most likely from heavy rainfall washing the invertebrates downstream.

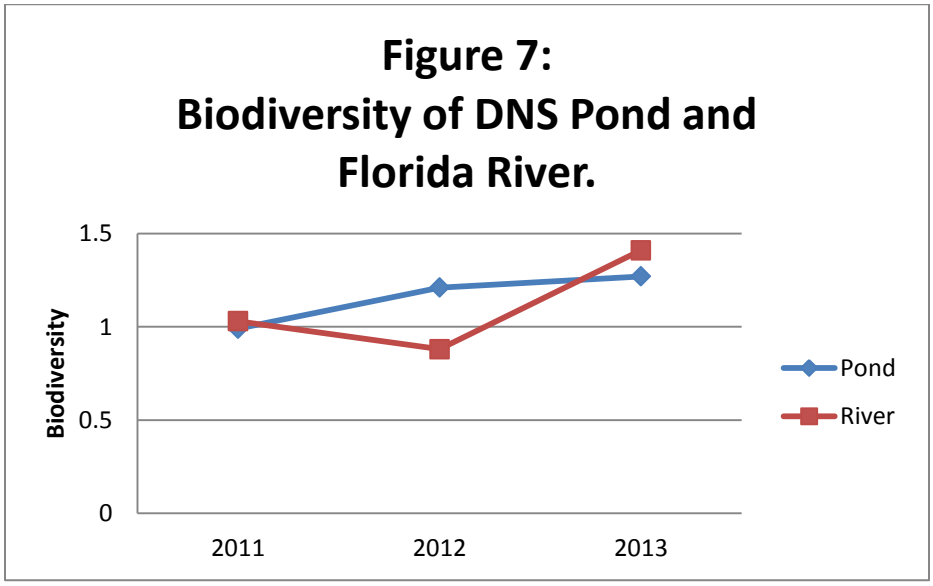


Figure 7 shows that the diversity of the pond and river have always been adequate for this geographic area. Given the location, a diversity of around one will be satisfactory. The pond started at a diversity of .99, increased in 2012 to a biodiversity of about 1.03, then made a slight increase in 2013 with a biodiversity of 1.3. This means the pond and river are getting healthier year by year. The river and pond had a similar biodiversity in 2011, but the river dropped to .88 in 2012. It then took an escalation in 2013 with a healthy biodiversity of 1.4.

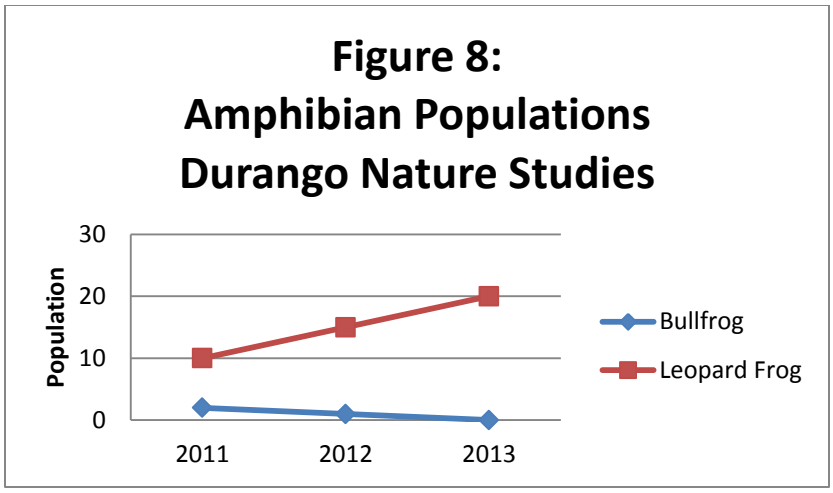


Figure 8 shows the amphibian population has been a reflection of the ideal outcome. The bullfrogs have steadily decreased to zero, and the leopard frogs have steadily increased to about twenty. This is the result of no huge plans for eradication, just simply catching and eliminating the bullfrogs when found.

Discussion and Recommendations

Based on these tests, Animas High School concluded that the Shannon Weiner Diversity Index showed that the diversity of the pond and river are sufficient and have increased over the past three years. More diversity means more stability and the river and pond are on the right track. Although the diversity is increasing, there are still some issues that need to be resolved. No stoneflies were found in either the Florida River or the Durango Nature Studies pond. Nor have stoneflies ever been present in the three years Animas High School has conducted studies there, yet they are found in bodies of water similar to the river and pond. Stoneflies, unlike other flies, need to breath underwater. How much oxygen they absorb depends on how much oxygen is in the water. Therefore stoneflies are only found in bodies of water in immaculate condition and in a very low pollution level so that they may breathe (Mayflies, 2003).This means that the river

and pond do not have top notch water quality. Animas High School also found high levels of phosphates in the river and in the DNS pond. The phosphates cause a decline in water quality and can making living conditions for the water creatures uncomfortable. Phosphorus is the nutrient that helps plant growth. When too many phosphates are found in a body of water, an excess of plants will also be present. Plants will then absorb the oxygen in the water, resulting in a decline in water quality (BASIN, 2007). Algal blooms are very likely to form in phosphorus and nitrate levels such as these. Algal blooms form quickly with an increase in phosphates and nitrates, take up the oxygen in the water, and cause the water quality to decline (Understanding, 2013).The Florida River originates in the Lemon Reservoir and the reservoir is the most likely cause for the excess phosphates. The cows living near the reservoir produce fecal matter that can drain into the river. The feces contain nitrates, phosphorus, and potassium. This explains the heightened phosphorus and nitrate levels. The best solution would be to ask the farmers to find an alternate route to eliminate their animal's feces to preserve the river's ecosystem. Heightened levels of phosphates were also found in the pond, most likely from the excrement of the creatures living in and around the pond. Since the pond doesn't have a current, the decomposition of the excrement takes longer, and allows for more phosphates to stay in the pond. This results in a heightened amount of phosphates.

Animas High School determined the frog population using two different methods: A visual encounter survey, estimating the population to be six, and a mark-recapture method putting the estimate at twenty. Both methods have faults to them by not factoring in everyday changes. The mark-recapture method is more reliable because it ensures that one will know if

that frog has already been spotted/caught. Also, based on previous years, twenty frogs seemed much more likely than a mere six (see Figure 8).

Recommendations

The coliform test came back positive. Next time, if the result is again positive, an additional test should be completed to determine the amount of coliform in the water and if steps need to be taken to reduce that level.

Instead of coming out only once a year to monitor the bullfrogs and leopard frogs, Animas High School should make an effort to go to DNS three times a year for a longer time period. This way more data will be collected. Each 10th grade class period should go out to the Durango Nature Studies in late September for a whole day and do all the water quality tests each day. That will provide a good amount of data to create more accurate results. In addition, water quality tests should be done regularly so they can easily tell what is affecting the water. Video recording could also be installed over the pond. The frogs are scared and hide when humans are around, but with a video camera, Animas High School can see how many frogs appear without human interaction. Before Animas High School gets on the grounds of Durango Nature Studies, each class period should look at live footage from DNS for the corresponding hour. Then they should come up with an estimated population of bullfrogs and leopard frogs. Once they get on DNS grounds to do their water quality tests and veg plot surveys, Animas will also conduct the usual frog mark-recapture method to observe the population difference with and without human interaction.

More studies should be taken to assess if the bullfrog is actually invading the leopard frog. A drastic plan should not be put into action anytime soon since currently the leopard frogs are not

being harmed. If a plan must be taken into action, one or two pitfall traps could be placed around the pond and checked daily for frogs. A pitfall trap is a fairly self-explanatory trapping method where a pit is hidden in the ground and wildlife fall into it with no way of getting out on their own. The trap should be checked daily to avoid a frog-eat-frog situation. This method will help eliminate the bullfrog and will also help DNS get a better feel for how many bullfrogs are currently calling Durango Nature Studies their home. When leopard frogs are captured, they should be marked and set free. If bullfrogs are captured, the quantity should be recorded and then removed from the property. This way an accurate population count will be established and any caught bullfrogs will not continue to live on the property.

Overall, drastic measures should not be taken to rid the bullfrogs from the property. The bullfrog population is relatively low, and is not invading or doing any visible harm to the leopard frogs. Of course, when a bullfrog is caught by a DNS visitor, there is no reason to keep it on the property and it should be exterminated. Due to the lack of bullfrog sightings and flourish in the leopard frog population, a conclusion can be reached that the bullfrog is not yet invading the leopard frog. Given that the bullfrog is invasive, any captured bullfrogs should be freed from the property, but drastic measures shouldn't be taken to eradicate it. Due to the lack of bullfrogs, a plan to exterminate them will only waste money. Surveys should continue to be taken to make sure the bullfrog population does not grow.

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