

*Amphibian population estimates and ecosystem assessment on the
Durango Nature Studies property*
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Introduction

Durango Nature Studies (DNS) located south of Durango on Highway 550 at the base of Bondad Hill is a program created to educate kids and adults in the community about nature. Under a conservation easement, Durango Nature Studies has possession of a 142-acre plot of land near the New Mexico border.

The DNS property is comprised of a variety of habitats; meadows, oak woodlands, piñon-juniper forests, and desert arroyos. Four years ago DNS noticed bullfrogs on the property. This is a concern because bullfrogs are not native and they out-compete native leopard frogs for resources.

Natural History

Bullfrogs (*Rana catesbeiana*) grow to around 3 inches to 6 inches and are native to eastern America and are invasive to Colorado, which means bullfrogs are over dominating a certain area and disturbing native species that already live there. The Leopard Frog (*Rana Pipeans*) is mostly green and spotted. They are native to western America and found in wet moist places such as marshes, ponds, lake, and reservoirs. Leopard frogs are one species that the bullfrog is threatening. The bullfrog competes with the best hiding places against the leopard frog. Bullfrogs are naturally bigger and push

the leopard frogs in open water. The leopard frogs get eaten by the bluegill (*Lepomis macrochirus*); a non-native fish that lives in rivers, lakes, and ponds. The same process happens with the bullfrog tadpoles, and leopard frog tadpoles. Invasive species are a concern all around the world and disturb the natural balance of ecosystems. Invasive species starve resources, and over populate areas due to the lack of predators.

Methods & Materials

Methods used to collect data were pitfall traps, visual encounters with frog species, tagging, water chemistry tests, and macro-invertebrate catching methods. Four pit fall traps were set by the pond and the river. A pitfall trap is a fence that lines a perimeter of an aquatic habitat and then two holes are dug at each end of the fence. The frogs are supposed to get confused when they approach the fence and hop along it, eventually they hop into the hole. Visual encounter surveys were conducted to find leopard frogs and bullfrogs. Students walk around the perimeter of the pond and count the number of frogs they see. A marking session was held by tagging leopard frogs with a pink elastomer. This kept track of the frogs that have been counted and hadn't been counted. Water chemistry tests were held to find nitrates, phosphates, dissolved oxygen, and pH. macro-invertebrates were collected both in the pond and the river. In the river the kick method was used; the kick method is where someone shuffles their feet on the bottom of a streambed, then catching the loose debris in a net. In the pond a dip net method was used which is simply just dipping a net into the bottom of the pond and collecting the

insects stuck in the mud. Macro-invertebrates were collected in order to gauge water quality and calculate biodiversity.

Results

The diversity index was calculated, as well as nitrate levels, phosphate levels, dissolved oxygen, and coliform. The diversity index is a measurement to calculate the amount of different species living in one ecosystem. Numbers above 2.0 for a diversity index means that the ecosystem is extremely healthy. Numbers around 1.5 mean the ecosystem is average, and numbers below 1.0 is an unhealthy ecosystem. The diversity index of the pond was 0.98 in 2011 and 1.206 in 2012. The diversity index of the Florida River was 1.03 in 2011 and 0.876 in 2012.

The nitrate levels that are around 4ppm are normal, and levels that reach up to 40ppm is considered dangerous. The nitrate level of the pond was 6ppm, and the nitrate level of the Florida was 10ppm.

An average phosphate level is around 0.03ppm. The phosphate level of the pond was 4ppm and the phosphate level of the Florida was 8ppm.

The pH that is 7 is considered neutral. The pH of the pond is 10, and the pH of the river is 8.

Dissolved oxygen is how much oxygen is being taken out of an ecosystem. An average level is around 3ppm. The pond is 1ppm, and the Florida is 3ppm. Both the Florida and the pond tested positive with coliform.

The leopard frog population is 15. And the bullfrog population is 1.

Conclusion & Discussion

Based on the Diversity Index in 2011, the pond was 0.98, which is a relatively healthy, and the river was 1.03. But in 2012 the pond was 1.206, and the river 0.876. From the data from the pond, the results can conclude that the diversity index from 2011 has increased by 2012. This means there is a more diverse range of insects living in the pond then there was the previous year. However, in the Florida River the diversity has decreased from 1.03 to 0.876. Studies could say that this could be the cause of the dry summer. Not as much diversity with macro-invertebrates shows that the ecosystem is not as healthy as it was last year. Possible solutions for this problem could be less irrigation up stream and hope for a better winter. This would make the river have better nutrients flowing down stream, there for more macro-invertebrates can grow.

Looking at the nitrate and phosphate levels in the pond. One thing that could be an issue mostly for the pond is an algal bloom. High nitrate and phosphate levels is a result to an abundance of nutrients mostly from phosphates, which creates an excessive amount of algae. Algae doesn't live very long and dies quickly, which makes a lot of dead matter that sucks up all the dissolved oxygen. When there is no oxygen other living things like macro-invertebrates, amphibians, and fish die off. The result is of a completely dead ecosystem. Eutrophication is from waste, usually from livestock or sewage systems with nutrients that gets put into an excess amount of water, like rivers, lakes, and streams. This disturbs the natural balance of the ecosystem. Eutrophication could be an issue for the

river considering all human agricultural activity up stream. The phosphate level of the stream is 8ppm, which is considerably higher than the average of 0.03ppm. But since the river is moving water an algal bloom is less likely to happen than in a place like the pond. The pond has a phosphate level of 4ppm that could cause a minor algal bloom. The pond does have an excessive amount of plant matter in it, which in the future could threaten the life in the pond. There is no viable solution for this, but to hope for the best.

Both the river and pond were around average for pH. This means they both are stable when it comes to acidity in the water. Amphibians and fish can't tolerate very acidic conditions so the higher the pH scale the better it is for them, the lower the pH the more acidic, which they can't survive.

Dissolved oxygen is the amount of oxygen being used by living things. The pond amount of dissolved oxygen is pretty low, only 1ppm. This could be because of the abundance of plants living in the pond that create high levels of oxygen. The organisms that use the oxygen aren't as abundant as the plants, which may create that low level. However the river has a very normal level of dissolved oxygen because that balance of oxygen users and oxygen producers are equal.

Amphibian population of the leopard frog is doing very well. From last year visual encounter conclude that the population of leopard frogs has increased by 3 frogs. Four years ago Durango Nature Studies noticed a population of invasive species of bullfrogs in the area. Animas High School has started moderating the bullfrog population. Now in

2012, there is only 1 known bullfrog living in the area. This has caused the native species of leopard frogs to flourish.

Invasive species have uncreatively been a problem ever since humans started to explore the world. Could humans be the blame? Humans are really the biggest invasive species in the world. The human population has over thrown all other animal populations by the millions, and has inhabited almost every bit of land except Antarctica. Humans are disrupting many natural ecosystems and destroying the world everyday. And yet humans give such an effort to control invasive species. To conclude should humans control invasive species or should nature take its course.