Durango Nature Studies Habitat Assessment

2013

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**Executive Summary**

The Durango Nature Study’s land is used for many activities. These activities include children discovering nature, surviving and thriving in winter, nature in the classroom, classroom backpacks, junior naturist field camp, river days, birthday parties, and many other group activities. Because Durango Nature studies has such a vast number of people coming to it, it needs help maintaining the property, so Animas High School students help by monitoring biodiversity and invasive species.

There were four basic objectives in place to achieve these tasks at Durango Nature Studies. These objectives were to catch and remove any bullfrogs (*Rana* *catesbeiana*) seen, to estimate the population size of bullfrogs and leopard frogs (*Rana* *pipiens*) via a catch, mark, release system, to determine the quality of the water, and finally to determine the biodiversity of the plants. To achieve these goals fieldwork needed to be conducted.

At Durango Nature Studies, fieldwork was conducted. This fieldwork included catching, marking, and then releasing leopard frogs; testing water for contaminates; collecting macroinvertebrates; and the collection of veg plots to determine the biodiversity of plants. Frogs were caught with nets and then were marked. Each frog was marked by injecting a pink liquid underneath the skin of its hind leg. Finally, these frogs were counted and released. Veg plots were also taken. A PVC square was placed over an area. Then the numbers of different species and the individuals for each species were counted. This method gave an estimate of the biodiversity of the plants. Water samples were taken to determine the level of contamination of the water.

Durango Nature Studies is an environmentally focused non-profit organization with an annual budget of approximately $140,000. Recommendations for future monitoring and management will be made with this budget in mind.

**Species Overview**

*Rana pipiens*

The leopard frog or *Rana Pipiens* is an amphibian native to most of the Northern United States, Canada, and the Rocky Mountains. The species’ diet ranges greatly with age. As tadpoles they appear to be generalist herbivores, eating many kinds of aquatic plants; while adults are generalist predators and eat anything that moves and can fit in its mouth even smaller leopard frogs. This species is also 5.1 to 9.0 cm long and tend to be born in ponds ranging from 30m-60m in diameter and 1.5m-2m deep. These ponds usually have no fish and are dry for part of the year or every few years. Their breeding season begins in mid-march and lasts until early or late May. Number of eggs per clutch varies greatly with anywhere from 645 to 7000 eggs in each clutch. When the eggs hatch and the frogs reach adulthood, they leave for summer-time habitats in grassy areas, straying anywhere from 0.5km to 3km from the water. When fall begins, these frogs migrate again to winter habitats. These include ponds, rivers, and streams that hold water all year and may contain fish. In this habitat, they will stay underwater and hibernate for the winter (Smith 2004).

The leopard frog is currently a species of Special State Concern due to the threats faced by this species (Colorado 2011). These threats include natural predators and introduced predators. These natural predators include mallards, blue-winged teal, newts, waterfowl, fish, aquatic insects, leeches, diving beetles, larvae of various insects, giant water bugs, spiders, snakes, and tiger salamanders. Of the natural predators, the tiger salamander, which has a similar habitat, is the most serious as it has, in several experiments, completely wiped out frog tadpoles. Bullfrogs are the most predominant of the introduced predators as they can eradicate entire populations of other frogs, although several species of introduced fish also dine on the leopard frog (Smith 2004).

*Rana catesbeiana*

The bullfrog (*Rana catesbeiana*) is, like the leopard frog, an amphibian. The bullfrog is naturally found in Eastern North America. This species is extremely invasive and has been introduced to Belgium, Brazil, China, Colombia, Cuba, Dominican Republic, Ecuador, France, Germany, Greece, Indonesia, Italy, Jamaica, Japan, Malaysia, Netherlands, Peru, Philippine, Puerto Rico, Singapore, Spain, Taiwan, Province of Chin, Thailand, United Kingdom, Venezuela and also in Western North America. These creatures are generalist predators that eat any fish, amphibian, rodent, reptile, bug, or bird that can fit in its mouth and can grow anywhere from 10 to 18cm. They breed in the summer and females can lay as many as 20,000 eggs. When these eggs hatch, the tadpoles remain tadpoles until about two to four years later, so they spend their first few winters underwater in their breeding pond. They prefer to live in large, deep water, but need permanent wetlands to breed. They hibernate in their homes in the winter and are extremely territorial, so population density is low (Spitzen 2010).

In Colorado, the bullfrog is considered an invasive species (Colorado 2012). It is a threat to several species of frog including the red-legged frog, the yellow-legged frog, the plains leopard frog, the northern leopard frog, and the spotted frog. The reason for the bullfrog’s effectiveness at eradicating other species is predation, competition, and diseases caused by *B. dendrobatidis*, which is the fungus it carries. This fungus causes Chytridiomycosis, which is one of the main causes of global amphibian decline, including the decline of the leopard frog. The bullfrog when paired with non-native fish species becomes even more of a threat (Spitzen 2010).

**Results**

 The data showed the results of the many experiments. For water quality phosphate levels were 4 in the river and 5 in the pond. These levels are fairly high. The dissolved oxygen levels in the pond where normal at 7.5 mg/L and the river levels were inconclusive. The pH levels in the pond and river were both between 8 and 9, which are considered alkaline levels. The nitrate level of the pond was 2ppm, and the river’s level was 1ppm. These are both considered unpolluted levels. Coliform tested positive in both the pond and the river.

 The Shannon-Weiner index number for the plants was calculated to be an average of 1.296. This number means that the environment is diverse enough to be stable. The Shannon-Weiner number for the macroinvertabrates in the river was 1.34. The number for the pond was 1.27. Based on these numbers both the pond and the river are stable environments. An average of 6 leopard frogs were seen and no bullfrogs were observed. Thirty-seven people hours were spent on this project.

**Discussion and Recommendations**

 Diversity is necessary for stability. To calculate diversity the Shannon-Weiner index is widely accepted. It is represented by the equation, H’= -∑[(ni/N)x(ln ni/N)]. When calculated, if the answer is one or greater, then the environment is stable. Based on the data, the ecosystem of the pond and river is stable. The system is, however, not in perfect balance, as the river contained no stoneflies. The lack of stoneflies suggests that the river is polluted, as stoneflies have a very low pollution tolerance.

This pollution is partially due to excess levels of phosphates. Excess phosphates come from man made sources like septic systems, fertilizer, improperly treated wastewater, and used to be present in detergents. These materials end up in water due to runoff and erosion. To lower levels of phosphates, less fertilizer should be used in proximity to the Florida River and the DNS pond. Erosion control, via strategically placed rocks would also help lower phosphate levels. If phosphate levels are not lowered, then the environment will suffer. This chemical stimulates plant growth and thus causes algae blooms. The blooms then raise water temperature and kill off other plant life, thus decreasing diversity and stability (EPA).

Bullfrogs are present in this area. They have been observed in the past though none have been caught by this group. A more effective method needs to be found for catching them and otherwise removing them from this ecosystem. One possible way to remove more bullfrogs would be to set traps. These traps would have one-way doors so they could enter but not leave. If these traps were placed with a male frog already inside, and set up during the mating season, then female frogs would be attracted to the trapped frogs, and the female bullfrogs could be removed from the environment. This trap placement could be done by DNS staff or volunteers. The trapped bullfrogs will then be removed from this ecosystem.

The other frog issue is catching, counting, and releasing the leopard frogs. While the catch, mark release, and catch again form is the most accurate gauge of population size, it is flawed as the frogs can escape between catching and marking. To fix this problem, frogs should be kept in the net during marking. In addition to this precaution, the first group of observers could set traps for frogs. Later, the last group of sampling session could check the trap and count and mark those frogs. In addition, changes could be made to the habitat to make it more suitable for leopard frogs. One change would be to make the pond unsuitable for bullfrogs, but still usable by leopard frogs. To do this the pond could be made seasonal, so that it is only there for part of the year. This would allow leopard frogs to use the pond for breeding, but not bullfrogs, as the bullfrog tadpoles stay tadpoles for at least a year and would die if their pond dried out.

Two methods were used for estimating the population size. These methods were visual encounter surveys and mark-recapture. At the pond, only an average of six frogs were seen, however when the mark-recapture method was used the population size was measured to be much higher, at twenty frogs. The mark recapture method is more accurate and should be referenced. This is because of the assumptions made in the visual encounter survey method. According to Luke Haupt these assumptions are; “1) Every individual has an equal chance of being counted during the survey, 2) Each species is equally likely to be observed during each sampling session, 3) Each individual is only counted once, and 4) results from two or more observers surveying the same area simultaneously are identical.” Because of these necessary assumptions the method is less accurate as the same frog could be seen multiple times, and many frogs could remain hidden.

However the mark-recapture method also makes some assumptions. They are as follows: “1). During the interval between the preliminary marking period and the subsequent recapture period, nothing has happened to upset the proportions of marked to unmarked animals; 2). The chances for each individual in the population to be caught are equal and constant for both the initial marking period and the recapture period; 3). Sufficient time must be allowed between the initial marking and the recapture period for all marked individuals to be randomly dispersed throughout the population; 4). Animals are not affected by their marks; 5). Animals do not lose their marks” (Kasmer). These assumptions are however irrelevant because they were taken over a short two-day period, and very few frogs die or are born in two days at a small pond. They are also inconsequential as the marks were placed just under the skin, and, therefore, could not be easily lost. Even if it is incorrect, it is still a closer estimate as the marking shows there to be at least thirteen individual frogs in the pond. Therefore the mark- recapture data is more accurate and should be referenced.

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