**Durango Nature Studies Habitat Assessment**

**2013**

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**Executive Summary**

Durango Nature Studies wanted Animas High School students to visit the property and assess the health of the pond and Florida River and estimate amphibian populations. DNS was concerned about the invasive species *Rana catesbeiana* (bullfrog), and how they are pushing out the native species *Rana pipiens (leopard frog).*  This is the third year fieldwork has been conducted by AHS on the DNS property.

Durango Nature Studies is located outside Durango, Colorado, near the New Mexico border off of HWY 550. The property is 140 acres, and has a wide variety of habitats like, riparian, meadows, oak woodlands, piñon-juniper forests, and desert arroyos. The land is under a conservation easement. The property also holds school programs, summer programs, workshops, naturalists/naturalist training, nature clubs, wee walks, full moon and new moon hikes, social events, and professional training. Fort Lewis College, Southwest Conservation Corp., Eagle Scouts, Colorado State University, Animas High School, and Colorado Bird Breeding Atlas use the land to conduct research.

Animas High School students visited the DNS property and conducted a series of different tasks, to help estimate the amphibian population size, and the overall quality of the habitats. The students tested the Florida River and the Pond through tests of the pH, dissolved oxygen, coliform, nitrate, and phosphate levels, as well as conducting a visual encounter survey of the amphibians, to estimate frog populations.

Durango Nature Studies has an annual operating budget of $140,000. Recommendations for Management and Monitoring will be made with this budget in mind.

**Species Overview**

*Rana catesbeiana*

Bullfrogs (*Rana catesbeiana*) are an invasive species to Colorado, they were introduced

to Colorado in the 1920’s by the Colorado Division of Wildlife for hunting purposes. Bullfrogs will outcompete the native leopard frog, and the DNS Faculty is concerned about the invasive species eliminating the leopard frogs. The bullfrog is a generalist predator, which means that they will eat anything that will fit in their mouth, which makes them an extreme danger to the leopard frog. Their mating season is May to July and can lie up to 20,000 eggs at a time (per season). They hibernate in the winter, but they can be woken up throughout the winter.

*Rana pipiens*

The leopard frogs (*Rana pipiens*) need a plethora of space to have a fully functioning healthy habitat. This species can grow from 5.1-9.0 SVL’s (nose to tail) but males are smaller than the females, but you can distinguish them by their feet, the males have a swollen thumb when it is mating season. The leopard frogs eat beetles, ants, rats, flies, and worms. They breed between March and June, and can lay up to 6,000 eggs at a time, from the time that the eggs are hatched; it takes up to 110 days to turn from a tadpole into a fidget. For the when the winter comes the species stays in the pond, but they go to the bottom and go dormant for the winter until spring comes. One of the biggest threats to *Rana pipiens*, are *Rana catesbeiana*.

**Results Section**

Phosphate levels in the pond were found to be 5ppm the Florida River was found to be 4ppm, which both of these levels are considered high. Dissolved oxygen levels in the Florida River were inconclusive, where the levels in the pond were 7.5 mg/L which is normal. The pH level in the river and pond were both 8, which is alkaline. Nitrate levels in the pond were 1ppm, which is normal. The nitrate levels in the Florida River were 2ppm, which is also normal. Coliform was positive in both the Florida River and the pond. In the pond located at DNS we found that the biodiversity was 1.3 which is healthy. The macroinvertabrates in the Florida River located that runs through DNS biodiversity was 1.4 which is also healthy. We saw no bullfrogs at DNS this year but we did catch about 6.25 leopard frogs together. The diversity index calculated from the vegetation plots averaged out to be 1.3, which is considered healthy.

**Discussion and Recommendations**

In an ecosystem, diversity equals stability and stability is essential for sustainability. The Shannon-Weiner Index is an accepted way to quantify diversity within an ecosystem. Plants are a reliable gauge of diversity because they are the base of the energy pyramid. The more diverse the primary producers are the more diverse the higher trophic levels will be. The Shannon-Wiener Diversity Index indicates that the Durango Nature Studies pond, and river that flows through the property, are both adequately healthy.

In the Florida River, no stoneflies were found, but mayflies and caddisflies were collected since stoneflies are not tolerant to pollution. This indicates that the river has moderate water quality. One possible reason for the absence of stoneflies is high levels of phosphates. A possible pollution source in the river is an excess of phosphates. The Florida River starts at the Lemon Dam. The area surrounding Lemon Dam is open range; and cow feces may be running off into the river and resulting in high phosphate levels. The water from the dam then turns into the Florida and then runs through many private properties, which also have cattle and other animals that use the river a water source. The dam should be more regulated and not let the cows in as much in the summer, so that the water doesn’t become more polluted than needed. The high phosphate levels affect the pond because the phosphate just settles and collects over a period of time and that is not healthy because after a while all of the aquatic vegetation will die, which will increase animal decomposition, and then decrease dissolved oxygen in the water. To reduce the phosphate levels in the pond, DNS should exchange some of the water in the winter, when there aren’t as many sources of phosphates around, and add in new water from the river, and do this annually.

Animas High School students have never been able to catch any bullfrogs while on the property of Durango Nature Studies. A way to increase the chances of catching the invasive species would be to set up traps in an all week ‘field trip’ to the property to set up the traps and analyze the data in the first two days, the rest of the week would be analyzing the data each day and recording the data to get a more accurate overall average. The traps that the students would use would be drift traps, pitfall traps, and funnel traps. The students would set up the drift traps, with pitfall traps and funnel traps on either side of the drift trap. The drift traps would be 5 feet long with 2 pitfall traps and 2 funnels on either side. There would be 5 of the traps total surrounding the pond, and 4 traps for the river, two on each side (Wilson 2009). The reason why there would be so many traps would be to increase the chances of catching the bullfrogs, and leopard frogs.

To better monitor the leopard frog population, DNS and Animas High School need to cooperate and mark-recapture the frogs for a more accurate population number. The two groups could use the traps explained in the paragraph above. Mark-recapturing is the best most effective way to determine the leopard frog population. The reason why mark-recapture is the most effective other than visual encounter surveys is because you may mistake a leopard frog for another species similar to the leopard frog, and with mark-recapture you can physically analyze the species for certain characteristics that no other species have to undoubtedly identify the species correctly.

To further increase the population of the species *Rana pipiens*, Animas High School, should visit the property of DNS during the leopard frog mating season and gather two pairs of the frogs, two female, two male, and put them in an enclosure, which has shallow water from the pond, grass, leaves, shrubbery, a food source, and protection from predators, all needed to help the area. DNS should also include the traps to help catch the invasive species *Rana catesbeiana*, and reduce the population, to increase the species *Rana pipiens*.

**Citations**

Wilson, John D., and J. Whitfield Gibbons. "Drift Fences, Coverboards, and Other Traps."

(2009): 229-42. Web. 13 Oct. 2013.

"Case Study 2: The Decline Of The Leopard Frog." *Wetland Curriculum Source*. N.p., n.d.

Web. 17 Oct. 2013. <http://www.torontozoo.com/adoptapond/curriculum/j2-casestudy.html>.

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| **Durango Nature Studies Macroinvertabrate Data 2013** | | | | | | | | |  | |  |  |  |  |  |  |  |  |
|  | |  |  | | |  |  | |  | |  |  |  |  |  |  |  |  |
| **Pond** | |  |  | | |  | **River** | |  | |  |  |  |  |  |  |  |  |
| Insect Type | | Number |  | | |  | Insect Type | | Number | | Diversity Index |  |  |  |  |  |  |  |
| Mayfly | | 4 | -0.360413429 | | |  | Mayfly | | 5 | | -0.317049736 |  |  |  |  |  |  |  |
| Damselfy | | 0 |  | | |  | Damselfly | | 0 | |  |  |  |  |  |  |  |  |
| Dragonfly | | 0 |  | | |  | Dragonfly | | 0 | |  |  |  |  |  |  |  |  |
| Caddisfly | | 1 | -0.244136064 | | |  | Caddisfly | | 11 | | -0.363931305 |  |  |  |  |  |  |  |
| Midge | | 2 | -0.334239422 | | |  | Midge | | 2 | | -0.197303797 |  |  |  |  |  |  |  |
| Riffle Beetle | | 2 | -0.334239422 | | |  | Diptera | | 0 | |  |  |  |  |  |  |  |  |
| Stonefly | | 0 |  | | |  | Stonefly | | 0 | |  |  |  |  |  |  |  |  |
| Diptera | | 0 |  | | |  | Riffle Beetle | | 6 | | -0.338385477 |  |  |  |  |  |  |  |
| Amphipoda | | 0 |  | | |  | Amphipoda | | 2 | | -0.197303797 |  |  |  |  |  |  |  |
|  | | H' | -1.273028337 | | |  |  | | H'= | | -1.413974111 |  |  |  |  |  |  |  |
| **Durango Nature Studies Frog Data 2013** | | | | | |  | | |  | |
|  | |  | | |  |  | | |  | |
| Class | | Leopard Frogs | | | Bull frogs | People | | | Time | |
| Period 2 | | 10 | | | 0 | 23 | | | 30 min | |
| Period 3 | | 6 | | | 0 | 14 | | | 30 min | |
| Period 5 | | 4 | | | 0 | 17 | | | 30 min | |
| Period 6 | | 5 | | | 0 | 20 | | | 30 min | |

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| **Durango Nature Studies Veg Plot Data 2013** | | |
|  |  |  |
| Plot 1 |  |  |
| Species 1 | 43 | -0.279144681 |
| Species 2 | 6 | -0.217990479 |
| Species 3 | 3 | -0.14050193 |
| Species 4 | 5 | -0.195470972 |
| Species 5 | 2 | -0.105954775 |
| Species 6 | 1 | -0.063479617 |
| Species 7 | 3 | -0.14050193 |
| Species 8 | 3 | -0.14050193 |
|  | H' | -1.283546313 |
|  |  |  |
| Plot 2 |  |  |
| Species 1 | 49 | -0.221119511 |
| Species 2 | 7 | -0.237972911 |
| Species 3 | 6 | -0.217990479 |
| Species 4 | 3 | -0.14050193 |
| Species 5 | 5 | -0.195470972 |
|  | H' | -1.013055804 |
|  |  |  |
| Plot 3 |  |  |
| Species 1 | 3 | -0.284567998 |
| Species 2 | 12 | -0.306495374 |
| Species 3 | 5 | -0.34657359 |
|  | H' | -0.937636962 |
|  |  |  |
| Plot 4 |  |  |
| Species 1 | 1 | -0.374466534 |
| Species 2 | 2 | -0.34657359 |
| Species 3 | 1 | -0.259930193 |
| Species 4 | 1 | -0.259930193 |
| species 5 | 1 | -0.259930193 |
| Species 6 | 1 | -0.259930193 |
| Species 7 | 1 | -0.259930193 |
|  | H' | -2.020691088 |
| **Durango Nature Studies Veg Plots Continued** |  |  |
| Plot 5 |  |  |
| Species 1 | 1 | -0.160576209 |
| Species 2 | 12 | -0.270310072 |
| Species 3 | 2 | -0.244136064 |
| Species 4 | 2 | -0.244136064 |
| Species 5 | 1 | -0.160576209 |
|  | H' | -1.079734618 |
|  |  |  |
| Plot 6 |  |  |
| Species 1 | 2 | -0.128755033 |
| Species 2 | 4 | -0.202058292 |
| Species 3 | 2 | -0.128755033 |
| Species 4 | 4 | -0.202058292 |
| Species 5 | 28 | -0.324698357 |
| Species 6 | 10 | -0.321887582 |
|  | H' | -1.308212589 |
|  |  |  |
| Plot 7 |  |  |
| Species 1 | 5 | -0.336728305 |
| Species 2 | 7 | -0.364360279 |
| Species 3 | 7 | -0.364360279 |
| Species 4 | 3 | -0.271695022 |
|  | H' | -1.337143884 |
|  |  |  |
| Plot 8 |  |  |
| Species 1 | 1 | -0.197303797 |
| Species 2 | 5 | -0.367504402 |
| Species 3 | 2 | -0.287969566 |
| Species 4 | 1 | -0.197303797 |
| Species 5 | 1 | -0.197303797 |
| Species 6 | 3 | -0.338385477 |
|  | H' | -1.585770835 |

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| **Durango Nature Studies Water Quality Data 2013** |  |
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| Phosphate Levels |  |
| Pond | 5 |
| River | 4 |
|  |  |
| Dissolved Oxygen Levels\* |  |
| Pond | 7.5 mg/L |
| River | Inconclusive |
|  |  |
| pH Level |  |
| Pond | 8 |
| River | 8 |
|  |  |
| Nitrate Levels |  |
| Pond | 1ppm |
| Florida River | 2ppm |
|  |  |
| Coliform |  |
| Pond | Positive |
| River | Positive |