COLLEGE OF ENGINEERING

Sawmill Wetlands Salamander Restoration

Sponsored by Friends of the Lower Olentangy Watershed (FLOW)
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FLOW
Friends of the Lower Olentangy Watershed

Problem statement:

Friends of the Lower Olentangy Watershed (FLOW) needs a best management plan to allow for the breeding and maturation of salamanders at the Sawmill Wetlands Educational Area.

INTRODUCTION

FLOW is a non-profit whose goal is to keep the Olentangy River and its tributaries clean and safe for all to enjoy, through public education, volunteer activities, and coordination with local decision-makers. The sawmill wetlands includes a series of vernal pools that provide ideal habitat for salamander breeding and development. Over the last few years, FLOW has noticed a decline in the populations of salamanders at the site. Since habitat for salamanders is dwindling, FLOW has asked the team to investigate this site.

The team mapped, modeled, and sampled the site to determine a solution to keep the pools inundated long enough to allow for the maturation of salamanders. The team is proposing a curb cutout and a berm seen in figure 2.

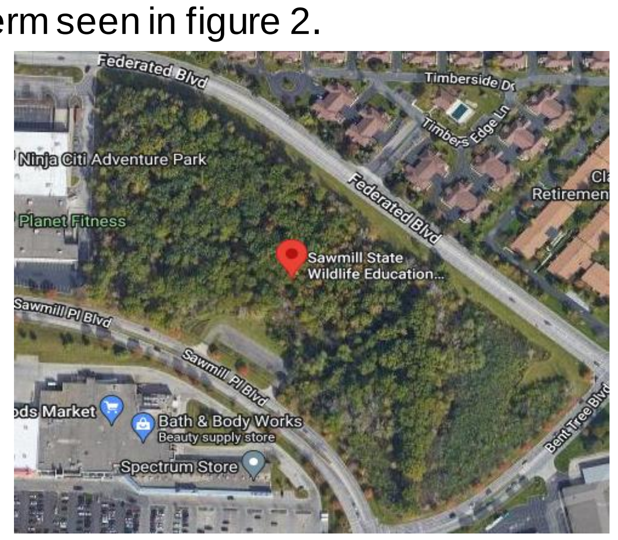

Figure 1 – Satellite view of Sawmill Wetlands

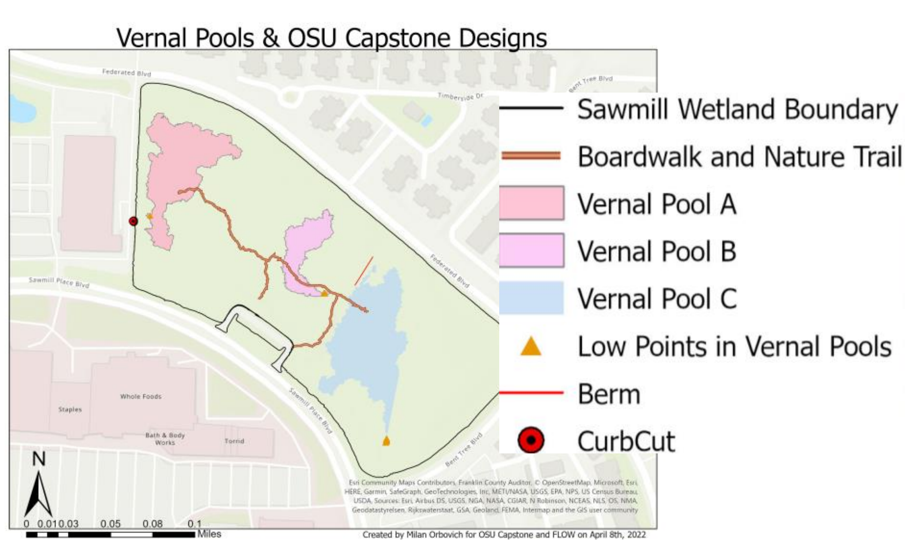

Figure 2 – Map with proposed solutions

Figure 3 – Picture of break in the lip in vernal pool C

Detailed Design

The team has selected a two-part design which includes adding a berm and a curb cutout on the site.

When the team was surveying one of the vernal pools, a break in the lip was noticed on its northwestern edge. This break led to a depression which allowed water to flow north out of the site. A berm along the edge would stop the flow out of the pool.

A curb cutout along the western edge would allow for runoff to entire the site. The salinity of the runoff was tested throughout the winter season to ensure the water quality was within a safe range for the salamanders on site. Additionally, a sand filter will be included where the runoff first enters the site to help filter out pollutants. The filter was selected based on researching filters and consists of an 8' x 20' section for the sand and an 8' x 20' detention section.

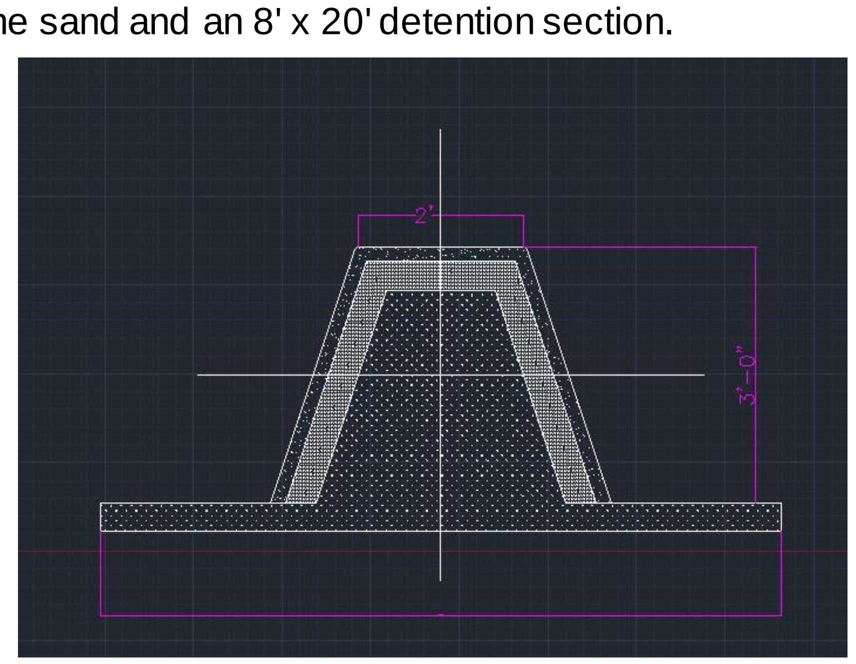

Figure 4 – Side View of Berm

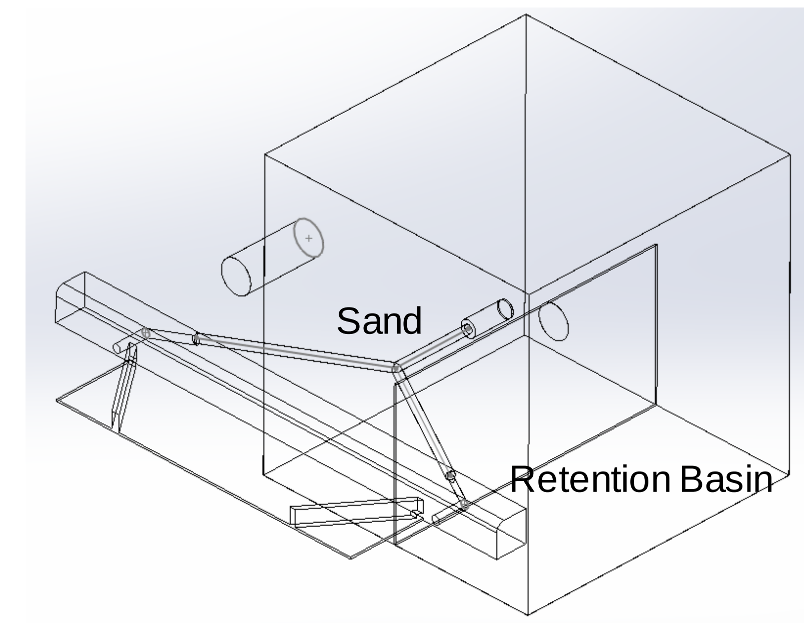

Figure 5 – Filter and curb cut design

Design Evaluation

The team evaluated the designs in a hydrology modeling software called Wetbuds. The software uses weather data from the OSU airport, 1.5 miles away, and uses the temperature, humidity, and precipitation data to calculate a water budget for the site. The team surveyed each pool's area using a handheld GPS unit while using visual indicators to determine the pools' boundary lines and then used ArcGIS to delineate a watershed for each pool. For the berm, a water output parameter was used to simulate the amount of water flowing out of the pool where this break is located. To simulate the curb cutout, a water input parameter was added in the model to simulate the additional water flowing in from this curb cutout. The models with the designs were then compared to the models without the designs and the results indicated that the addition of the two proposed solutions would allow for the required 75 days of inundation for salamander maturation.

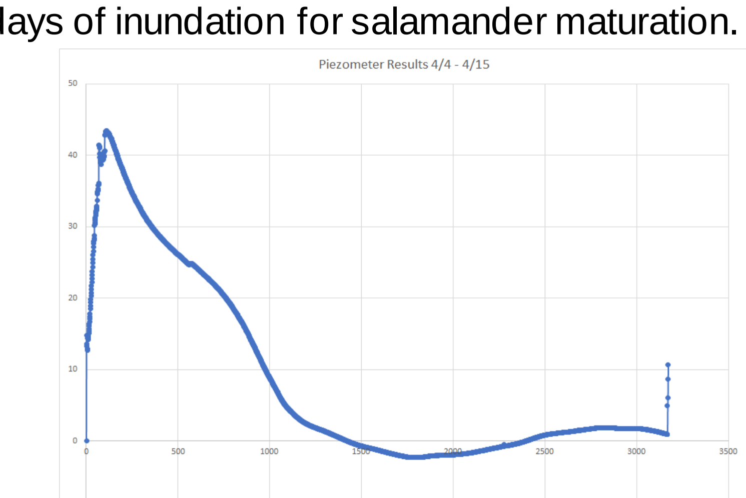

Figure 6 – Piezometer results

Results

In addition to using models to determine a water budget, the team also deployed a piezometer to measure water levels at regular intervals to determine the accuracy of the models. The results from the piezometer show that the pools have water and are indicative of correct modeling. The figures below show the comparative results of the models.

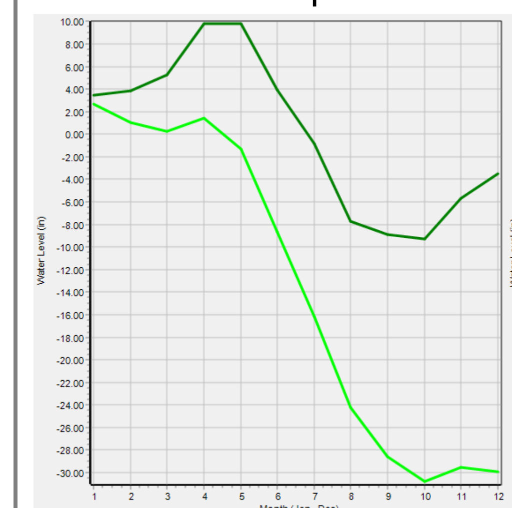

Figure 7 – Pool A before and after curb cutout

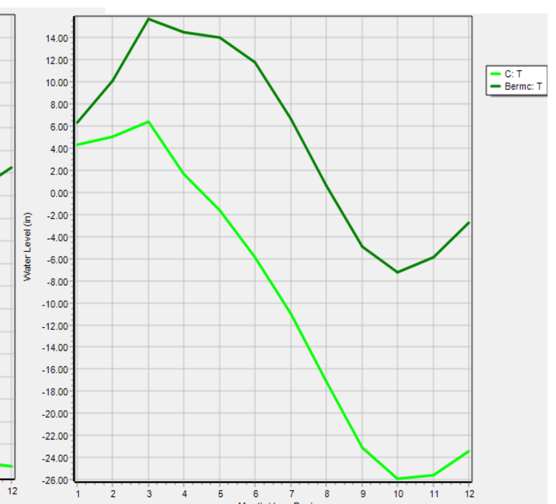

Figure 8 – Pool C before and after berm

CONCLUSIONS

With the implementation of the designs recommended by the team, the models show that the pools will stay inundated for over the minimum of 75 days required for salamander maturation with normal Ohio precipitation.

With the sand filter for the curb cutout, between 80 - and 94 percent of pollutants removed including total suspended solids, phosphorus, and nitrogen, allowing for the water quality to meet the standard required for salamanders to remain healthy.

References

1 Urbonas, B. R. (2008). *Stormwater Sand Filter Sizing and Design: A Unit Operations Approach*. Accessed 6/1/09 at: www. udfcd. org/downloads/pdf/tech_papers/Sand-flt-paper. Pdf.

2 . Doyle, J. M., Nolan, J. R., & Whiteman, H. H. (2010). Effects of relative size on growth rate and time to metamorphosis in mole salamanders (Ambystoma talpoideum). *Journal of Herpetology, 44*(4), 601-609.

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