Sustainability Capstone:

Spirit Mound Team

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Background

Spirit Mound is an important geological feature of cultural importance on a national and local level. It has existed as a land feature since before the Native Americans, and was a magnet for mystic stories to explain the anomalous presence it has. It is popularly known due to its significance in the voyage to investigate the west by Euro-Americans Meriwether Lewis and William Clark and the Corps of Discovery. Through efforts made by the Spirit Mound Trust, it is now a valuable prairie preserve and home to many native plants and animals. After much hard work by this group, and some help from others, it has become an eco-tourism location where visitors can look upon what Lewis and Clark saw when they hiked it.

For this project we had hoped to work with the further rehabilitation of the site while educating the local fourth grade class about the importance of local ecosystems. Pheasants Forever is currently working with the Spirit Mound Trust to seed an area with native prairie plants to aid in the cultivation of the pheasant population in a protected area. The fourth grade class was to aid in this seeding process while having an educational field day incorporating various activities including games, lectures, and a hike up the mound to view what Lewis and Clark saw. The goal was to give them the full young explorers experience.

Unfortunately, when planning ecologically educational activities one must incorporate nature which does not always comply in the most favorable of ways. The creek out at Spirit Mound flooded which caused a disruption in the well-thought-out plans that we had made with our community contact and research that we had done all semester on various topics involving Spirit Mound. Although this setback was difficult to deal with, we decided that the education of the children was of the utmost importance. The field day was moved to Cotton Park and the events altered to be more about pollinators of native plants in general and the Vermillion River.

Place-Based Education

The Vermillion fourth graders are very lucky to have places like Spirit Mound and Cotton Park to go to and learn about different environmental processes. Not only that, kids who spend times outdoors may end up developing more of an understanding of the importance of natural spaces. The idea behind place-based education is that learning at all different levels and in all different subjects can be taught using the local environment as a classroom. For example, when students are learning about animals and biodiversity, they may be able to connect more with the ideas of biodiversity if they are learning about it from a landscape that is more familiar to them, like a prairie, rather than a rainforest or a coral reef.

As rural agricultural communities struggle with declining populations and unsustainable farming practices, place-based education may be a way to involve a community's youth in its revitalization efforts. For students who plan to stay in rural communities and farm, a curriculum that stresses sense of place and environmental stewardship may inspire students to educate themselves about more environmentally-friendly farming practices. A learning environment that stresses the local may also help young students to see their place in the community as well as their place within the environment, which is important if we want to encourage younger generations to appreciate and work toward a more sustainable world.

By teaching the Vermillion fourth graders about prairies, local history, and the importance of pollinators to the local and global environment using a local space that, hopefully, the kids have been to before, we helped them to become more environmentally literate. Also, by stressing the history of the area and how it has changed over time, we can show the kids that the way things appear is not how they always were or how they will be in the future--and ultimately, that they can play a part in changing their community for the better, even if it is just by planting a milkweed plant or telling their friends about how bees are good, not bad.

Education Techniques

We were going to be working with the fourth graders at Spirit Mound, since we have such a great place to learn about the natural environment and local ecosystems, but because of some unfortunate weather patterns before the event and flooding at Spirit Mound we held the event at Cotton Park. Prior to the event I asked, “what are the different ways to teach elementary schoolers about conservation most effectively?” With some help from Concordia Online Education I created three categories of learning: social interaction and adult expression, in-class lecture, and hands-on learning.

First, social interaction and adult expression are grouped together to represent interactions with peers and teachers. This category can include methods like learning with peers by participating in group projects and in team-building activities. Students can collaborate and demonstrate learned principles in this format. Adult expression includes expression, authority, and example. Adults who are not a student's’ regular teacher often have a higher level of authority since kids are learning from someone new and are therefore more likely to pay attention and retain information. If these authoritative adults can be expressive and show children how interesting and fun their topic is, the kids will walk away with a better lesson than if their regular teacher taught the lesson. These adults are perfect for leading by example. Since we will be adults teaching the children, if we can set a good example they will look up to us and hold our teachings in higher esteem.

Second, in-class lecture is where most students spend their time. As children grow older, time can be spent more effectively in this method of teaching, but younger children will often struggle to learn with too much lecture time. In-class lecture time can be spent on a traditional, demonstration, and hands-off lecture styles. Traditional lecture is just what it sounds like--a teacher standing at the front of a classroom lecturing students. Demonstration lectures occur when a teacher shows, or demonstrates, a hands-on activity that the students may not be able to do, but is still valuable to see. Hands-off lectures include a teacher giving students the necessary materials to learn and letting them run with it and learn on their own. The best way to have in-class lectures is to incorporate a number of these techniques into an active learning environment for young students.

The third, and final, method of learning is hands-on. This method is arguably the best kind of learning, especially for very young students. It is also the method that is most likely to incite change is students’ everyday lives. As great as hands-on learning can be, it is significantly more difficult to carry out than the other two methods. Hands-on learning requires a great deal of forethought and planning and is therefore very time-intensive--the activities need to be at a level that students can carry out and succeed at. These activities can also be costly. Materials needed for hands-on activities are more than some schools may be able to afford, and therefore hands-on activities are limited in some places. Hands-on learning is also limited because of where learning activities can be carried out. Especially when learning biological, conservation, and ecological principles, students who are limited to an urban environment do not have as much exposure to nature and a variety of ecosystems. Place-based education is key for hands-on learning in the natural sciences and can be limited if the student's’ location is undesirable for outdoor learning.

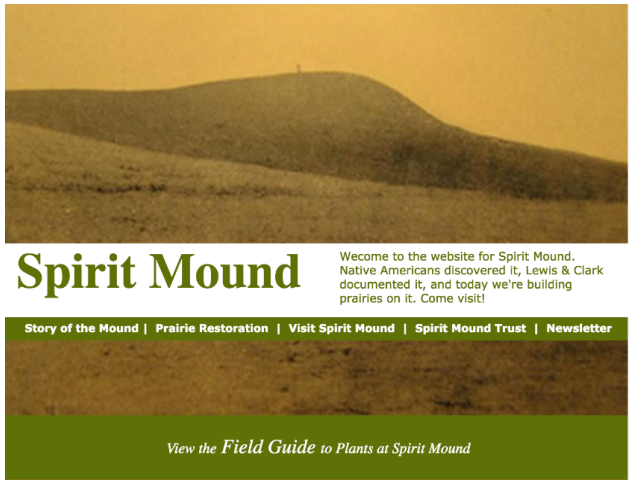
For our day at Cotton Park, the Sustainability Capstone class from The University of South Dakota will use a variety of in-class lecture, social interaction/adult expression, and (mostly) hands-on learning techniques. The college students will be effective, expressive adults and get the children excited about the different activities to learn about prairie ecology and conservation in and around Vermillion.

Timeline

DATE	AGENDA
1/11/16	Decided on Teams
1/11/16	Began Brainstorming Process
1/25/16	Decided on Paper Topics
2/1/16	Planted Plants in Greenhouse
2/1/16	Contacted School
2/1/16	Met with Community Contact about Resource Needs
2/8/16	Set Date with School with Backup Dates
2/8/16	Decided on how Paper Topics Would Pertain to Project
2/29/16	Self-Watering System Installed by Bob
2/29/16	Finished Papers (Final Research Papers Due)
3/14/16	Walked out at Spirit Mound, Looked at Site Logistics
4/10/16	Finalized Presentation, Practiced with Group Members
4/13/16	Presented at IdeaFest and Recruited Volunteers
4/18/16	Interview with Plain Talk/Final Timing of Spirit Mound
4/25/16	Met With Jim Heisinger to Ensure Needs Met
4/25/16	Contacted Volante and Coyote News
4/25/16	Brainstormed Uses for Plants in Greenhouse
4/25/16	Worked out Responsibilities for Report
4/29/16	Notified of Spirit Mound Flooding
4/30/16	Began Report
4/30/16	Moved to Cotton Park
5/1/16	Met in Library to Back Up Plan
5/3/16	Event at Cotton Park
5/4/16	Finalization of Report
5/5/16	Presentation and Discussion

Who We Worked With (Partners)

For the Monarch Meadows project, we worked with several community partners. The Spirit mound trust who helped us plan the best possible way to have the project at Spirit Mound. However, due to flooding of the area the project would be we had to move it to Cotton Park in Vermillion so thank you to the city for allowing that. Our other partner was Pheasants Forever (Sioux Falls Chapter) who provided guidance on several of the stations and materials for those stations. Finally, the project was focused on education so we partnered with fourth grade classes at Jolley Elementary.



Event Day History Talk and Geology/River Walk

When plans were set to walk up Spirit Mound one of the rotations was to be lead by team member Sabrina Schnack. She researched the history of Spirit Mound and Vermillion and constructed a discussion with the most interesting and important points to discuss. This discussion was to occur as the children hiked up to the top of Spirit Mound. The first point to be made was the presence of Lewis and Clark on the trail, how they heard about Spirit Mound and what they saw. The children had likely heard of them so this section would be relatively short and heavily discuss the river. The next point to discuss was the old school house in an effort to relate to the children as they are in school.

The school house on spirit mound property is particularly interesting because it was destroyed on three occasions twice by fire and once by lightning. It is also interesting because when this school fell out of use it was because Austin and Jolley elementary's were constructed which is where the children currently attend and though the school has changed its appearance over the years it has kept its name. After this the discussion would lead into how the area was converted to farmland for a very long time and looked much different than it does today. Finally it looks like it does today because of the work of Larry Monefore and the Spirit Mound Trust and interested visitors and tourists like the children. The goal of the discussion is to educate about the area, form an emotional bond with the prairie, and end on the note that if they find protecting wildlife important they can be advocates like Larry Monefore and really make a difference. After finishing the discussion the plan was to pass the group off to team member Calvin Brink who would discuss the geology and ancient pre-human history.

Instead of this planned discussion Sabrina Schnack with help from team member Calvin Brink and volunteer Kaitlyn Rangel lead an educational discussion and hike through the trails at cotton park. With very little time to do intense historical research about the area the discussion became very group oriented and ecologically based. They discussed many different aspects of flooding. Sabrina covered the dangers of living in a floodplain informing students that rivers move pointing to the evidence of the former locations of the Vermillion and Missouri Rivers. After providing students with this evidence they then discussed the move of the city of Vermillion. Vermillion used to be on the mouth of the Missouri so that people could run businesses out of it and use it as transportation. We did not get a chance to talk about the railroad or the schoolhouses much because the kids were really entranced with being out in nature and had many questions about the burnt and dead trees, interesting bugs and flowers, and the river. Sabrina also discussed the process of dendrochronology and how scientists can take samples of trees throughout a forest and look at ring width to map out weather patterns over a long period of time. The kids had some great questions about why that was important and they seemed to really grab hold to the concept of trees remembering floods.

Volunteer Kaitlyn Rangel was a great last-minute asset to have. She provided much information about animals that live in dead trees, teaching the kids what everything has a purpose even if it looks useless to us. She also discussed the ecological harms that dams can cause. She emphasized that the students were very lucky to have access to such a vibrant forest area because this part of the river is left free to flow. Sabrina discussed the importance of plants on the river bank to hold soil in place. Calvin followed up with some great information about sediment deposits emphasizing that brown rivers are often healthy rivers. The kids contributed some great information about their trips out to Gavins point dam and the sandbars at Burbank Beach. It really seemed to hit home that those sandbars are only possible where the dam doesn't stop the sediment from moving and they discussed it fervently on the way back to the field. Calvin also spoke about the geologic history of the area, mainly the formation of familiar Niobrara Chalk. The students were amazed to imagine that they place they stood was once inundated by a shallow sea, teeming with oceanic life.

Event Day

History Talk & Geology/River Walk

Event Day

Wetland Ecology & Herpetology Talk

Alexa Kruse used a variety of teaching techniques to effectively communicate the importance of our amphibian and reptile friends and the places (wetlands) where they live. With each of the groups, she began by talking a little about how wetlands are formed, what they provide for us in terms of ecosystem services, and then asked the students what kinds of animals they thought lived wetlands. After some educated guessing from the students, she showed the students a variety of native, live, South Dakota herpetological specimens. These animals will included an American Toad (*Anaxyrus americanus*), a Tiger Salamander (*Ambystoma tigrinum*), an Ornate Box Turtle (*Terapene ornata*), and a Fox Snake (*Lampropeltis pantheropis*). Students had a special hands-on experience with these amphibians and reptiles and were able to ask questions and handle the interesting creatures.

Event Day

Prairie Plants

The Spirit Mound Team planted a variety of native prairie plants in the greenhouse at USD to give to the students at the end of the field trip. Each student received one Butterfly Milkweed to plant at their homes in a Pheasants Forever cup. The greenhouse still has a lot of plants that need to be distributed. Some may be planted at Spirit Mound, the wellness center, and in Dr. Nordyke's yard. See the table on the next page for the total plant numbers. There should be enough plants for all of these proposals.

Plant Totals	
Common Name	**Units**
Aromatic Aster	94
Butterfly Milkweed	603
Button Blazing Star	47
Common Milkweed	63
Dotted Blazing Star	103
New England Aster	291
Panicled Aster	154
Prairie Milkweed	56
Rose Milkweed	22
Silky Aster	249
Smooth Blue Aster	533
Whorled Milkweed	51
Total	**2266**

Event Day

Pollinator Game

Emily Roberson put together a game for the fourth graders to learn about pollinators. The game focused on the which animals are pollinators, the process of pollination, and the role that pollinators play in that process. The idea of the game was for the students to all act as “pollinators” from different hives, and they competed to collect the most “nectar” for their hives in a relay-style race. First, we asked the students what they could already teach each other about pollination and pollinators. Then, the students were split into three groups, or hives. Each hive was given a measuring cup, or “nectar collector,” and only one student from each hive could go out and look for “nectar” at a time. The nectar was in a series of buckets filled with water, and each hive had its own bucket that acted as its hive. After a few minutes, the hives had to stop collecting nectar, and then the amount they collected was measured using a yardstick. At the end, we reflected on what might have happened while they were out collecting nectar. How many of them visited more than one flower? Could they have picked up pollen along the way? Did some plants have more nectar than others?

Overall, the pollinator game went over really well with the fourth graders. The game gave the kids a chance to run around and be pollinators. It also gave them a chance to show us what they already knew and apply that to the game. Lastly, the game allowed them to strategize--the smaller flowers/buckets had less nectar, but they were closer to the hives. It was interesting to see them communicate as a team and tell each other to go to the small flowers first to get more nectar faster. Some teams figured this out right away, but for others it took a few trips to the bigger, farther-away flowers for them to realize the best strategy. Lastly, at the end, we had the kids measure how much water was in each bucket and determine which team had won. I thoroughly enjoyed facilitating this game; it was rewarding to see the kids running around, splashing water all over, and being silly while they were learning about an important natural process!

Event Day

Mudball Station

The mud-ball activity is a hands-on way for the kids to make balls filled with native prairie seeds that they can take home and plant at their own houses. To do this, Cody Sack prepared a mixture of soil, water, and prairie seeds. The soil and and seeds were provided by Mike Stephenson and Pheasants Forever. The seed mix was a mixture between milkweeds asters and other prairie species. Cody had two buckets at his station with this mix. He showed the kids how to make the mudball by pinching off some dirt from the buckets and rolling it in there hands. Then the kids wrote their names on a plastic ziplock bag and placed their mudball in the bag, placed theirs, with their groups, in a spot along the fence line to find it later. After this the kids went and washed their hands. When the kids were done with this, Cody talked to them about the different types of prairie ecosystems (Tall, Mixed, and Shortgrass Prairie) and the types of vegetation that make these similar but yet different ecosystems. One point he made was how much of the prairie was converted to farmland and that prairies can be important to agriculture He talked about the different types of organisms that rely on tallgrass prairies but mainly focused on pheasants because the pheasant is a really important symbol to South Dakota and it was something the kids knew about and gave them something that is considered important to people. It was a fun experience and the kids had a lot of fun learning but mostly playing with mud.

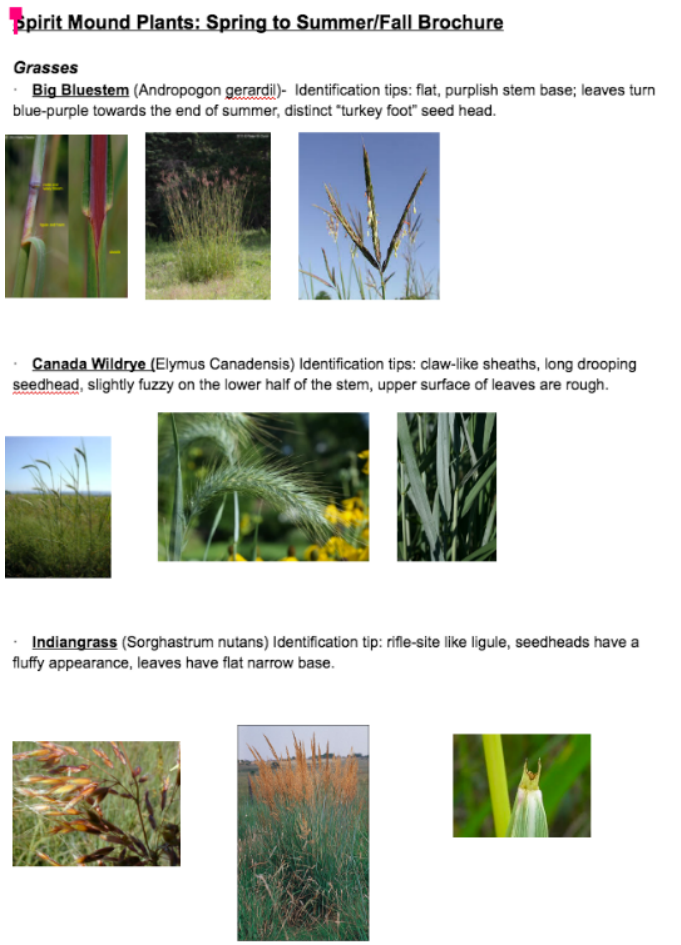
Event Day

Monarch Activity

The Monarch butterfly activity was a station to talk to the kids about the life stages of the Monarch butterfly by incorporating a physical activity to demonstrate each stage. Before they played the game, Sydney talked to the kids about what Monarch butterflies look like, what kind of plants they need to live, and then the life stages of the Monarch butterfly. From the start the kids knew quite a bit about Monarch butterflies so it then become more of a friendly conversation then somewhat of a lecture. The kids established that Monarchs are black and orange and that they feed on milkweeds. They then talked about the life stages; the egg, the caterpillar coming from that egg, the caterpillar forming a chrysalis, and finally the butterfly emerging from that chrysalis. Sydney added in that the eggs are laid onto the milkweed plant as that is the only plant that the caterpillar can eat. The kids were very informed with the development of the Monarch butterfly. Lastly Sydney talked about how the Monarch butterflies migrate long distances like Mexico, Florida, and California when it starts to turn cold. They flock to trees and cover them completely to the point of not even seeing the tree anymore.

Sydney then split the kids up into 3 groups. The groups then sat single file behind each other acting as the “eggs.” The kids then had to “caterpillar” crawl to a blanket where they then “cocooned” themselves and spun around 3 times, and finally these new “butterflies” emerged and ran around a soccer goal (20 yards away) migrating all the way to Mexico and back where they slapped hands with their next teammate who was going to start the cycle all over again. The kids did this relay race 2 to 3 times then Sydney finished up the station by talking to the kids about other pollinators and how they play a role in the pollination of 75% of all the flowering plants on earth. The kids really enjoyed this station as it gave them a chance to compete with each other, run around, and learn about Monarch butterflies.

Brochure Development



Spirit Mound Plants: Spring to Summer/Fall Brochure

Grasses

- **Big Bluestem** (Andropogon gerardii)- Identification tips: flat, purplish stem base; leaves turn blue-purple towards the end of summer, distinct "turkey foot" seed head.

- **Canada Wildrye** (Elymus Canadensis) Identification tips: claw-like sheaths, long drooping seedhead, slightly fuzzy on the lower half of the stem, upper surface of leaves are rough.

- **Indiangrass** (Sorghastrum nutans) Identification tip: rifle-site like ligule, seedheads have a fluffy appearance, leaves have flat narrow base.

Finally, even though we ultimately ended up at Cotton Park, we still wanted to give something to Spirit Mound. Sydney volunteered to be in charge of creating a brochure that would be placed at Spirit Mound to showcase what a person would see during each season. Sydney started off by finding out what plants were at Spirit Mound; she did this by going on to the Spirit Mound website and writing down the list of plants they supplied. From there she used trusted websites like those connected to Universities or ones sponsored by the Government to find descriptions and pictures. Sydney wanted to have the brochure done at the beginning of April as Alexa was going to design the brochure and then take the information and pictures Sydney found and put it into the brochure for the final product. Sydney is currently in the process of finishing up finding the information and pictures and will be sending it to Alexa within the week. This brochure will help visitors at Spirit Mound find and identify plants while walking up the mound. Falling behind the due date came from synergistic projects that Sydney fell behind on due to technology problems. The ultimate goal is to have a brochure made, regardless if school is out for the summer or not.

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