STEM Bio/Biotech Field Study

Ecology Site Study
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2/3 period STEM Biology/Biotech

Objective: Our main objective is to pick an average sized wildlife site in our local forest to study and collect data on the physical and biological changes of our chosen site.

Site Description: The site I chose to study is a small river bed with a small river running through it. This site is shaded about 70% throughout the day due to towering trees over the site. Some deer visit this site for water and most of the animal populations are small insects such as crickets, beetles, mosquitoes and fish in the river. This site smells like oak wood or a nice deep forest smell; the only sounds present at this site are cricket sounds and water running through the creek.

Site Prediction: I predict within the next 5-6 weeks that there might be more plant growth on the river bed, there could be a change in the river width and depth depending on the amount of water running through the river, I also predict within 6 weeks that the angle of the sun will change during this time so I predict to see different shade patterns. I will constantly be watching the water level and observing the plant growth. I will also observe the shade patterns to observe a change in what plants now get shaded.

Geographical Map of Site
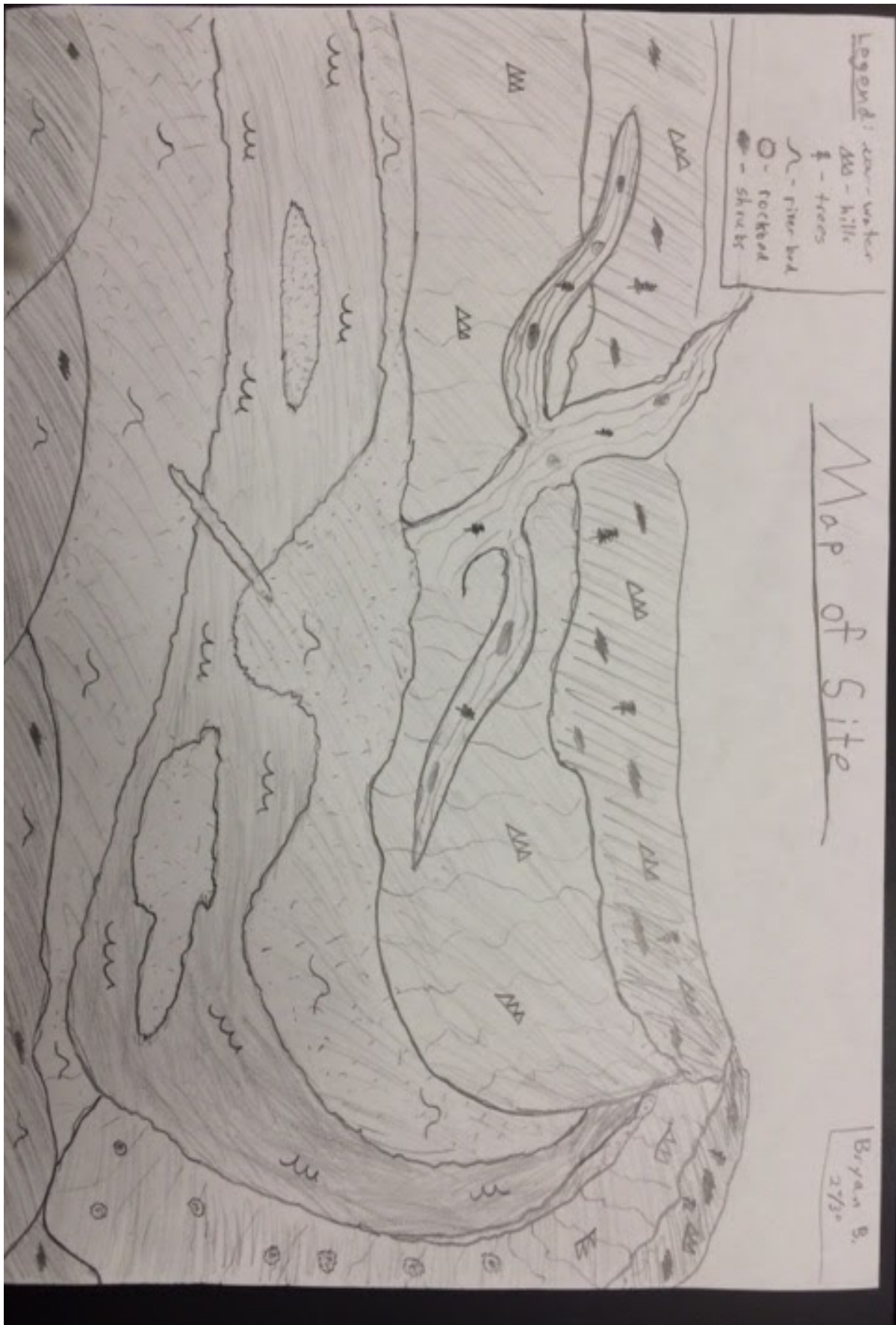
<u>Site Pictures</u>(Week 1-3)

This is the picture of the river bed with the creek running through it.

Beside the river bed is a 7 foot cliff wall that leads to other flat land. This wall extends 7 feet up and is filled with roots from nearby trees.

Here is a more clear view of the layout of the river.

This picture is showing the other side of the river. This part contains most of the wildlife plants and some animals; most of the animals are found down by the river but the plants are mostly here is this site.

Here is the river bed by the creek. While the creek is only about 6 feet across, the river bed extends 14 from where this picture was taken to the creek. Deer and raccoons are known to visit this site for water or shade.

Site Pictures(Week 4-5)

In the week these photos were taken, The sun has been blocked out for most of the day by a fog bank, so no plants or trees have been getting the same amount of sunlight as before.

The creek width has been getting smaller, and the water flow has slowed.

More have been collecting at the bottom of the creek rapids, causing a blockage in water flow.

Site Pictures(Final Week)

The creek speed has increased since last week. The creek is flowing smoothly.

The creek depth and width has stayed the same.

Debris has started to collect at the bottom of the creek rapids causing the creek to form a big body of water at one end.

Site Data Collections

Biotic Data:
- Percent of plant coverage: 85%
        - most of the plants in this site are tall grass, poison oak, 2 foot tall weeds, and towering oak trees up to 40 feet high.

- Types of animals: Animals such as deer and raccoons visit the river for water. Other animals such as dogs and horses are seen being rode or walked on the nearby trail next to the river bed.

- Types of small insects: Mosquitoes are present in this site along with small clusters of flying insects. Crickets, beetles, and spiders are found under rocks or at bases of trees.

- Percentage of leaves: Approximately 90% of leaves. Most of this site is shaded by the tall oak trees. Most of the leaves are found on the trees but some leaves are on the poison oak and weeds.

Abiotic Data:
- Depth of creek water: Approximately 1 foot in most places. Depths can be between 5 inches to about 2 feet in depth.

- Average day and evening temperatures: Since this site is shaded most of the time, the daily temperature doesn't change much. During the summer, Temperatures can reach up to about 90 degrees F. in this site while in the winter temperatures can drop to about 50 degrees F. On an average summer morning, the temperature can be around 45 degrees F., then heat up to about 65-70 degrees F. The average winter temperatures can be 41 degrees F. in the morning then can reach up to 65 degrees F. in the day.

- Average Rainfall: winter (November-March) - average of 32.15 inches.

- Average length of day- In the summer, the average day is about 15 hours. In the winter, the average day is about 10 hours.

Site Data Table
The data collected every week from the site study is seen below.

Measurement	Intro-week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Plant 1 - height	2.5 ft.	2.7 ft.	3 ft.	3 ft.	3.5 ft.	4 ft.
Plant 2 - height	35 ft.	35 ft.	35 ft.	35 ft.	35 ft.	35 ft.
Tree 1 - % of leaf coverage	85%	85%	85%	85%	85%	85%
% of spiky weed coverage area	10%	15%	25%	20%	20%	20%
Estimation of flying insect seen	20%	25%	25%	25%	20%	15%
Average # of worms under a rock	2 worms	3 worms	3 worms	2 worms	2 worms	1 worm
Average # number of spiders seen	7 spiders seen	5 spiders seen	5 spiders seen	3 spiders seen	3 spiders	4 spiders seen
# of deer footprints	8 deer footprints	5 deer footprints	no new footprints	4-5 new footprints	no new footprints	2 new footprints
# of raccoon footprint	4 raccoon footprints	4 raccoon footprints	6 raccoon footprints	3 raccoon footprints	4 raccoon footprints	3 raccoon footprints
Width of creek	Average 6 feet	Average 6 feet	Average 5 feet	Average 5 feet	Average 4 feet	Average 4 feet
Speed of creek	Average 5-8 mph	Average 5-8 mph	Average 5-8 mph	Average 3-4 mph	Average 3 mph	Average 5 mph
Average day temperature	65-70 degrees F	62-71 degrees F	61-65 degrees F	55-61 degrees F	51-57 degrees F	56-61 degrees F
Average night temperature	40-45 degrees F	40-45 degrees F	40-44 degrees F	38-43 degrees F	37-43 degrees F	39-43 degrees F
Average Rainfall	Winter-32.15 in.	Winter-32.15 in.	Winter-32.15 in.	Winter-32.15 in.	Winter-32.15 in.	Winter-32.15 in.
Average length of day	13.5 hours	14 hours	14.5 hours	15 hours	15 hours	15 hours

Weekly Focus Questions

Week 1

1. What California biome is your area?
   - Tropical dry forest.
2. What type of relationships do you see between organisms in your area?
   - Trees and bigger plants provide shade for other animals, animals eat off of the plants leaves.
3. Describe a food chain in your area?
   - Insects eat plants, rats eat insects, and raccoons eats rats.

Week 2

1. What is man's impact in your area?
   - Humans impact this area by throwing trash in this environment and the horse ranch's exhaust from the tractor right next to the park pollutes the air.
2. What are limiting factors in your area for plants and animals?
   - Most plants on the ground get less shade due to towering trees, animals in this area don't get direct sunlight. Since there is shade, not much leafy plants grow here.

Week 3

1. Why are bacteria important for plants in your area?
   - Bacteria provides a good source of nutrients for the plants to grow
2. Where in your site is fungi found? Why is it important?
   - Fungi in my site is found on the ends of big shrubs and bushes
   - Fungi acts as a major decomposer that contributes to the carbon cycle
3. Do you have any role in your area?
   - Technically no we don't have a role, our goal is to observe and collect data
   - Nature is at its best when it is left alone

Week 4

1. Research the invertebrates in your area.
   - Mainly earthworms, beetles, small insects, and flies.
2. What is their role?
   - The main role of these invertebrates in this area is for decomposing biotic matter in our area. The waste product is used for a substantial source of nutrients for plants and animals.
3. Where are they found?
   - Beetles are found near tree stumps and under rocks, worms are underneath rocks near the river bed, and flies fly around in clusters.

Week 5

1. Identify any bryophytes, seedless vascular plants, gymnosperms, or angiosperms that are in your area.
- Vascular seedless- shrub/fern growing along the river bed, some have thorns and pricks.
- Gymnosperms- about 1 or 2 cone flowers growing up by the rock wall by some tree stumps, bright pink and yellow flowers.
- Angiosperms- Bright purple and red growing near some weeds, about 2 feet high in height.
- Bryophytes- Moss is growing all over the bases of big trees. greenish color.

2. For each, explain why you classified the plants the way you did.
- I went into my area to collect week 5 data. This weeks data was about our plant classification and how many plants are in my area. My area is near a creek, a lot of life and sunlight hit these areas. A lot of the flowers were up near some shrubs and up on the rock bed or dirt wall. Most of the moss was growing on trees at the bases. Up on the river bed, there is a weed sections that contains flowers weeds and spiky plants, the flowers growing there are pedal flowers that are very colorful, these flowers are classified as angiosperms.

Week 6

1. What are the essential nutrients needed in soil?
- Just to name a few that are found in my site: nitrogen, zinc, hydrogen, oxygen, iron, and potassium.

2. Explain different methods of pollination in your area?
- Bees come along and distribute pollen from one plant to another. Wind can blow pollen around the area as well. Animals can carry seeds and distribute them to be fertilized to grow.

3. What are some adaptations plants have in your area?
- Small plants that need sunlight grow in sun patched areas because the big towering trees block most of the sun in my area. Plants that need more water are growing along the river bed to retrieve more water through the soil.
- Poison oak is found in my area. Poison oak has an oil-like substance on the leaves that when it makes contact human skin and other skin, it causes an outbreak in rashes. The main reason poison oak has this protection is to help the plant to not be eaten all the time by other living organisms.

Analysis/Conclusion

Analysis:

      We have been working on this project for about 6 weeks. This last data input is our final data for this project. From the Introduction of this site, 6 weeks ago, my site was a small river bed with a the Novato creek flowing through it. Over the course of 6 weeks, a lot has changed. Firstly, The creek in the beginning was about 6 feet across in most areas and was at an average speed of 8-9 mph. Within the last couple weeks, the creek width is now about 4 feet across and the speed has slowed greatly. This concludes that there is not enough water flowing through the Novato creek. This can affect the plants around the creek. If the water supply is slowly decreasing, then the plants aren't going to be receiving the right amount of water they need to grow steadily and healthy.

      Other biotic changes include the plant coverage. I have been observing a spiky weed plant over the course of these 6 weeks. The plant has grown from about 2 feet in the beginning to now about 4.5 feet tall. This observation shows that the plant is receiving the right amount of nutrients in the soil to allow it to grow healthy and fast. I've been watching a small purple flower over the course of the 6 weeks. I saw this flower when it first was a bulb about to bloom in the first couple weeks. Now the flower is a very bright purple and is fully bloomed. Biotic factors such as animal population and plant coverage has changed over the course of 6 weeks. In the first few weeks, many deer and and raccoons have visited my site and I could see visible evidence of footprints along the riverbed. More flying insects have populated the area as well. Any abiotic factors such as water supply and temperature could affect these plants. Since the creek doesn't have much water flowing through it, some of the plants along the riverbed have less water supply. If the water supply keeps decreasing at its steady rate, the plants along the riverbed could soon die. While performing other labs in

school, I have learned how to supply nutrients and take care of small plants in my area. For example, to keep a delicate flower from dying, the flower must be water on a daily basis and supplied the right amount of nutrients to keep the plant growing healthy.

From this field study, I have learned much information and lessons about nature and how we affect our environment. I have learned that everything in an environment affect each other. For example, if a water supply is low, than the plants surrounding the water won't be receiving as much water as those plants need or if a huge tree is blocking a small plant that needs sunlight, that small plant might die due to lack of vitamin D from the sun. Everything in an environment affects each other because it is all part of an ecosystem. A system only works if it works together.

Conclusion: Originally, our main objective of this project is to pick a site in nature; then collect and study the data from the site. The data included any biotic or abiotic factors within the site and observe the physical changes done to the site within the course of 6 weeks. My prediction for my site was to originally see more plant growth based on the water level increasing and the temperature slowly increasing. Instead, over the course of 6 weeks, the water level slowly decreased. For the middle 2 weeks, it was cloudy in the morning and then the sky cleared up around 12 pm. For the last 2 weeks, it has been sunny with nice weather. My final thoughts on this project are high. I liked doing this project because I learned a lot about ecology and nature and how we interact with our community and environment.

Opinion: My favorite part of this project is getting the chance to get outside and enjoy the forest. While i was collecting data, I had the chance to just sit back and relax to the calming sound of the creek and birds. This is truly a wonderful experience. By far, this is one of my favorite projects from the STEM program.