Digital Representations of Food Chains in Sudbury Forests during Winter Months

Digital Resource Created: https://jeannettemills.wixsite.com/my-site

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Grade 4*:* Habitats and Communities
Curriculum Strand: Understanding Life Systems: Habitats and Communities
Topic: Forest Ecosystem Changes during the Winter Months
Guiding Question: How do food chains and the roles of organisms change in the winter?

Big Ideas:

1. Plants and animals are interdependent and are adapted to meet their needs from the resources available in their particular habitats. (Overall expectations 1, 2, and 3)
2. Changes to habitats (whether caused by natural or human means) can affect plants and animals and the relationships between them. (Overall expectations 2 and 3)

Overall Expectations
1. Investigate the interdependence of plants and animals within specific habitats and communities.
2. Demonstrate an understanding of habitats and communities and the relationships among the plants and animals that live in them.

Specific Expectations
2.2 Build food chains consisting of different plants and animals, including humans
3.2 demonstrate an understanding of food chains as systems in which energy from the sun is transferred to producers (plants) and then to consumers (animals)
3.3 identify factors (e.g., availability of water or food, amount of light, type of weather) that affect the ability of plants and animals to survive in a specific habitat
3.6 identify animals that are carnivores, herbivores, or omnivores
3.7 describe structural adaptations that allow plants and animals to survive in specific habitats

Digital Project Overview

For my Habitats and Communities Unit culminating project, I created a digital model of the Sudbury forest ecosystem in the winter months. Often, when grade 4 students explore interdependence of organisms and their adaptation to their habitats for the Habitats and Communities unit, they are not challenged to consider how these food systems may change when

habitats change from season to season. In my project, I used the organisms found on the "Forests of Greater Sudbury" web resource to create my own food chain web, using a digital, hypertextual format. This involved researching how the organisms listed on the "Forests of Greater Sudbury" application adapt and change during the winter months when their habitats and food sources change, and using appropriate information and images to create food chains and a food web. Each animal is classified as herbivore, omnivore, carnivore, or decomposer, and how they receive energy is also indicated (i.e., producer, consumer and decomposer). A brief description of the significant characteristics or behaviours they adopt during winter is provided. The web resource were designed to answer the following question: How do food chains and the roles of organisms change in the winter?

My Process and Procedures

I will provide a detailed, chronological breakdown of the process I took while developing and completing this project. There were two main phases to this project: the research phase, and the creating phase. Each phase will include screenshots, diagrams and photos to illustrate this process.

Phase 1: The Research Phase

I began my project knowing broadly that I wanted to create some kind of digital representation of northern Ontario food chains and web during winter. As I would ask any student doing an inquiry or design project, I had to think of what specific region I wanted to cover. I first decided to narrow my scope to northern Ontario Boreal forests, but I had trouble choosing which organisms I should include in my project. Using a resource that I had seen during the first round of science microteaching presentations, I decided to narrow my scope to Sudbury forest animals,

in order to make the project connect to my lived experiences. The “Forests in Sudbury” resource not only provided a culled list of organisms in a specific, familiar area to focus on, but also gave me an example of the kind of layout I could use for my final product (Figure 1).

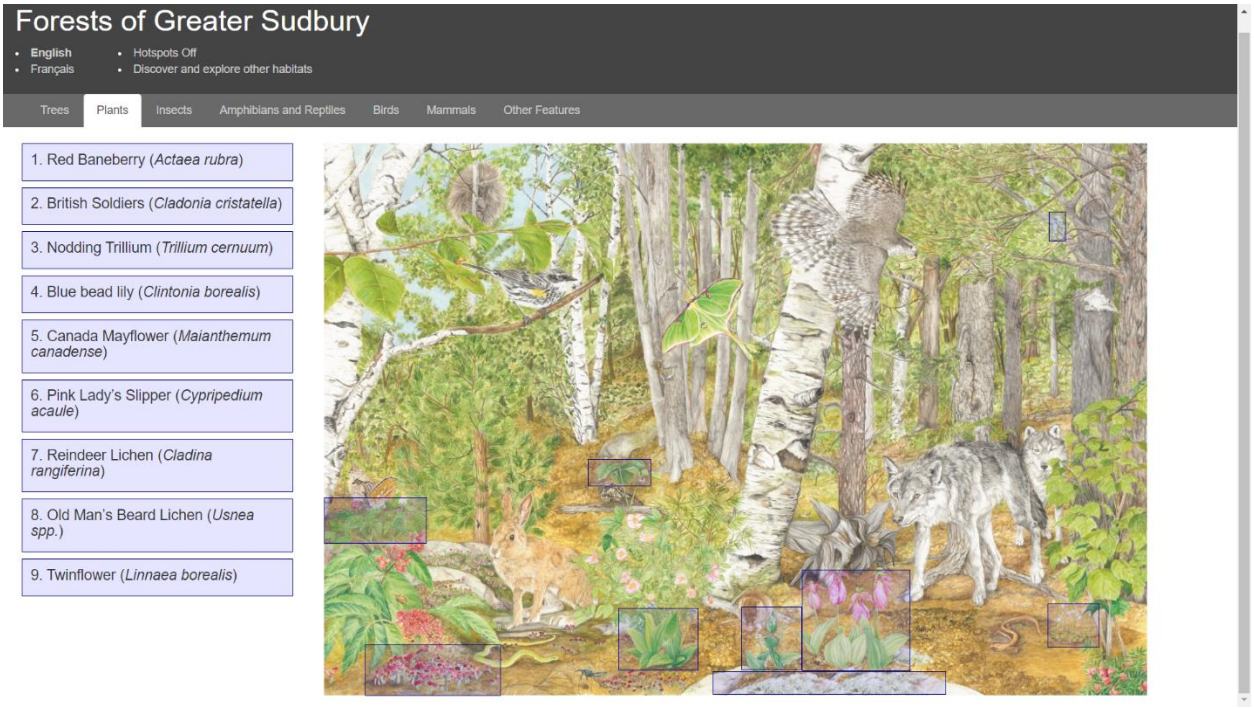

Figure 1: A Screenshot of the Forests of Sudbury Web Application.

The application allows users to browse through the different classifications of organisms, with blue boxes appearing depending on which classification the user has chosen. In Figure 1, the classification chosen is “Plants”, and users may click on the blue boxes of plants in the image to learn more about their function in the forest ecosystem.

While I knew my own project would most likely not be as elaborate, this gave me a good basis for my research and potential final product. I created a Google document to record the different organisms listed in each classification on the web application, and began collecting information about each organism’s predators, diet and winter habits (see Figure 2). I started using

information from this resource, and branched out to other sources, as needed. I also ensured that humans were included on this list, as they were not included on the original "Forests in Sudbury" resource.

Organism	**Classification**	**Energy Type (Producer, Consumer, Decomposer: Herbivore, Carnivore, Omnivore if animal)**	**Diet**	**Predators (those that consume it)**	**Winter Habits/Other Relevant Information**
Red pine	Plant (tree)	Producer	N/A	Seeds: eaten by pine siskins, crossbills, other songbirds, chipmunks, voles	Coniferous; maintains needles and seeds in winter
Red-Berried Elder	Plant (shrub)	Producer	N/A	N/A (all parts are poisonous)	Loses leaves in winter
Prickly Wild Rose	Plant (tree/bush)	Producer	N/A	Rose hips can be crushed by humans for jellies and teas (good source Vitamin C)	Will lose flowers and leaves
Striped Maple	Plant (tree)	Producer	N/A	"provides food in the form of bark and keys (winged seeds) for many species, including beaver, deer, many songbirds, and small mammals. Moose like to eat this tree so much that it is known	Deciduous; leaves in winter Note: "The green stripes on young bark allow it to photosynthesize better in the shade, even before the leaves appear in spring" (F of S)

Figure 2: A section of the chart tracking information for all of the organisms listed on the "Forests of Sudbury" web application.

Part 2: The Creating Phase

After completing the chart with my research, I began choosing which organisms I wished to include in my project, and writing them in bubbles on a piece of paper (Figure 3). I decided to focus on any organisms that were present during the winter, especially those that had unique

adaptations for the winter months. Since I was creating winter food chains, I did not include organisms that had no bearing or nothing noteworthy about them in terms of their influence on the winter food chains.

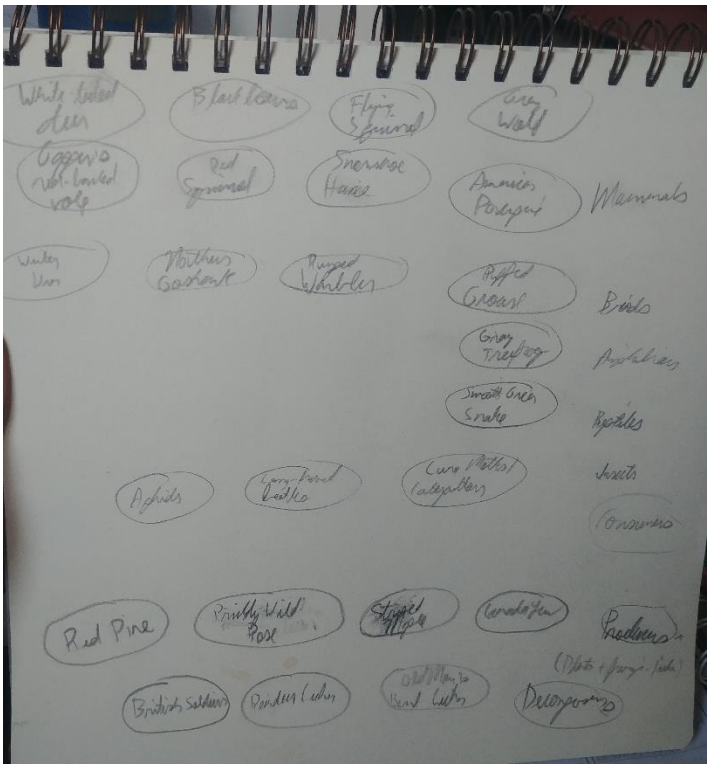

Figure 3: Roster of organisms to potentially be used for the final product.

This process took quite a long time, between compiling the relevant data, organizing the animals, and figuring out how these animals were all connected to each other. Ultimately, I decided to use 15 of the original organisms for my site: red pine, striped maple, prickly rose, British soldier lichen, Old Man's Beard lichen, long-horned beetles, Luna moths/larvae, smooth green snake, gray treefrog, ruffed grouse, chickadee, Gapper's red-backed vole, snowshoe hare, grey wolf, and the flying squirrel.

The format I chose for my project was a Wix website, since using a website would allow me to display various connections between organisms using different lists and links. Since this is a

digital project that could easily be changed and edited if I made a mistake, and I had all the data I needed, I decided to jump directly in to formatting and designing my project. One problem that I had with food chains as representations of the transfer of energy from organism to organism is that they are very simplistic. Students, when presented with food chains, start to only think of these chains as linear, with little to no overlap with other food chains. By using a website, I could classify organisms, and use links to other organisms to show their many connections to other creatures. When clicking through and exploring the links from creature to creature, it becomes clearer that food chains are multi-faceted, non-linear systems, than if I were to use a more conventional, chain-link model. It would also allow me to show which types of organisms are removed from the food chains in the winter due to migration or hibernation.

I started by creating pages for the general classifications of organisms: Plants, Fungi and Lichen, Insects, Reptiles and Amphibians, Birds, and Mammals (see Figure 4). Humans were to be put under “Mammals”, to demonstrate how humans are not separate beings from other organisms. I then created an entry for each organism under the appropriate category, which included a picture of the organism, their diet with appropriate link to other organisms on the website, what they fall prey to or are ultimately consumed by with appropriate links to other organisms, and whether they are a consumer (herbivore, carnivore, omnivore, insectivore), producer or decomposer.

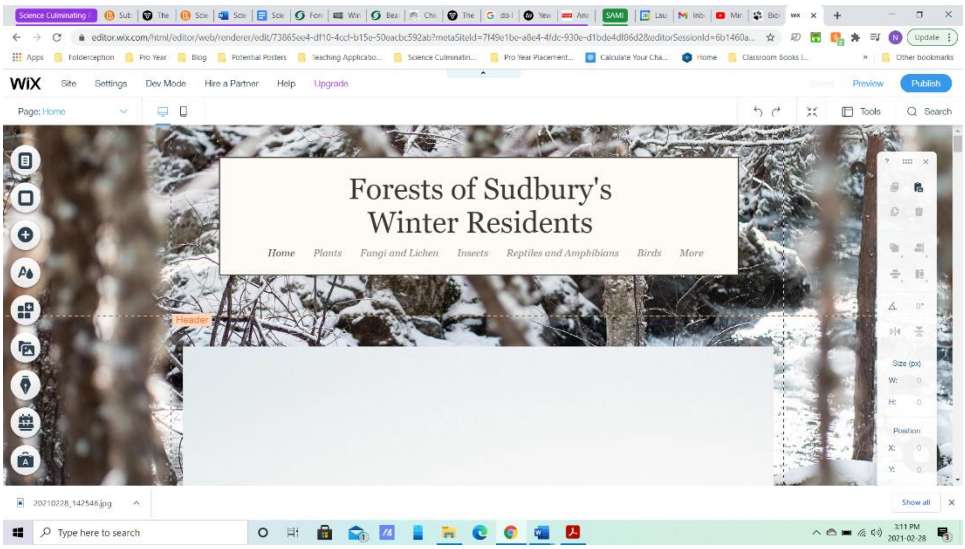

Figure 4: Beginning categories for the project.

I then began adding each organism under the correct category, each with a short description, a list of which organisms on the website it eats, and which organisms on the website eat it, or part of it, during the winter months (see Figure 5).

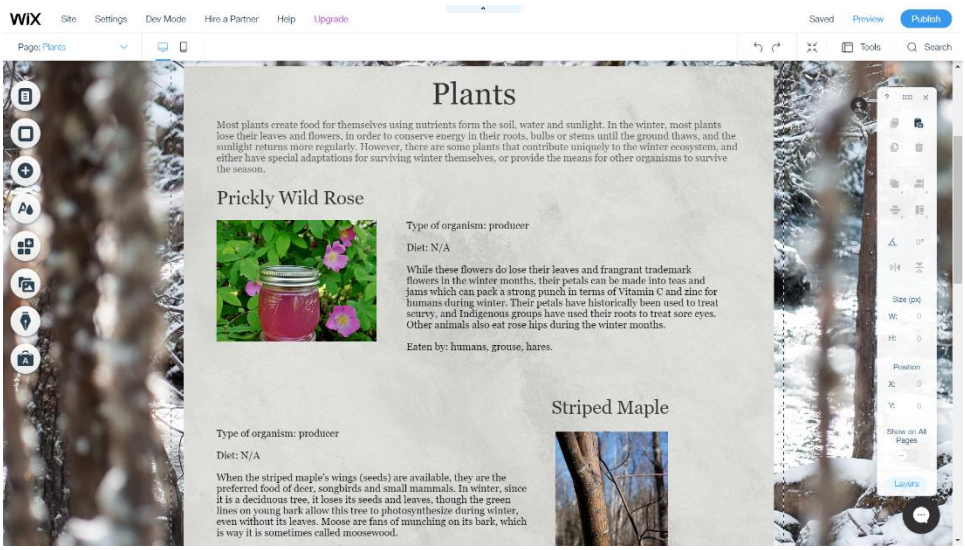

Figure 5: An example of the plant category, with each organism having a picture, short description, who it eats, and who eats it (for plants, I put N/A for who it eats).

I only included information pertaining to winter predators/prey, and I tried to keep the prey/predators I listed to those who were a part of my 15 organisms featured on the site.

After completing the entry for each animal and each category, I began adding links for each organism's listed predators and prey. I created anchors for each organism, then linked each time they appeared as some other organism's predator or prey to their anchor (see Figure 6). This way, I could have multiple organisms on one page, and still directly go to them when clicking on their name from another organism's entry.

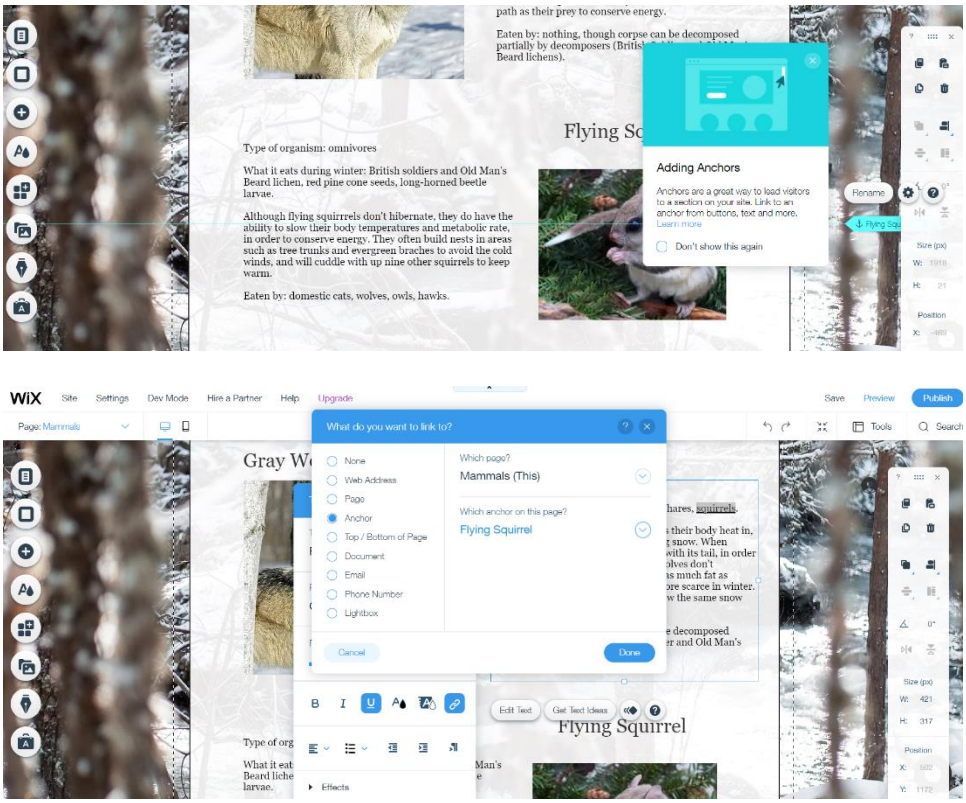

Figure 6: Creating an anchor on flying squirrel, and connecting it to the gray wolf as one of its prey.

Finally, I created an introductory video for the "Home" page of my website, explaining how to navigate my project, and why I chose a website format to represent food chains.

Ideas for digital food chain and food web projects for students

The nice part about this format is that it incorporates much of the science content directly into the website, as I was able to provide short descriptions for each organism, explaining what adaptations they have that help them survive winter. This would work as a good exemplar for any digital food chain projects for students, and also, as a way of expanding student thinking of how food chains change during the winter months. While I will be thorough with my documentation and explanations, if implementing a similar project in the classroom, I would not expect a students' individual work to be as elaborate, especially at the elementary level. I do, however, believe most students would be capable of creating a digital representation of a food chain, and would be able to complete the main steps that I have undertaken, if scaffolded towards and put in student-friendly language.

Possibilities of Math Integration

In terms of integrating math into this project, students could use their coding knowledge from their experiences with Scratch to create food web and food chain projects as a way to incorporate math into this assignment. I did not be using Scratch for this model, but it is a possibility I could explore in the future.

Answer the question "How do these food chains and organisms change when their habitats change in the winter?"

Through my research, I found that winter eliminates most reptiles, amphibians and insects from the food chain, due to the cold. To adapt, many of the birds and mammals who would feed on these organisms begin to either feed on larvae of insects hiding in wood, or focus more on eating tree or lichen-based sources of food, such as pinecone seeds or tree buds. The diets of carnivores, such as gray wolves, do not change much, since its prey were available all year round. I was very

surprised that lichen was able to survive winter, and that it was a key winter food source for some organisms, such as flying squirrels.

I also found that many animals shared similar types of adaptations to survive winter. All of these adaptations involved either keeping warm or limiting energy expenditure, since food for all organisms was scarcer in the wintertime. These adaptations often included having thick coats of fur or feathers, finding places to hide, sharing body heat with other organisms of its kind, or storing food in hiding places or in terms of body fat. The limitations and severing of food chains due to the migration and hibernation of many organisms caused all active, remaining organisms to aim to survive the winter until those food sources returned in the spring.

References

Forest Ecosystems in the Winter Months website link: https://jeannettemills.wixsite.com/my-site.

Forests of Greater Sudbury: https://www.greatersudbury.ca/webapps/eLearning/forest.html

Research Notes:

https://docs.google.com/document/d/1F2r2hyMkfKgDEpA4qsXNHfvtcomHKaQUCtaJ2Ww7aS0/edit?usp=sharing.

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