2016

Field Ecology Curriculum on White Tail Deer Population in Maine

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Project Outline & Syllabus:

We will be beginning the Spring 2016 Field Ecology course with a three-week interdisciplinary project. You will assume the identity of a Special Interest Group member and have the task of crafting a report to present at the upcoming Maine Deer Mitigation meeting with the local government. Your goal is to inform the audience about your group's plan for managing the White Tail Deer population in Maine.

Over the course of the project we will learn about an array of important ecological concepts that help scientists make decisions and solve problems, including: biogeochemical cycles, biome formation, succession, niche theory, interrelationships, and carrying capacity. The final presentation will summarize how each group has used the concepts and analyzed the available data and information to make a decision about the best way to manage the population of deer here in Maine.

Essential Question:
How do scientists use ecological data to make decisions about populations and ecosystems?

Guiding Questions:

1. How do matter and energy flow through physical and biological systems?
2. How are species interdependent and interrelated?
3. How do populations respond to positive and negative inputs?
4. How do ecosystems respond to positive and negative inputs?

Grading:

- Your work is expected to be completed and turned in when it is due. If you are not finished with your assignment, make a copy of the work and turn in what you have. You must turn in SOMETHING, even if it is a blank page.
- All formative assessments (projects, worksheets, classwork, quizzes, etc) will be given feedback and recorded in **IC** as T(turned in, completed on time and done well) or M(not completed or missing).
- In order to revise *ANY* assessment *ALL* prior homework assignments must be completed before revisions can be attempted.
- Lets look at the Habits of Work rubric. You also must be ON TARGET to revise and/or for extra time.

Project Outline:

Topic:	**Target:**	**Mini Project:**
Biogeochemical cycles	I can illustrate the flow of matter through biological and physical systems.	Group biogeochemical cycle drawing Energy flow quiz
Biome formation	I can compare and contrast Earth's major biomes.	Biome slide
Succession	I can construct and illustration of the patterns of succession.	Succession timeline
Niche Theory	I can determine and describe the niche of a given species.	Niche worksheet
Interrelationships	I can model the interrelationships and energy flow within an ecosystem.	Food web bulletin board Interrelationship quiz
Carrying capacity	I can estimate the carrying capacity for a given species in a given area.	Carrying capacity worksheet
Final project	I can integrate and evaluate multiple sources of information to solve a problem.	Interview an expert Final Presentation

A Note about Notebooks: Your Science Notebooks will be crucial to the completion of this project. We will have time to record new concepts, evidence and reflections each day. This notebook should include both content knowledge and complex thinking and reasoning as you connect and build upon the concepts.

Curriculum Map

Essential question: How do scientists use ecological data to make decisions about populations and ecosystems?

Guiding questions:

1. How do matter and energy flow through biological and physical systems?
2. How are species interdependent and interrelated?
3. How do populations respond to positive and negative inputs?
4. How do ecosystems respond to positive and negative inputs?

Goal:	Outcome:	Pre-knowledge:	Content Knowledge:	Complex Skill:	Assessment:	
					knowledge	skill
B.A. Planetary Systems: Local Ecology	Students will explain and demonstrate the flow of matter and energy in major biologic and physical processes	- basic vocabulary	- biogeochemical processes - biome formation - abiotic and biotic factors - niche theory - interrelationships - food webs - energy flow (rule of 10)	- diagram matter/energy cycles - compare the biomes - explain the niches of given organisms - explain the flow of energy through an ecosystem	- vocab. quiz - worksheets - conference	- notebook - presentation
B.A. Planetary Systems: Biome Formation	Students will use understanding of the interaction between major Earth systems to explain an aspect of local ecology.	- basic vocabulary	- succession - carrying capacity - maps and data vocabulary	- create a time line of succession - estimate the carrying capacity for a species - predict the future using raw data - analyze maps	- vocab. quiz - worksheets - conference	- notebook - presentation
CCSS: ELA LITERACY.RST.11-12.7	Students will integrate and evaluate multiple sources of information presented in diverse formats and media	- reading skills - experience using different sources of information	- the components of a “reliable source” - note taking method	- evaluate different types of sources - integrate multiple sources of data to solve a problem - complex thinking and problem solving	- conference	- notebook - presentation

	(e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.					
ME Guiding Principle: E: Responsible and Involved Citizen	Students will understand the interdependence within and across systems and bring to each situation the appropriate actions.	- social norms - research skills	- class expectations - project expectations	- participates positively - accepts responsibility - use ethical behavior - respect diversity - global and local awareness	- observation - conference	- group contract - group assessment - self assessment

Assessment Plan:

Standard:	Learning Objective:	Pre Assessment:	Formative Assessment:	Summative Assessment:	Reflection:
Planetary Systems: Local Ecology	Niche Theory	Pre Assessment Quiz (Day 1)	Niche Worksheet (written response)	Science Notebook (Independent) Final Presentation (Group)	The pre-assessment and post-assessment were the most critical components of understanding student growth and learning. The niche worksheet was successful in that students enjoyed the activity and found really great information - this one exceeded my expectations! The succession timelines were also well done and accurately showed student understanding of the learning target. The carrying capacity worksheet was important for the final presenations and while student's answers for what carrying capacity for whitetail deer in ME varried, their answers as to how they got there were well crafted and I was able to see they understood the ideas behind carrying capacity. The biogeochemical cycle drawings are great! They are in the student work section and are also going to be displayed at a Baxter Academy art show! The drawings helped students understand and express the interconnected nature of ecosystems and nutrients. Photos of the food web are also in the folder - this was one of the best activities. Students were incredibly
	Succession		Succession Timeline (performance assessment)		
	Carrying capacity		Carrying Capacity Worksheet (written response)		
Planetary Systems: Biome Ecology	Biogeochemical		Drawing (written response)		
	Biomes		Biome slide (written response)		
	Interrelationships / Food webs		Contribution to bulletin board (personal communication) Exit slip (selected response)		
	Energy flow		Contribution to bulletin board Exit slip (selected response)		
ELA CCSS 1:	Evaluate information and data	Observation	Notebook check-in Teacher conference	Science Notebook (Independent) Final Presentation (Group)	
	Integrate information to solve a problem				
ME Guiding Principle:	Meet criteria for Responsible and Involved Citizen	Group Contract	Group conference Teacher conference (Interpersonal Communication)	Self-Evaluation Group-Evaluation	

					engaged and enjoyed talking about their organisms, and we've continually referenced the web on the wall while continuing the unit! The exit slips were useful formative assessments in that they directly asked students to apply the content to the learning target. If students were able to answer the exit slip, I knew that they had met that day's target. The notebook was the independent summative assessment and was so important for my understanding of student knowledge. It's definitely something I'll use in my class in the future. The presentations were extremely well crafted and I can confidently say that students were able to apply the ecology content knowledge to solving a real world problem. I am happy with my assessment system and have plenty of data on each individual student to make accurate judgement calls on their progress towards the standards.

Maine Deer Mitigation Project: Final Presentation

Each group will have fifteen minutes to present their proposal at the Maine Deer Mitigation Meeting. Remember, you are designing your presentation for an audience that hasn't been in this class. Present the information we have learned and apply it to your group's solution to deer management in Maine.

Use the following rubric to plan your presentation:

	Below Target	On Target	Above Target
Content:	The team is unable to: - describe biochemical and limiting factors - explain interrelationships - explain succession - explain changes in the local area - make a recommendation that aligns with the group you represent - cite most sources correctly	The team is able to: - describe biochemical and limiting factors - explain interrelationships - explain succession - explain changes in the local area - make a recommendation that aligns with the group you represent - cite most sources correctly	The team is able to meet all on-target requirements AND: - relate the concepts to information not learned in class - relate the information to other content areas - describe global applications for the content
Evidence:	The team does not: - consult experts to gather information - use spreadsheets and graphs to organize data - incorporate maps and visuals to explain research	The team: - consults experts to gather information - uses spreadsheets and graphs to organize data - incorporates maps and visuals to explain research	The team meets all on-target requirements AND: - gathers evidence from multiple experts - creates an authentic map or visual to explain research
Group Work:	Some team members: - contribute to presentation - respond to questions from audience	All team members: - contribute to presentation - respond to questions from the audience	In addition to meeting all on-target requirements, team members are able to reflect on the challenges they faced and solutions they used in their group.

Science Notebook

Table of Contents:

Product Descriptor

Learning Target: I can integrate and evaluate multiple sources of information.

Instructions:

This notebook will be your individual summative assessment. Keep it organized and easy to read by updating the table of contents daily. We will have time in class each day to add to these notebooks.

Each topic should include:

- essential vocabulary
- new concepts learned in class
- daily "connections" - relate the material to other concepts, explain your thinking.

I will check-in and comment as we go to help clear up misconceptions and give you feedback on your progress. We will also have one mid-project check-in.

Rubric

	Below Target	On Target	Above Target
Content:	Does not include: - all "master" vocabulary terms - daily notes from class - notes from interview	Includes: - all "master" vocabulary terms - daily notes from class - notes from interview	Includes all On Target requirements AND: - additional vocabulary words - any "extension" work
Complex thinking:	Does not include: - daily "connection" log - connect concepts to other scientific concepts - connect concepts to local and global issues - ask questions, make comments and otherwise share your complex thinking process	Includes: - daily "connection" log - connect concepts to other scientific concepts - connect concepts to local and global issues - ask questions, make comments and otherwise share your complex thinking process	Includes all On Target requirements AND: - connect concepts across disciplines or content areas - connect concepts to solving local and global problems
Reflection:	Does not include: - Goal setting - Check-in Reflection - Final Reflection	Includes: - Goal setting - Check-in Reflection - Final Reflection	Includes all On Target requirements AND: - frequent personal reflections - more goals than required

Individual Goals:

1. Explain this project - what is expected of you?
    a. Turn in work
    b. Finish work
    c. Do work
    d. Don't get distracted
    e. Be on task
    f. Behave
    g.

2. Set 2 goals for yourself. Your goals should be specific and measureable. How will you know if you meet your goals?
    a. Turn in work, same as below make sure its finished and professional
    b. Do work, remind myself that there is homework, check classroom

Mid-Project Check-In:

Each person will sign up to conference with a teacher for a few minutes. We will discuss your progress towards your individual goals and your learning in this class. In preparation for the meeting, answer the following questions:

1. Are you meeting your goals? How do you know?

2. What is your self HOW rating? Attach the rubric you filled out.

3. What assignments are you missing? What assignments are you still waiting for feedback on?

After the meeting, answer the following questions:

1. Are you on-target in this class in regards to the academic standards? If you are not on-target, what do you need to get there?

2. Are you on-target in this class in regards to your HOW grade? If you're not on target, what do you need to do to get there?

3. Are you making progress towards your goals? How do you know?

4. What is your plan for the next week and a half?

Final Reflection:

1. Explain what you did in this project:

2. Did you meet the project expectations? Did you meet the learning targets? How do you know?

3. Did you meet your individual goals? Why or why not?

4. What are you most proud of?

5. What would you change if you could do this over again?

6. Did you like this? What was your favorite part? Do you have any tips or advice for me as a teacher?

Biogeochemical Cycles:	**Abiotic:** physical rather than biological not derived from living organisms **Biotic:** relating/resulting from living things, especially in their ecological relations **Biogeochemical** cycles: relating/denoting the cycle in which chemical elements and simple substances are transferred between living systems and the environment.
Succession:	**Primary Succession: O**ne of two types of biological and ecological succession of plant life, occurring in an environment in which new substrate devoid of vegetation. **Opportunistic Species:** a species with a low level of civilization. **Secondary Succession:** series of community changes which take place on a previously colonized but disturbed or damaged habitat **Climax Community:** historic term that express a biological community of plants, animals, and fungi. **Pioneer Species**: hardy species which are first to colonize previously distrubed and damaged ecosystems.
Biome:	**Biome:** a large community of plants and animals that occupies a distinct region. **Climate:** weather conditons prevailing in an area in general or over a long period. **Biosphere:** regions of the surface, atmosphere, and hydrosphere of the earth occupied by living organisms. **Biodiversity:** variety of life in the world or in a particular habitat or ecosystem. **Ecosystem:** a biological community of interacting organisms and their physical environment
Niche:	**Niche:** the function or position of a species within an ecological community. **Prey:** an animal hunted for food by another animal **Predator:** the hunter, preying on other animals organisms. **Habitat:** natural home or environment of an animal, plant, or other organism.
Interrelationships:	**Commensalism:** aan association between two organisms in which one benefits and the other derives neither benefit nor harm **Competition:** the activity or condition of competing

	Mutualism: symbiosis hat is beneficial to both organisms involoved **Parasitism:** is a nonmutual symbiotic relationship between species when one species the parasite benefits at the expense of the other. **Symbiosis:** the living together of two kinds of organisms to their mutual advantage **Predation:** the preying of one animal onto another. **Trophic level:** each of several hierarchical level in a ecosystem comprizing organisms that share the same functionin the food chain in the same nutritional relationship. **Food web:** a system of introlocking and independant food chains **Energy pyramid:** is a graphical model of energy flow in the community
Carrying Capacity:	**Carrying capacity:** certain amout of species a community can hold **Density independent:** any fact limiting a size of population loose effect in not dependant by the number of individuals in the population. **Limiting factor:** are environmental conditions that limit the growth abundance or distrubution of an organism or a population of organisms **Equilibrium:** the day a state in which opposing forces or influences are bound **Density dependent:** a situation in which a population growth is facilitated by increased population density.

What do you Know!?

1. What is an abiotic factor? What is a biotic factor?
2. What is the difference between qualitative and quantitative data?
3. What is a biogeochemical cycle? Name an example.
4. What is the difference between primary and secondary succession?
5. What is an opportunistic species?
6. What is a pioneer species?
7. What is a climax community?
8. Put the following levels of organization in order: community, species, population, biome, ecosystem, biosphere
9. What does biodiversity mean?
10. What is the difference between climate and weather?
11. What is a niche?
12. What is a habitat?
13. Explain what a predator/prey relationship is. Give an example:
14. What is a food web? Draw or explain an example.
15. What is a trophic level? List them. Label them on your food web.
16. What is an energy pyramid? Label the energy units on your food web.
17. What is symbiosis? Give an example of a symbiotic relationship.

18. What is commensalism? Give an example of a commensalistic relationship.
19. What is mutualism? Give an example of a mutualistic relationship.
20. What is competition? When does it occur? What can it cause?
21. What is a parasitic relationship? Give an example.
22. Define carrying capacity. Draw a graph of what this sometimes looks like.
23. What is the difference between density dependent and density independent? Give an example of each.
24. What is a limiting factor?
25. What is equilibrium in populations? What would cause this to happen?
26. What does G.I.S. stand for? What is it used to do?
27. What does G.P.S. stand for? What is it used to do?

Interest Group Preference:

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1. People for the Ethical Treatment of Animals (PETA): **animal rights**
2. National Rifle Association (NRA): **gun rights**
3. Small Woodland Owners Association of Maine (SWOAM): **landowners' rights**
4. Maine Department of Inland Fisheries and Wildlife: **government rights**
5. Maine Tourism Association: **business' rights**
6. Sportsman Alliance of Maine: **hunters' rights**

List your top three choices in order of preference:

Vocabulary list:

Biogeochemical Cycles:	- abiotic and biotic factors - biogeochemical cycles
Succession:	-primary succession - opportunistic species - secondary succession - climax community - pioneer species
Biome:	- biome - climate - biosphere - biodiversity - ecosystem, biome, community, population, species
Niche:	-niche - prey - predator - habitat
Interrelationships:	- commensalism - competition - mutualism - parasitism - symbiosis - predation - trophic level - food web - energy pyramid
Carrying Capacity:	- carrying capacity - density independent - limiting factor - equilibrium - density dependent

Peer Review

Each person will watch one other group's presentation and will give them constructive criticism and supportive feedback. Your job as a reviewer is to help your peers improve their presentation. Each person must fill out the following table and then share it with ME and THE GROUP YOU REVIEWED.

Special Interest Group you are reviewing:

Good stuff:	
Questions or confusions:	
Things to improve:	
In your opinion does this presentation meet the On Target requirements on the rubric? Why/why not?	

Lesson Plan One - Syllabus and Expectations

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1. Content Learning Objective and Language Learning Objective:

We will introduce the class today and review all of the learning targets and the overarching Baxter, Common Core and ME Guiding Principle standards. We will also discuss the essential question: "How do scientists use ecological data to make decisions about populations and ecosystems?" and the driving questions:

1. How do matter and energy flow through biological and physical systems?
2. How are species interdependent and interrelated?
3. How do populations respond to positive and negative inputs?
4. How do ecosystems respond to positive and negative inputs?

The day's learning objective is: "I can understand and explain the expectations for the Deer Mitigation Project."

2. Curriculum Connections:

- **B.A. Planetary Systems: Local Ecology:** Students will explain and demonstrate the flow of matter and energy in major biologic and physical processes
- **B.A. Planetary Systems: Biome Formation:** Students will use understanding of the interaction between major Earth systems to explain an aspect of local ecology.
- **CCSS: ELA LITERACY.RST.11-12.7:** Students will integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- **ME Guiding Principle: Responsible and Involved Citizen:** Students will understand the interdependence within and across systems and bring to each situation the appropriate actions.

This is the first day of the Field Ecology class. The day is dedicated to introducing the three-week interdisciplinary unit and assigning the long-term projects. Students will also take a brief pre-assessment and an interest survey.

3. Assessment:

Students will take a pre-assessment in the form of a select-response and written-response Google Sheets quiz. The goal is to assess pre-knowledge and to determine the class' prior exposure to and interest in the topic. The results will help guide the curriculum for the remainder of the unit.

Students will be assigned the long-term summative assessments and we will read through the rubrics together. All three are performance indicators.

- **Science Notebook:** Students record content and vocabulary as well as their complex thinking, connections and reflections daily. This serves as the independent summative assessment for the skills of the standard. There is a rubric that outlines the requirements to be On Target and Above Target for the assessment.

- **Independent Goals and Reflection:** Setting independent goals is a part of the science notebook. We will set goals on day two, revisit and revise them in week two, and then reflect on the final day of class. The teacher will briefly conference with individual students and have a dialogue about the goals and progress at each step. This personal communication will serve as the assessment for ME Guiding Principles.

- **Maine Deer Mitigation Meeting Presentation:** Groups of students prepare final presentations that summarize the content from the unit and apply it to solving a real-world problem. This performance indicator directly answers and applies the essential question: "How do scientists use ecological data to make decisions about populations and ecosystems?". There is a rubric that outlines the requirements to be On Target and Above Target for the assessment.

- **Exit Slip:** Students will answer the question "What is expected of you for this project?" In their science notebooks. This is a written communication that assesses the learning target: "I can understand and explain the expectations of this project"

4. Lesson Procedure:

1. Welcome and attendance (10 minutes)
    - This is the first day of the class and I only know a handful of the students. I will introduce myself and briefly explain ETEP and what I'm doing there. I have found that being clear about the unit I'm teaching being MY assessment in school actually helps generate more buy-in from the students. It seems to make their work have more value when they know that I'm collecting data and learning from and with them, and that this project has a larger audience.
    - I will have students go around and introduce themselves. I must do this in order to take attendance, because I do not know their names. The class is a mix of 10th, 11th and 12th graders, so I also expect that they may not know all of their peers. The introductions is the beginning of establishing a safe classroom culture.

2. Introduce and discuss syllabus (essential and guiding questions, project outline, learning targets) and summative assessments (science notebook, group presentation, habits of work) (15 minutes)
    - I want to make the project outline, targets, and rubrics explicitly clear at the onset of the unit so that everything is completely transparent and students feel safe and understand what is expected of them. By explaining the project and the long-term summative assessments, they can be thinking about their plans and projects as they learn the content. By discussing the grading, habits of work and behavioral expectations, students can be sure there are no tricks or surprises in store.

3. Students take pre-assessment and interest survey. (20 minutes)
    - The pre-assessment will be the individual data for students' progress in the unit. They will take the same assessment on the final day and I will have clear evidence of how much they have learned. It also helps inform me of students' prior knowledge, which will inform what I need to teach.
    - I also ask students to pick their top three choices of interest groups. I wanted to give them this personal choice to increase their investment and interest in the project; they will have much more

drive to understand an organization's ideas if they actually identify with that organization. I still kept plenty of teacher control though: I will use their top three choices to assign groups that I think will be most productive. Elke (my mentor teacher) has had most of the students in HEA, so she will help me assign the groups based upon what she knows about the student's work habits and behavior.

4. Students fill out individual goal sheet and exit slip (10 minutes)
   - The individual goals are to collect data on habits of work. Students will revisit these goals in the middle of the unit and again at the end of the unit. I will ask them to make their goals specific and measurable, so that we can analyze quantitative data and assess their progress.
   - The exit slip is a question in their science notebooks: "Explain what is expected of you in this project". By answering this question, I will have direct formative evidence of if they have met the learning target: "I can understand and explain the expectations for this project".

5. Assign homework: read about the water cycle (5 minutes)
   - Students will read about the water cycle for homework so they have background information to inform our discussion tomorrow.

5. Instructional Strategies:

- **Direct instruction/class discussion** - Most of the this day is informational. It is the first day of class and I need to introduce the standards, scope of the unit and long-term projects. I will engage students by having them read through the handouts and then explain to me what they are expected to do. The class will generate lists and I will write them on the board. This makes the process more active and student-lead, thus increasing interest and retention of the information. It also serves as a formative check for understanding.

- **Independent work** - students will take a pre-assessment and student interest survey independently on their computers. They will also fill out their goals and an exit slip in their science notebooks.

6. Materials and Equipment:

- syllabus
- presentation product descriptor
- science notebook product descriptor
- Pre-Assessment
- water cycle reading for homework - http://water.usgs.gov/edu/watercyclesummary.html

Lesson Plan Two:

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1. Content Learning Objective and Language Learning Objective:

- I can integrate and evaluate multiple sources of information.

2. Curriculum Connections:

- **B.A. Planetary Systems: Local Ecology:** Students will explain and demonstrate the flow of matter and energy in major biologic and physical processes
- **B.A. Planetary Systems: Biome Formation:** Students will use understanding of the interaction between major Earth systems to explain an aspect of local ecology.
- **CCSS: ELA LITERACY.RST.11-12.7:** Students will integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- **ME Guiding Principle: Responsible and Involved Citizen:** Students will understand the interdependence within and across systems and bring to each situation the appropriate actions.

Students will be assigned to their unit-long special interest groups today and together will draft a group contract. They will then spend some time researching their special interest group. The goal of today is for students to build relationships and accountability within their groups and develop some knowledge about their special interest group.

3. Assessment:

- **Group contracts:** The group contract serves as a formative assessment for the ME Guiding Principles (their habits of work). It also is a reference point for any potential conflicts within the group. This will not be assessed itself, but is a component of the presentation rubric for the summative assessment.

- **Science Notebook:** Students will have time to record the topic's vocabulary and content as well as any connections and reflections they have. This is a personal communication that formally assesses their independent mastery of the concepts as well as their complex thinking.

4. Knowledge of Students:

This lesson requires students to work collaboratively with peers to draft a group contract and research their interest group. I will assign the groups based upon both interest in the organization and also peer-relations. I will consult with Elke, as she has a knowledge of the students from past classes. She will help me create groups that have good dynamics and that will support each other well. The purpose of today is to allow groups to get to know each other in a low-stress situation and develop a group culture. If students seem disengaged I will sit with the group and ask them questions to engage them. It is critical that each member of the group contribute and be heard, especially on day one when the dynamics are being established.

5. Lesson Procedure:

1. Assign groups and group contracts. (30 minutes)
    - I will upload a list of the Special Interest Groups to Google Classroom using the student's' choices from the pre-assessment.
    - Groups will get together and draft their group contract. The contract asks students to assign roles, exchange contact information, decide what happens when someone is absent, and otherwise strategies plan-Bs. If there are any conflicts within the group, we will refer back to the contract to decide what to do.

2. Groups research their special interest group (25 minutes)
    - Students will use their computers to do some research about their special interest group and will take notes in their science notebooks. The purpose of this activity is to help students get into the mindset of their group. The project will be especially fun if students approach the entire three weeks as their special interest groups, and I want them to be thinking of how their group would use each bit of information we learn.
    - This little project also helps groups get to know each other. I expect there will be significant chatter, but I want them to be excited about the project and comfortable with their groups, so I will encourage this (for a few minutes!).

6. Instructional Strategies:

- **Group work**- Students will meet their group, draft a contract and research their special interest groups' stance. This is to establish a group dynamic and help build excitement for the project.

- **Direct instruction/class discussion-** We will discuss the reading that was assigned as homework on Monday. It will form the background knowledge for our conversation about the water cycle. Students will recall what they know about the cycle as I take notes on the board. I will then have them draw the parts of the cycle on the board.

- **Modeling-** I will model the biogeochemical project with the water cycle. I will project the worksheet that the students will use on the board and we will fill it out together about the water cycle. This gradual release of responsibility will build students confidence in their ability to do the project, and also ensures the expectations are very clear.

7. Materials and Equipment:

- Group Contract

8. Reflection

This lesson went relatively well despite a few hiccups. I began the lesson by projected the special interest group assignments onto the board and asked students to sit with their group members. Since yesterday two students have dropped the class and one has joined, so I had to do some quick on-the-spot rearranging of groups. I did

this privately on my computer because as soon as I mentioned I had to do some quick rearranging I began getting change requests from everyone. I put a lot of thought into the groupings and did not plan to honor switch requests, so I simply said "No, you are in the group I put you in, no switching. Give me one second and I will project the final groups". One student also asked to talk to me about his group privately- he expressed that he and another student in his group "do not talk to each other". He also explained that he knows sometimes in school you have to work with people you don't like, but he thought the problem would negatively affect the work. I respect the fact that he communicated this issue with me with such maturity. I assigned the student who had just added the class to that group, and let the other student change to his second choice group.

Groups were instructed to create a "group contract" that outlines attendance expectations (what happens if a group member misses a class?), division of work (do you want to assign roles? What happens if someone doesn't follow through with their job?") and conflict resolution ("list two conflicts that could arise and outline your plan for solving them"). The purpose of this document was to have students take ownership of the expectations and help set their own criteria and repercussions. I looked them over and they are so great! I am very glad that I decided to do this activity - it got the group members talking about what they expected of each other, and it also will help them stay accountable to their groups. Rather than saying "you didn't do your part" at the end, this setting of expectations and guidelines allows students to have very clear and concise expectations from their group and it makes them take the progress and their contributions more seriously. It also troubleshoots any conflicts and problems before they arise. Most groups have different conflicts and solutions, but all of them are relevant and thoughtful. One group said "if someone doesn't do an assignment they said they would, they have to do sixty jumping jacks". Another group said they would allocate work based upon who had the least on their plate, but if everyone had equal work "we will play rock paper scissors". Even though these plans are sort of silly, I do expect them to work! The conflict resolution plans will eliminate arguing, instead I can just say "well, look at the contract. You agreed you'd rock-paper-scissors to allocate that." I felt sort of guilty spending so much time these first two days on introductions, goal setting and group contracts, but looking back I am very glad that I did. I am happy that the students took the contracts seriously and think that they will be useful throughout the next few weeks! We will revisit the group goals in the middle of next week and again at the end of the project.

The groups spent the remainder of time researching their special interest groups. I heard a few "wait what are we doing with these groups" resounding through the room so I decided to stop the class and re-explain the project. I said something along the lines of "now that you are in your special interest groups, you need to understand your group's' philosophy when it comes to deer mitigation". I briefly explained what each group's stance is to lead them in the right direction. And then I went into a little more detail about the project - I projected the project outline from the syllabus (which lists an alignment of topics, targets and "mini-projects" or formative assessments). I talked us through the sequence of topics and targets along with what we would be doing to learn about each. This second explanation seemed to sink in much better than yesterday's. I think that students thought that they understood the scope of the project yesterday, but once they were in their groups and actually getting to work they needed clarification and a clearer scope of the unit. I think I should probably have expected this - from my experience it is extremely rare for students (especially at Baxter!) to comprehend instructions the first time they are given. I also recognize that this class and project are structured differently than they are used to, and that it may take a little while for them to feel comfortable learning in this style and format.

Because I dedicated some extra time to direct instruction I ran out of time to begin the biogeochemical cycle topic. I will start class tomorrow with the discussion of biogeochemical cycles and the water cycles, before putting students into groups to research another nutrient cycle in depth. We may need to finish the drawings and discussion on Thursday morning before beginning the biome slides.

If I could do this lesson again I would have began the class with the second explanation rather than having it arise naturally. I could have put the students into groups and then gone over the unit scope and each group's stance before setting them free to do the contract and research. It would have given a little more structure to the class. I also wish that I had remembered to assign the pre-assessment to the students who were absent yesterday. I am going to email them and suggest that they do it for homework tonight.

Finally, I wish that I had thought to assign the biogeochemical cycles to groups before the end of class so that students could do some research for homework. Instead we are going to need to use some class time for research and the biogeochemical cycle drawings may take longer than anticipated. In conversations with Elke she has expressed that students usually have a very hard time understanding biogeochemical cycles, so it may be wise to anticipate some extra time on this topic anyway. If they usually have a hard time understanding this information it will be good to have them do the research in class while I am available to answer questions and help tutor and explain difficult concepts.

Interview An Expert

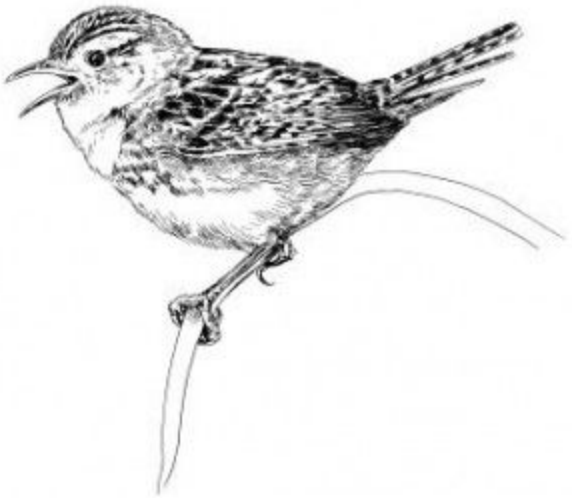
Learning Target: I can evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

Instructions:

Each member of your group must conduct an "interview" with an expert in the field. It would benefit you to choose people that are members of your Special Interest Group, or that have ideas that align with those of your groups. The information you glean from this interview will be of crucial importance in formulating your group's deer mitigation proposal.

Each member of your group must find a video or article online and take notes about the speaker or author's opinion and stance. Use these notes to help form your own stance in the final project.

Each member of your group must submit their interview notes along with a citation of the source in APA format. This should go into your science notebook.



Biogeochemical Cycles

Group Members: GROUPS

Learning Target: I can illustrate the flow of matter through biological and physical systems.

Instructions:

1. Make one copy of this document and share it amongst your group members. Put everyone's name on the document. When you are finished with this assignment, you will submit one copy per group.

2. Explore the sources I have provided about your element cycle:

Carbon cycle:	Source 1 (EarthObservatory)
	Source 2 (VisionLearning)
Sulfur cycle:	Source 1 (Animation from Cengage)
	Source 2 (Boundless)
	Source 3 (Oceanus)
Phosphorus cycle:	Source 1 (ScienceLearn)
	Source 2 (Animation from Discover Biology)
Nitrogen cycle:	Source 1 (VisionLearning)
	Source 2 (Physical Geography)

3. Find and explore at least two additional resources per group. Consider watching a short video. Check out a few diagrams on Google Images. Link additional sources you used here:

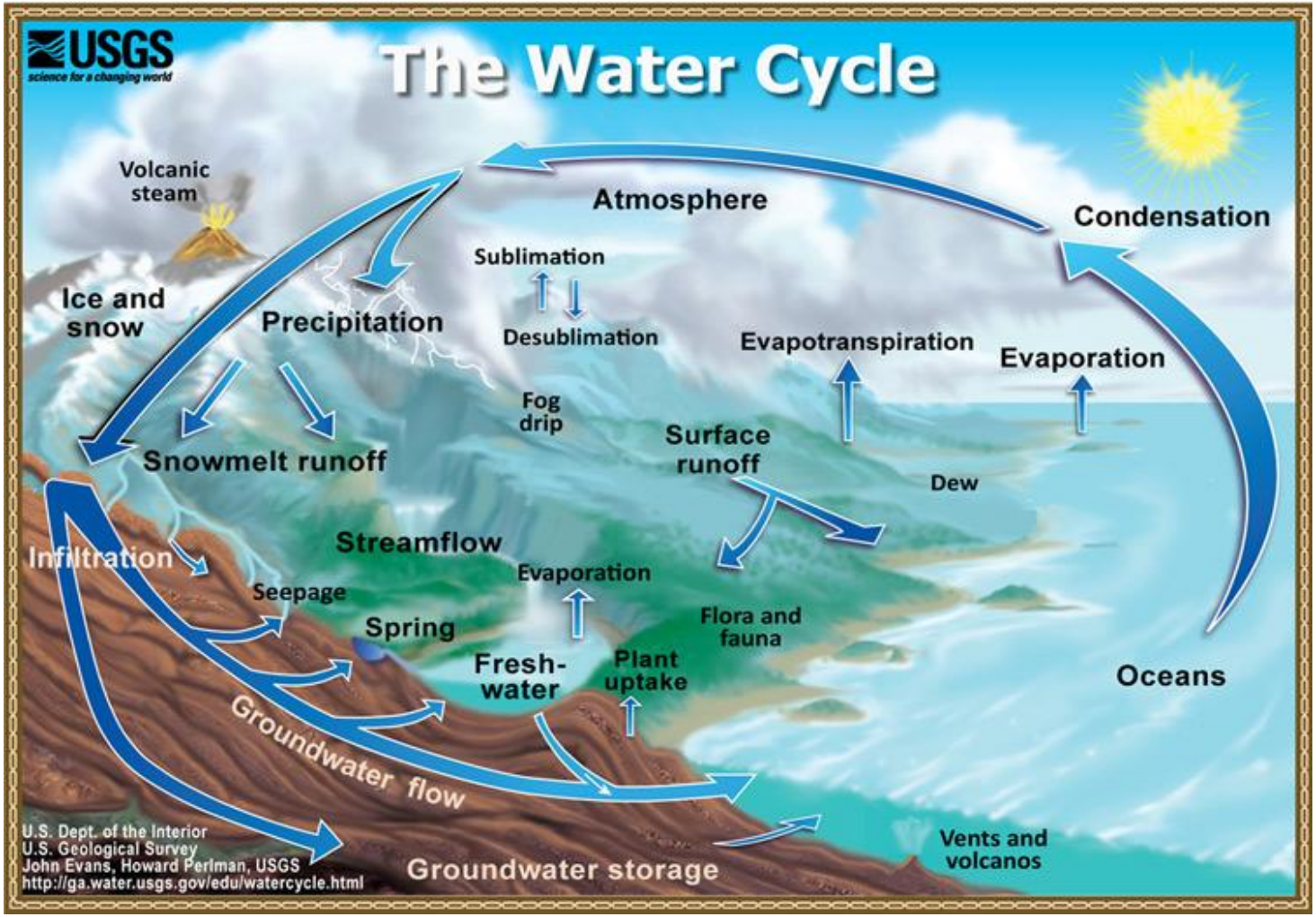
4. Draw a large scale representation of your element cycle on the paper provided.

5. Answer the following questions (on this document) and be prepared to talk about them:

Why is this cycle important? What is the element in the cycle used for in humans, animals and plants?

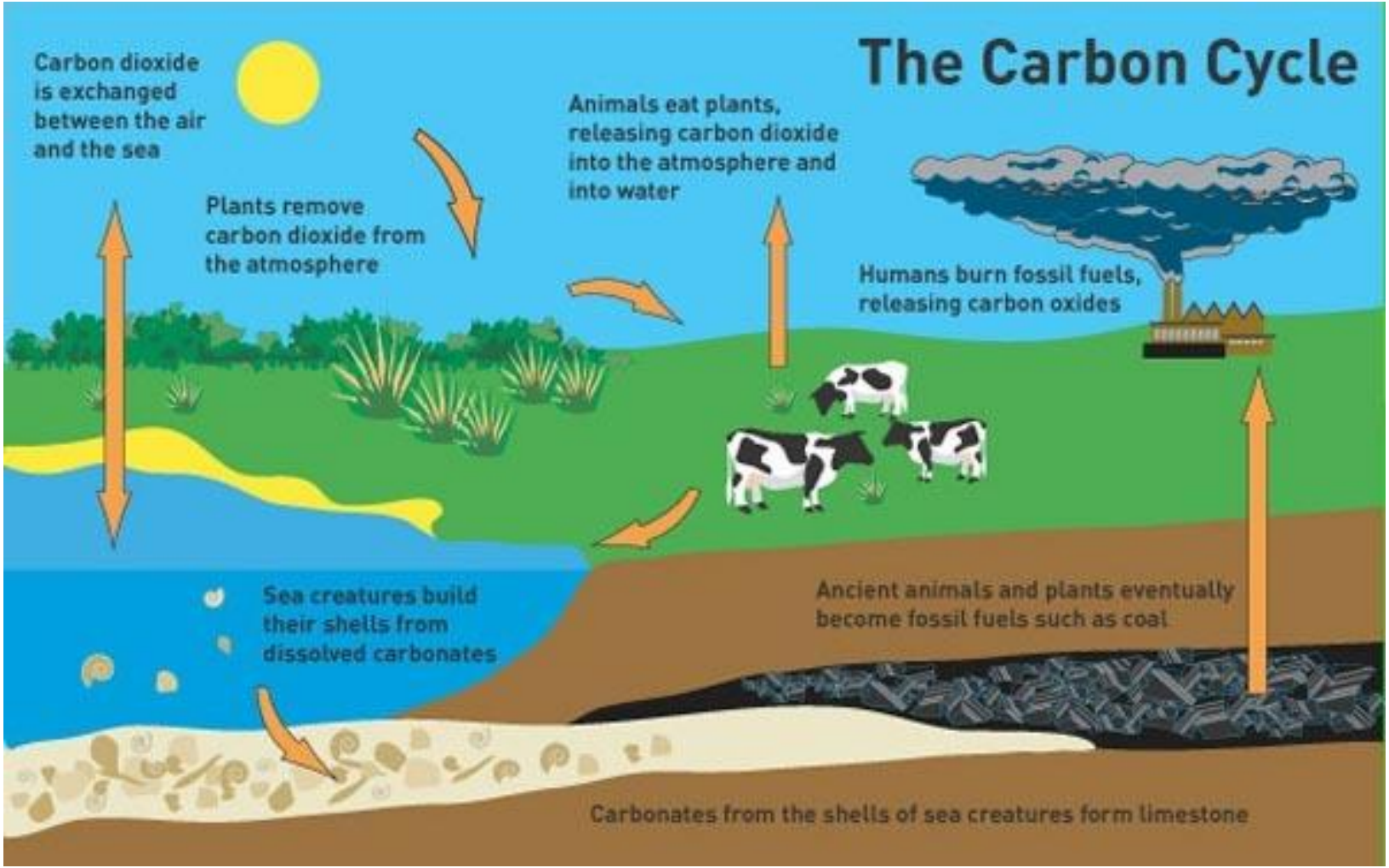
BIOGEOCHEMICAL CYCLES

	LITHOSPHERE	BIOSPHERE	HYDROSPHERE	ATMOSPHERE	PROCESSES
WATER	Rivers (fast) Soils (medium) Deep ground (slow)	Liquid in plants and animals (med)	Mostly liquid: - streams (fast) - ground H20 (med) - glaciers (slow)	Water vapor, clouds, precipitation (fast)	Evaporation, transpiration, condensation, precipitation, runoff, infiltration, percolation,
CARBON	Limestone Coal (Very slow) Coral	Biomass = Energy (fast) Structure (slow)	- Equilibrium with ocean -Biomass = structure (shells)	C02 (carbon dioxide) CH4 (methane)	Respiration and photosynthesis, weathering, runoff, shell/rock/fuel formation, combustion, volcanoes, dissolution, sedimentation
NITROGEN	Nitrogen fixation (fast) nitrification (fast)	Tissues, amino acids of plants and animals (medium)	Run-off (short-term)	N2 (Stable) ~80%	Nitrogen fixation, nitrification, assimilation (uptake) ammonification (decomp), denitrification
SULFUR	Gypsum Pyrite (in coal)	Assimilation by proteins, decomposition, some deposition on plants	Where DMS forms (from S04-2)	- S02 from Volcanoes, combustion - DMS (cloud nuclei)	Coal combustion, volcanoes, vents, DMS, deposition, assimilation, decomposition, weathering, runoff, sedimentation
PHOSPHORUS	In soil (fast) In rocks (slow unless mined)	Absorbed into plants and animals, ATP and DNA	Some in solution (water) sediments		Assimilation, decomposition, weathering, leaching, runoff, mining, fertilizing


USGS
science for a changing world
The Water Cycle
Volcanic steam
Atmosphere
Condensation
Sublimation
Ice and snow
Precipitation
Desublimation
Evapotranspiration
Evaporation
Fog drip
Surface runoff
Snowmelt runoff
Dew
Streamflow
Infiltration
Evaporation
Seepage
Flora and fauna
Spring
Fresh-water
Plant uptake
Oceans
Groundwater flow
U.S. Dept. of the Interior
U.S. Geological Survey
John Evans, Howard Perlman, USGS
http://ga.water.usgs.gov/edu/watercycle.html
Groundwater storage
Vents and volcanos

Water Cycle

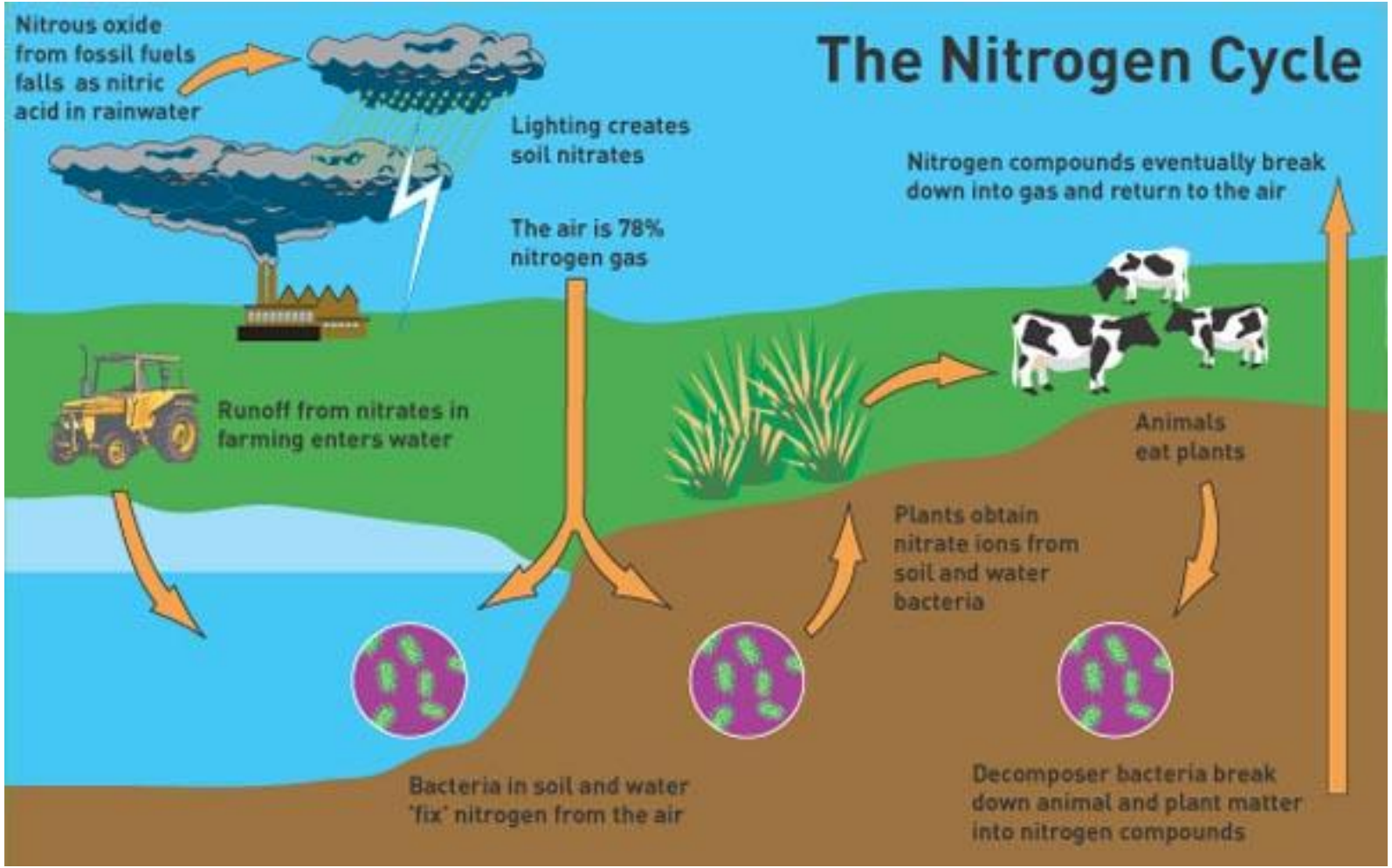
- The sun heats ocean/lake water, causing evaporation (liquid -> vapor)
- Ice and snow sublimate directly from the solid state into vapor.
- Evapotranspiration = water transpired from plants and evaporated from the soil. (liquid -> vapor)
- Vapors rises into the air where cooler temperatures cause it to condense into clouds.
- Air currents move clouds around the globe, and cloud particles collide, grow, and fall out of the sky as precipitation.
- Some precipitation falls as snow and can accumulate as ice caps and glaciers, which can store frozen water for thousands of years.
- Melting snowpacks and precipitation flow over the ground as surface runoff
- A portion of runoff enters rivers in valleys in the landscape, with streamflow moving water towards the oceans.
- Runoff, and groundwater seepage, accumulate and are stored as freshwater in lakes.
- Some runoff soaks into the ground as infiltration. Some of the water infiltrates into the ground and replenishes aquifers (saturated subsurface rock), which store huge amounts of freshwater for long periods of time.
- Some infiltration stays close to the land surface and can seep back into surface-water bodies (and the ocean) as groundwater discharge, and some groundwater finds openings in the land surface and emerges as freshwater springs.
- Yet more groundwater is absorbed by plant roots to end up as evapotranspiration from the leaves.


The Carbon Cycle
Carbon dioxide is exchanged between the air and the sea
Plants remove carbon dioxide from the atmosphere
Animals eat plants, releasing carbon dioxide into the atmosphere and into water
Humans burn fossil fuels, releasing carbon oxides
Sea creatures build their shells from dissolved carbonates
Ancient animals and plants eventually become fossil fuels such as coal
Carbonates from the shells of sea creatures form limestone

Carbon Cycle

IMPORTANCE OF CARBON:
Carbon is found in many organic molecules = carbohydrates, fats, proteins, bones, cartilage and shells
Carbon bonds store energy

THE CYCLE
- Photosynthesis by plants, algae and cyanobacteria removes carbon dioxide from air and water and produces oxygen and carbohydrates (plants are a major reservoir of carbon)
- Respiration by animals returns carbon to the air and oceans
- Decomposition returns carbon to the sediment (limestone and coral are examples)
- The largest reservoir of carbon is underground - may be trapped for hundreds of millions of years
- Aquatic organisms die and settle in the sediment, oder layers are buried deep and undergo high pressure, ultimately it may be converted into fossil fuels (oceans are the second largest reservoir of carbon)


The Nitrogen Cycle
Nitrous oxide from fossil fuels falls as nitric acid in rainwater
Lighting creates soil nitrates
The air is 78% nitrogen gas
Nitrogen compounds eventually break down into gas and return to the air
Runoff from nitrates in farming enters water
Animals eat plants
Plants obtain nitrate ions from soil and water bacteria
Bacteria in soil and water 'fix' nitrogen from the air
Decomposer bacteria break down animal and plant matter into nitrogen compounds

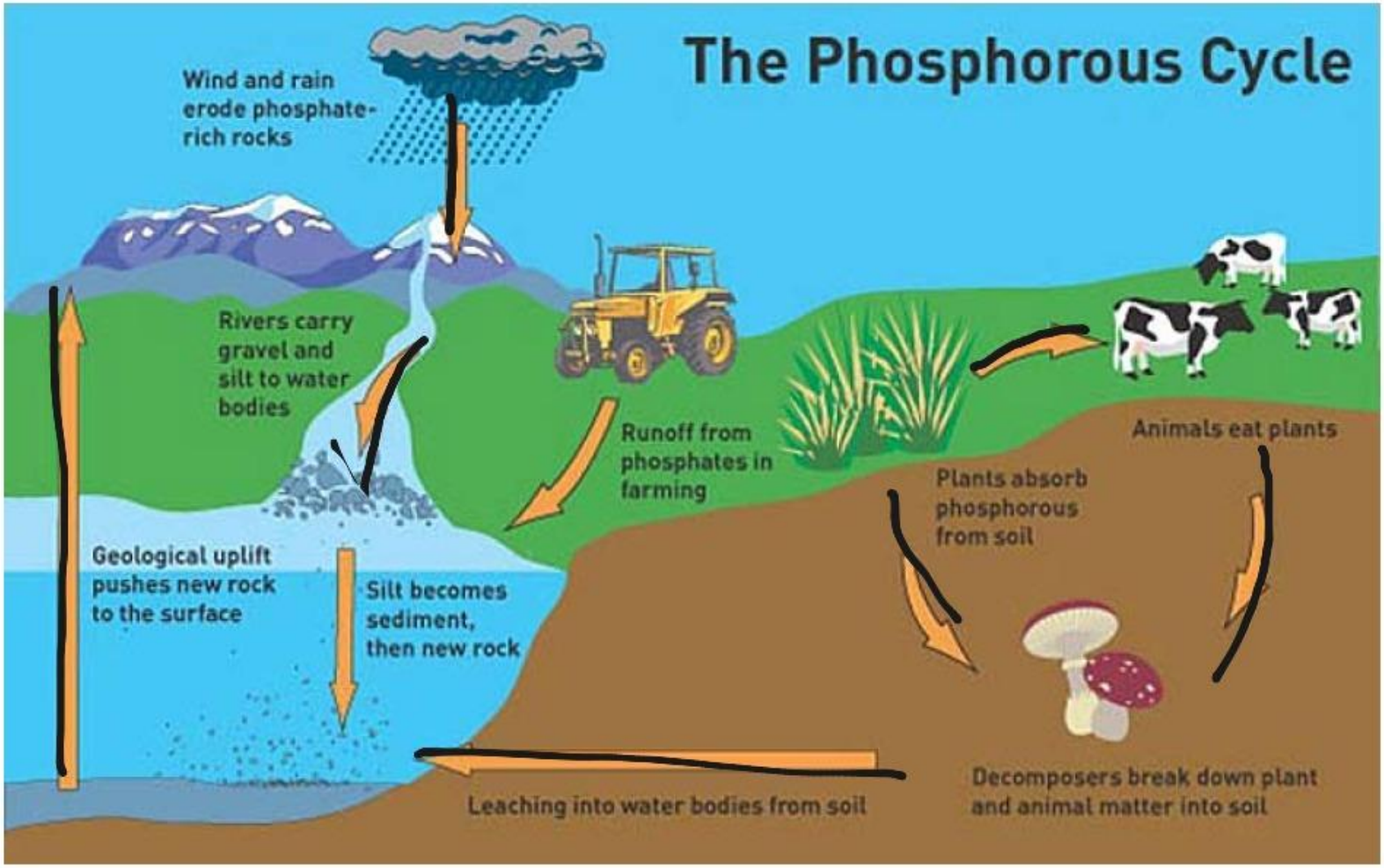
Nitrogen Cycle

IMPORTANCE OF NITROGEN:

- Nitrogen comprises 78% of our atmosphere
- It is contained in proteins, DNA and RNA (nitrogen bases!)

THE CYCLE:

- Nitrogen gas (N_2) cannot be used by organisms. Organisms can use nitrate (NO_3) and ammonia (NH_3)
- **Nitrogen fixation** = lightning, nitrogen-fixing bacteria, and root-nodules combine (fix) nitrogen with hydrogen to form ammonium which can be used by plants.
- **Nutrification** = bacteria convert ammonium ions first into nitrite ions then into nitrate ions, plants can take up these ions
- Animals obtain nitrogen by eating plants or other animals
- Decomposers get it from dead and decaying plants or other animals, releasing ammonium ions to nitrifying bacteria
- **Denitrifying bacteria** = converts nitrates in soil or water to gaseous nitrogen, releasing it back into atmosphere


The Phosphorous Cycle
Wind and rain erode phosphate-rich rocks
Rivers carry gravel and silt to water bodies
Runoff from phosphates in farming
Animals eat plants
Plants absorb phosphorous from soil
Geological uplift pushes new rock to the surface
Silt becomes sediment, then new rock
Leaching into water bodies from soil
Decomposers break down plant and animal matter into soil

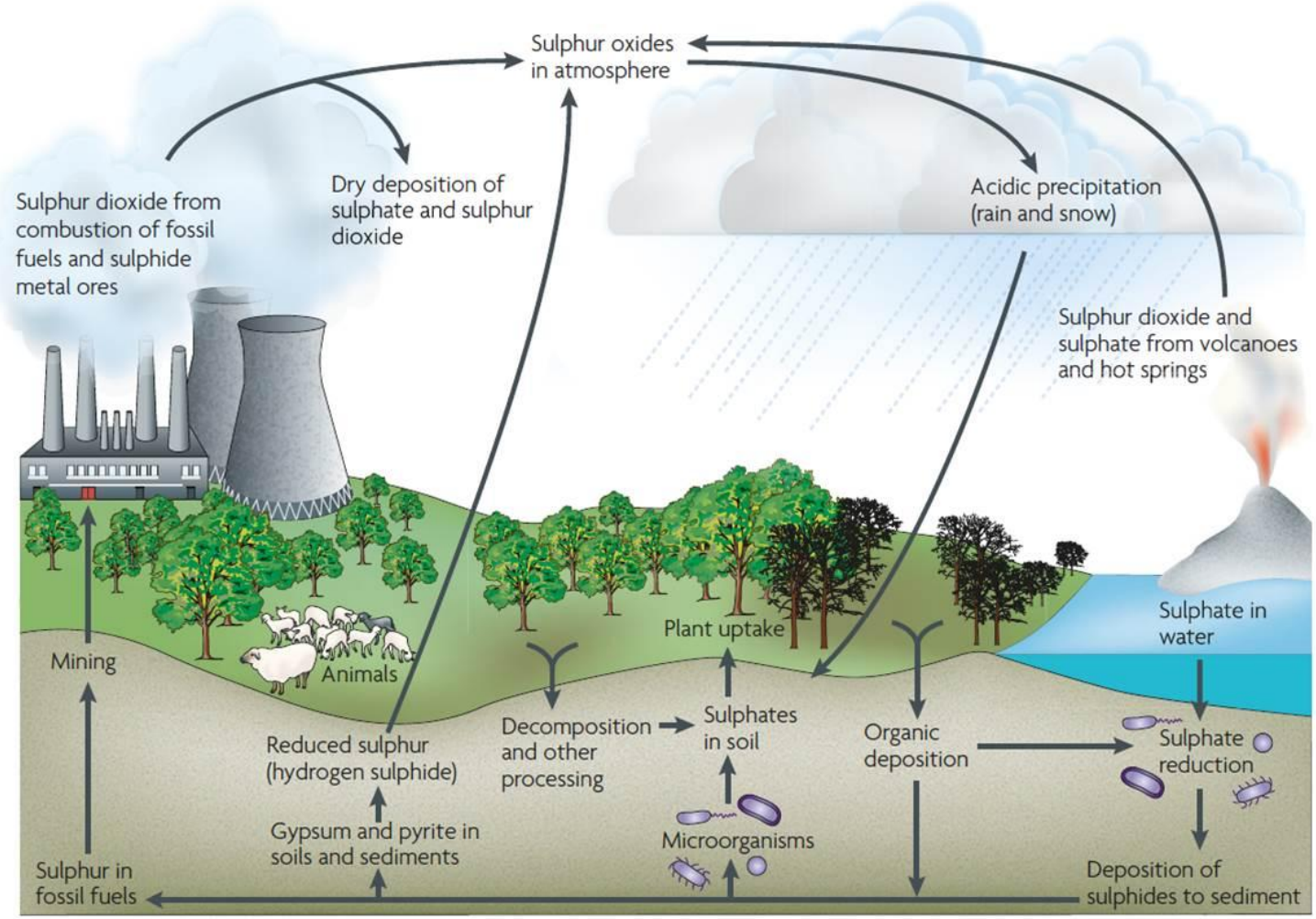
Phosphorus Cycle

IMPORTANCE OF PHOSPHORUS:

- Phosphorus is an important nutrient for human and animal nutrition. It is necessary for the growth and repair of all body tissues and for the proper growth of bones and teeth, where about 85 percent of phosphorus in the human body is found.
- Phosphorus compounds are essential for energy production and storage in the body. Phosphorus is a key component of cell membranes, DNA, RNA, ATP, and ADP
- It is essential for plant nutrition and plays a vital role in photosynthesis, energy transfer, root formation, seed formation, plant growth and improvement of the quality of fruits and vegetables (Phosphorus is a limiting factor for plant growth)

THE CYCLE:

- Most phosphorus is within igneous and sedimentary rocks and is released by weathering and leaching.
- Rivers and runoff carries this sediment to the ocean, where it eventually settles as sediment and becomes new rock.
- Plants absorb phosphorus from the soil, plants eat animals, animals die and decompose, returning phosphorus to the soil.
- There is no significant atmospheric content with naturally low environmental concentrations


Sulphur oxides in atmosphere
Sulphur dioxide from combustion of fossil fuels and sulphide metal ores
Dry deposition of sulphate and sulphur dioxide
Acidic precipitation (rain and snow)
Sulphur dioxide and sulphate from volcanoes and hot springs
Sulphate in water
Plant uptake
Mining
Animals
Decomposition and other processing
Sulphates in soil
Organic deposition
Sulphate reduction
Reduced sulphur (hydrogen sulphide)
Gypsum and pyrite in soils and sediments
Microorganisms
Sulphur in fossil fuels
Deposition of sulphides to sediment

Sulfur Cycle

IMPORTANCE OF SULFUR:

- Sulphur is one of the components that make up proteins and vitamins. Proteins consist of amino acids that contain sulphur atoms. Sulphur is important for the functioning of proteins and enzymes in plants/animals.

SULFUR CYCLE:

- Plants absorb sulphur when it is dissolved in water. Animals consume these plants, so that they take up enough sulphur to maintain their health.
- Most of the earth's sulphur is tied up in rocks and salts or buried deep in the ocean in oceanic sediments.
- Sulfur enters the atmosphere from natural recourses: volcanic eruptions, bacterial processes, evaporation from water, or decaying organisms.
- Sulphuric acid may also be produced from dimethylsulfide (DMS), which is emitted to the atmosphere by plankton species and acts as a cloud forming nuclei.
- All these particles will settle back onto earth, or react with rain and fall back onto earth as acid deposition.
- The particles will than be absorbed by plants again and are released back into the atmosphere, so that the sulphur cycle will start over again.

People are affecting Earth's biogeochemical cycles by shifting carbon from fossil fuel reservoirs into the atmosphere, shifting nitrogen from the atmosphere to the planet's surface, and depleting groundwater supplies, among other impacts

Fill out the following table about the form of your element in each sphere:

	Form (solid, liquid, gas):	**Location:**	**Timeframe:**
Lithosphere:			
Biosphere:			
Hydrosphere:			
Atmosphere:			

List the processes through which your element flows:

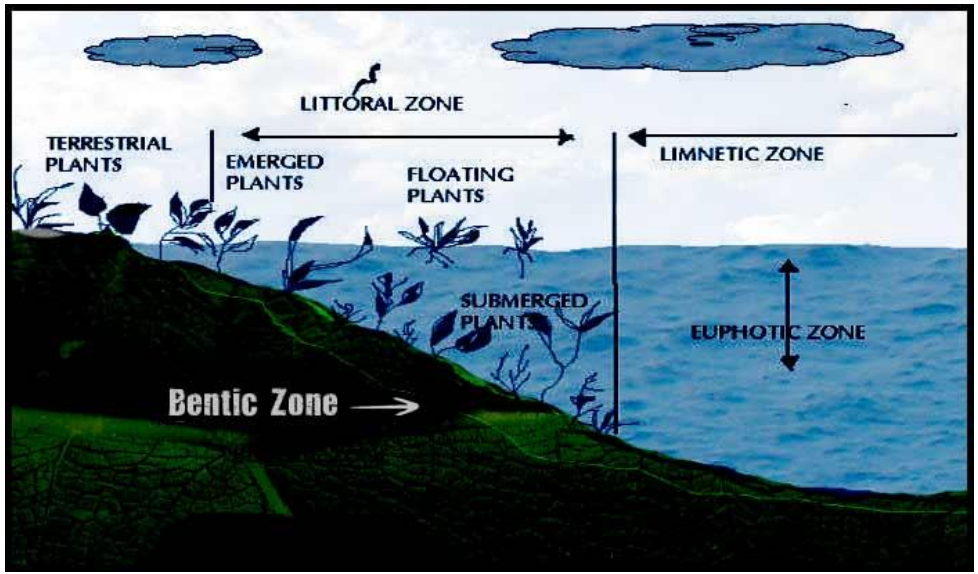
Is your element a limiting factor in ecosystems? What would happen if your element were to increase or decrease by a large amount with an ecosystem?

What would happen if one of the processes by which your element flows were to be interrupted or the rate of the process were to change?

Any additional interesting information:

Biomes

Freshwater Lakes



Freshwater Lakes

Freshwater Availability by Country ---->

All Freshwater lakes have at least one

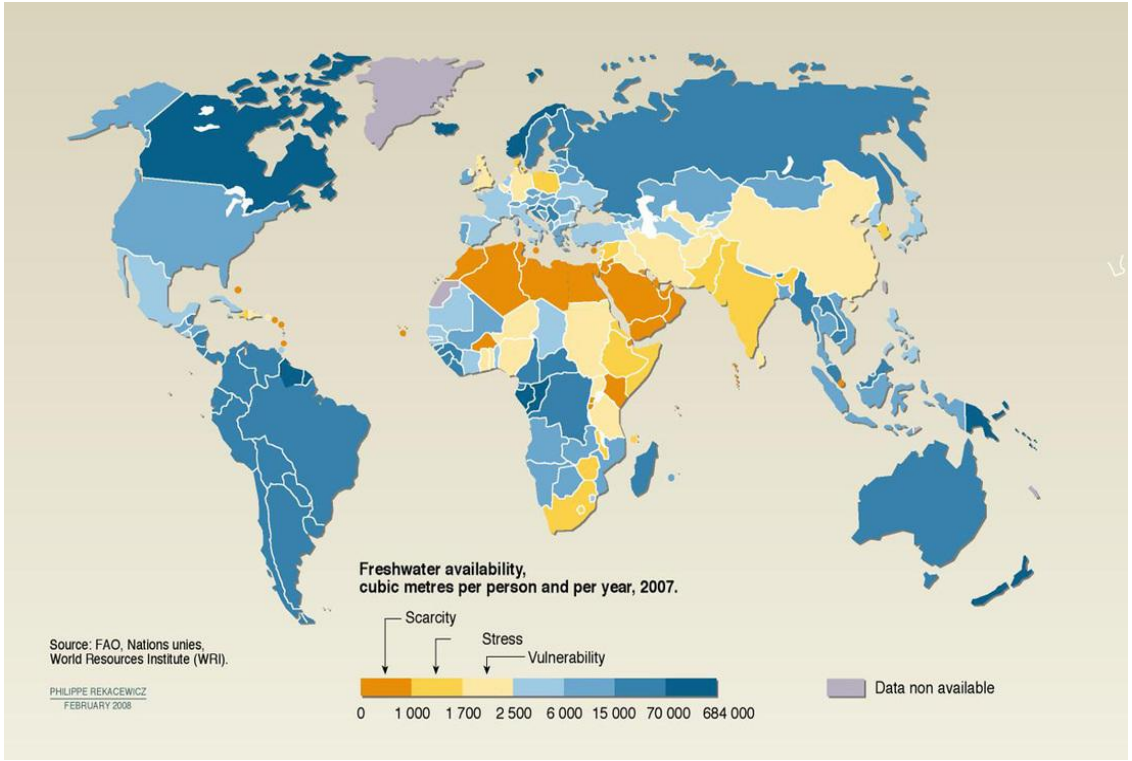
Species of fish inhabiting the body of water.

Most human interactions are with lake home

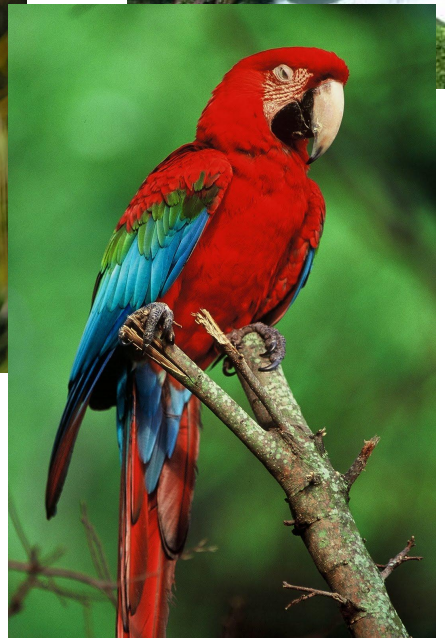
and boating activities.

Freshwater Lakes can be found

almost anywhere.



Tropical Rainforest



Tropical Rainforest

- It is an area covered with tall trees in a region of year round warmth
- Temperature rarely gets higher than 93 degrees, doesn’t drop below 68
- Cover less than 6% of earth, they produce about 40% of earths oxygen
- Has more kinds of trees than any other area in the world
- Medicines we use come from rainforest plants

Freshwater Biome: Rivers

Geographic Location: Varied. All over the world. Freshwater Biomes as a whole cover roughly 20% of the world.

Weather & Climate: The Weather and Climate are varied based on the surrounding area. For example a freshwater river in a northern woods area may have a colder climate and snow where as a freshwater river in a southern desert climate may have very little precipitation.

Flora (Plants): Flora around freshwater rivers changes based on location. If you live up here in Maine most commonly you will see the banks lined with trees of varied types as well as smaller plants however in Maine we have a strong problem with invasive species (Such as Milfoil, Hydrilla, and European Naiad).

Fauna (Animals): Just like fauna the animals in freshwater rivers vary depending on location. In Maine you most commonly will find trout and smaller organisms like bacteria.

Ecological Issues: Some ecological issues include: Invasive Species (Milfoil), Dams, Runoff, and Pollution.

Human Impacts: Pollution stemming from runoff such as chemicals getting into sewers as well as some runoff from agriculture can have a large impact on freshwater systems and the organisms surviving in and around it. Water extraction for human use also shrinks and degrades habitats.

Diseases: Some freshwater river based diseases include: Cyclosporiasis, Giardiasis, and Otitis Externa.

Liz Patriotti & Luke Rainsford

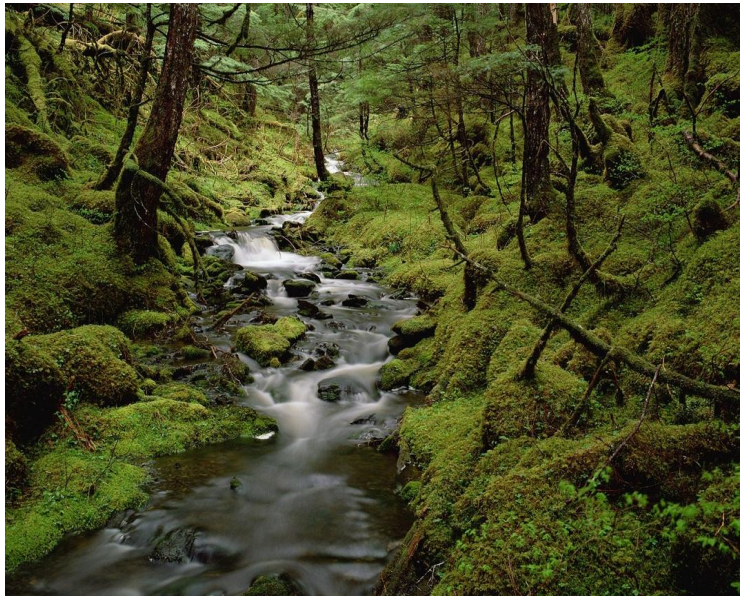
Temperate Forest

Geographic Location

- Located primarily in the eastern half of the United States, Canada, Europe, parts of Russia, China, and Japan.

Weather and climate

- The average temperature in temperate deciduous forests is 50°F (10°C). Summers are mild, and average about 70°F (21°C), while winter temperatures are often well below freezing. PLANTS: Trees and plants in deciduous forests have special adaptations to survive in this biome.



Liz Patriotti & Luke Rainsford

Temperate Forest

Deciduous Forest: (of a tree or shrub) shedding its leaves annually.

Coniferous: Any of various mostly needle-leaved or scale-leaved, chiefly evergreen, cone-bearing gymnospermous trees or shrubs of the order Coniferales, such as pines, spruces, and firs.

Animals

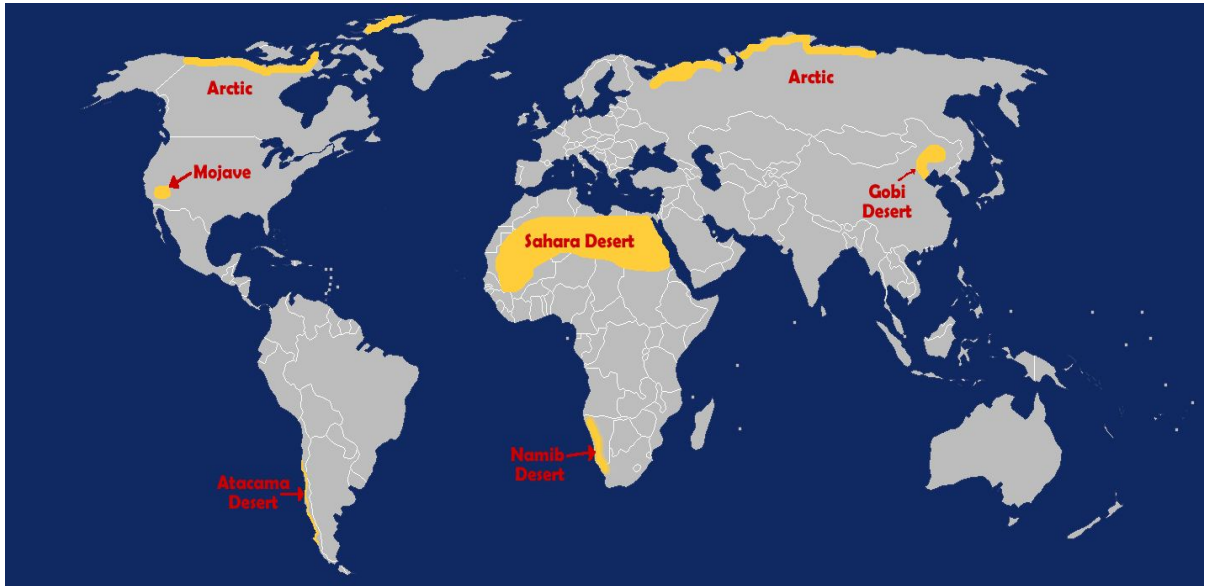
- Birds like broad-winged hawks, cardinals, snowy owls, and pileated woodpeckers are also found in this biome. Mammals include white-tailed deer,raccoons, opossums, porcupines and red foxes.

Ecological Issues

- Natural fires destroy many trees, and animals lose their homes. Lightning causes natural fires.
- There are a lot of problems in the Temperate Forest. When it rains the acid inside the raindrops goes inside trees and completely destroys them. When people clear the forest, that they are lowering quality of the soil. Lumberjacks, when they cut down trees for paper are destroying the forest one tree at a time.

Deserts

Ryder Kallweit



Deserts are an extreme biome to survive in. Though there are little resources, there are thriving plants and animals that live there.

The three major deserts are the

- Sahara(3,500,000 Sq miles)
- Gobi(500,000 Sq miles)
- Kalahari(225,000 Sq miles)

Plants & Animals

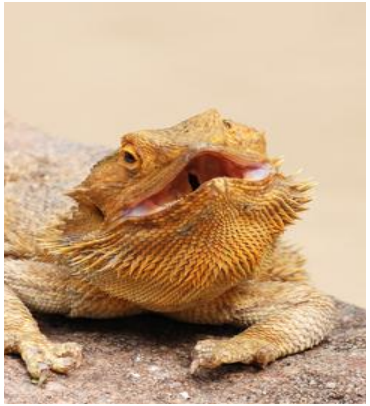
Xerophyte and Phreatophyte plants use two different ways of surviving desert conditions.

The Xerophyte plants have altered their physical structure to survive.

- Waxy skin to lock in moisture
- ability to store water in stems
- shallow root system

The absence of leaves allow less transpiration to occur.

The Phreatophyte trees grow their roots deep into the earth to draw water from the water table



There are a lot of animals in the desert that all have something in common.

All animals that live in the desert have evolved in a way to acquire, conserve, recycle, and actually manufacture water. They all also have ways to avoid excess heat.

Some of these animals include the Great Horned Owl and Bearded Dragons.


GB
♀
Lv00
HP
OWL
♂
Lv00
HP
00/00
EXP

Grasslands And The Savanna

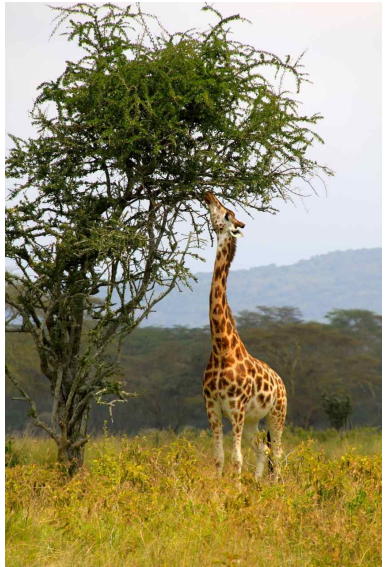
By: Harrison Cyr

Human Impacts:

- Fires
- Hunting
- Industrialization

Food:

- Leaves
- Carnivores
- Grass



Water:

- Xeropause
- Wet season
- Roots

Animals:

- Elephants
- Giraffes
- Leopards

G/S 2

Tundra

Average Temperature is around −28 °C (−18 °F) and can get as low as −50 °C (−58 °F).

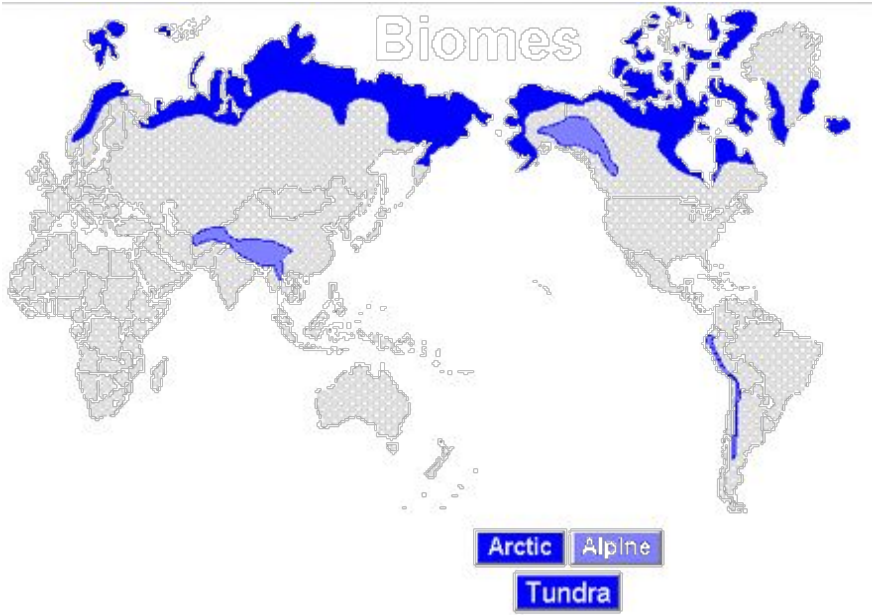
ET climate so once a year it gets warm enough to melt

Animals.

Caribou, ermine, water birds, mosquitoes, polar bears, arctic fox, white wolves, grizzly bears, gray falcons, bald eagles, bumble bees, squirrels, Norway lemmings, shrews, voles, and fish.

A lot of the animals eat plant life that grows.

Elevation differs between the types of tundra.



Tundra

The Tundra has a completely frozen subsoil which causes a lack of trees due to no running water. There is only one known body of water and that is the ocean.

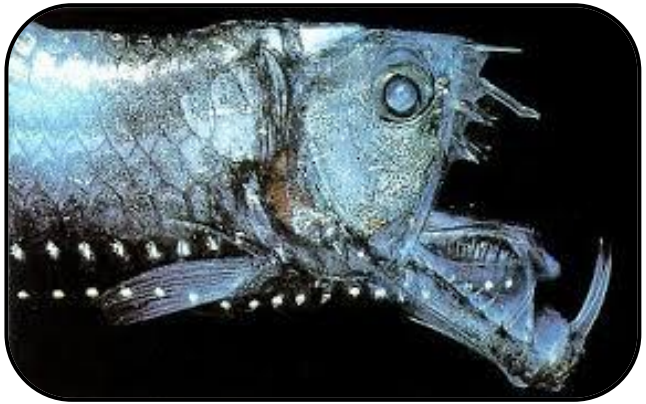
Threats to the Tundra are that the permafrost is melting as a cause of global warming could change the landscape and what species can live there.

The Tundra is home to quite a few plants like Berries, arctic moss, caribou moss, labrador moss and much more. Plants stay alive by growing hairy stems to keep them warm and staying low to the ground from high winds.

The Deep Sea (Lucia and Sophia)

- Climate
  - 2-5℃
  - Always dark.
- Pressure and associated problems
  - 20 -1,100 atmospheres(293.919 -16165.54 psi)
  - The Bends aka decompression disease
- Altitudes
  - 1,800 m - 10,916 m below sea level
  - Grand canyon

Deep Sea Flora and Fauna



- Bioluminescence
  - Lure
  - Attraction
  - Protection
- Pressure
  - Deep sea life in shallow waters
  - Oxygen in muscle

Food

- No sunlight = no plants

Mangrove Forests

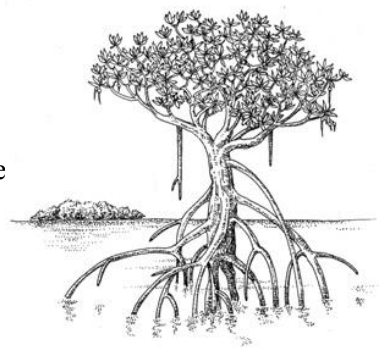
Oliver and Simon

Location:

- Mangrove Forest are typically found near the equator (e.g Florida, Peru, India)
- They can't grow too far north or too far south (e.g Detroit, Chicago, Antarctica)
- Mangrove trees are interesting, because they are capable of thriving in salt water. Their roots have salt-filtering taps.
- Being dependant on the sea, mangrove forest have low elevation. They can grow up to 20 feet or only 2 feet depending on their area.
- Mangrove trees grow at the mouths of rivers, where slow moving water allows fine sediments to accumulate.
- Mangrove forests tend to come in all different shapes and sizes. In colder climates, with less nutritional sedatives, mangroves can only grow two feet, forming a 'dwarf mangrove forest.' Some mangrove forests are better growing locations for the tree. If a tree is secluded from thrashing waves, it will most likely grow larger than a tree that isn't.

Climate and Weather:

- Being near the equator, the climate is hot and sunny. This allows for the mangrove trees to grow strong. The average annual temperature is around 75 degrees.
- The mangrove trees help during tropical storms because their roots prevent the erosion of coastlines. Hmmmm.

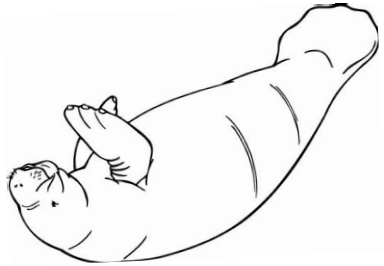


Biodiversity

Dominant Vegetation:

- Rhizophoraceae are the most common species of mangroves in the mangrove forests. Their seeds become fully mature before dropping off their mother tree.
- In places like Florida and Louisiana, the Rhizophoraceae are endangered by the invasive Brazilian Pepper Trees. The Rhizophoraceae itself is an invasive species in some areas.
- Other common vegetation includes White Mangrove, Loop-Root Mangrove and Nipa Palm. The latter of which looks like a palm tree without the tree part.

Common animal species:



- Manatees are large, round mammals. They are most common in South and North American mangroves. They are herbivores and therefore eat a lot of mangrove leaves. The heat of the mangrove forest is quintessential to the manatees' survival. In the fall, most of them migrate towards the Floridan mangroves. They enjoy the shallow depth of the mangroves, because water is warmer. They have no natural predators, but are still endangered.
- Egrets are big, white birds. They eat crabs and small fish, which are abundant in mangrove forests. To avoid predators, they sleep utop the mangrove trees.
- Mangrove tree crabs are small, speckled crabs. They spend their days munching upon mangrove leaves and hiding from the predators. They spend much of their time out of water, because it is safer.

Human Effects

Changes in Climate:

- With Coral Reefs deteriorating, wave activity will increase. This can lead to damages in the mangroves, upsetting their sediments.
- With sea levels fluctuating, mangroves long-term survival may be threatened.

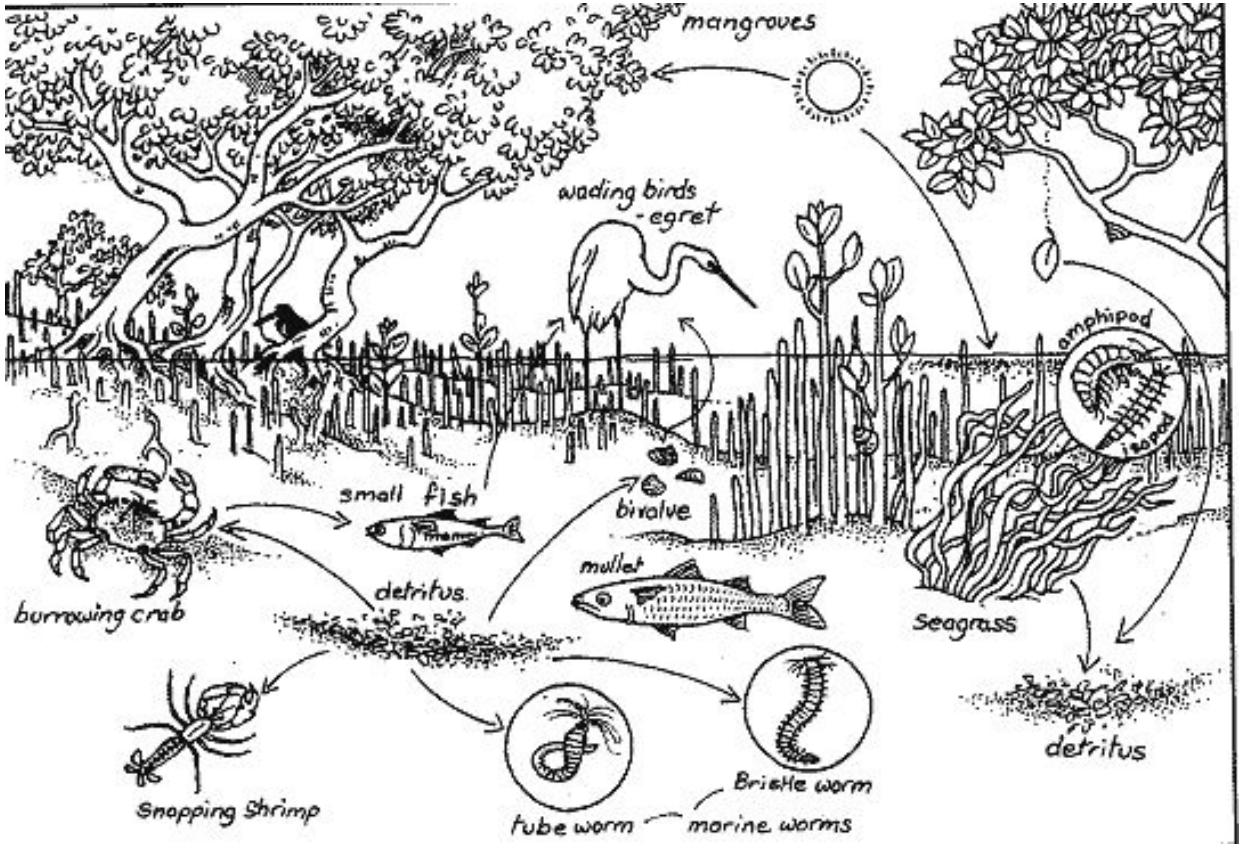
Over Harvesting and Clearing:

- Mangroves have been cleared to make room for industrial areas and tourist sites.
- For years mangroves have been harvested for fire and construction wood. However, in some parts of the world, it is no longer sustainable.

Pollution:

- Oil pollution can smother the mangrove’s roots, leading to suffocation in the trees.
- Chemicals carried by river currents can poison animals.

Mangrove Food Chain



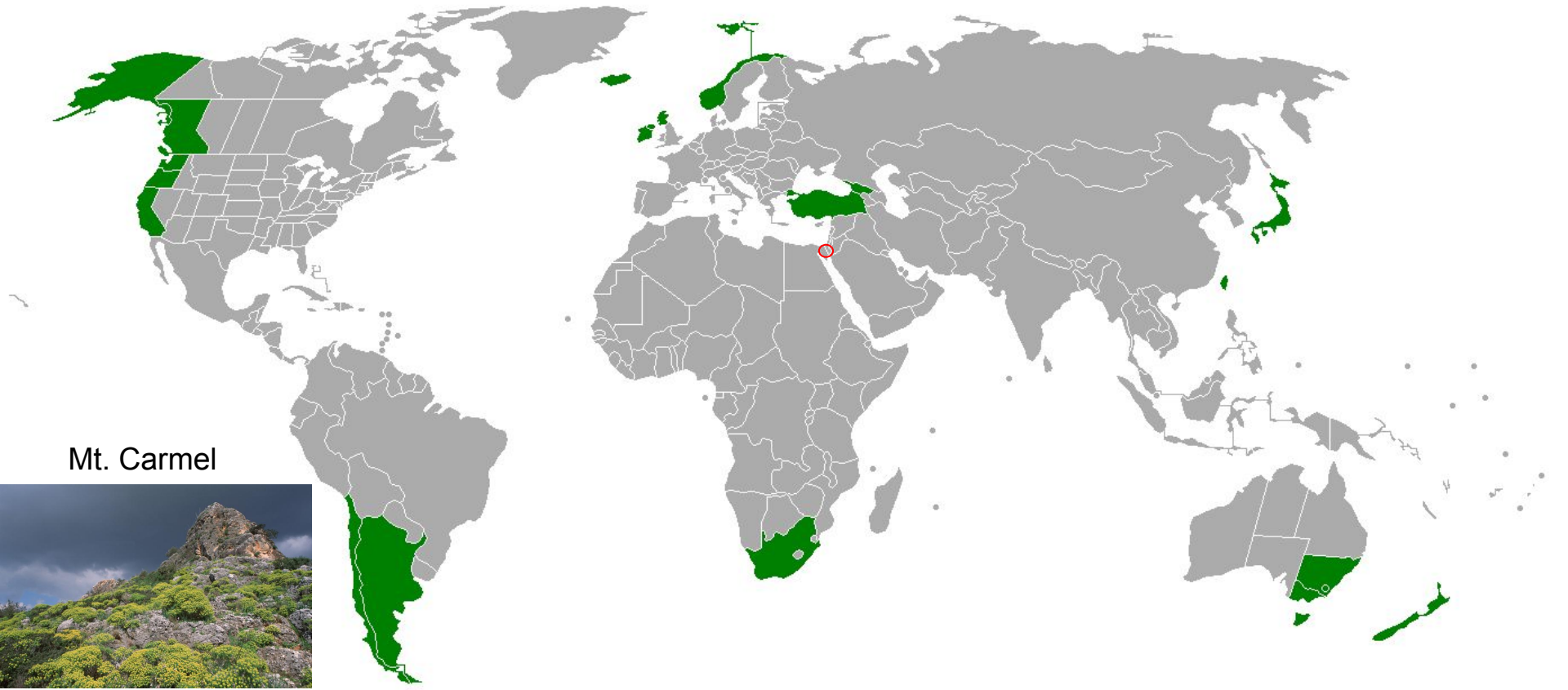
Estuary

Estuary: an area where seawater mixes with freshwater. Estuaries can be found along the coast.

Chaparral

Davin Tafuri

Geographical Locations



Mt. Carmel

Weather and Climate

Species that Inhabit

Yucca Whiple

Poison Oak

Cacti

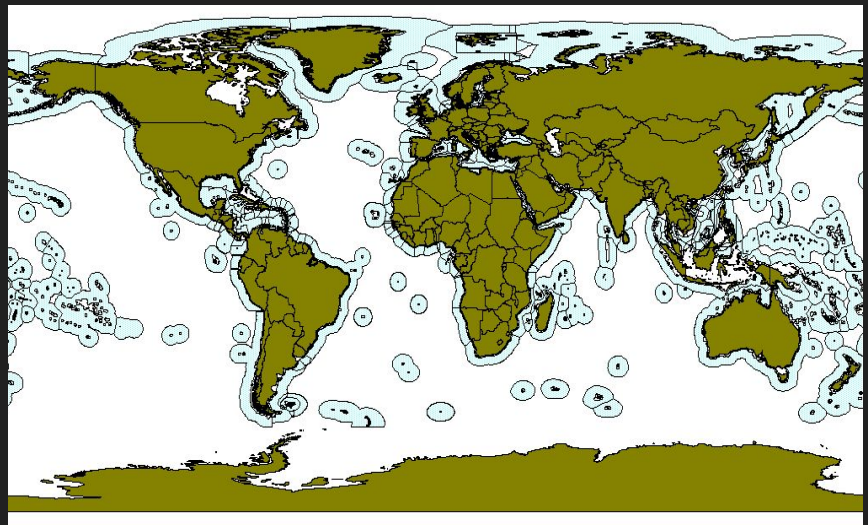
Intertidal Zones

-Located along all coastlines that are tidal

-Climates vary based on location and ocean

-Elevation also varies on the land side, but always at sea level

-Definition: The area between the high tide line and low tide lines; and can be split into two groups; soft and rocky



Intertidal Zones; Biotic Relationships

Typical Varieties of Flora: Algae, Autotrophs, Seaweed

Typical Varieties of Fauna: isopods, crustaceans, mollusks, other marine invertebrates, anemones, filter feeders

Food Chain: zooplankton, plankton-mollusks, worms, barnacles, squirts-Starfish
autotrophs-limpets and kelp crabs
crustacean-dead organic material

Apex Predator: Starfish and like Echinodermata

Intertidal Zones; Human Impacts

-Climate Change

  -Salinity and Temp Changes due to emissions

-Invasive Species

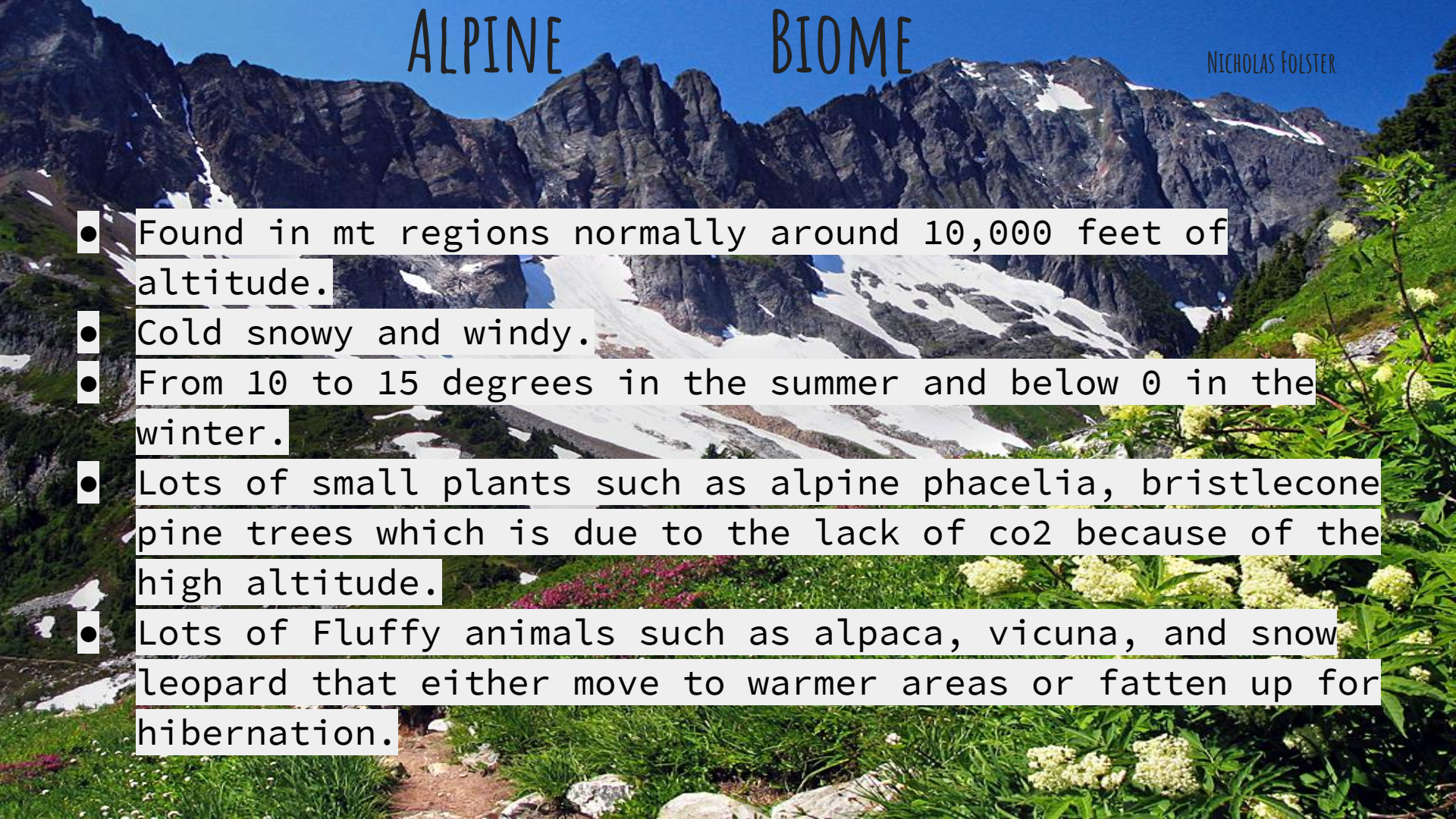
-Over-harvesting

  -Little to no protected zones from harvesting

  -Over 50% of human pop. lives within 100km of an ocean

Alpine Biome

Nicholas Folster



- Found in mt regions normally around 10,000 feet of altitude.
- Cold snowy and windy.
- From 10 to 15 degrees in the summer and below 0 in the winter.
- Lots of small plants such as alpine phacelia, bristlecone pine trees which is due to the lack of co2 because of the high altitude.
- Lots of Fluffy animals such as alpaca, vicuna, and snow leopard that either move to warmer areas or fatten up for hibernation.

Alpine Flora and Fauna

Biomes

Learning Target: I can compare and contrast Earth's major biomes

New Vocabulary:
- biome
- biosphere
- biodiversity
- climate
- abiotic and biotic factors
- what other vocab do you use here? make a list.

Instructions:
You must choose one of Earth's biomes and create a presentation that encourage the audience to visit your region. You may pick from the following biomes:

1. Tundra
2. Taiga/alpine
3. Grassland/savannah
4. Chaparral
5. Desert
6. Temperate forest
7. Tropical rainforest
8. Mangrove forest
9. Freshwater - lakes
10. Freshwater - Rivers
11. Estuary -
12. marine - tidewater
13. marine - deep ocean
14. marine - coral reef

Each individual person is responsible their own biome presentation. You use Google Docs to organize your information or Google Slides to create a visual. Include a mixture of pictures and information. We will spend the last twenty minutes of class presenting our biomes, so use your time wisely!

You can include information about the following topics:

- geographic location
- weather and climate
- flora (plants) and fauna (animals)
- predator and prey relationships
- ecological issues
- human impacts
- diseases
- types of food
- landforms, bodies of water
- anything interesting or surprising!

Succession Timeline:

Learning Target: I can construct an explanation of patterns of succession.

New Vocabulary:
- -primary succession
- secondary succession
- pioneer species
- opportunistic species
- climax community

Instructions:

1. Your group will be assigned a succession scenario.
2. Research the stages of your type of succession.
3. Create a pictorial timeline.
4. Include a description next to each stage with the dominant species, information about the community and a description of any processes that are occurring.

bare rock

Obviously, on bare rock, no develop soil exists. The niche of the lichen (mutualistic relationship between algae and fungi) is to live on the rock where it releases carbon dioxide, which when mixed in rainwater, makes a weak acid (carbonic acid). The acid begins breaking the rock into small grit-sized pieces which wash down into depressions or cracks in the rock.

As a little bit of grit forms a small amount of soil in cracks and depressions in the rock, mosses begin to take hold on the rock. As the mosses begin to die, they decay with the dead organic matter held within the mass of moss, slowly increasing the depth of the soil. Additions of pine needles and leaves further deepen the soil.

When enough decay adds enough depth of soil to a crack or depression in the rock, the seeds of small shrubs or trees may blow in (or be planted by rodents or birds) and sprout. These young sprouts of lodgepole pine have sprouted in a hole in the rock with less than 3 cm or soil in it.

With addition of soil, the pine seedlings continue to grow. The roots may split the rock, adding more room for soil which develops as needles and eventually cones fall to the crevice below. Eventually, if enough soil develops there, a large tree may grow there.

Which Niche?

Learning Target: I can determine and describe the niche of a given species

New Vocabulary:
-niche
- predator
- prey
- habitat

Instructions:
You will pick three organisms out of a hat. You must determine the niches of these organisms. Find reputable websites to use as sources for your research. Fill out the following organizer and submit it by the end of class:

	Food/prey:	Predators:	Habitat:	Life History:
Organism 1:				
Organism 2:				
Organism 3:				

EXTENSION: draw the food web of one or all of your organisms.

Maine Food Web Project:

Learning Target: I can demonstrate my understanding of the interrelationship of species and energy flow through the creation of a food web.

New Vocabulary:
- commensalism
- mutualism
- symbiosis
- competition
- parasitism
- predatory relationship

Instructions:

1. Find your organisms. Glue them to index cards and write the name of the corresponding organism on the front of the card.

2. The class must assemble the cards into one complete food web. Use the string and tape provided.

3. Use additional index cards to describe each of the new vocabulary terms in the context of this food web.

4. Once the food web is complete, answer the following questions:

- describe a commensalism relationship:

- describe a mutualistic relationship:

- what is symbiosis?

- describe an instance of competition:

- what is parasitism?

- discuss one predatory relationship. What is an adaptation that the prey has evolved to deal with this specific predator?


Tim Auer | www.4b.io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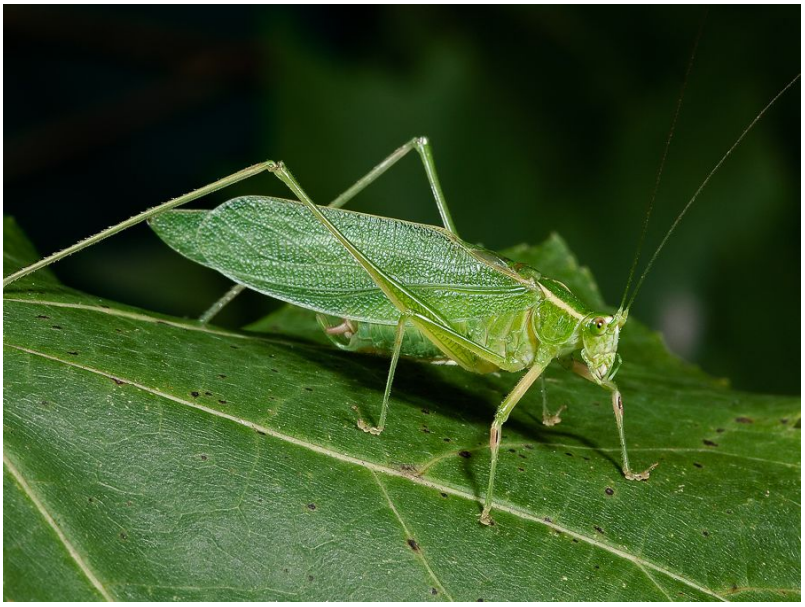


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Nuts in Bladder-Like Bract
(Hophornbeam)
Acorn
(Oak)
Nut in Husk
(Pecan)
Multiple Seed
(Mulberry)
Multiple Seed
(Sycamore)
Samara
(Maple)
Samara
(Elm)
Samara
(Ash)
Berry
(Texas Persimmon)
Pod
(Redbud)
Drupe
(Hackberry)
Seeds in Prickly Bur
(Ohio Buckeye)
Drupe
(Cherry)
Cone
(Baldcypress)
Cone (Pine)
Winged Seed
Hairy Seed
(Willow)
Seeds in Spiny Bur
(Sweetgum)
Nut-Like
Drupe
(Basswood)


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Maine is home to 60 species of mammals, 226 species of birds, 17 species of reptiles, 18 species of amphibians, 69 species of fish, more than 500 species of spiders, 110 species of mollusks and more than 15,000 species of insects.

	BIRDS:	HERPS:	INSECTS:	PPs:
Little black bat	Ruby-throated hummingbird	Spotted salamander	Northern crescent butterfly	berries
	Golden Kinglet	American toad	Northern Mole Cricket	grasses
Lynx	Wild turkey	Red backed salamander	Planthopper	shrubs
Bobcat	Common Raven	Eastern Garter snake	Wolf spider	trees
blackbear	Black-Capped Chickadee	Wood turtle	Earth worm	mosses
Grey fox	Northern Cardinal	**Wood frog**	Carpenter ants	seeds
coyote	Magnolia Warbler	Eastern Newt	Deer tick	herbs
White tail deer	Song Sparrow	Grey tree frog	Millipede	lichens
	Purple Finch	Ringneck snake	Red Oak Borer	
Moose	Barred owl	Smooth green snake	Snail	
deermouse	Great horned owl		Katydid	
Cottontail rabbit	Peregrine falcon		Isopod	
Snowshoe hare	Cooper's hawk			
Red squirrel	Bald Eagle	FISH:		
mink	Turkey vulture	Landlocked salmon		
beaver	Pileated woodpecker	Brook trout		
opossum	Loggerhead shrike			
raccoon				
skunk				
vole				
shrew				

Relationship Entrance Slip:

---

1. Look at the class food web that we created.

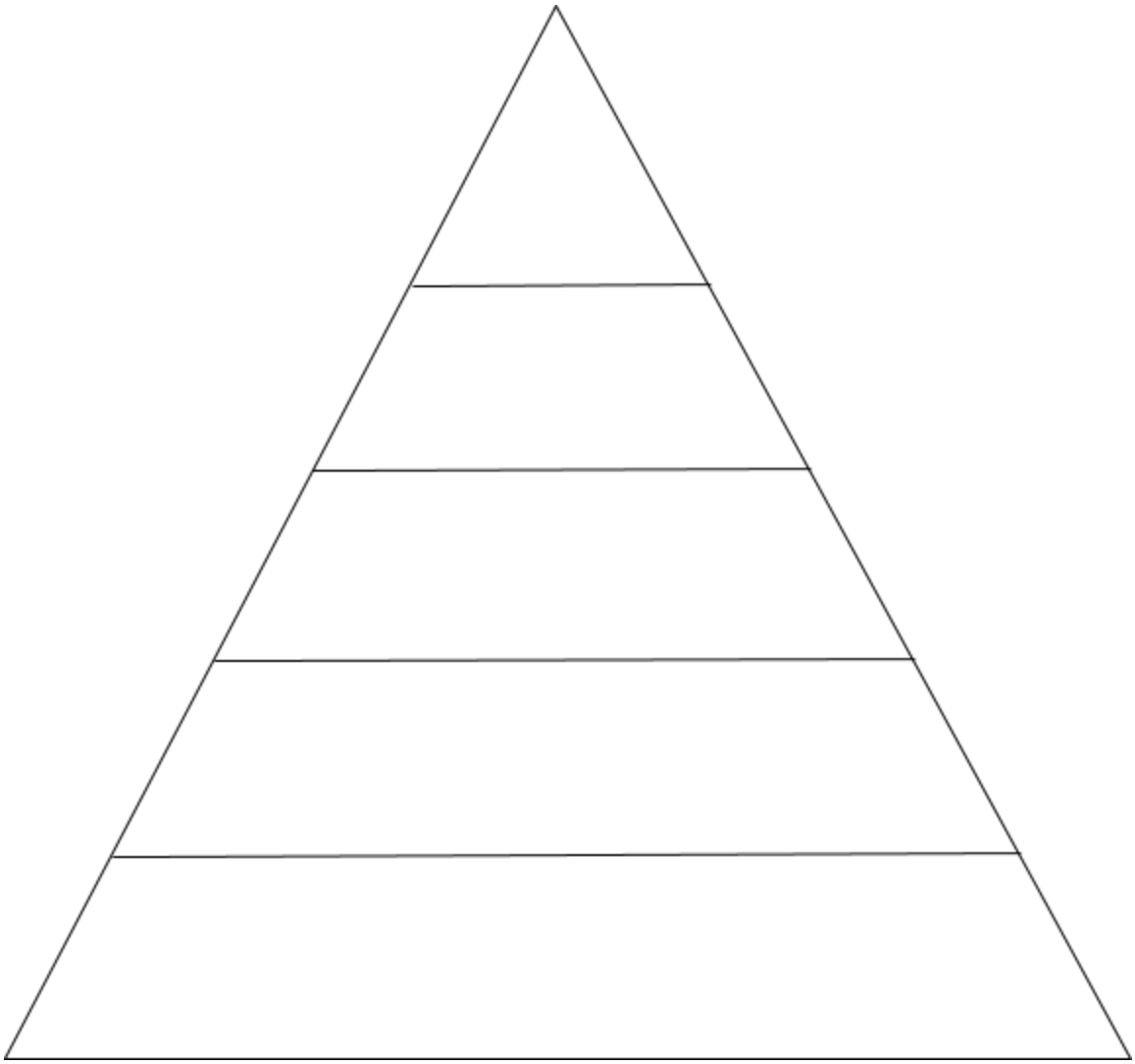
2. Imagine that one species is removed from the board. What is it? _____

3. Describe the short and long term effects of the removal of that species. Use scientific vocabulary.

Energy Flow Exit Slip:

Fill in each level of the triangle with the following information:

- Trophic level
- Organism that is on that level
- Energy flow (assign the bottom level an energy unit and go from there)
- Any other information you'd like to add (relationships, facts, etc.)



How Many Deer is Too Many Deer?

Learning Target: I can estimate the carrying capacity for a given species in a given area.

New Vocabulary:
- carrying capacity
- limiting factor
- density independent
- density dependent

Instructions:

1. Research how many square it takes to support a single healthy deer: _____
1. Open Google Earth. (You may need to first download Google Earth.)
2. Zoom in to an area that includes your house. Put a **placemark** where you live with your name.
3. Select an area between 10 and 20 square miles that includes your house. Click the ruler icon and **draw a path around the area**.
4. Calculate the area you have included: _____ (include units)
5. In the corner, **draw a one mile scale** that will be used for other calculations.
6. Close the line/path drawing tool by clicking the red X.
7. The map should now have one pushpin with your house labeled, one line to be used as scale, and a box around the perimeter you selected.
8. Save the image you created and attach it to this worksheet.
9. Calculate the carrying capacity of the area you selected _____
10. Answer the following questions:

- How did you calculate the carrying capacity?

- Things you had to consider to calculate the carrying capacity:

- How correct do you think your answer is? Explain.

- How has the area changed in the past 20, 50, 100 years?

- What effect would these changes have had on the deer population in the area?

- What changes can be expected in the next 20, 50, 100 years?

- What effect would these changes have on the deer population in the area?