Directions: **Read all the directions thoroughly and make sure to read the overview and objectives. Answer all questions below on a separate piece of paper, and be sure to visit all the web links as indicated. When visiting the web links, make sure you read all the information and look over the images, and answer any associated questions.**

Objectives: ***After studying this material you should be able to:***

1. Describe an ecosystem and explain how the biological community interacts with its environment.
2. Explain the role of disturbance in (natural and managed) ecosystems and its relationship to succession.
3. Explain what primary succession is and give some real world examples.
4. Explain what secondary succession is and distinguish it from primary succession.
5. Describe how living components in the ecosystem change nonliving components during succession.

Ecological Succession - Overview

From the Latin, succedere, to follow after
"Change in the species composition of a community over time." (Lewis, Life glossary)

- **Primary Succession** follows the formation of new land surfaces consisting of rock, lava, volcanic ash, sand, clay, or some other exclusively **mineral substrate**.
  - This means that there is **NO SOIL** present.
  - Soil is a mixture of mineral material, decaying organic material, and living organisms.
- **Secondary Succession** follows the destruction or partial destruction of the vegetation area by some sort of disturbance, like a fire, windstorm, or flood that leaves the soil intact.
- **Pioneer species** initiate recovery following disturbance in both primary AND secondary successions

  Pioneers "pave the way" for later colonists by altering the biotic and abiotic environment:

  - soil stabilization
  - soil nutrient enrichment (organic matter and biological nitrogen fixation)
  - increased moisture holding capacity
  - light availability
  - temperature
  - exposure to wind

- Species composition tends towards a **Climax Community** through succession.
- The climax community describes an end product of succession that persists until disturbed by environmental change.
- Succession occurs on large scales involving higher plants and animals, but may involve microbial communities on a smaller scale.

Watch the youtube video→ http://www.youtube.com/watch?v=_Y9EQbKH_hA&feature=related (*note if the video does not play, just move on to the next portion of the activity*)

Visit the web link→ http://www.geowords.org/ensci/imagesbook/04_03_succession.swf

1. How is primary succession different from secondary succession?
2. Describe the example of secondary succession indicated in the simulation
3. How does the rate of secondary succession compare to primary succession?
4. Imagine a lawn on campus or in someone's yard. Are there any examples of succession there now? If no one maintained it for five years, what might it look like? What would it look like after 10 years? 50? 100?

http://bcs.whfreeman.com/thelifewire/content/chp55/55020.html

Visit the link above, read the introduction, watch the animation, take the quiz, and answer the following questions:

5. What are some of the "pioneer" species in glacial moraines?
6. How do alder trees affect nitrogen content in soil?
7. How do the alder trees influence spruce tree growth?
8. Write the answers to the two quiz questions.

http://kisdwebs.katyisd.org/campuses/MRHS/teacherweb/hallk/Teacher%20Documents/AP%20Biology%20Materials/Ecology/Primary%20Succession/53_A02s.swf

Visit the link above and click on the ANIMATION, watch the animation, and answer the following questions:

9. Is a glacier and example of primary or secondary succession? Why?
10. Describe the pattern of primary succession the Glacier Bay area. Are all of the regions of the bay at same stage of succession process? What factors might explain this?
11. What is the general pattern between the direction of glacial retreat and stage of primary succession?
12. Compare and contrast the general plant communities from the far North and upper portions of Glacier Bay vs. the middle and lower bay areas of Glacier Bay.
13. How the presence or absence of soil critical of identifying an area as either primary or secondary succession?

http://www.wiley.com/college/strahler/0471480533/animations/ch23_animations/animation1.html

Visit the link above and answer the following questions:

14. Is the story of bog succession and example of secondary or primary succession? Why
15. What are some characteristics of a "bog" area?
16. Describe how water is diverted and how that contributes to the death of trees and many plants.
17. How is the bog in the animation eventually changed into a bog forest?

http://ecoplexity.org/node/219

Visit the link above and answer the following questions:

18. What is the disturbance illustrated in this animation?
19. Is this an example of secondary or primary succession? Why?
20. Over what time period does the course of succession take place in this temperate forest example?
21. Describe what happens in the post disturbance phase from 1-20 after the initial disturbance.
22. Over time describe what happens to the complexity/biodiversity of the temperate forest over the course of hundreds of years after the initial disturbance.
23. Fire is one cause of secondary succession. List at least four other examples of secondary succession.

http://www.caryinstitute.org/science-program/research-projects/buell-small-succession-study

Visit the link above and answer the following questions: Make sure to look at the map and pictures at the bottom of the page after reading the basics of the Buell study on the webpage.

24. Describe the time associated with Buell small succession study as compared to an example of primary succession. Which takes longer?
25. In general describe the progression of plant species in the secondary succession process. That is, which plants are first, second, third, forth, etc., all the way up to the formation of the climax community.

Fire Succession in San Diego county **Click on each of the links and answer the associated questions**

Chaparral→ http://interwork.sdsu.edu/fire/resources/chapparal-charecteristics.htm

26. **What is the difference between and obligate seeder and obligate sprouter?**
27. **According do the article what has been the impact of fire suppression strategies in general in chaparral communities in San Diego.**
28. **According to the article, what might happen if human population in chaparral areas continues to increase, and the frequencies of wildfires become more prevalent?**

Mixed Coniferous Forest→ http://interwork.sdsu.edu/fire/resources/conifer-forest.htm

29. **How have fire suppression efforts in coniferous forest influenced shade tolerant plants?**
30. **In National Forests, government policy has been to suppress forest fires whenever possible for the last century. Now some regions are starting to allow fires to burn. Based on what you know about succession, what impact do you think this might have in the mixed coniferous forests of Sand Diego and areas like it?**
31. **List the 3 species of conifers and 3 species of oak common to the mixed coniferous forest of San Diego county.**

Click on the link→ http://www.fire-ecology.org/education/doc1.htm (Fire Ecology)

32. **What are some of the adaptations common to plants and trees in fire prone areas?**
33. **According to the article, how does wildfire and the wildfire recovery process influence animal biodiversity?**
34. **How do "mature" coniferous forests or the coniferous forest *climax community* rate in terms of biological productivity compared to other states of coniferous forest succession stages. What implications do you see this having on fire suppression programs or controlled burn programs?**
35. **List the six major U.S. fire-adapted ecological communities.**
36. **What is your opinion of prescribed fires and their role after reading the article?**

Fire prevention and preparedness in your home

Click on the link→ http://www.wildfirezone.org/beforefire/index.asp

37. **Click through the tabs at the top of the page, looking over the suggestions regarding fire prevention and preparedness. Focus on you own home, condo, apartment, etc. where you live and list the top preparation tips that would be applicable specifically to your own dwelling**

Sources:

www.pbs.org_____
http://www.life.uiuc.edu
http://www.fire-ecology.org
http://www.wildfirezone.org
http://www.youtube.com/watch?v=_Y9EQbKH_hA&feature=related
http://www.geowords.org/ensci/imagesbook/04_03_succession.swf
http://www.nodvin.net/snhu/SCI219/demos/Chapter_4/Chapter_04/Present/animations/50_2_2_1.html
http://www.life.illinois.edu/bio100/lectures/f03lects/03f03-succession.html#succession
http://www.wiley.com/college/strahler/0471480533/animations/ch23_animations/animation1.html
http://bcs.whfreeman.com/thelifewire/content/chp55/55020.html