

Succession and Habitat Diversity



OBJECTIVE

Forest Succession represents a complex process of shifting in species dominance through time. This change creates a variety of habitat types to support different animals, fungi and microorganisms. Protecting the diversity of organisms that depend upon Oregon's many forest ecosystem types requires understanding succession and the importance of supporting natural processes that govern it. *In this activity, the learner will demonstrate knowledge of all five successional stages and how time and disturbances shift a forest through these stages by participating in this simulation. He/she will also discuss the importance of succession in maintaining a mosaic of habitat types necessary to support a diversity of animals.*

Appropriate grades: 5th – 10th

Time required: 1-1.5 hours depending on time spent explaining succession.

Benchmarks achieved: Unifying concepts and processes; Life Science: Diversity Independence

Materials: Disturbance cards, Forest Succession Timeline Diagram, Student Activity Sheets to report their shifts in succession, Succession Background Information.

ACTIVITY

- This activity divides students into groups, each group representing a section or stand of a larger forest. Arrange the sections such that you stand in the center of them all (this way the groups are spatially arranged as if they are sections of a forest). Each group needs a laminated copy of the Forest Succession Timeline Diagram to help guide them in the activity. All sections begin as a climax forest of old growth White Fir with some remaining pines that seem to be slowly dying out.
- The teacher or activity facilitator randomly gives each section a **disturbance** or **time** card. When all groups have a card, they then discuss briefly amongst their section (allow 1-2 minutes), how this **disturbance** or **time** will impact their successional stage. **The teacher may strategically give a group a certain card to direct a section's progression through succession in order to enhance the activity.**
- The teacher then asks each section to share with the class (representing the forest as a whole) how and why they stayed in the same successional stage, progressed to the next successional stage, or reverted to the herbaceous stage. The teacher should help students when they struggle using the teacher cheat sheet and help tease out finer details that add to the understanding of succession. Teachers may also have students assume poses to demonstrate the life forms present in their stage (**hands and knees for herbaceous stage, sitting up on knees for shrubs, on knees with arms in air for young forest, standing with hands on hips for mature forest and standing with arms in air for climax forest**).
- Once all groups have shared how they have changed because of the disturbance, the teacher hands out a new **disturbance** or **time** card and repeats the process.
- Each section must keep track of the successional stages they have gone through on a Student Activity Sheet provided with the Activity.
- End the activity by giving your own disturbances to facilitate a discussion of why succession is important and how some disturbances decrease overall habitat diversity.



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DISCUSSION

It is vital to facilitate a discussion at the end of this activity to bring the concept of why succession is important. The game should have demonstrated that different disturbances impact successional processes in different ways, yet it doesn't necessarily explain why succession is important. Since each forest section (group of students) wrote down all the stages that they went through, the teacher can explain that the forest as a whole has multiple successional stages present at any given time. (Since each section got different time cards, sections don't really match up. The point can still be made that different sections end up in different successional stages at any one time). Attempt to get the students to determine why having multiple habitat types is important to biological diversity (remember that each organism has its own niche). Also, try to bring out the point that some successional stages offer more niches than other stages (young forests are not very diverse so they have fewer niches, while old growth has old trees young trees, dead trees, and even herbaceous vegetation on the ground). Ask questions like, "What happens if the whole forest is cut all at once" (or some other disturbance that starts over the cycle). Try to get them to determine that natural disturbances that support a mosaic of successional stages is preferred for ecosystem health over catastrophic disturbances that are less natural (While fire is sometimes labeled as catastrophic, it is not bad. Even fires that kill all the vegetation are good sometimes and occur naturally. However, fires that burn in a mosaic with varying degrees of intensity create habitat in multiple stages of succession. Fire suppression creates high fuel loads resulting in fires of extremely high intensity that kill all the vegetation).

ASSESSMENT

Provide each student with a blank succession template. Working independently, the students should illustrate the stages of succession. Additionally, have each student choose a disturbance factor, and write a paragraph explaining how it may influence succession.



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Teacher Cheat Sheet

Concepts to cover:

1. Forests are constantly changing.
2. Succession describes the shifts or changes that occur through time on forests.
3. While this activity has simple answers for what happens with particular disturbances, remind students that succession is complex. The same disturbance might affect different areas differently. There are many variables to think about, i.e. weather (fire), tree health (sick trees more prone to insect infestation), topography, intensity of the disturbance, and site specific characteristics of the vegetation etc.
4. Natural disturbances promote forests with multiple successional stages.
5. Forests with a mosaic of habitat types offer more diverse and larger numbers of niches to support greater biological diversity.
6. Human interaction (i.e. fire suppression) often interrupts natural disturbance regimes impacting successional processes and decreasing habitat diversity.
7. Some successional stages support more diversity than others.
8. Climax forests are not stagnant but constantly change. They usually have patchiness within them of other successional stages (tree fall gaps).

Likely successional trends from disturbance and time cards:

1. Ground fire – usually clears out shrubby herbaceous vegetation in the understory killing small trees. Larger trees often survive. A ground fire in the herbaceous stage, shrub stage, or young forest stage usually kills all the vegetation starting the cycle over at the beginning of the herbaceous stage. If students are in mature forest or climax forest then they stay in the same stage they're presently in.
2. Insect infestation – usually insect infestations impact only older trees and on small scales. For the sake of this activity, we'll have students go back to the herbaceous stage whenever they're in a young forest, mature forest or climax forest stage. Herbaceous vegetation and shrub stages are not usually impacted by insects like bark beetles.
3. Windstorm – sections in a mature forest or climax forest will be impacted by this disturbance but will not revert to the herbaceous stage. These rarely do damage significant enough to revert succession back to the herbaceous stage. However, they do create patchiness where larger trees will fall, creating openings in the canopy that allow light to reach the forest floor. Therefore, even though the successional stage hasn't changed small patches of herbaceous vegetation occur, increasing habitat diversity.
4. Landslide – all section that have landslides revert to the herbaceous stage since all vegetation is destroyed.
5. Catastrophic fire – these high intensity fires kill all vegetation reverting all sections back to the herbaceous stage.
6. Time – time simply allows for the progression of succession when disturbances are absent. Each forest succession should advance forward in the successional process the appropriate amount when they receive a time card.

