Leaf litter decomposition in tropical and temperate rainforests: teaching climate-driven ecosystem processes outside the science classroom.

Introduction

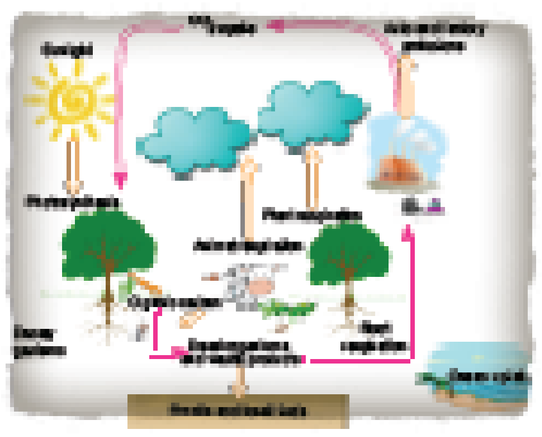
One of my goals as a future teacher is to motivate students to better understand the environment and the natural processes that regulates the ecosystem functionality. One way to accomplish this is by teaching ecosystem processes, conducting field research to improve the science lessons.

• Leaf litter decomposition is an important ecosystem process. It refers to the process that converts dead organic matter into smaller and simple compounds.

• Litter decomposition is mainly a biological process, its rates can vary with abiotic or biotic factors like:

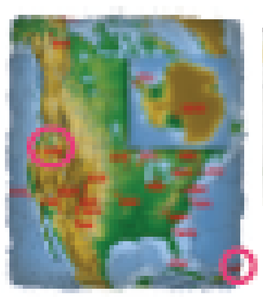
-leaf species - treatment (location on soil)

- temperature -arthropods (abundance)



• As a future teacher I have seen the necessity of creating innovative ways to communicate the importance of ecological processes to my students. With this same purpose projects like the Long term ecological research network (LTER) exist:

- LTER Network (Figure 2) - create science research for teachers and their students
- Ecoplexity - resource for science teachers on the web.



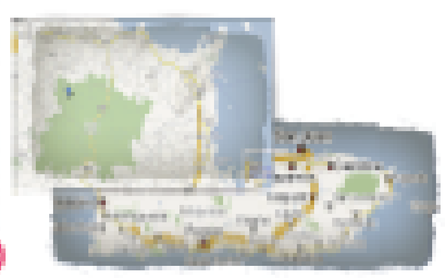


Figure 3: Study site: El Verde Field Station demonstration plot, located within the Luquillo Experimental Forest, PR.

Figure 2: The LTER Network

Question

How does the rate of litter decomposition differ between tropical and temperate rain forests?

Objectives

Improve science lessons related to ecosystem function and climate.

Develop an experimental lesson plan based on field experiences to assist teachers in conveying the concept of climate-driven ecosystem processes to students, the comparison of leaf litter decomposition rates between two environments with different climate will be used to help understand this concept.

Exchange and compare leaf litter decomposition data between Luquillo Experimental Forest and HJ Andrew.

Determine the role of arthropods in controlling leaf decomposition by comparing rates above and below the soil surface.

Figure 4: Selected plant species

Methodology

Results

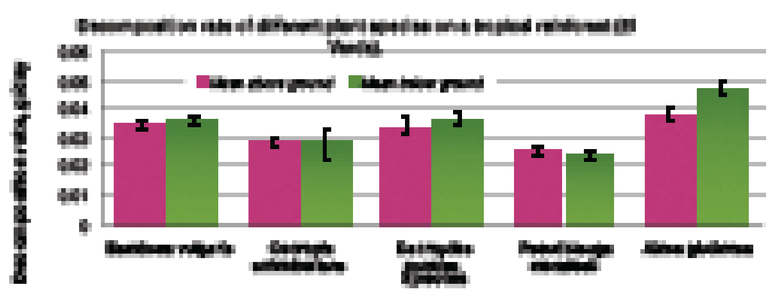


Figure 5.
Comparison of leaf litter decomposition of five species, three from a tropical rainforest and two from a temperate rainforest. Leaf litter bags were placed above and under the soil surface of the LEF. In the tropical rainforest (LEF), the three tropical species showed similar decomposition rates above and below surface, but the two temperate species showed drastic differences. *Alnus glutinosa* had the highest decomposition rate of all species, especially below surface.

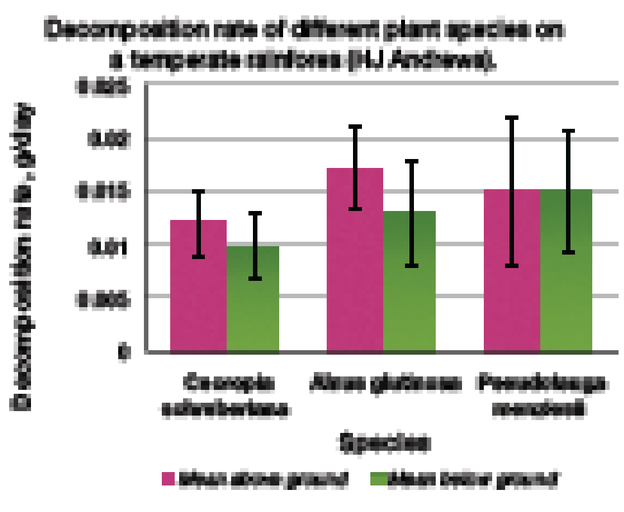


Figure 6.
Comparison of leaf litter decomposition of three species, one from a tropical rainforest (Cecropia) and the other two from a temperate rainforest. In the temperate rainforest HJ Andrews, we found that the temperate species show higher decomposition rate than the tropical species. *Pseudotsuga menziesii* (Douglas Fir) showed equal decomposition rate above and below surface, while *Alnus glutinosa* (Red Alder) show higher decomposition rate above soil surface.

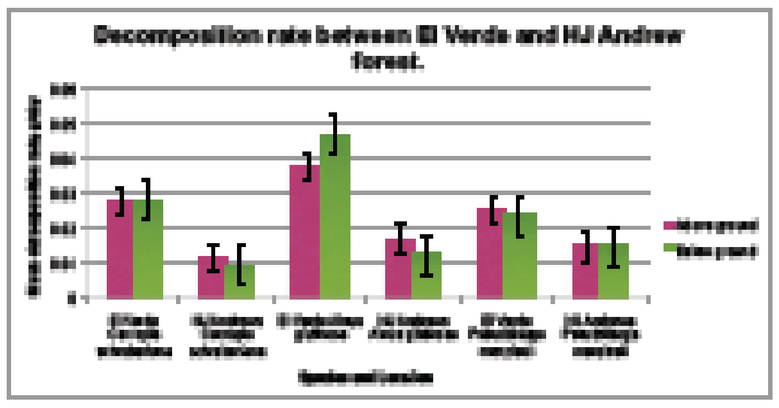


Figure 7.
We found that the highest leaf litter decomposition rate between *Cecropia schreberiana* (Cecropia), *Alnus glutinosa* (Red Alder) and *Pseudotsuga menziesii* (Douglas Fir), occure in the tropical rainforest at the Luquillo experimental forest, Puerto Rico. We can noticed that Red Alder had the highest decomposition rate below the surface. Cecropia had the lower decomposition rate below and above the surface on the temperate forest (HJ Andrew).

Conclusions

- Participation in authentic scientific research gives teachers confidence and motivation. At the same time, these experiences can be implemented as part of their class work.
- With this research we can develop a lesson plan that we can integrate to the curriculum. By doing this we can understand climate driven ecosystem processes and motivate students to do scientific research.
- In the experiment performed here, location (tropical vs. temperate) was more important than arthropods (above vs. below ground) in determining leaf litter decomposition rates. We propose that high humidity and temperature in tropical forest are the main drivers explaining this difference.
- Lack of arthropod effects could be the result of the duration of the experiment. Incubation over longer periods of time could potentially increase arthropod participation of this process.

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