

STUDENT GUIDE

ELABORATE LESSON 19



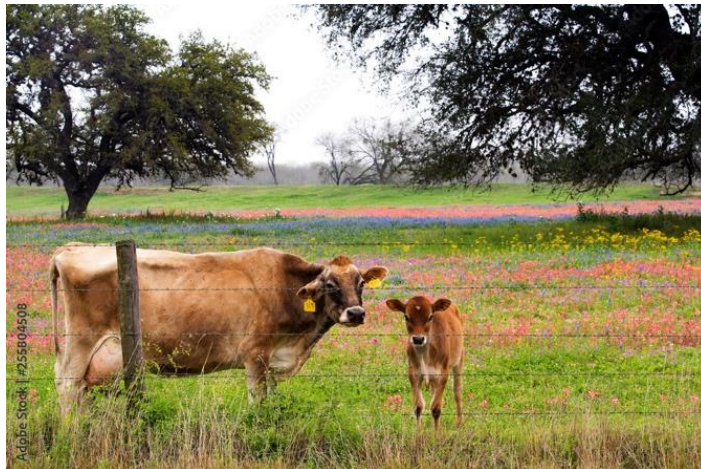
Part 1: Our Motivation

Record what we were trying to figure out that led to this investigation.

We wanted to figure out what is a way to feed cattle that does not decrease biodiversity as much as feeding cattle monocultured feed.



Part 2: Observing a New Phenomenon



What do you observe in this picture regarding biodiversity? What do you wonder?

I see dairy cattle in the picture, but it looks like a thriving pasture with all the different kinds of flowers present. It reminds me of what we did earlier to calculate biodiversity. It seems like this dairy system has chosen to focus on their pastures to include a variety of plant life. I can't see wildlife in this picture, but it seems like it could be a good habitat for birds because of the trees and maybe even pollinators like bees and butterflies because of the flowering plants.

How do you think this land's biodiversity compares to monoculture croplands? Or to undisturbed lands?

I think the biodiversity here might be comparable to the biodiversity in undisturbed lands. It looks like there is more biodiversity than in the monocrop fields.





Part 3: Analyzing Data on Changes in Biodiversity

After completing the computational model, what average level of biodiversity did you calculate for the three sample sites for this location? How does it compare to the biodiversity for a monoculture crop field and to the undisturbed lands that you determined in Lesson 16?

I remember that the undisturbed land had the highest diversity. The biodiversity calculation was 0.90 for undisturbed land. The higher the number, the more diverse the area. I am surprised to find that the land with cattle is almost as diverse as the undisturbed land, with a score of 0.88, which was way higher than the monoculture land which had a score of 0.79. The cattle on pasture are not quite the same level of biodiversity, but its biodiversity is higher than the monoculture crop land.

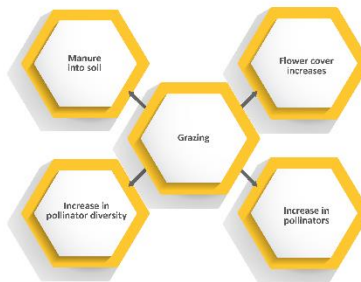
What can you conclude from this data about the desired effect of the way this grazing system is designed?

The grazing system can increase biodiversity compared to monocultured land. This new system has a new intended effect to improve biodiversity compared to when cattle are fed with monocultured crops.



Part 4: Developing a Model of How Grazing Can Improve Biodiversity

Create a concept-map model that shows how you think adding cattle to a pasture with grazing can increase biodiversity and how that can help humans.



Record an explanation of your model.

This model shows that grazing can provide multiple benefits to biodiversity. From the data we analyzed, we learned that implementing grazing with cattle can increase pollinators' abundance and diversity, could increase flower cover, and will add manure into the soil.

I think this impacts everything in a beneficial way. If biodiversity increases, we can expand food sources, find balance in ecosystems, increase healthy nutritious food available to consumers, and create increased security in the global food supply. Each of these impacts benefit people, animals, and plants.



Part 5: Obtaining Information from Text

Read the text provided. Record evidence from the text that can help you explain how grazing can change the biodiversity impacts of the dairy system.

Selected Quotes for Evidence

Through the above, “managed livestock grazing can have 4 general impacts on vegetation: (1) alter the composition of the plant community, (2) increase the productivity of selected species, (3) increase the nutritive quality of the forage, and (4) increase the diversity of the habitat by altering its [physical] structure.”

Grasslands with more vegetation heterogeneity support a greater number of plant and animal species because they contain additional structural complexity and/or diverse plant communities, which provide added spatial and temporal niches.

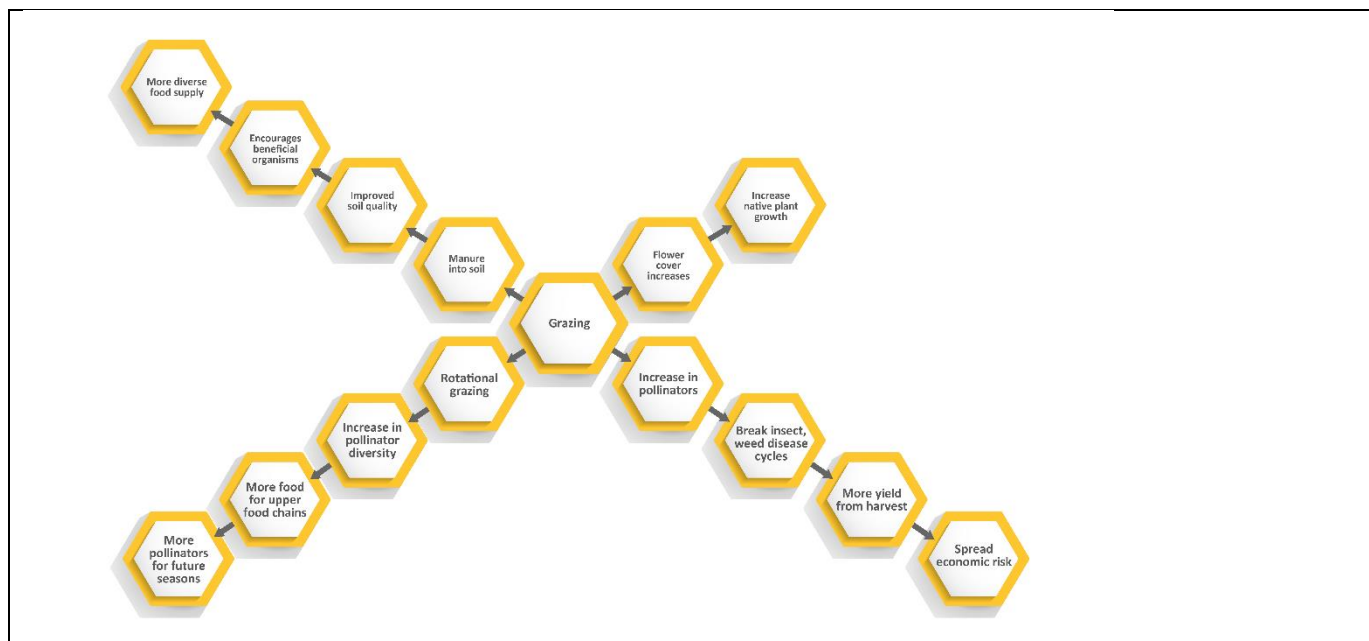
Grazing, through influences on vegetation heterogeneity, can maintain a variety of successional or ecological states in grasslands. This increases both heterogeneity and biodiversity locally by limiting the proportion of climax communities in favor of increased and varied intermediate ecological states.

The effects of grazing on plant communities and biodiversity thus reflect some basic ecological principles. These include: (1) plants are distributed in patches, and the status and distribution of patches depend upon the processes, such as grazing, that create them; (2) grazing can increase heterogeneity of plant communities by reducing dominance by a few species, which are replaced by numerous secondary species; and (3) habitat diversity (patchiness) and resultant ecotones or edges are important as wildlife habitat for many species, but not all.



Part 6: Revise a Model and Use It to Explain the Phenomenon

Revise your model using the evidence you have gathered in Part 5.



Use your model to construct an explanation of how adding cattle to a pasture with grazing can increase biodiversity and how that can help humans. In your explanation, be sure to:

- Explain how grazing can positively impact biodiversity.
- Explain how changes in biodiversity impact humans, including how biodiversity can enhance ecosystem functioning and productivity.

Grazing improves biodiversity in a variety of ways. Grazing breaks disease cycles in animals, making them produce a healthier product. It increases plant and therefore pollinator diversity, meaning more plants will bloom and reproduce. It can also add manure to the soil, which provides the soil nutrients to grow more different plants.

An increase in biodiversity impacts everything in a beneficial way. If biodiversity increases, we can expand food sources, find balance in ecosystems, increase healthy nutritious food available to consumers, and create increased security in the global food supply. Each of these impacts benefit people, animals, and plants.