

The Great Clearcut Controversy:

An Inquiry-based STEM Unit

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Introduction

In this inquiry-based unit, students investigate how a bird community and individual forest animals respond to a clearcut timber harvest using real scientific data.

Students:

1. Use the scientific process to gain knowledge and answer questions
2. Apply that knowledge to the engineering design process
3. Design a viable management solution given the constraints and trade offs they discover

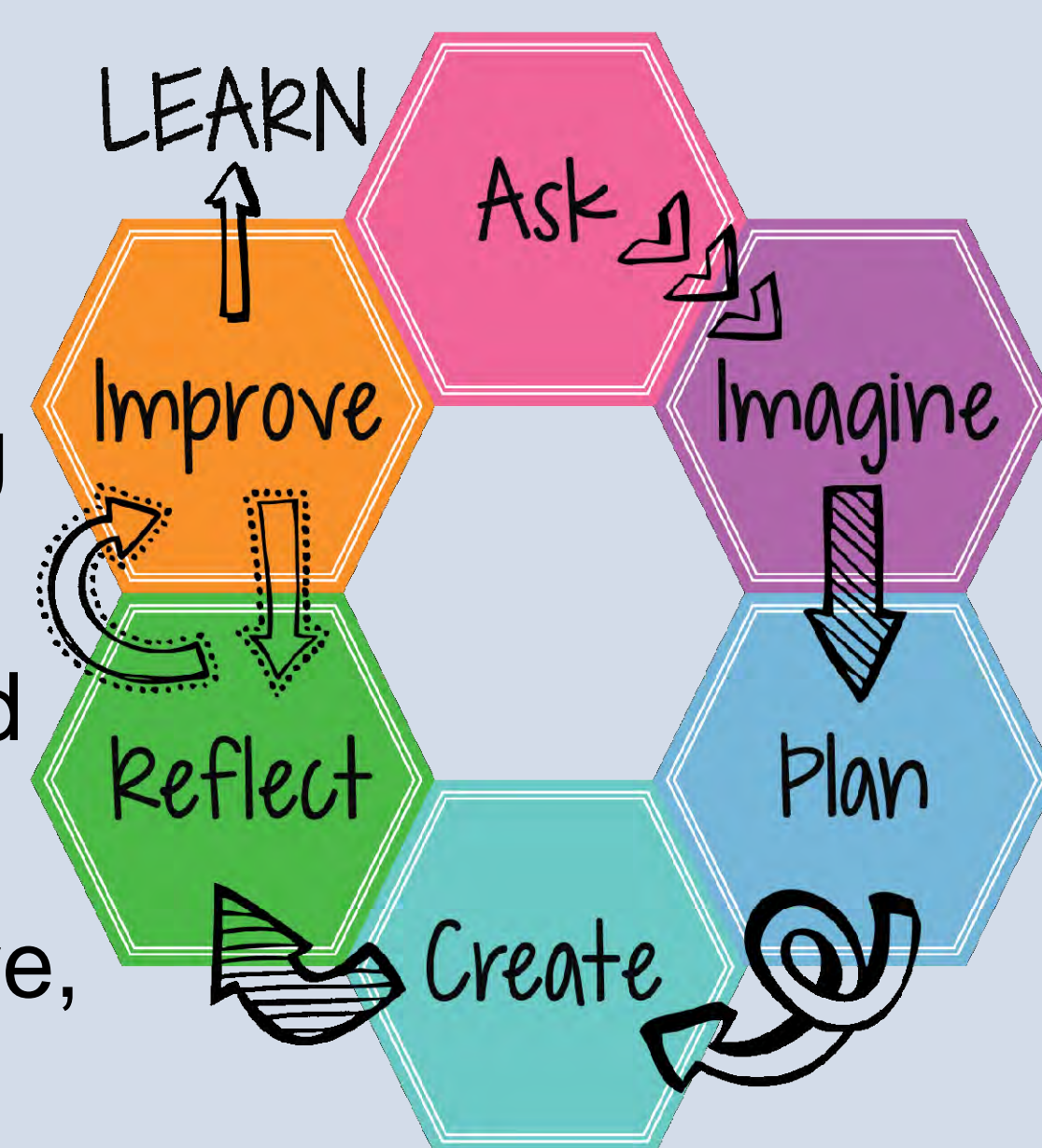


Target Audience: Grade 6-8 Science or Environmental Science

Estimated Time: Three 45-60 minute lessons

Methods

- Unit aligns with:
 - Next Generation Science and Engineering Practices
 - Indiana Science and Engineering Process Standards
- Includes: Active, Inquiry-based, and Contextual Learning Approaches
- Incorporates: Formative, Summative, and Continuous Assessments



Unit Objectives

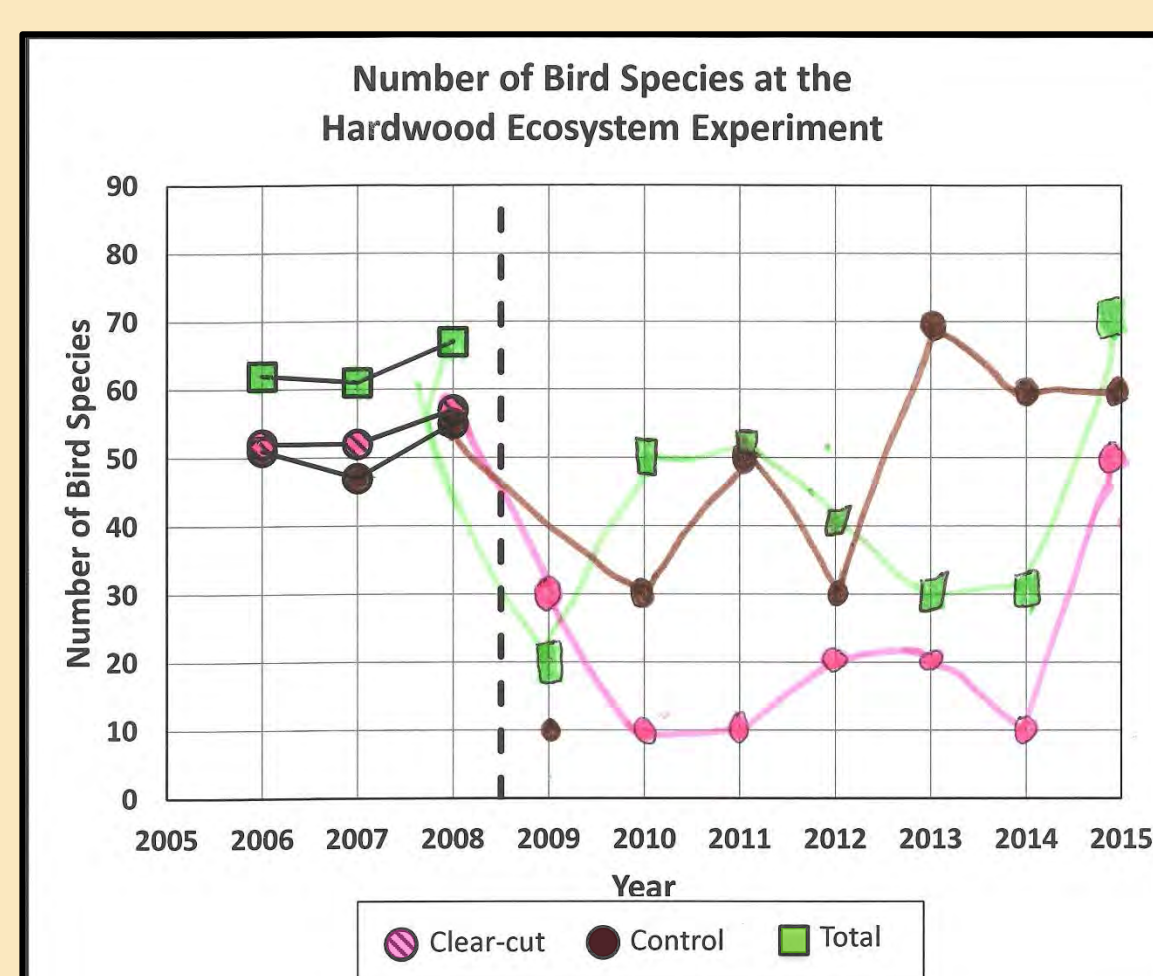
1. Analyze how a clearcut affects the total number of bird species in a forest and the abundance of individual animals
2. Explain how and why an animal's life history traits influence its habitat preference
3. Describe how to use outside information to interpret scientific data
4. Design an appropriate forest management plan based on investigation of scientific data
5. Critique a promotional video; explain how media can be misleading; and describe how to check for misinformation
6. Explain why it is important to manage forests for multiple species

Results

Lesson One:

How do bird communities change after clearcuts?

- Discuss importance of forests and wood products
- Learn about the Hardwood Ecosystem Experiment
- Scientific method and graphing activity with real-life bird community data
 - Make quantitative and qualitative predictions
 - Revise predictions
 - Formulate questions to future investigations



How Do Bird Populations Change After a Clearcut? Questions

Initial Predictions:

I think the control sites will increase because they birds are not bothered

I think the clearcut sites will decrease because they birds can't nest or eat

I think the whole forest will stay the same because the clear cut won't have any birds and the rest of the forest is stable

Lesson Two:

Do I use clearcuts? Why?

- Groups investigate a forest animal using packets of graphs, pictures, and excerpts from scientific papers
- Discover how their animal responds to clearcuts and why
- Create a forest habitat map as a class

Indigo Bunting (Passerina cyanea)

Document 1: [Image of Indigo Bunting]

Document 2: [Graph showing Indigo Bunting population]

Document 3: [Text excerpt about Indigo Bunting]

Document 4: [Image of Indigo Bunting in a forest]

How does your species respond to clearcuts? (Hint: Does its population increase, decrease, or stay the same?)

decrease

Where does it live in the forest? Are the things it needs to make its home available in clear-cuts?

Hardwood forest

What does it eat? Is there lots of food for it in clear-cuts?

worms

What kind of environment does it need? Is this environment similar or different from clear-cuts? (Hint: Think about things like water, moisture, cover, sunlight, and temperature)

doesn't like living on the ground like lots of big trees

Can you figure out the TOP THREE reasons your species likes or doesn't like to live in clear-cuts?

- 1) less shade
- 2) doesn't like little trees on the ground
- 3) they need litter

How does your species respond to clearcuts? (Hint: Does its population increase, decrease, or stay the same?)

increase

Where does it live in the forest? Are the things it needs to make its home available in clear-cuts?

Burrows in the ground

What does it eat? Is there lots of food for it in clear-cuts?

seeds, fungi, and animal foods,

What kind of environment does it need? Is this environment similar or different from clear-cuts? (Hint: Think about things like water, moisture, cover, sunlight, and temperature)

areas where it can observe from a place at least once high and where it can burrow

Can you figure out the TOP THREE reasons your species likes or doesn't like to live in clear-cuts?

- 1) they can climb the tall trees
- 2) seeds, fruit and fungi get there
- 3) they can burrow into the ground

Lesson Three:

Big management decisions in the boardroom!

- Use engineering design process to cooperatively formulate a management plan
- Optional performance-based assessment



Discussion

Optional final assessment

- Write formal business letter to state forester or land manager describing a forest management plan
- Explain importance of forest management and the class's management plan using specific examples from Lesson 2

Where to find this unit

- Present at Indiana educator conferences
- Will be available summer/fall 2017 on Purdue Extension Nature of Teaching (www.purdue.edu/nature)



References

- Krajcik, Joseph, et al. Planning instruction to meet the intent of the Next Generation Science Standards. Journal of Science Teacher Education 25.2 (2014): 157-175.
- NGSS Lead States. Next Generation Science Standards: For states, by states. The National Academies Press. (2013).
- Vasquez, Jo Anne, Cary Ivan Sneider, and Michael W. Comer. STEM Lesson Essentials, Grades 3-8: Integrating Science, Technology, Engineering, and Mathematics. Heinemann. (2013).

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