Invasive vs. Native: Battle for the Ecosystem

Grade Level: 5–6
Time Required: 60 minutes (option for 2–3 day extension included below)
Subject Areas: Science, Environmental Education, Civic Responsibility

Lesson Synopsis
Students explore the difference between native and invasive species and analyze how invasive plants disrupt biodiversity and ecosystem stability. Through a hands-on ecosystem simulation and local case studies of kudzu and bush honeysuckle in Sevier County, students model how biodiversity changes when invasive species spread. The lesson emphasizes the importance of protecting native species to maintain ecosystem resilience and connects directly to environmental stewardship in the Smoky Mountain region. This lesson is important because invasive plants are actively impacting forests, pollinators, wildlife habitats, and biodiversity in Sevier County. Students learn how human actions contribute to the spread of invasive species and how local stewardship efforts can reduce environmental harm.

Learning Objectives
By the end of the lesson, students will be able to:

1. Define native species, invasive species, biodiversity, ecosystem resilience, and limiting factors.
2. Explain how invasive species affect food webs and ecosystem stability.
3. Model how biodiversity changes when invasive species spread.
4. Analyze the environmental impact of kudzu and bush honeysuckle in Sevier County.
5. Propose prevention or management strategies appropriate for their local community.

Tennessee Standards Alignment
5th Grade
5.LS4.1 – Analyze how environmental changes affect biodiversity.
5.ESS3.1 – Use evidence to support how human activities impact Earth's systems.
6th Grade
6.LS2.5 – Analyze how invasive species impact ecosystems and evaluate mitigation strategies.
6.ESS3.3 – Assess the impacts of human activities on ecosystems.

Background Information for Instructor
Biodiversity strengthens ecosystems by increasing stability and resilience. When a wide variety of species exist, ecosystems are better able to recover from disturbances such as disease, weather events, or human impact.
Invasive species are non-native organisms that spread rapidly and cause environmental harm. They often lack natural predators in their new environment and may outcompete native species for sunlight, nutrients, water, and space.
In Sevier County, invasive plants such as kudzu and bush honeysuckle threaten forest structure, reduce insect populations, disrupt pollination systems, and alter food webs. Tourism, landscaping practices, transportation, and land development contribute to the spread of these species.
Understanding invasive species helps students recognize the connection between human decisions and ecosystem health.

Key Vocabulary
Native species – A species that naturally occurs in a specific region.
Invasive species – A non-native species that spreads rapidly and causes environmental harm.
Biodiversity – The variety of living organisms within an ecosystem.
Ecosystem resilience – The ability of an ecosystem to recover from disturbances.
Limiting factor – A condition (such as food, water, or space) that restricts population growth.
Food web – A system of interconnected food chains within an ecosystem.

Why This Matters in Sevier County
- Native plants support local pollinators, birds, and wildlife.
- Kudzu and bush honeysuckle are actively spreading in Tennessee.
- Invasive plants reduce insect populations and disrupt food webs.
- Protecting biodiversity helps maintain healthy forests, waterways, and wildlife habitats.
- Environmental health supports tourism, recreation, and community well-being.

Lesson Procedure
1. Hook (10 minutes)
Display two images:
- A biodiverse native meadow
- An area dominated by a single invasive species

Think–Pair–Share Questions:
- What differences do you notice?
- Which ecosystem appears more stable? Why?
- What might happen to animals if plant diversity decreases?
- Is greater biodiversity generally beneficial? Why?

Guide students toward recognizing that diversity increases stability.

2. Vocabulary Discussion (5–7 minutes)
Introduce key terms and ask:
How do these terms connect to the ecosystems shown in the images?
Encourage students to use vocabulary in complete explanations.

3. Simulation: Ecosystem Takeover (20 minutes)
Materials
Green tokens – Native plants
Yellow tokens – Pollinators
Red tokens – Invasive plant
Open space
Round 1: Balanced Ecosystem
Pollinators may "visit" green plants only.
Discuss biodiversity and stability.
Round 2: Invasive Spread
Add multiple red tokens.
Red spreads twice as fast as green.
When red touches green, green is removed.
Pollinators cannot use red.
Round 3: Ecosystem Impact
Remove additional green and yellow tokens to represent biodiversity loss.

4. Debrief (5–7 minutes)
Discussion Questions:

- What happened to biodiversity?
- How did limiting factors change?
- How did ecosystem resilience decrease?
- How did one invasive species affect the entire system?
- Could this ecosystem easily recover? Why or why not?

Connect the simulation to real ecosystems in Sevier County.

5. Local Invasive Species Mini-Lessons (10–15 minutes)
Kudzu in Sevier County
Non-native vine from Asia introduced for erosion control and decoration.
Can grow up to one foot per day in summer.
Covers trees and blocks sunlight.
Environmental Impact:

- Prevents photosynthesis
- Kills native plants
- Reduces biodiversity
- Weakens food webs

Removal Challenges:

- Deep root systems
- Regrows after cutting
- Requires repeated treatment

Bush Honeysuckle in Sevier County
Non-native shrub introduced for landscaping.
Competitive Advantages:

- Leafing out earlier in spring
- Keeping leaves longer in fall
- Capturing more sunlight

Environmental Impact:

- Crowds out native understory plants
- Produces low-nutrient berries
- Reduces insect populations
- Alters forest structure

Removal Challenges:

- Spread by birds
- Resprouts after cutting
- Tolerates shade and sun

Compare:

- Which spreads faster?
- Which dominates vertically?
- Which dominates the forest floor?

6. Project Options
5th Grade Project – Invasive Showdown
Students create:

- Awareness poster
- Food web diagram
- Biodiversity explanation
- One prevention strategy

6th Grade Project – Invasive Species Management Plan
Students design a management proposal including:

1. Local spread
2. Biodiversity impact
3. Population changes
4. Removal strategy
5. Prevention strategy
6. Challenges
7. Public education component

Students present as if addressing Sevier County officials or Keep Sevier Beautiful.

Evaluation of Student Understanding
Exit Ticket (5 minutes)
Students must complete one of the following:

1. Explain how invasive species reduce biodiversity.
2. Describe how one invasive plant could affect an entire food web.
3. Explain why ecosystem resilience is important for Sevier County.

Informal Assessment

- Participation in simulation
- Accuracy of vocabulary usage
- Project presentation clarity

Formal Assessment Option
Rubric-based evaluation of project including:

- Scientific accuracy
- Use of vocabulary
- Understanding of local impact
- Proposed solutions

Optional 2–3 Day Mini-Unit Extension
Includes deeper research, compare/contrast charts, extended project development, and formal presentations aligned with 5.LS4.1 and 6.LS2.5.

Invasive vs. Native: Battle for the Ecosystem
Grade Level: 5–6
Total Time: 2–3 class periods (45–60 minutes each)
Standards Alignment:

- **5.LS4.1** – Analyze how environmental changes affect biodiversity.
- **6.LS2.5** – Analyze how invasive species impact ecosystems and evaluate mitigation strategies.

Mini-Unit Overview
This extension allows students to move beyond introduction-level understanding and into deeper analysis, research, and application. Students examine local invasive species in greater detail, compare ecological impacts, evaluate mitigation strategies, and develop evidence-based solutions. The unit culminates in a formal presentation simulating a civic environmental task force.

Day 1 – Foundations & Ecosystem Modeling
Focus
Understanding biodiversity, ecosystem resilience, and invasive species impact through modeling.
Objectives
Students will:

- Explain how biodiversity contributes to ecosystem stability.
- Model how invasive species alter ecosystem balance.
- Analyze cause-and-effect relationships within ecosystems.

Lesson Components

1. Review & Vocabulary Reinforcement (10 minutes)

- Quick write: Define biodiversity and ecosystem resilience.
- Review limiting factors and food webs.

2. Ecosystem Simulation (20 minutes)

- Conduct or revisit the "Ecosystem Takeover" simulation.
- Emphasize data tracking (count remaining native species, pollinators).

3. Structured Debrief (15 minutes)

Students answer in writing:

- How did biodiversity change over time?
- What limiting factors were affected?
- Why was recovery difficult once biodiversity decreased?

4. Introduction to Local Invasive Species (10–15 minutes)

Brief overview of:

- Kudzu
- Bush honeysuckle

Homework (optional):

Students predict which invasive species causes greater long-term ecosystem damage and justify their reasoning.

Day 2 – Deep Dive & Comparative Analysis

Focus

Analyzing real-world invasive species impact in Sevier County.

Objectives

Students will:

- Compare growth patterns and spread mechanisms.
- Evaluate ecological consequences.
- Use evidence to support claims.

Lesson Components

1. Review Predictions (5–10 minutes)

Students revisit homework predictions and discuss.

2. Research Stations or Guided Notes (25–30 minutes)

Station A – Kudzu

- Growth rate
- Sunlight competition
- Impact on native plants
- Removal challenges

Station B – Bush Honeysuckle

- Seasonal advantages
- Impact on pollinators
- Spread through birds
- Forest understory effects

Students complete a compare/contrast chart:

Feature	Kudzu	Bush Honeysuckle
Growth Type		
Spread Method		
Biodiversity Impact		
Food Web Impact		
Removal Difficulty		

3. Analysis Discussion (15–20 minutes)
Discussion Questions:

- Which invasive species spreads more aggressively?
- Which affects more trophic levels in the food web?
- Which would be more difficult to manage long-term?
- How do human activities contribute to their spread?

Students must support answers with evidence.

Day 3 – Civic Action & Project Development
Focus
Applying scientific understanding to environmental management and civic responsibility.
Objectives
Students will:

- Develop a mitigation or management strategy.
- Communicate scientific findings clearly.
- Propose realistic local action steps.

Project Options
5th Grade – Invasive Species Awareness Campaign
Students create:

- Educational poster or digital presentation
- Food web diagram showing disruption
- Explanation of biodiversity loss
- One prevention strategy for Sevier County

6th Grade – Invasive Species Management Proposal
Students develop a structured action plan including:

1. Description of local spread
2. Biodiversity impact analysis
3. Affected populations
4. Removal strategy
5. Prevention strategy
6. Challenges and limitations
7. Public education plan

Students present as if addressing:

- Sevier County officials
- Park managers
- Keep Sevier Beautiful

Assessment & Evaluation
Formative Assessments

- Vocabulary accuracy
- Simulation participation
- Compare/contrast chart completion
- Discussion contributions

Summative Assessment
Project Rubric Categories:

- Scientific accuracy
- Use of evidence
- Understanding of biodiversity impact
- Feasibility of proposed solutions
- Presentation clarity

Reflection Prompt

Students respond in writing:
How does protecting biodiversity protect Sevier County's environment, wildlife, and community?

Extension Opportunities

- Field observation of native vs. invasive plants
- Guest speaker from conservation or park services
- Native planting plan for school grounds
- Service-learning cleanup or invasive removal event