

Hazard Literacy Center

Hazard Literacy Education Program

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More Lovebugs, Spreading Rats: What Happens When Ecosystem Balance Is Disrupted?



1. Program Overview

This program is designed to help students explore how changes in ecosystem balance affect urban life and society through cases of increasing lovebug and urban rat populations. Students compare the lovebug case in Korea with cases of increasing rat populations in cities abroad and examine why population increases are perceived as problems and how actual harm differs from public inconvenience. Lovebugs are known not to bite people or directly transmit disease, but mass outbreaks have caused public inconvenience and a sharp increase in complaints. Surveys in Seoul have also shown that many citizens experience discomfort and stress. In contrast, urban rats can transmit disease and damage facilities, and recent studies and news reports have identified rising temperatures, higher population density, and reduced green space as factors associated with increasing rat populations.

The program also encourages students not to simply accept these cases, but to critically interpret causes and responses by comparing different sources. For lovebugs, climate change, adaptation to urban environments, and changes in emergence timing have been suggested as possible causes, but the exact causes and the most effective responses have not been fully determined. Various approaches, including eco-friendly control, monitoring emergence patterns, and public guidance, are therefore being discussed. Students examine which information is evidence-based and which statements may be exaggerated or uncertain, and consider why accurate information sharing and responsible risk communication are important rather than communication that increases fear. Through this process, students understand that interpreting and sharing information is also an important part of responding to ecosystem issues.

Grade Level	Grades 6-9	Instructional Methods	Lecture, Discussion, Hands-on Activity
Learning Environment	Classroom	Duration	90 minutes (45 minutes × 2 class periods)
Required Materials	Quarter-size drawing paper, colored pens, or a digital device for each group to create a poster		

2. Learning Objectives (Hazards Literacy Framework)

① Explain how changes in ecosystem balance affect human life and society through cases of increasing lovebug and urban rat populations.

② Critically interpret information about the causes, impacts, and responses to population increases by comparing news articles and research materials.

③ Create a poster to responsibly share information about ecosystem issues with the local community and suggest appropriate ways to communicate responses.

Learning Objectives	Knowledge & Understanding		Reasoning & Skills					Values & Attitudes			Psychology & Emotion			Behavioral & Practical Enagement		
	A1	A2	B1	B2	B3	B4	B5	C1	C2	C3	D1	D2	D3	E1	E2	E3
Objective ①		O	O				O	O							O	
Objective ②	O	O					O					O		O	O	
Objective ③					O				O			O		O	O	

3. Key Concpets

· Changes in Urban Environments and Increasing Populations

· Differences Between Actual Harm and Public Inconvenience

· Evidence-Based Interpretation and Critical Evaluation of Information

· Community Communication and Risk Communication

4. Program Sequence

Learning Activities	
Introduction	·Recognize the issue through news cases about lovebugs and urban rats ·Discuss: "Can an increase in a species become a social problem?"
Development 1	·Identify the characteristics and mass emergence patterns of lovebugs ·Examine how actual harm and public inconvenience appear ·Examine cases of increasing urban rat populations and their social impacts ·Explore connections with disease, facility damage, and urban environments
Development 2	·Compare similarities and differences between the lovebug and urban rat cases ·Compare actual harm, public inconvenience, and uncertainty in available information ·Distinguish clearly supported information from information that requires further investigation
Development 3	·Organize information and precautions needed by the local community ·Consider ways to communicate accurately without increasing fear ·Select key messages for the poster and create the poster
Wrap-up	·Review how changes in ecosystem balance affect urban life and society

5. Theoretical Background and Activity Design for Disaster Education

A rapid increase in the population of a particular organism in a city can be more than a simple inconvenience; it can reveal the relationship between ecosystem change and human society. In the case of lovebugs, there is no clear evidence that they bite people or transmit disease, but mass outbreaks have caused public inconvenience and increased complaints. Urban rats, meanwhile, are discussed in relation to disease transmission, facility damage, waste management, and urban environmental problems. Recent sources suggest climate change, adaptation to urban environments, and changes in emergence timing as possible factors in lovebug outbreaks, while rising temperatures, higher population density, and reduced green space have been reported as factors related to increasing urban rat populations. These cases show that ecosystem change involves actual harm, public inconvenience, urban management, and public perception together.

Accordingly, this program is designed for students to read the lovebug and urban rat cases separately and compare the causes and impacts of population increases, as well as actual harm and public inconvenience. Students then organize the two cases in a table, compare their similarities and differences, and distinguish clearly supported information from information that requires further investigation. Finally, they create a poster that can responsibly share information with the local community. This allows students not only to encounter ecosystem issues, but also to critically interpret uncertain information and construct appropriate response communication. These activities help students understand ecosystem change as an issue involving both scientific facts and social responses.

6. Instructional Considerations

Teachers should avoid presenting lovebugs and urban rats simply as “harmful” and “less harmful” organisms. Although lovebugs may not pose serious direct harm, mass outbreaks can still become social issues by causing public inconvenience, complaints, and a need for management. Likewise, the urban rat case should not be treated simply as a matter of eradication, but as a problem connected to climate, waste management, urban structure, and human behavior. When comparing news articles and other materials, students should be guided not to accept the wording of a single source without question, but to distinguish between information that is relatively well established and information that still requires further investigation. During poster creation, teachers should provide feedback so that students avoid unsupported claims or expressions that create excessive fear and instead include information and actionable messages that are useful to the local community.

7. References

- Kim, S., Jung, S., Choi, J., Tsai, C.-L., Farrell, B. D., & Shin, S. (2022). History does not repeat itself; It rhymes: Range expansion and outbreak of Plecia longiforceps (Diptera: Bibionidae) in East Asia. Journal of Integrated Pest Management, 13(1), Article 31. https://doi.org/10.1093/jipm/pmac026
- Kim, S. J., Ban, J. H., & Lee, K. Y. (2024). Current status and response strategies for the spread of seasonal urban pests in Seoul. The Seoul Institute.
- Kukmin Ilbo. (2025, June 26). ‘Summer nuisance’ lovebugs controlled with light and scent instead of pesticides. Science Times. (2025, February 3). Rats thrive in a warming world... explosive increases across major cities worldwide.
- Lee, C. R. (2025, July 6). U.S. entomologist with 50 years of lovebug research: “Pesticides are ineffective... emergence patterns should be identified.” DongA Science.

Lesson 2: More Lovebugs, Spreading Rats

Theme	Exploring Real Cases of Disrupted Ecosystem Balance
What Will We Learn?	① Explain how changes in ecosystem balance affect human life and society through cases of increasing lovebug and urban rat populations. ② Critically interpret information about the causes, impacts, and responses to population increases by comparing news articles and research materials. ③ Create a poster to responsibly share information about ecosystem issues with the local community and suggest appropriate ways to communicate responses.

1 Let's Think!

- What would happen if polar bears continued to hunt white beluga whales? (Video: https://youtu.be/-HYyJY3wqPw?si=DBJYxVXM1x0OwAek)

2 Lovebugs Suddenly Increasing in Cities (Plecia longiforceps)

- Read the passage below and answer the questions.

In early summer, swarms of black insects began appearing on trail signs, benches, and building walls. People called them "lovebugs." Lovebugs do not bite people or release venom, and there is still no clear evidence that they transmit disease. Their larvae are also known to help decompose fallen leaves and decaying plants. Even so, large numbers of lovebugs can cause major inconvenience. They stick to people and clothing, cover buildings and walking trails, and may leave marks when they hit cars. In fact, lovebug-related complaints in Seoul increased sharply from 4,418 in 2022 to 9,296 in 2024.

Experts suggest climate change, adaptation to urban environments, and changes in emergence timing as possible reasons for the rapid increase in lovebugs. However, the exact causes and the best response methods have not yet been fully determined. Some researchers suggest that predicting when and where lovebugs will appear may be more practical than heavy pesticide use. Other areas are testing ways to control their populations using light or eco-friendly control agents. Therefore, rather than simply thinking, "They are harmless, so we should just tolerate them," or "We should get rid of them completely," we need to consider their ecological role, public inconvenience, and the possible side effects of control methods together.

1) What reasons were suggested for the increase in lovebugs?

2) What inconveniences can large numbers of lovebugs cause in people's daily lives?

3) Before trying to solve the problem, write three things you still need to know or questions you have.

3 Warmer Cities, More Rats

- Read the passage below and answer the questions.

A study found that rat populations are increasing in many major cities around the world. Researchers compared data from several cities over the past 10 years and found statistically significant increases in rat populations in many of them. They reported that the increase was more noticeable as temperatures rose, population density increased, and green space decreased. Warmer urban winters make it easier for rats to survive, while cities with many restaurants and trash bins provide easy access to food.

Urban rats are more than just unpleasant to see. They can spread disease, contaminate food and animal feed, and damage electrical wires and facilities. Some estimates suggest that rat-related damage in the United States reaches about $27 billion each year. However, simply catching more rats does not solve the problem. Researchers emphasize the need to reduce food waste, block rats from entering homes and stores, and combine citizen reporting with urban management. In other words, the urban rat problem is not only about rats, but also about climate, waste management, urban structure, and human behavior.

1) What factors affect the increase in rats in cities?

2) What problems can increasing rat populations cause in the lives of urban residents?

3) Before trying to solve the problem, write three things you still need to know or questions you have.

- Complete the table below by comparing the lovebug and rat cases. If there is something you are unsure about, look for more information.

	Lovebugs	Rats
Where did the problem occur?		
How did they affect the ecosystem?		
What social inconveniences occurred?		
How serious was the actual harm?		
What causes were suggested?		

4 Create a Group Poster

- Before Making a Poster for Our Community, discuss the following questions with your group.

1) What do you think people who see this poster must know?

→ Which organism has increased, what causes or characteristics are currently known, and why it has become a problem.

2) How would you like people to feel or think after seeing this poster?

→ Minimize unsupported statements, expressions that may cause excessive fear, and difficult terminology.

3) What would you like people to do after seeing this poster?