Ripple Effects

Lesson 04: Seeing Purple - A Population Explosion

Grade Level

6–8th

Subject

Science

Class Time

3 CLASS PERIODS

Next Generation Science Standards

www.nextgenscience.org/

MS-LS2-2
MS-LS2-4
MS-LS2-5
MS- ESS3-3

Great Lakes Literacy Principles

www.cgll.org/purpose-principles/

Principles 5, 6, 8

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Activity at a Glance

Through a simulation, sampling, and estimation activity, students learn about the impact of purple loosestrife on a wetland due to its exponential growth. They learn about the life cycle of purple loosestrife and appreciate how scientists determine the population size in an ecosystem.

Objectives

Students will be able to:

- Recognize purple loosestrife and tell how the seeds are dispersed.
- Describe that purple loosestrife produces over 2 million seeds and have a concept of how much that really is.
- Determine the population of purple loosestrife seeds in their wetland ecosystem through sampling.

Materials

- ☐ Purple loosestrife (*Lythrum salicaria*) factsheet
- ☐ Dot worksheet
- ☐ How Much is Two Million Seeds? worksheet
- ☐ One bag of purple paper confetti (or hole-punches from purple construction paper)
- ☐ Fan or blow dryer
- ☐ Meter sticks
- ☐ String (optional)

Vocabulary

- Population
- Purple loosestrife
- Sampling

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Background

Through its competitive advantage, purple loosestrife is an aggressive nonindigenous plant that rapidly disperses throughout wetland areas. It interferes with the growth of native species and fills in the spaces where the natives would normally grow. Purple loosestrife creates many problems that cause an imbalance in the wetland ecosystem.

Helpful Hints

- Students should already have an introduction to invasive species and their impact on ecosystems and native populations.
- Students should know how to multiply and use a calculator. It would be helpful for students to be able to use linear measurements to construct a grid.

Procedure

1. Distribute the informational factsheet on purple loosestrife. Have the students read it independently or read it aloud as a class.

2. Distribute the Dot Worksheet and have students complete the worksheet How Much Is Two Million Seeds? to realize the enormity of this number. If possible, bring in two reams of paper (500 sheets). Two reams of paper with 50 dots on each page would make 2 million dots!

3. Groups of students should be given large sheets of paper or poster board and asked to draw a wetland ecosystem. The teacher can show pictures of wetlands to help them understand.

4. Students make a grid on their wetland by drawing lines to make equal-sized sections. For example, poster board that is 22 x 28 inches (56 x 70 centimeters) could be divided into sections of 14 square centimeters. Students could mark off every 14 centimeters down (4 marks) and every 14 centimeters across (5 marks). The total number of sections would be 20. Then have students draw lines in at these marks. Finally, have students number the poster board sections.

5. Each group lines up their wetland ecosystem side-by-side leaving no spaces. The teacher spreads out a bag of purple confetti (or purple hole-punches) on cardboard. With a fan or hair dryer, the teacher simulates the wind and spreads the “seeds” to every ecosystem.

6. Students should take their ecosystem back to their desks. Have students estimate how many purple loosestrife seeds are in one section. Then they should estimate how many seeds are dispersed throughout the whole ecosystem. Students should look at their wetland and choose what section should be used to count the purple loosestrife seeds. All the seeds in this section are to be counted. To find the estimate, students should know that the size of the population equals the number in the section that was counted multiplied by the number of sections: population estimate = number in one section x number of sections.

7. If there is time, have students estimate and then count another section. Compare the results.

8. Compile the data from each of the groups. The ecosystem closer to the parent plant (fan) will receive more seeds (confetti or hole-punches). Notice how the seeds can be spread by the wind.

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9. Discuss the following questions (with sample answers):

   Purple loosestrife seeds can also travel by water and on things that move from place to place. The plant can also reproduce from its roots and parts of the stem. How would this affect our findings?

   The different ways they are transported would affect how far and fast the seeds could be dispersed.

   Did each section of your wetland ecosystem have the same number of seeds? Which wetland ecosystems had the most seeds? The least seeds? What factors determined which wetland ecosystem got the most?

   Each section counted should yield a different number of seeds. Students need to realize that typically a scientist cannot possibly count every organism in the environment.

Wrap-Up

- Have students describe how to count the number of insects in a square meter area of the playground, using the sampling method.
- By making calculations, have students compute how many sheets of paper with dots are needed to make 3 million.

Extension

1. Have students research the difficulty of getting rid of purple loosestrife and its impact on a wetland—how it can upset the balance of a wetland ecosystem.

Resources

Factsheets and Publications:

Why Are Wetlands Important? US EPA: https://www.epa.gov/wetlands/why-are-wetlands-important
Purple Loosestrife. Minnesota Department of Natural Resources: https://www.dnr.state.mn.us/invasives/aquaticplants/purpleloosestrife/index.html
Purple Loosestrife, Wisconsin Sea Grant: https://www.seagrant.wisc.edu/our-work/focus-areas/ais/invasive-species/invasive-species-fact-sheets/plants/purple-loosestrife/

Websites:

Nonindigenous Species Information System: https://www.glerl.noaa.gov/glansis/

Kits:

Aquatic Invaders Attack Pack: https://iiseagrant.org/education/loanable-kits/

Credits

Originally created for ESCAPE Compendium, Great Lakes Sea Grant Network
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Modified by: Terri Hallesy, Illinois-Indiana Sea Grant

This lesson has been reviewed for content and accessibility by the Center for Great Lakes Literacy.

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Purple Loosestrife (Lythrum salicaria) Factsheet

Purple loosestrife is a harmful invasive plant that grows in wetlands. It originally was native to Europe and Asia, but people brought it to North America in the 1800s as a garden flower. Many people thought it would be a great addition to their gardens because of its bright purple flowers. Also, some seeds may have arrived accidentally on ships with imported sheep. However, this plant spreads quickly from gardens to swamps, marshes, and ditches. It takes over these areas by growing fast and pushing out native plants.

Wetlands have many important plants like cattails, bulrushes, and grasses. These plants provide food, shelter, and places for animals to nest and breed. Cattails are especially useful because they create homes and nesting spaces for wetland animals. But purple loosestrife grows so thick that animals cannot use it for shelter or nesting. Very few animals eat it, and deer are one of the only ones that do—but they don't eat enough to stop it from spreading.

Purple loosestrife blooms from July to September. It grows between 2 and 7 feet tall and has long spikes of purple flowers, with each flower having 5–6 petals. Its leaves are long and narrow. This plant is a perennial, meaning it lives for many years. It has strong roots that spread out and form a thick mat underground. One of the biggest problems is how quickly it spreads. Each flower on the stalk eventually releases seeds, and each stalk can produce up to 300,000 seeds. A single mature plant can create more than 2 million seeds! Water carries these seeds to new places, spreading the plant even farther. Seeds can remain dormant for many years and sprout when conditions are just right. Seeds can also travel by wind, rain, vehicles, and animals—including humans. People who are working to stop the spread of the plant must be careful not to carry seeds on their shoes or clothes.

Not only does purple loosestrife grow from seeds, but it can also spread from broken stems and roots. The roots of a mature plant can send out 30–50 new shoots, creating dense clusters that take over wetlands. Controlling purple loosestrife is extremely difficult because of its fast growth and ability to spread seeds. It is nearly impossible to remove completely.

When purple loosestrife takes over a wetland, it reduces the number of native plants available for animals to eat. This causes animal populations to decrease and disrupts the balance of the ecosystem. For example, insect populations that rely on native plants for food can decline if they don't have enough to eat. This, in turn, impacts the birds that eat those insects. Purple loosestrife covers wetlands in a sea of beautiful purple flowers, but it harms native plant and animal life. The thick mats also make wetlands harder to use for recreation like boating and fishing. It can also increase the risk of flooding because it prevents drainage ditches from working properly.

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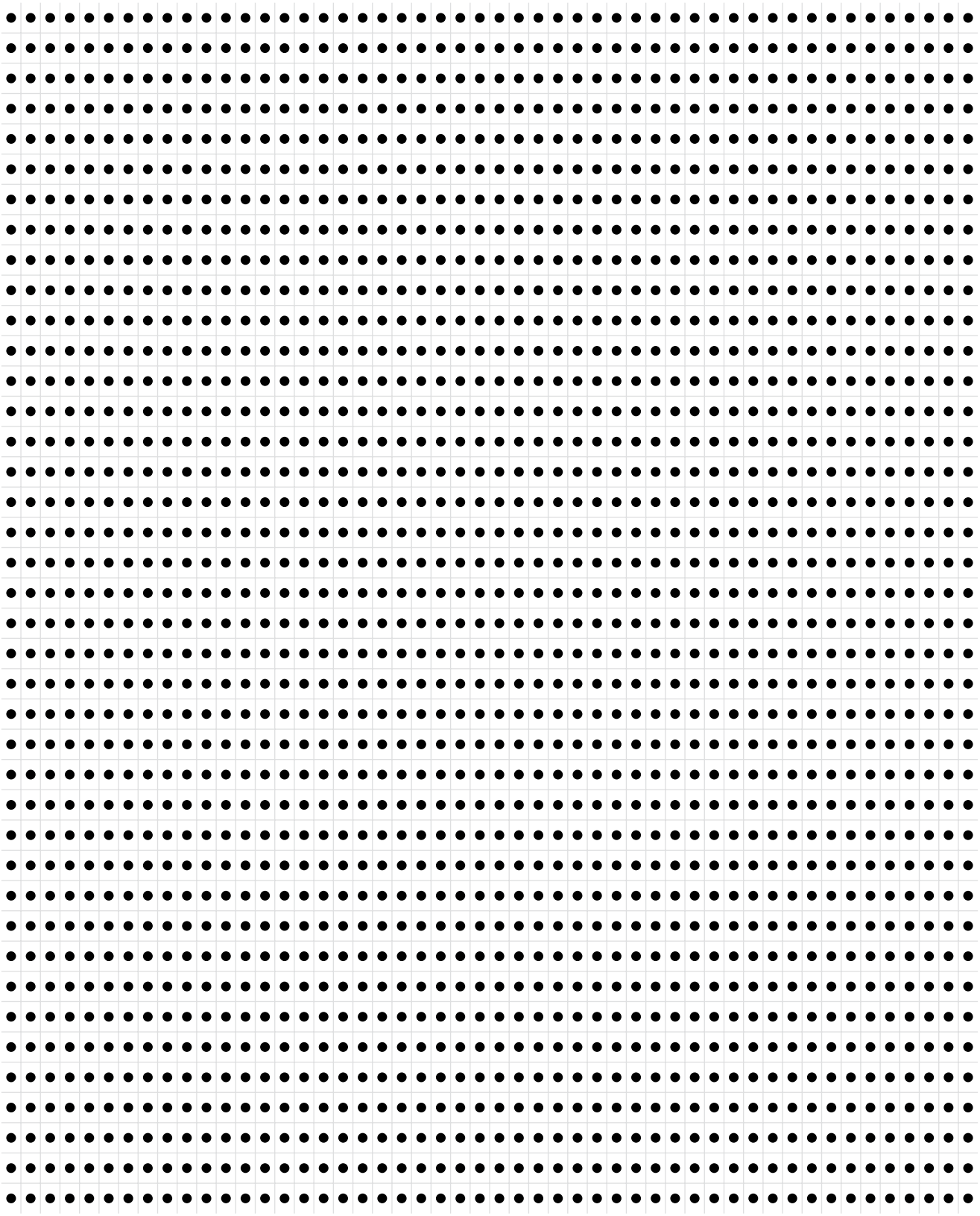
Student Activity: Dot Worksheet



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How Much Is Two Million Seeds?

Name _____ **Date** _____ **Class Period** _____

Directions: Please read all questions and show any work necessary to calculate your answers. All questions refer to the number of dots on the worksheet.

1. How many dots are on the worksheet? _____
2. How many total dots would there be on 5 sheets of paper? _____
3. How many total dots would there be on 50 sheets of paper? _____
4. How many sheets of paper would it take to make 1 million (1,000,000)? _____
5. How many sheets of paper would it take to make 2 million (2,000,000)? _____
6. Imagine each dot represents a seed. Each purple loosestrife plant can produce up to 2 million seeds. Explain how this characteristic allows purple loosestrife to take over wetland ecosystems it is introduced to.

_____

_____

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_____

_____

ANSWER SHEET

Ripple Effects | Seeing Purple: A Population Explosion

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Name _____ **Date** _____ **Class Period** _____

Directions: Please read all questions and show any work necessary to calculate your answers. All questions refer to the number of dots on the worksheet.

1. How many dots are on the worksheet? 40 x 50 = **2,000 dots**

2. How many total dots would there be on 5 sheets of paper? 2,000 x 5 = **10,000 dots**

3. How many total dots would there be on 50 sheets of paper? 2,000 x 50 = **100,000 dots**

4. How many sheets of paper would it take to make 1 million (1,000,000)?

   1 million dots would be 10 x the bold number above. So, 10 x 50 sheets = **500 sheets of paper**

5. How many sheets of paper would it take to make 2 million (2,000,000)?

   2 million would require 2 x the bold number of sheets above. So, 2 x 500 sheets = **1,000 sheets of paper**

6. Imagine each dot represents a seed. Each purple loosestrife plant can produce up to 2 million seeds. Explain how this characteristic allows purple loosestrife to take over wetland ecosystems it is introduced to.

   With so many seeds that can be disbursed great distances in multiple ways, purple loosestrife can reproduce rapidly and steal space and resources from native plants. Seeds that lie dormant can sprout when there is room for them to grow.

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