



Seeing Purple: A Population Explosion

Trip 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 purple loosestrife's life cycle and appreciate how scientists determine population size in an ecosystem.

Destination

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 for their wetland ecosystem through sampling.



Adventure Levels

Grades 3–8

(Mathematics aspect is more appropriate for grades 5–8.)

Areas of Interest

Mathematics and Science

Locale

Indoor, open area for spreading simulated purple loosestrife; desks or tables

Length of Stay

Three or four class periods

Invader Background Check

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



Foreign Language

Population
Purple loosestrife
Sampling

Amenities Provided

Purple Loosestrife (*Lythrum salicaria*) Fact Sheet 24.1
Dot Worksheet 24.2
How Much Is Two Million Seeds? 24.3

Things to Pack

Wetland ecosystems on posterboard—made in the *ESCAPE* activity “Be Creature Creative!” (19)
One bag of purple confetti
Fan or blow dryer
Meter sticks
String (optional)



Passport for Success

- ✿ Students should already have had an introduction to exotic species and wetlands. They should understand how purple loosestrife can endanger a wetland. It is recommended that this activity follow the *ESCAPE* activities “Impact of Purple Loosestrife on a Wetland” (22) and “Be Creature Creative!” (19).
- ✿ Students should know how to multiply and apply its usage on a calculator. It would be helpful for students to be able to use linear measurements to construct a grid.

Itinerary

1. Distribute the information sheet on purple loosestrife.
2. Have students work through the activity sheet **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. Have students work within the same groups that were used to make a wetland on posterboard. Students make a grid on the wetland by drawing lines or stretching string to make equal-sized sections. For example, posterboard 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 or stretch strings across at these marks and tape them down. Stretching string across the posterboard would be a simulation of what is actually done in the field. Last, have students number the posterboard sections.
4. Each group lines up their wetland ecosystem side by side leaving no spaces. The teacher spreads out a bag of purple confetti on cardboard. With a fan or hair dryer, the teacher simulates the wind and spreads the seeds to every ecosystem.
5. Students should take their ecosystems back to their desks to count the seeds. They must guess how many purple loosestrife seeds are in one section. Then they should guess how many seeds are dispersed throughout the whole ecosystem. Students should look at their wetland and determine what section will be used to count the purple loosestrife “seeds.” All the seeds in this section are to be counted, and each group can devise their own way of doing it. 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:

$$\text{population} = \text{number in one section} \times \text{number of sections}$$

6. If there is time, have students estimate and then count another section. Compare the results.
7. Compile the data from each of the groups. The ecosystem closer to the parent plant (fan) will receive more of the seeds (confetti). Notice how the seeds can be spread by the wind. Draw the ecosystems on the chalkboard and duplicate the path of the spreading seeds.

8. Discuss the following questions (with sample answers):
Purple loosestrife seeds can also travel by water and on things that move from place to place. It 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 how fast the seeds could be dispersed.*
Did each section of your ecosystem have the same number of seeds? Which ecosystems had the most seeds? the least seeds? What factors determined which ecosystem got the most? *Each section counted should yield a different number of seeds. Ecosystems closer to the fan should receive the most seeds if the wind is not very strong. Students need to realize that a scientist cannot possibly count every organism. If they could, that organism would only be found in low numbers, meaning that the organism is probably endangered or almost extinct.*

Debriefing

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

Extending the Visit

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.

Places to Go

Fact Sheets and Publications

"The Balanced Tangle—Understanding Ecosystems." *National Science and Technology Week*. 1991.

National Wildlife Federation. "What Makes a Wetland a Wetland?" *Ranger Rick's Nature Scope Wading into the Wetlands*. 1992.

Wildlife Conservation Society. *Wetlands*. 1995. To obtain, visit the Wildlife Conservation Society Web site: <http://www.wcs.org>



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"How Much Is Two Million Seeds?" worksheet is adapted from the activity
"What Does a Million Look Like?" *Hubble Space Telescope Deep Field Lesson Package*. NASA, 1997.

Purple Loosestrife (Lythrum salicaria) Fact Sheet

Purple loosestrife is a harmful exotic wetland plant that is native to Europe and Asia. Purple loosestrife was purposely introduced in eastern North America as a garden flower in the 1800s. It may also have entered with imported sheep possibly in dry ship ballast. It has a very attractive purple flower, which made it a seemingly desirable garden plant. Although lovely to look at, this exotic aquatic plant is spread easily from gardens to swampy areas, marshes, and ditches. It is aggressive and very harmful to wetlands because it crowds out the native plants and fills open spaces.

Cattails, bulrushes, grasses, and other native plants support many of the wetland animals. Cattails provide shelter, nesting and breeding spaces, and food for the animals. Purple loosestrife grows so densely that it cannot be used for shelter, nesting, or breeding. It has very few native predators; deer are one of the few animals that eat this plant. However, deer do not do enough damage to keep purple loosestrife in check.

Purple loosestrife is a beautiful plant when in bloom from July through September. It grows 2 to 7 feet tall and produces a long spike of purple-colored flowers, with 5 to 6 petals per flower. Purple loosestrife has linear-shaped leaves. It is a perennial species that develops a woody taproot with a fibrous root system, forming a dense mat.

Purple loosestrife blooms for a long time. It disperses seeds almost continuously, as each flower up the stalk matures and goes to seed. Each stalk can have 300,000 seeds. Every mature plant produces an alarming number of seeds—over 2 million! Another important factor is that the seeds are carried by the moving water and are dispersed over the entire watershed area. Seeds can remain dormant for many years (such as when they experience a hostile environment) and sprout when conditions improve. Seeds also use the usual methods of seed dispersal, such as wind and rain, cars and trucks, railroads, and animals including humans. People involved in spot control must be careful not to carry seeds on shoes and clothing when leaving the area.

This exotic aquatic plant can reproduce from roots and stem pieces as well as from seeds. On mature plants the roots can send up 30 to 50 shoots, creating a very dense growth, which chokes out other plant life. Because of the enormous numbers of seeds and root and stem replication, the purple loosestrife plant is probably impossible to eradicate and very difficult to control to an acceptable degree.

When purple loosestrife gets established in a wetland, the native plants are in short supply for the animals. This lowers the animal population and destroys the healthy balance in the area. This is a direct effect of purple loosestrife. Another impact is that if insects cannot breed in the cattail area due to a decrease in its density, some bird species will have less food and will go elsewhere. Purple loosestrife totally chokes plant life in wetlands under a sea of beautiful purple flowers. The dense stands of plants also reduce the ability to use wetlands, and rivers for recreation. Drainage ditches are unable to drain properly.

How Much Is Two Million Seeds? (Answer Key)

Objective: To realize the magnitude of large numbers and to see how many dots will make 2 million.

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 there on the worksheet? _____
[40 x 50 = 2,000]
 2. How many total dots would there be on 5 sheets of paper? _____
[2,000 x 5 = 10,000]
 3. How many total dots would there be on 50 sheets of paper? _____
[2,000 x 50 = 100,000]
 4. How many sheets of paper would it take to make 1 million (1,000,000)? _____
[1 million would be 10 x the number above = 10 x 50 = 500]
 5. How many sheets of paper would it take to make 2 million (2,000,000)? _____
[2 million would be 2 x the number above = 2 x 500 = 1,000]
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1. How many dots are there on the worksheet? _____
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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)? _____

Dot Worksheet

