

POLLUTION and GIS:

Mapping across Disciplines

LESSON PLAN

Title of Lesson **EPA Superfund Sites in Ohio**
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Time Required 75 minutes

Materials

- Compass rose
- Map legend
- Computers (Laptops/Mobile Phones)
- 5 Chains
- Cones and Placeholder Markers
- City Demographic Sheets
- Appendix A: Student Activity

Preparation: Prior to this lesson, instructor should be familiar with superfund sites and specifically what is happening in Ohio. Recommended reading through the <https://www.epa.gov/superfund> website and familiarize yourself with the idea and governance of the Superfund Site.

Objectives Students will learn how to pose spatial questions on the topic of pollution and waste disposal by:

- Identifying most populous cities in Ohio
- Identifying location where superfund sites are distributed
- Considering the reasons why superfund sites may be more prevalent in specific locations.

Essential Questions

- How can we use maps, specifically the Giant Ohio Map, to understand the link between superfund sites and geographic location?

National Geography Standards

- How to use maps and other geographic representations, geospatial technologies, and spatial thinking to understand and communicate information.
- How to apply geography to interpret the present and plan for the future.

Instructional Process

1. Review rules of learning with the Giant Map. No shoes, writing utensils, or sliding on the map.
2. Introduce students to the map.
 - Ask how we know which direction is north/south and add the compass rose to the map.
 - Ask what the colors and lines indicate on the map and add the legend to the map.
 - Discuss how the alpha-numeric grid is used to describe a location. Give a couple of examples. Where is Dayton (Toledo, Columbus...) located using the grid?
3. Introduce the topic: [Take from National Geographic, (Schons, 2011)]

Superfund is the common name given to the law called the Comprehensive Environmental Response, Compensation and Liability Act of 1980, or CERCLA. Superfund is also the trust fund set up by Congress to handle emergency and hazardous waste sites needing long-term cleanup. (In this sense, “trust fund” is money government sets aside for a specific purpose. That means that the government can’t spend Superfund money on anything except cleaning up hazardous-waste sites.) Superfund is administered by the Environmental Protection Agency (EPA).

Even though Superfund was created relatively recently, civilizations have always had to deal with the problem of waste disposal. Archaeologists have unearthed trash pits that are thousands of years old. During the Industrial Revolution of the 19th century, the economy shifted from agriculture to manufacturing.

Manufacturing created new products, as well as new wasteful byproducts. As more factories were built, the amount of hazardous waste began to grow. Before regulation, polluters could dump these toxic byproducts wherever they pleased: landfills, lakes and streams, or in metal drums in the countryside.
4. Explain to students how they will find the information to put on the worksheet (Appendix A). Instructor will have the students use the EPA website <https://www.epa.gov/superfund> and/or <https://www.epa.gov/superfund/national-priorities-list-npl-sites-state> to find several examples of Superfund sites within Ohio.
5. Let’s assess where you think the most superfund sites occur in Ohio. Use the markers to suggest where you think the top 5 superfund sites by the Hazard Ranking System (HRS). *On the National Priorities List (NPL) Sites*
 - a Lammers Barrel – 69.33 – Beavercreek, OH
 - b United Scrap Lead Co., Inc. – 58.15 – Troy, OH
 - c Wright-Patterson Air Force Base – 57.85 – Dayton, OH
 - d Miami County Incinerator – 57.84 – Troy, OH
 - e Feed Materials Production Center (USDOE) – 57.56 – Fernald, OH
6. What do you think the top three most heavily traveled interstates in Ohio are? [Mark them on the map with chains – I70, I75, I71].
 - a. How might these transportation routes factor into the location of Superfund Sites and how material must be transferred from one location to another.

7. What do you think the top 6 cities are by population? (world population review and census.gov) [Use the cones to mark the most heavily populated cities in Ohio.]
 - a. Columbus – 892,533
 - b. Cleveland – 383,793
 - c. Cincinnati – 302,605
 - d. Toledo – 274,975
 - e. Akron – 198,006
 - f. Dayton – 140,640

Is there any relationship between populous cities and superfund sites around Ohio.

8. Why do you think the superfund sites are where they are located based on the geography of Ohio, industry, population or etc.?

Further Discussion

Is there a Superfund Site in Your Neighborhood? To find out the answer to that, go to the listing of superfund sites in Montgomery County <https://www.homefacts.com/environmentalhazards/superfunds/Ohio/Montgomery-County.html> or go to <https://www.epa.gov/superfund/search-superfund-sites-where-you-live#community>. You can use google to map the distance from your home to the address of the superfund site. For additional activities, explore Brownfields, Polluters, and Tanks & Spills on the same website.

References

- EPA. Superfund Sites Where You Live. Retrieved June 18, 2020 from <https://www.epa.gov/superfund/search-superfund-sites-where-you-live#community>
- Homefacts. Montgomery County OH Environmental Hazards Report – Superfund Sites. Retrieved June 18, 2020 from <https://www.homefacts.com/environmentalhazards/superfunds/Ohio/Montgomery-County.html>
- National Geographic Society. (n.D.). National Geography Standards Index. Retrieved from <https://www.nationalgeographic.org/standards/national-geography-standards/>
- National Priorities List (NPL) Sites - by State. (2020, April 3). Retrieved June 11, 2020, from <https://www.epa.gov/superfund/national-priorities-list-npl-sites-state>
- Schons, M. (2011, January 21). Superfund. Retrieved June 11, 2020, from <https://www.nationalgeographic.org/article/superfund/>
- Superfund. (2020, June 10). Retrieved June 11, 2020, from <https://www.epa.gov/superfund>

Appendix A: Student Worksheet

Giant Ohio Map Activity

Group Member Names: _____

Directions: In your groups, use your phones and laptops to help you decide on the best answers to each question. If you can't find the answer, make an educated guess. Make sure to quickly note your sources so we can go back if we need to. We'll follow with in-class discussion.

1. Use the EPA website <https://www.epa.gov/superfund> and/or <https://www.epa.gov/superfund/national-priorities-list-npl-sites-state> and find the Top 5 Superfund site ranked by Hazard Ranking System (HRS)

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

2. Try to find the top 6 cities are by population in Ohio? Do your best to rank them.

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____
- f. _____

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