

Reading-Based Discussion Questions:

1. **How do you think microplastics end up in the food and water we consume?**
 - a. **Suggested topics to discuss:**
 - Rains and wind wash plastic materials into lakes and other waterways that lead to the ocean where they slowly break into smaller pieces.
 - Littering or improper disposal of plastic materials get lost in the natural environment where they breakdown.
 - Streams and storm drains carry debris directly into lakes and waterways.
 - Microplastics are eaten by fish living in the ocean, then we eat those fish.
 - Microplastics move up the food chain when other animals eat fish contaminated with microplastics.
 - The tiny plastic particles also make their way into lakes and rivers that we use to cook, clean, and drink from.

2. **Why is it important to have researchers from different nations on the eXXpedition voyage?**
 - a. **Suggested topics to discuss:**
 - Having people from different home countries brings many different perspectives. Each person can have input on how their work will benefit their country as well as the world.
 - An island nation may look at the ocean differently than a bigger, inland nation.
 - Getting different perspectives could provide insight on how plastic is used in each country and how it could be reduced.

3. **Whales are threatened by water pollution. What other forms of pollution can you think of that could affect different types of animals and their environment?**
 - a. **Suggested topics to discuss:**
 - Noise pollution
 - Air: Birds have to adjust how they sing to be heard over our noises. Both birds and bats may have trouble finding food in noisy areas if they can't hear their prey.
 - Land: Frogs can't hear each other's calls in noisy areas. Prairie dogs have a hard time finding food, hearing predators, and communicating in noisy areas
 - Ocean: Human noises can cause hearing loss in dolphins, porpoises, and whales. They interfere with animals' sonar and navigation systems. Marine ecosystems can be disrupted as animals move to quieter areas.
 - Air pollution
 - Smog, particulate matter, and ozone can affect wildlife health in similar ways to human health, including harming the lungs and cardiovascular systems. An animal's vulnerability depends on how it breathes – if it uses

lungs, gills, or some other form of gas exchange (passive diffusion across surface of the skin – amphibians).

- Heavy metals and toxic pollutants affect wildlife by entering the food chain and damaging the supply and quality of food. Top level predators like bears and eagles are particularly susceptible to bioaccumulation of air pollutants.
- Water pollution
 - Litter in the ocean includes containers that have fallen from ships, trash washed in from the cities, and waste from landfills. Water-dwelling organisms may eat the litter thinking its food, or get entangled or trapped in the waste.
- Light pollution
 - The abundance of artificial light can disrupt circadian (response to light and darkness) rhythms for both humans and animals. Throwing off this rhythm can affect when certain animals are active. Lights can attract moths, frogs, and sea turtles to be where they aren't usually, making them susceptible to predators.
 - Light can also drive certain organisms away from their natural habitat to seek a darker environment, causing a form of habitat loss.

4. Why is it important to learn as much as we can about animal species and populations, such as whales, when it comes to pollution?

a. Suggested topics to discuss:

- The more we know about a population of animals, the more we can identify the problems pollution causes for them, and effectively help them combat those challenges.
- Learning about how animals live their lives, how they have lived in the past, and what their death means for other animals is important to note when thinking about the ecosystem as a whole.

5. Why is it important to have controls in science experiments? Why did the researchers in the earthworm study use controls?

a. Suggested topics to discuss:

- Controls are used to compare the tests against what would happen naturally in nature. This helps us determine if there was any significant change in the thing that was being tested.
- Researchers used controls in the earthworm study to see if their weight differed from the ones that were exposed to plastics in the soil.

6. What do you think are some potential consequences of releasing mealworms (or the bacteria that live inside their gut) near landfills?

a. Suggested topics to discuss:

- There could be a potential cascade effect that is unknown to us.

- Having mealworms present near landfills could mean more predators near landfills which could increase disease near landfills. This could cause problems with animal and human health.
- Mealworms could also possibly outcompete other larvae that are already living in that area. This could cause another cascade effect in the ecosystem.
- If there is a lot of bacteria released near landfills, although their job is to breakdown plastics, they may release more methane into the atmosphere which would increase greenhouse gas emissions (because methane is a greenhouse gas).

7. What are some other ways we could reduce the light pollution that is affecting the sea turtles?

a. Suggested topics to discuss:

- Have a “lights out” event, where all unnecessary lights need to be off during sea turtle nesting and hatching times. This is something that we do here in Utah – especially in Salt Lake City – to help migrating birds.
- Encourage people to take different routes of travel so they are not encroaching on the nests of sea turtles and using their car headlights as distractions.
- Replace outdoor lights with intelligently designed, low-glare fixtures.
- Talk to local representatives and power companies to ask if they can reduce the outdoor lighting.

8. Microplastics are released by the breakdown of many plastic products, including water bottles and shopping bags. What are some other plastic products that can end up as microplastics in the environment? What are the best ways to reduce this plastic pollution?

a. Suggested topics to discuss:

- Food wrappers, straws, cups, plates, bottle caps, nets, toys, cigarette butts, etc.
- The best way to reduce plastic pollution is to reduce our use of plastics, reuse the plastics we do use, and recycle the ones that we don’t reuse. We can also volunteer to clean up plastic waste we find and dispose of waste properly.

9. How do you think more research to inform policy would help reduce Utah’s poor air quality?

a. Suggested topics to discuss:

- The more we know about what is causing Utah’s poor air quality, the better equipped we are to make decisions about policies that will help reduce dangerous emissions.
- Enforcing policies that are scientifically proven to reduce Utah’s emissions should incentivize citizens, communities, businesses, and corporations to act appropriately.

10. The Utah Clean Air Partnership reaches and educates the public about pollution issues and policy through online advertisements, television commercials and billboards. What are some other ways you can think of to educate members of the public about this global environmental challenge?

a. Suggested topics to discuss:

- Write a letter to the editor to a well-known local newspaper.
- Talk to people in your immediate community (family, friends, school mates, teachers, etc.)
- Make an art piece about the issue (whether it be watercolor, sculpture, poetry, music, dance, etc.) to reach audiences who maybe don't typically think about them.
- Talk about the issues on a local podcast or radio show.
- Do a puppet show for kids.
- Give a presentation at a school or community event.