

# Fertilizers and Pesticides

*by Sophia*



## WHAT'S COVERED

In this lesson, we will cover the topic of fertilizers and pesticides. We will discuss what fertilizers and pesticides are used for, what their impacts are, and how to mitigate those impacts. Specifically, this lesson will cover the following:

## 1. Fertilizers

Agroecosystems remove nutrients from soils in order to grow crops. This is especially true with the practice of monoculture, which removes large amounts of nutrients from soil. Therefore, in order for more crops to grow, nutrients have to be added back in, which is where fertilizers enter the equation. The main nutrients that are needed by plants to grow, and therefore need to be replaced, are nitrogen and phosphorus, so most fertilizers focus on those two nutrients.



Unfortunately, fertilizers with these nutrients tend to be expensive to produce, and they cause environmental problems through runoff. As croplands are irrigated, or if it rains, the fertilizer in the soil drains away into the local water system. This can cause bodies of water, like the one shown below, to become polluted and dangerous. It can even leak into aquifers to contaminate sources of safe drinking water and cause disease.

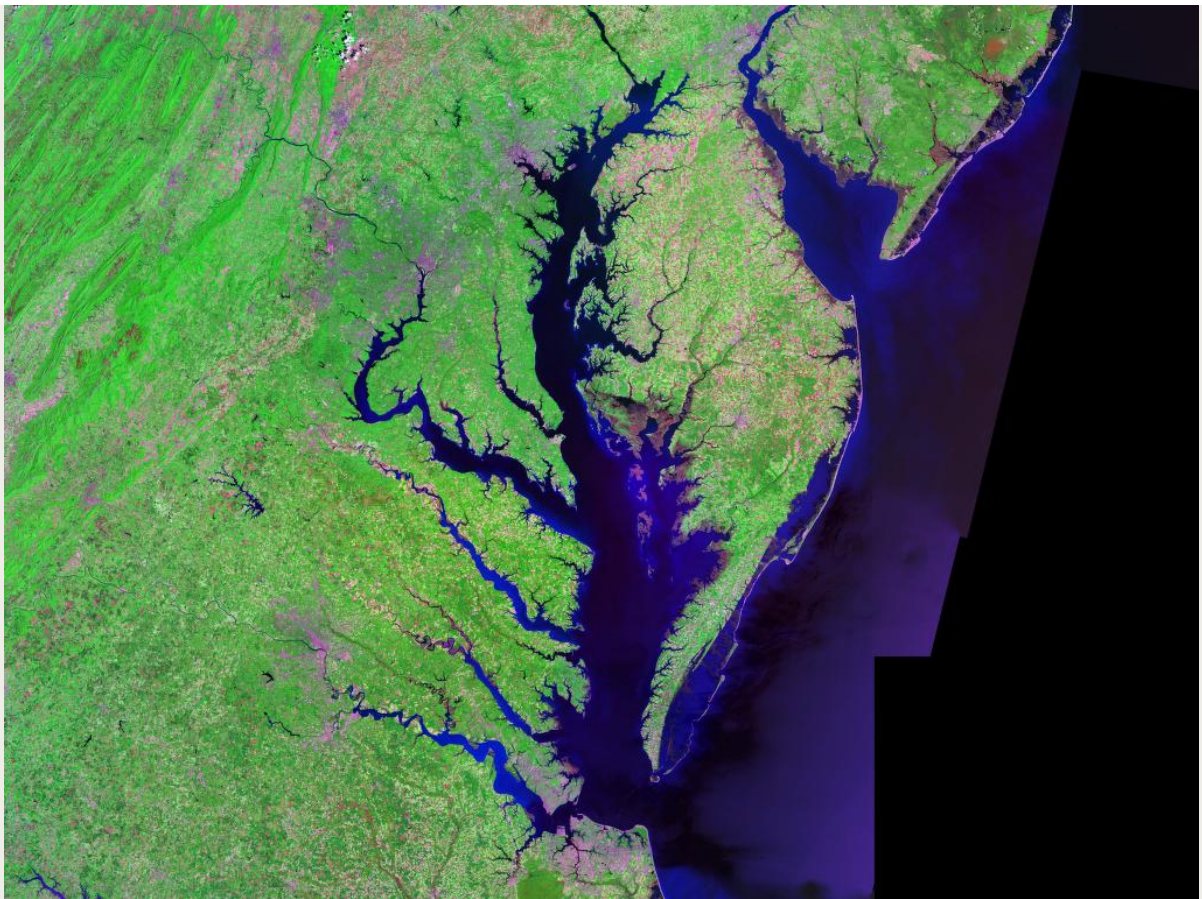




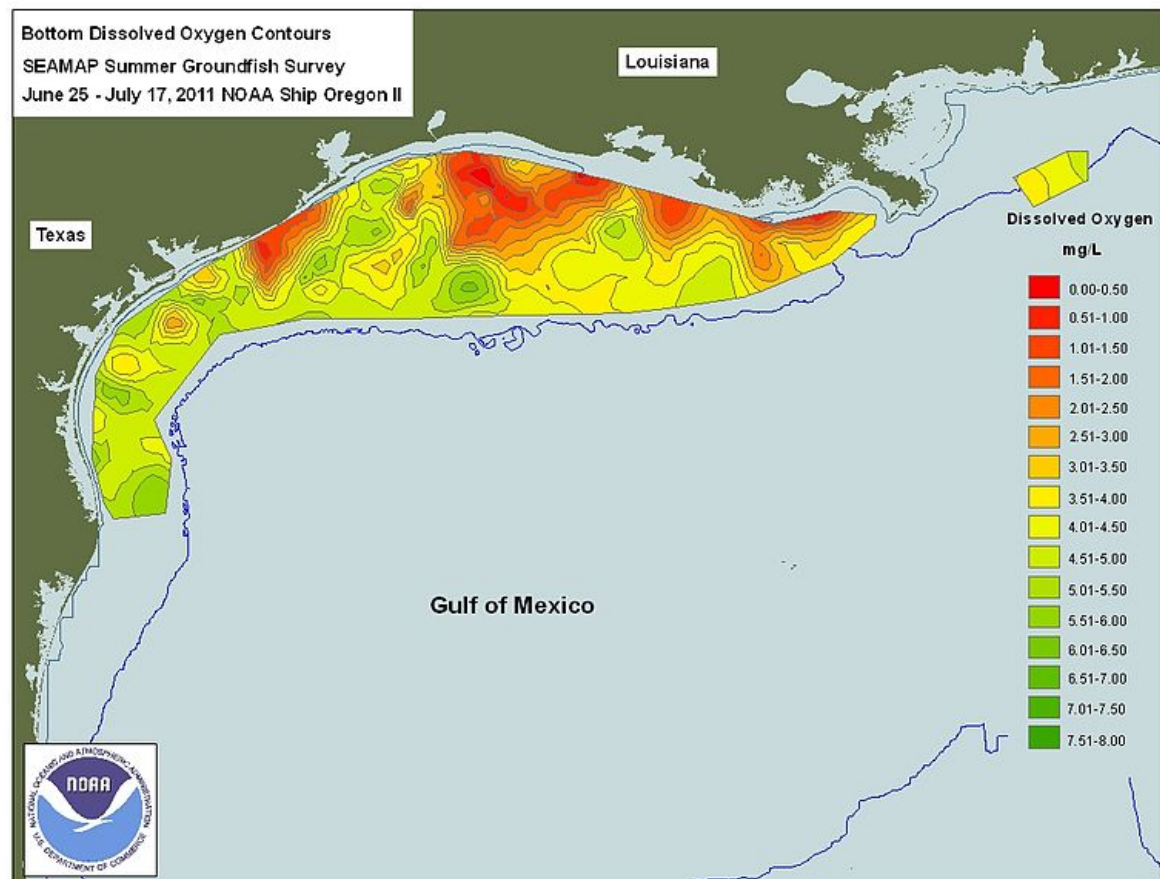
### IN CONTEXT

The Chesapeake Bay is a prime example of what can happen when fertilizer runoff occurs in high volumes. Phosphorus and nitrogen can cause what is called an algal bloom. Algae love fertilizers, just like crops, and when large amounts of fertilizer drain into bodies of water like the Chesapeake Bay (shown below), huge communities of algae grow. Algal blooms consume much of the oxygen and can threaten fish populations because there is not enough oxygen available.





This phenomenon has also occurred in the Gulf of Mexico, creating an algal bloom as big as some states, where it is difficult for aquatic species to survive.



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## 2. Addressing the Impact of Fertilizers

There are several ways to address the impacts of fertilizers. Some of these are listed in the table below.

Efforts to Address the Impact of Fertilizers	Effect
Organic farming	Organic farming does not use synthetic fertilizer and promotes soil health.
Manure	Using natural fertilizers like manure can reduce runoff problems.
Changing crops	When farmers change the crops they plant from year to year, it makes different demands on the soil's mix of nutrients, which promotes soil health and usually requires fewer added nutrients.

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## 3. Pesticides

Pesticides are chemicals that kill undesirable plants, insects, animals, and fungi that hinder crop production. There are a wide variety of pesticides that lead to an equally wide variety of negative environmental impacts.

The following are four main reasons why pesticides are used:

- To eliminate pests carrying disease
- To eliminate pests that make a crop look less appetizing (crop aesthetic)
- To eliminate pests that damage crop productivity
- To reduce the human labor needed to protect the crop



The more effective a pesticide is, the more toxic it usually is. Toxic pesticides are more dangerous to the environment as well as human health.

➞ **EXAMPLE** The pesticide DDT was a powerful pesticide that was eventually banned because it harmed many different animal species, especially baby birds.



There are a number of drawbacks to using pesticides.

- Resistance: Over time, pests build resistance to certain pesticides, which usually results in the need for employing a different, stronger, and more toxic pesticide.
- Human health: As one goes up the food chain, the process of consumption can concentrate certain pesticides into high quantities. This makes it dangerous for consumers at higher levels, especially humans.
- Harms other species: Pesticides can indirectly kill species not originally targeted, drain into water systems, contaminate soil, and disrupt the hormonal systems of animals.



#### DID YOU KNOW

Pesticides can also decrease ecological populations and reduce biodiversity.

#### IN CONTEXT

Atrazine is a prime example of a pesticide with dangerous effects. Atrazine was the most widely used pesticide in the world, yet it was banned in the EU in 2004 when scientists discovered its presence in drinking water and the harmful effects it can have on animals.

## 4. Addressing the Impact of Pesticides

The impacts of pesticide can be decreased by using alternatives such as those in the table below.

Pesticide Alternatives	Effect
Insect attractors	Planting crops that attract pests away from the more valuable crop
Crop rotation	Rotating crops or planting diverse crops to disrupt insect cycles



Integrated pest management	The practice of utilizing natural predators, parasites, and pheromones to disrupt insect cycles
Organic farming	Farming techniques that avoid or reduce the use of synthetic pesticides
Biological controls	Disruption in the mating of pests by utilizing substances like pheromones
GMOs	Planting GMO crops, which have been engineered with pest repellents inside them



## SUMMARY

In this lesson, we learned about **fertilizers**, which are chemicals used to add nutrients to the soil to improve crop productivity. We also learned about **pesticides**, which are chemicals used to kill and

deter pests from interfering with crop productivity. We explored the negative environmental **impacts** of both **fertilizers** and **pesticides** and ways to mitigate them.

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