How do some algae make the Earth warmer?

How do some algae increase the amount of greenhouse gases in the atmosphere?

(Green) algae increase the amount of greenhouse gases in the atmosphere when they produce nitrous oxide.

How did we figure out that photosynthesis helps algae transform nitric oxide into nitrous oxide?

We know that photosynthesis helps because nitrous oxide is produced at a faster rate in the light than in the dark.

Why do only green algae produce nitrous oxide?

Only green algae have the enzymes needed to make nitrous oxide from nitric oxide.

Enzymes play an important role in the production of nitrous oxide. Can you think of other processes that utilize enzymes?

Answers will vary based on previous knowledge of students. Encourage the students to research enzymes if they are unfamiliar with them. Some possible answers include:

- Digestion – enzymes help break down larger complex molecules such as fats and starches.
- DNA replication – enzymes help unwind DNA and copy it.
- Detoxification – enzymes in the liver break down toxins in the body.

The article suggests ways for people with gardens to reduce the impact of fertilizer. However, fertilizer runoff also comes from farms. Research one of the following solutions that farms can use to reduce fertilizer runoff. Describe how this solution works. Then explain if you would recommend it to farmers.

- Nutrient management
- Year-round ground cover
- Field Buffers
- Wetland protection
- No-till agriculture

The following are descriptions of how each technique reduces fertilizer runoff.

- Nutrient management techniques: apply fertilizer in the right amount, at the right time of year, with the right method.
- Year-round ground cover: farmers plant cover crops or perennial plants so that the ground is never bare. This reduces the amount of runoff and erosion.
- Field buffers: farmers plant trees, shrubs, and grasses along the edges of the fields to absorb or filter out fertilizer before it reaches a body of water.
- Wetland protection: farmers can work with community members and governments to protect wetlands along the edge of a body of water. Wetlands are natural filters for runoff and reduce the amount of fertilizer entering the body of water.
- No-till agriculture: Farmers can avoid tilling or reduce how often and how intensely they till the soil. No-till agriculture reduces the amount of runoff and erosion.

Student evaluations will vary. They should consider social, economic, and/or additional environmental costs and benefits if farmers implement their solution.