

Data source: Nitrate: Good for Plants, Bad for Drinking Water  
<https://datanuggets.org/2022/08/kernza-nitrate/>

#### Lesson Enhancement:

Solubility is a key part of the chemistry standards. One of the essential solubility rules is that nitrates are always soluble. Even in limited amounts of water, nitrate remains dissolved. Although it is used as a fertilizer, its high solubility can pose a problem as it can easily find its way into drinking water.

There are a few activities that include data. One centers around a plane crash, and using Mass Spec data to try to identify victims. I have never built a lesson around data like the ones centered around this assignment. Some of this is an attempt to "streamline" the learning process. Data is messy and at times confuses students. When I taught AP Chem, we did a lab where students determined an unknown metal by stoichiometrically calculating it following a reaction. Students would essentially guess and check it based on common ratios. Doing the lab correctly means students performing four calculations and assuming they did the lab correctly, getting one answer that makes sense. Depending on the group of students, it can take days to get them to a point to understand the results. What a data set like this can do is eliminate the students need to perform highly technical labs, as the necessary data has already been generated for them.

This topic is inherently interdisciplinary. Nitrogen is essential for plant growth, but since plants are unable to use atmospheric nitrogen, it is instead absorbed from the soil. Because of this nitrate based fertilizers are common due to their incredibly high solubility. The commercial use of fertilizer helps fight global hunger by being able to produce tremendously more food. There is a trade off: using fertilizer can also lead to runoff which can contaminate drinking water. While this would normally lead to a discussion about how to minimize the trade offs, through the use of a perennial version of wheat, the nitrates may be absorbed from soil and prevented from reaching drinking water. This naturally would involve a discussion of the water table.