

Comparison of Phosphorus and Nitrogen Levels within Indian Brook

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Introduction

The Essex High School team researched Indian Brook, a stream flowing through the town of Essex, then Colchester, and eventually into Malletts Bay of Lake Champlain. Our team decided to analyze the town's impact on the stream by comparing two sites. The first was located at the stream's origin, adjacent to Indian Brook Reservoir, and the other was 3.59 miles southeast. We tested nitrogen and total phosphorous levels—two indicators of stream health.

Our hypothesis was that both phosphorus and nitrogen levels would be much higher in the second site, since the stream flows through Essex town.



Stream source: Indian Brook Reservoir

Figure 1

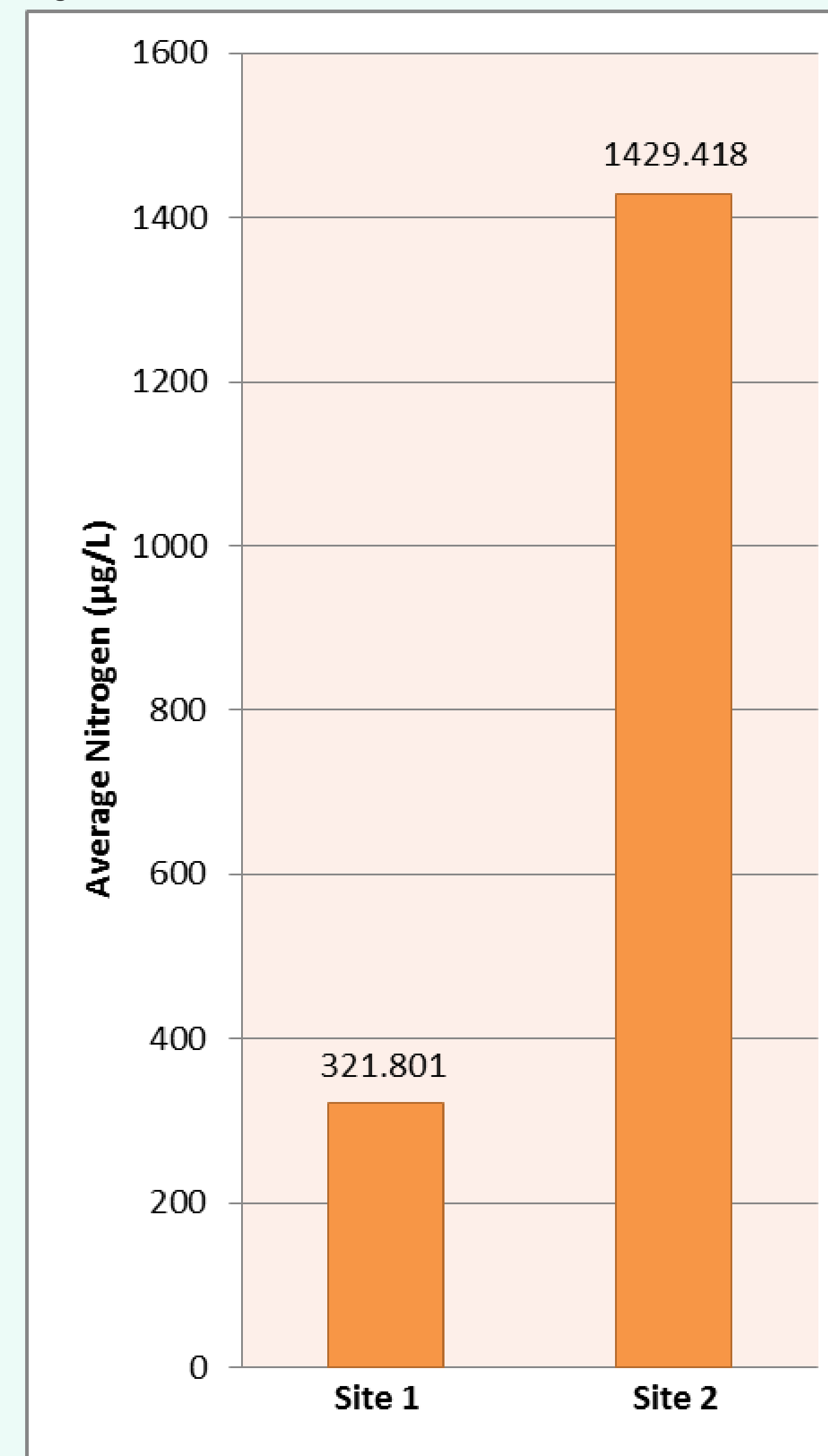


Figure 2

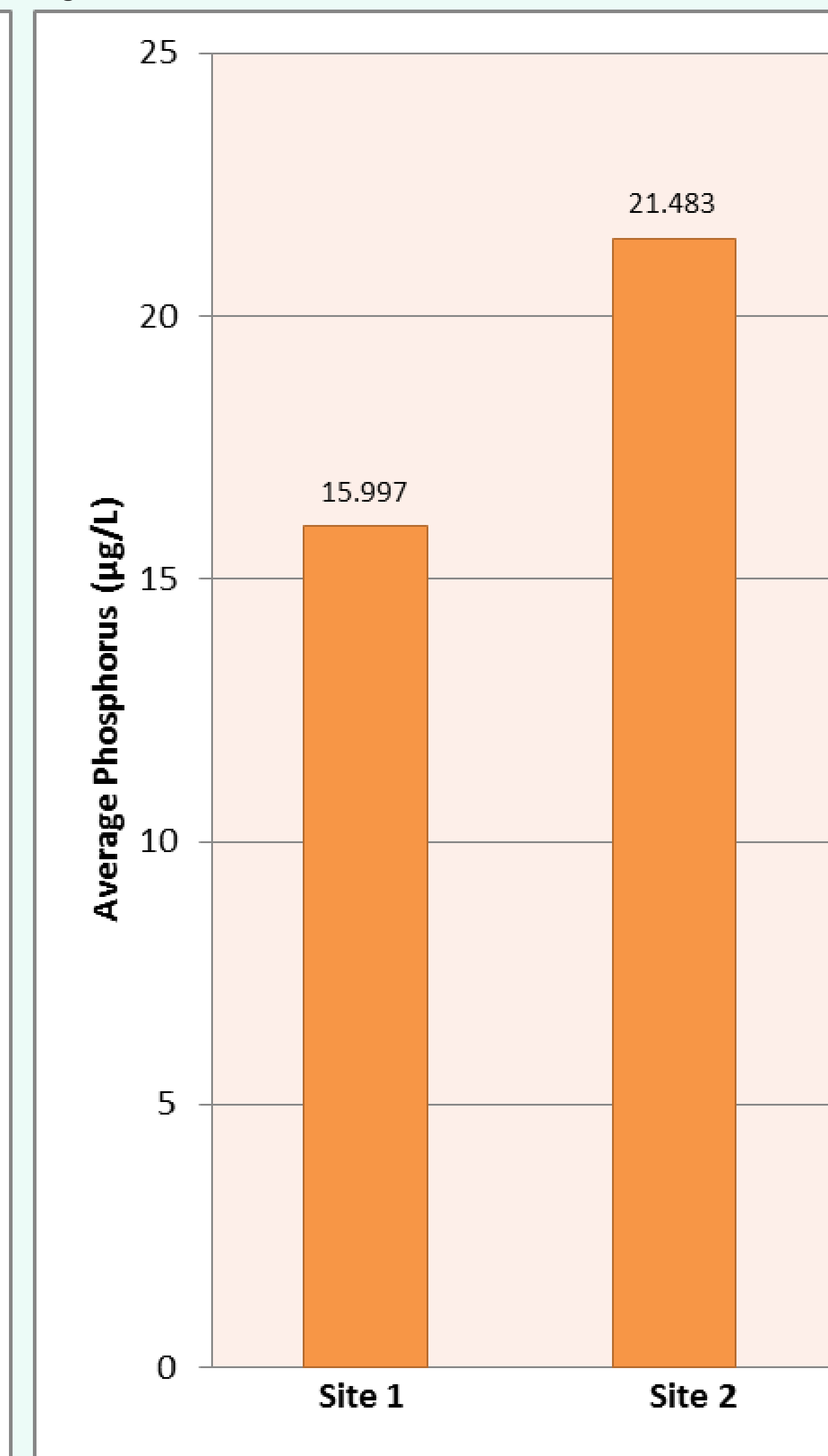
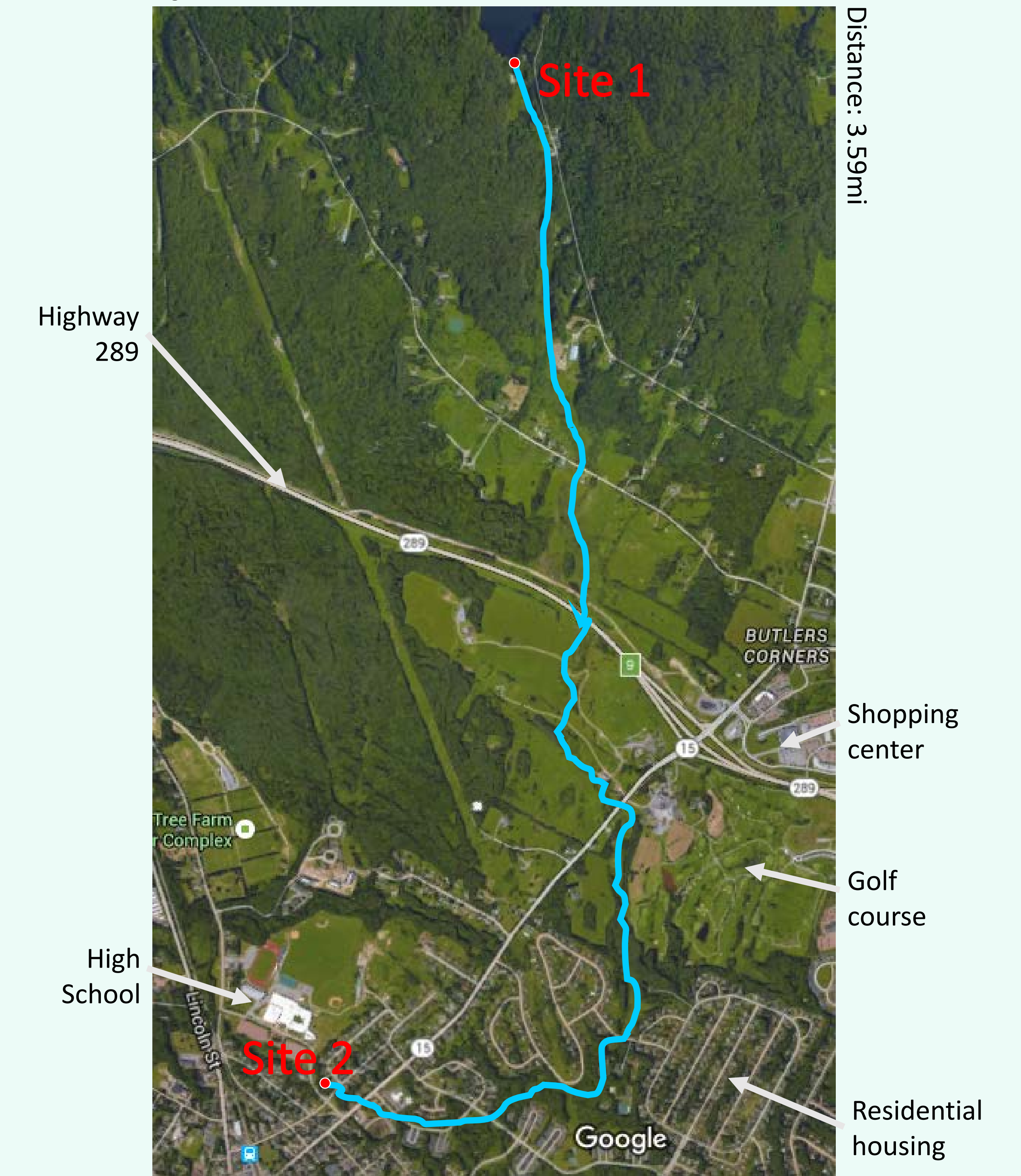


Figure 3



Background Information

We studied both nitrogen and phosphorus because both are pertinent to stream health.

- **Nitrogen** is crucial to healthy plant and animal growth and nourishment.
- Nitrogen can come from agricultural processes, acid rain, sewage in the form of ammonia, common fertilizers, runoff, and the combustion of fossil fuels.
- An overabundance of nitrogen can result in an overgrowth of aquatic plants and algae, which will in turn use up necessary dissolved oxygen in the stream. This can result in less biodiversity and therefore an overall less healthy stream.
- Similar to nitrogen, **phosphorus** is important for plant and animal growth in streams, originates from many of the same sources, and also creates a lack of dissolved oxygen.
- Other sources of phosphorus include commercial industry processes, cleaning supplies, human and animal wastes (sewage), farming, and power plants.
- Phosphorus is believed to be the cause of algae blooms in Lake Champlain.

Results

Just by a mere glance, the data is clear: site 2 had significantly higher phosphorus and nitrogen levels than site 1.

For nitrogen, both sites have high levels, yet site 2 had over *four times* the amount of site 1.

For phosphorus, the difference is not nearly as great as the difference in nitrogen. Site 2 had an average phosphorus level of about 5µg/L more than that of site 1. Although not a huge difference, it is still worth notice.

Observations

We observed many possible factors that could be contributing to the clear difference in phosphorus and nitrogen levels between the two sites in Essex town. Some of these possibilities (also shown in figure 3) include:

- Runoff and combustion from highway 289 (a heavily traveled road).
- Runoff from a construction site adjacent to highway 289 (large amounts of dirt, machinery, etc.).
- Runoff from houses and lawns in many residential areas.
- Runoff from a golf course located directly next to the stream.
- A commercial area with stores and restaurants.
- Runoff from multiple parking lots.

Conclusions

After reviewing our data and observations, we can conclude that **our hypothesis was correct**. Greater concentrations of both phosphorus and nitrogen are the consequence of Indian Brook flowing through Essex town.

If the phosphorus and nitrogen levels were elevated significantly in only 3.5 miles, then what are the levels when the stream unloads all the way into Lake Champlain (as Indian Brook is an LCD direct)? Could Indian Brook be a large contributor to the high phosphorus levels in Lake Champlain that produce harmful algae blooms?

Resources & Acknowledgments

"Nitrogen and Water." *The USGS Water Science School*. USGS, 2 Dec. 2015. Web.

Mueller, David K., and Dennis R. Helsel. "Nutrients in the Nation's Waters--Too Much of a Good Thing?" *National Water-Quality Assessment (NAWQA) Program*. USGS, 11 Jan. 2013. Web.