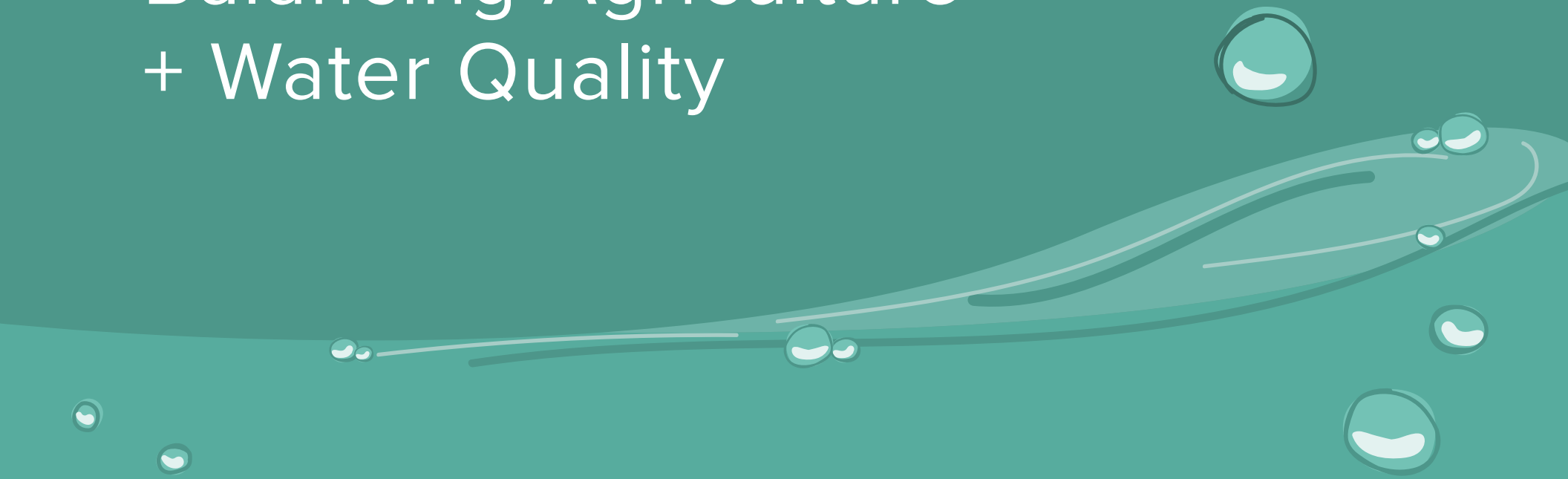
CFAES

KX 101:
Balancing Agriculture + Water Quality



KNOWLEDGE EXCHANGE

THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

December 2021

Ohio State University Extension Water Quality Associates

Water quality associates, co-authors of this KX 101, provide valuable research and resources from the College of Food, Agricultural, and Environmental Sciences from The Ohio State University to improve water quality in the Western Lake Erie Basin. Associates engage farmers and their advisors to identify and implement new production strategies, technologies, and best management practices. Areas of expertise include:

- Nutrient management
- Field-specific conservation practices
- Measuring economic and environmental benefits
- Promoting soil health
- Managing cover crops
- Reducing nutrient and sediment loss
- Funding opportunities for practice implementation

Visit waterqualityextension.osu.edu to view webinars, research projects, and counties covered by Water Quality Associates.

Contents

Ohio Agriculture

Agriculture is one of the leading industries in Ohio, contributing approximately $129 billion to the state's GDP annually. Ohio farms span 60% of Ohio's land area, and nearly 1 in 8 Ohioans are directly or indirectly employed by food or agriculture. The sheer scale of Ohio's agricultural sector highlights the importance of this industry to the state, while also demonstrating its sizeable impact on Ohio's natural resources. The interaction between agriculture and water quality is a full-circle relationship. Water quality can be affected by agricultural practices, and agricultural production relies on water.

What is Water Quality?

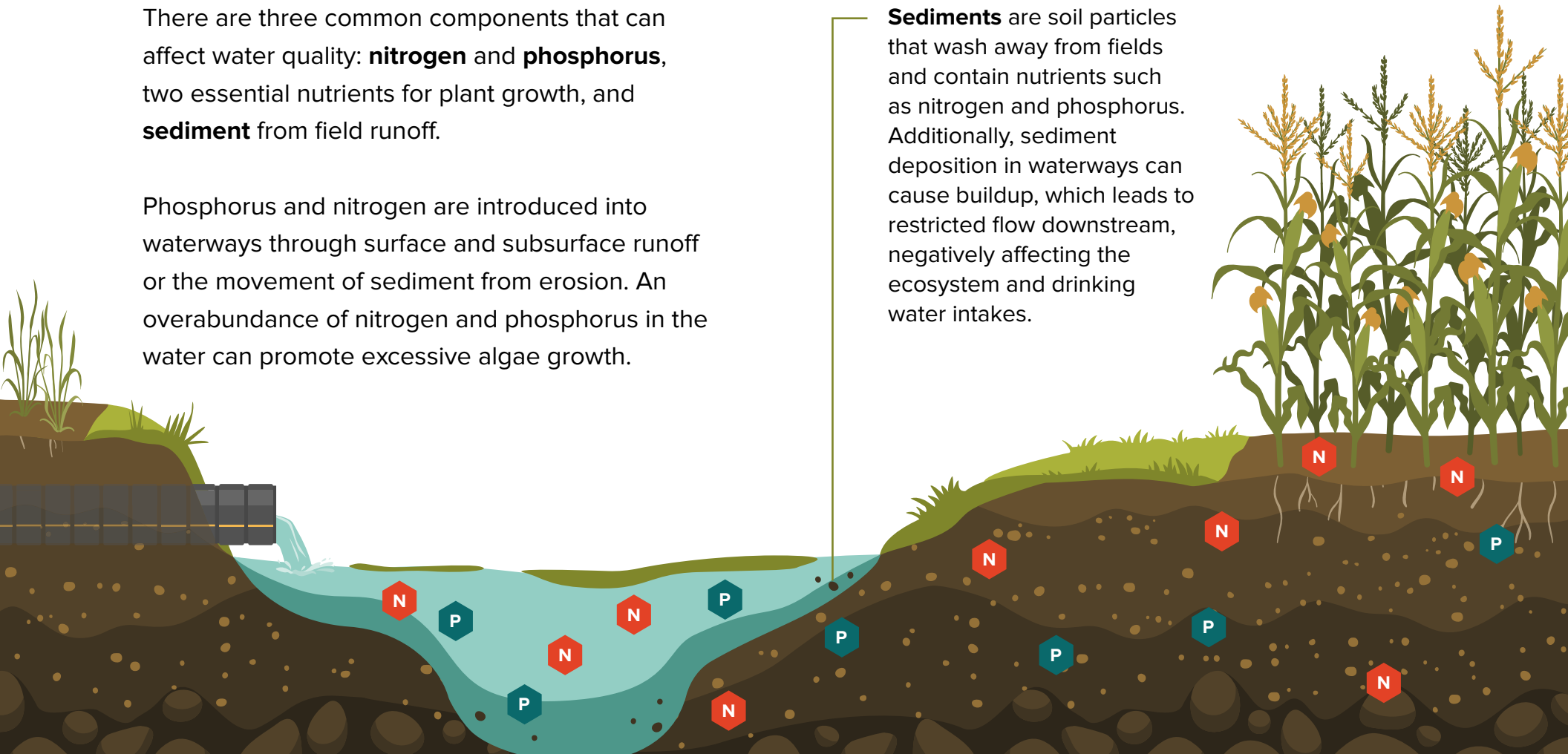
Water quality is a balance of chemical, physical, and biological characteristics. Understanding how water will be used—drinking or recreation—can change the importance of those values. Clean water is the backbone of a healthy ecosystem. Various measurements help assess water quality, such as the amount of nutrients and sediment in the water, the pH of the water, and what plants and animals we find living there.

Sources and Components of Excess Nutrients

There are three common components that can affect water quality: **nitrogen** and **phosphorus**, two essential nutrients for plant growth, and **sediment** from field runoff.

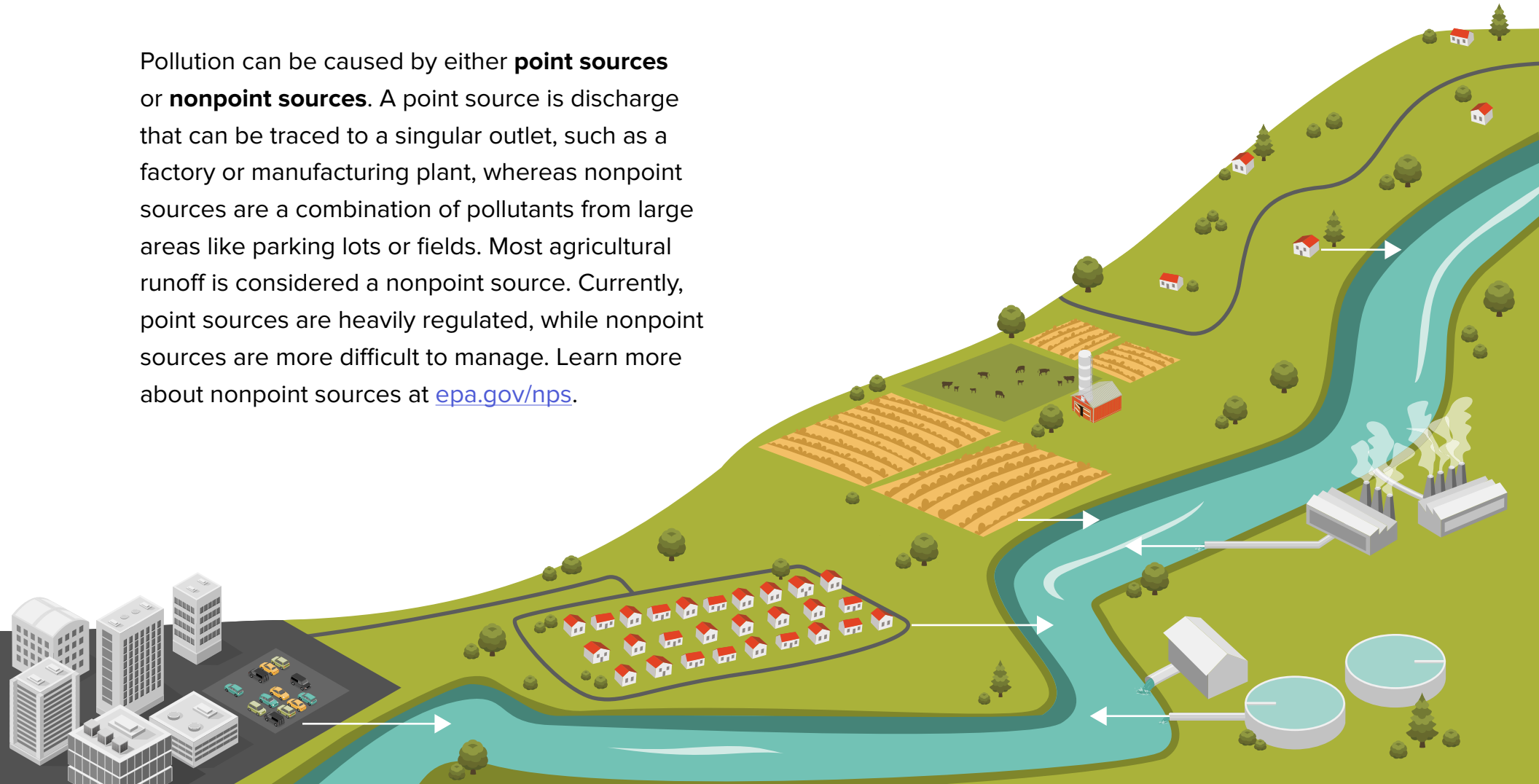
Phosphorus and nitrogen are introduced into waterways through surface and subsurface runoff or the movement of sediment from erosion. An overabundance of nitrogen and phosphorus in the water can promote excessive algae growth.

Sediments are soil particles that wash away from fields and contain nutrients such as nitrogen and phosphorus. Additionally, sediment deposition in waterways can cause buildup, which leads to restricted flow downstream, negatively affecting the ecosystem and drinking water intakes.



Sources and Components of Excess Nutrients

Pollution can be caused by either **point sources** or **nonpoint sources**. A point source is discharge that can be traced to a singular outlet, such as a factory or manufacturing plant, whereas nonpoint sources are a combination of pollutants from large areas like parking lots or fields. Most agricultural runoff is considered a nonpoint source. Currently, point sources are heavily regulated, while nonpoint sources are more difficult to manage. Learn more about nonpoint sources at epa.gov/nps.

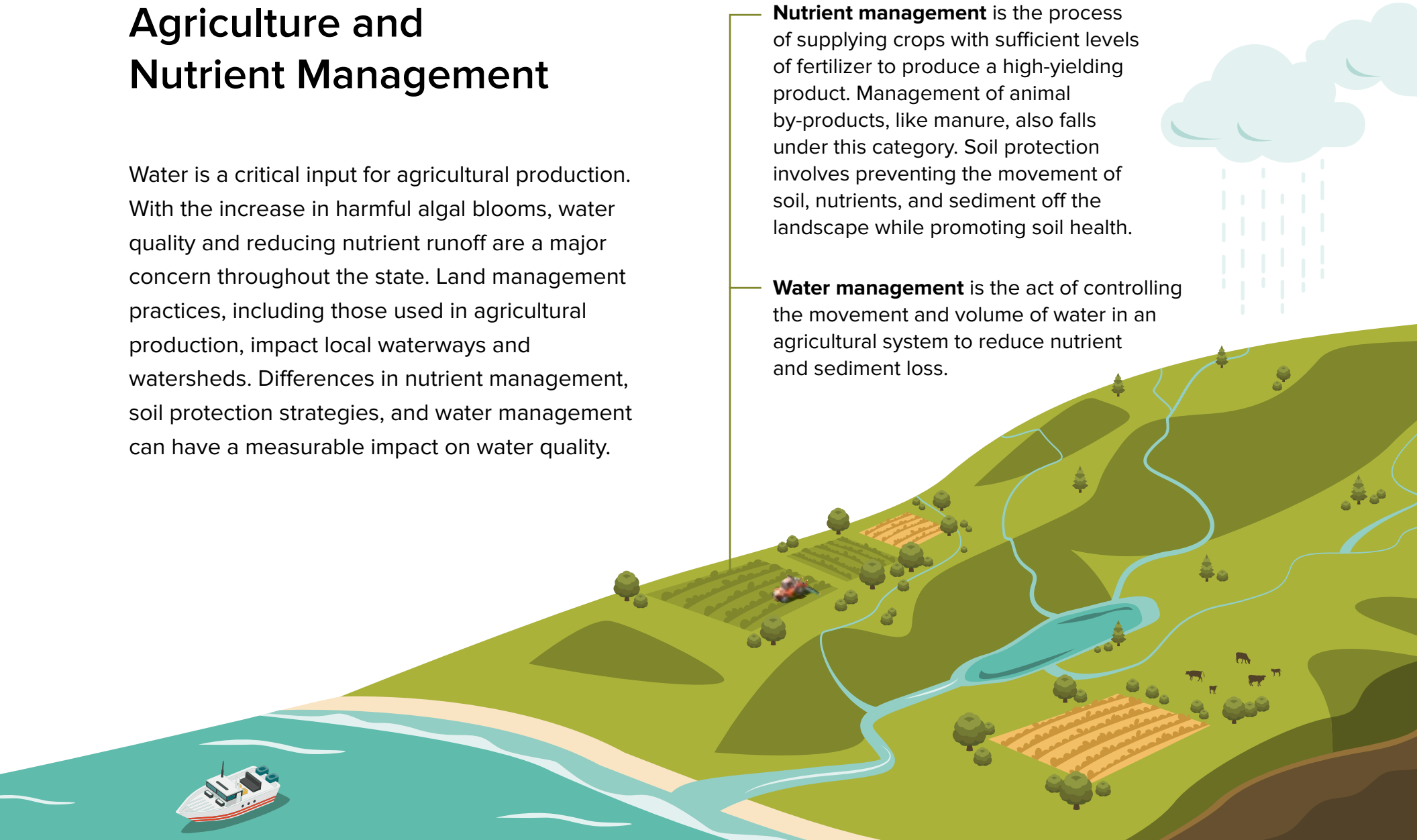


Agriculture and Nutrient Management

Water is a critical input for agricultural production. With the increase in harmful algal blooms, water quality and reducing nutrient runoff are a major concern throughout the state. Land management practices, including those used in agricultural production, impact local waterways and watersheds. Differences in nutrient management, soil protection strategies, and water management can have a measurable impact on water quality.

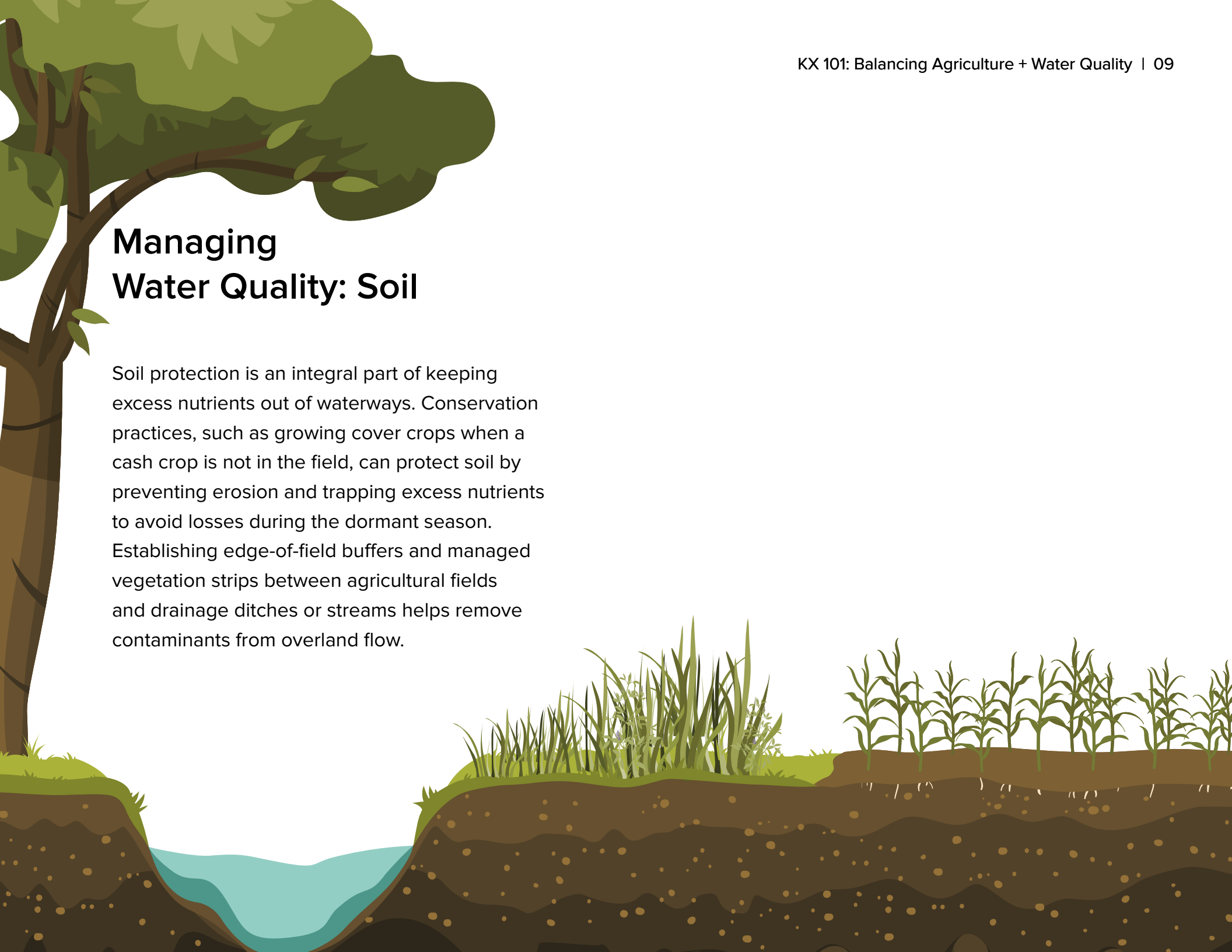
Nutrient management is the process of supplying crops with sufficient levels of fertilizer to produce a high-yielding product. Management of animal by-products, like manure, also falls under this category. Soil protection involves preventing the movement of soil, nutrients, and sediment off the landscape while promoting soil health.

Water management is the act of controlling the movement and volume of water in an agricultural system to reduce nutrient and sediment loss.



Managing Water Quality: Soil

Soil protection is an integral part of keeping excess nutrients out of waterways. Conservation practices, such as growing cover crops when a cash crop is not in the field, can protect soil by preventing erosion and trapping excess nutrients to avoid losses during the dormant season. Establishing edge-of-field buffers and managed vegetation strips between agricultural fields and drainage ditches or streams helps remove contaminants from overland flow.



Managing Water Quality: Nutrients

To improve management of their land as well as the environment, producers follow Best Management Practices or BMPs. There are multiple BMPs available to address water quality concerns. For additional information about BMPs, visit agbmps.osu.edu/bmp.

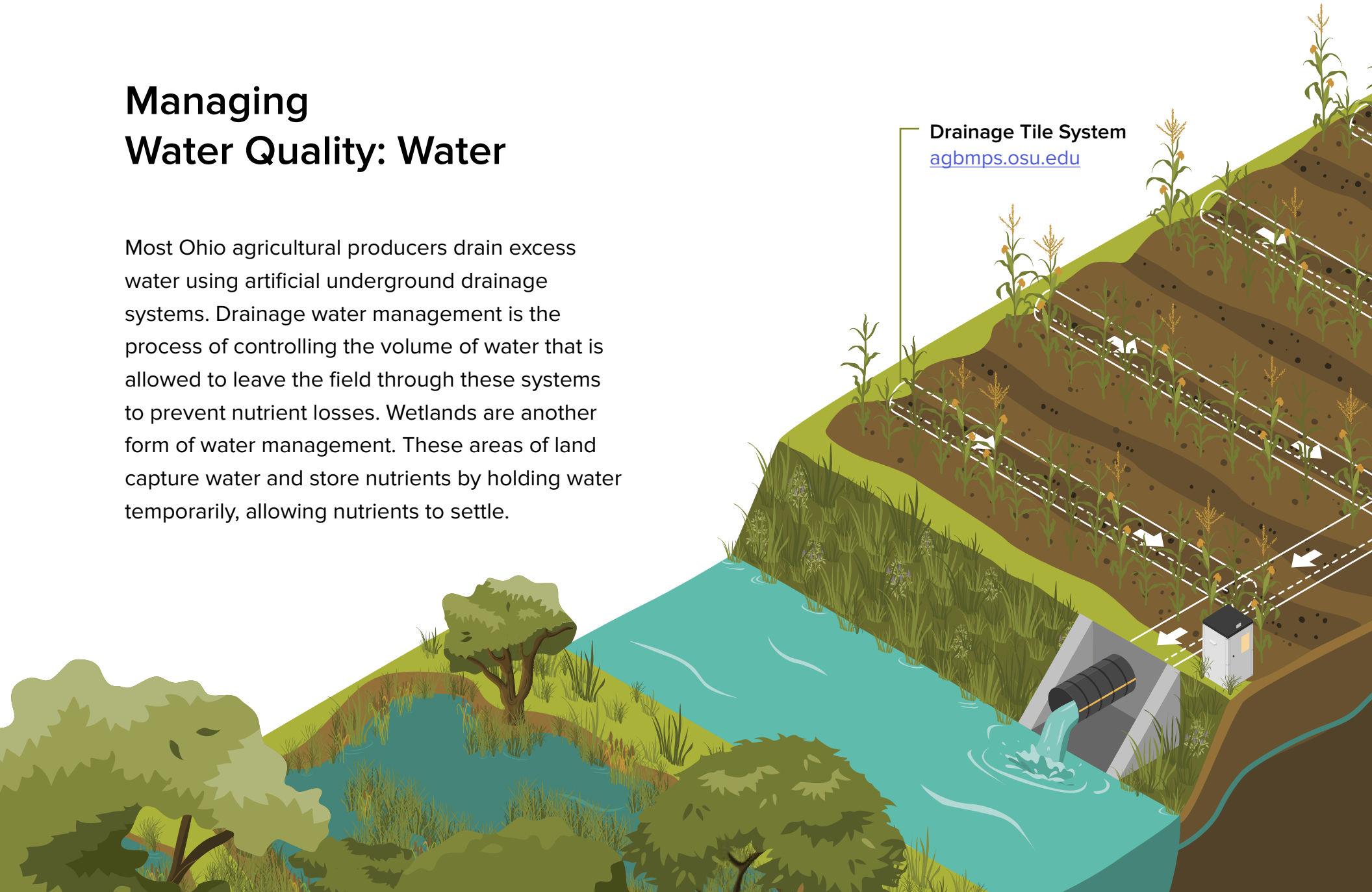
Nutrient management plans provide a roadmap for producers to follow. These plans detail the 4Rs of nutrient applications:

Right Source **Right Rate** **Right Time** **Right Place**

Today's technology allows farmers to follow a prescription determined by their soil test results to apply specific rates of nutrients that vary across a field. In addition, utilizing practices such as subsurface application for nutrient incorporation can also reduce instances of overapplication that lead to increased nutrient runoff.

Managing Water Quality: Water

Most Ohio agricultural producers drain excess water using artificial underground drainage systems. Drainage water management is the process of controlling the volume of water that is allowed to leave the field through these systems to prevent nutrient losses. Wetlands are another form of water management. These areas of land capture water and store nutrients by holding water temporarily, allowing nutrients to settle.



Monitoring Water Quality

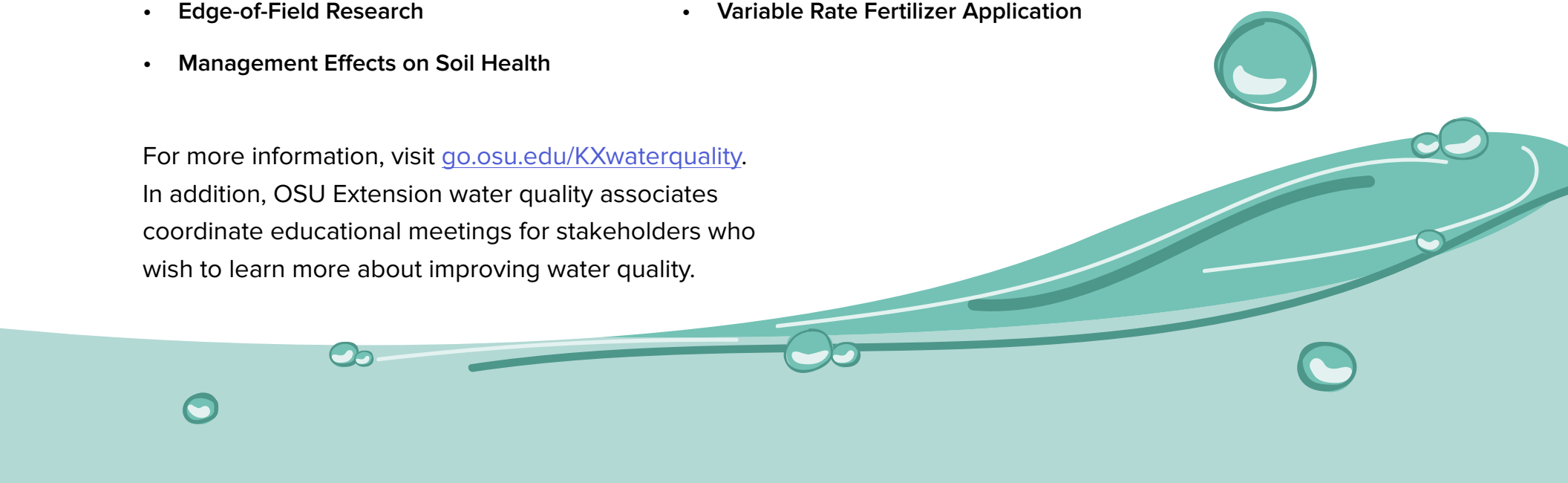
Edge-of-field studies monitor runoff via subsurface drains and surface water to better understand nutrient losses from a field. These sites can help determine which BMPs are most effective at reducing nutrient losses and runoff. Drinking water intake monitoring evaluates the levels of nutrients in drinking water sources according to EPA standards. Several university and governmental entities also maintain in-stream monitoring stations to assess water quality over time. For additional information, visit limnotech.com and ohioseagrant.osu.edu.

Agriculture-related Water Quality Projects at Ohio State

At The Ohio State University, numerous research projects investigate various aspects of water quality. Our research focuses on:

- **Cover Crop Implementation**
- **Drinking Water Monitoring**
- **Edge-of-Field Research**
- **Management Effects on Soil Health**
- **Manure Management**
- **Remote Sensing**
- **Variable Rate Fertilizer Application**

For more information, visit go.osu.edu/KXwaterquality.
In addition, OSU Extension water quality associates coordinate educational meetings for stakeholders who wish to learn more about improving water quality.



Additional Resources

Collaborative efforts to protect Ohio's watersheds by advancing agricultural practices include vital work by the following groups:

ohioaci.org

wrc.osu.edu

ohioseagrant.osu.edu

agbmps.osu.edu

h2.ohio.gov

epa.ohio.gov

For more water quality information, visit kx.osu.edu or contact Kim Winslow, winslow.52@osu.edu.