Water Stewardship

Water quality not only determines where fish live, how they behave, and whether they survive—it is also important for human health and quality of life.

What Will the Students Learn?

Minnesota has an abundant resource of fresh water in its 11,842 lakes (of ten acres or larger) and 6,564 natural rivers and streams totaling 69,200 linear miles. In constant motion, water travels and changes states in the water cycle. Students will learn that the water cycle is a fundamental system that connects all living things. They begin to see the relevance of a variety of water issues as they analyze how we all need and use water and by discovering how a watershed works.

Fresh, clean water contributes to the quality of life for all living things. The things that happen on the land in a watershed are eventually reflected in the water quality of lakes and rivers. People's choices and actions within their watersheds impact water quality and can benefit or harm plants, people, fish, and other animals.

Chapter Concepts

Water: A Valuable and Vulnerable Resource

Lesson 3:1—The Incredible Journey
Lesson 3:2—The Function of Aquatic Plants
Lesson 3:3—Wonderful Watersheds
Lesson 3:4—Would You Drink This Water?
Lesson 3:5—The Lake Game
Lesson 3:6—Macroinvertebrate Mayhem
Lesson 3:7—Mussel Mania

Only three percent of the world's water is fresh. More than 75 percent of that amount is frozen in polar icecaps. Another 20 percent is trapped as ground water, much of which is inaccessible. Only a small portion of the world's total water supply is available for human use. Water is a limited resource. The water cycle enables the earth's living things to use the same water again and again.

Students participate in roleplaying activities, make models, and conduct experiments that demonstrate how people make choices about water use. They learn that land use Best Management Practices can help reduce or prevent negative impacts to water quality and help ensure that available fresh water supplies can continue to sustain life on earth.

Around in Cycles

Lesson 3:1—The Incredible Journey
Lesson 3:3— Wonderful Watersheds

Water is always moving. Students discover where—and how—water molecules travel. The water cycle is powered by the sun's energy and by gravity. Water travels downhill (thanks to gravity) and as it travels, it changes from a solid, to a liquid to a gas, depending on temperature (the amount of energy from the sun).

People can pollute water by adding things to it that negatively impact its quality. Point-source pollution enters water from a single source, such as an outflow pipe or an oil spill. Nonpoint source pollution can't be traced to a single source. Pollution—which can travel with water in the water cycle—often creates impacts far from where it entered the environment.

Water Dwellers

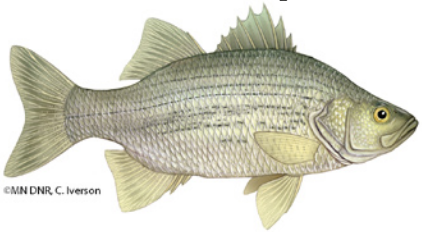
Lesson 3:2—The Function of Aquatic Plants
Lesson 3:6—Macroinvertebrate Mayhem
Lesson 3:7—Mussel Mania

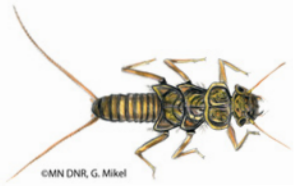
A diversity of plants and animals live in and near Minnesota's waters. Each species has unique adaptations that help it survive in its environment. Each organism also plays a particular role in maintaining ecosystem balance, which ensures a healthy aquatic habitat for fish populations.

Personal Choices That Protect or Degrade Water Quality

Lesson 3:2—The Function of Aquatic Plants
Lesson 3:3—Wonderful Watersheds
Lesson 3:5—The Lake Game
Lesson 3:7—Mussel Mania

Pollution includes physical or biological agents that degrade water quality and affect the organisms that depend on it. Non-point source pollution results from numerous sources and can't be traced to a single source or point of origin. Because non-point source pollution is more difficult to address, it poses a greater threat to water quality than point source pollution. Erosion can be an example of non-point source pollution. Too much soil in the water can produce numerous effects that impair aquatic ecosystems. Human activities on land, including development, energy production, industry, livestock, farming,





"Never doubt that a small group of committed citizens can change the world; indeed, it's the only thing that ever has."
—Margaret Mead

and recreation can accelerate erosion and cause other types of water pollution, too. Buffers of plants on land and riparian areas help protect water by taking up nutrients, filtering sediments, slowing runoff, and stabilizing soil and shorelines. Transporting water or organisms from one location to another can introduce invasive species, which often compete with native species or otherwise harm habitat. Simulations and models can demonstrate how land use Best Management Practices and informed choices can help prevent or reduce the impact that human activities often have on water quality.

We All Live in a Watershed

Lesson 3:3—Wonderful Watersheds
Lesson 3:4—Would You Drink This Water?
Lesson 3:5—The Lake Game

What is a watershed? Where does the water go? How does water travel throughout the watershed? You live in a watershed. Natural and human made systems are interconnected by the water cycle and throughout a watershed. Students make models, experiment and make choices to discover how human activities on the land in the watershed impact water quality where we live. We each make decisions and choices every day that can impact water quality in a positive or negative way. Students continue to acquire the awareness, information and analytical skills to be able to make informed decisions and address environmental problems. If we are well informed and can critically analyze problems, we can choose to take action and be good stewards of our water resources.

Water continually changes from solid to liquid to gaseous states. Water can be recycled, or re-used, but ultimately, it's a limited resource—water can't be created.

Indicators of Water Quality

Lesson 3:4—Would You Drink This Water?
Lesson 3:6—Macroinvertebrate Mayhem

What *is* clean water? Students use their senses to discover that polluted water comes in many forms, *some* of which we can detect with our senses. Pollutants can be physical, chemical, or biological.

By inspecting and studying aquatic macroinvertebrates, students discover that these small organisms are indicators of water quality. The types and diversity of species existing in lakes, rivers, or streams provides clues for monitoring water quality.

Harmful Invaders

Lesson 3:7—Mussel Mania

Many non-native plant and animal species have been accidentally or intentionally introduced to Minnesota waters. Students discover how an invasive species can harm aquatic ecosystems. Students assume the roles of native mussels to find out what happens when zebra mussels are introduced into a Minnesota ecosystem. Everyone who engages in water activities must learn to prevent the spread of zebra mussels and other invasive species from infested to uninfested bodies of water.

Stewardship: A Call to Action

Service-learning Appendix

What can you do to conserve and use water in a sustainable way? Can one person make a difference? The lessons in Chapter 3 inform students they can choose to take action and practice good stewardship regarding water—which is everyone's responsibility. Service-learning offers students opportunities to become engaged in their communities and empowered to exercise the skills they've learned

"The frog does not drink up the pond in which he lives."
—Native American proverb

about water and watersheds by identifying a local water issue or problem, and designing a project to address it. This provides an early path to lifelong and active citizenship and stewardship.

Human activities, decisions, and choices can positively or negatively affect water resources. Cleaning degraded or polluted water isn't always possible—it can be prohibitively difficult and expensive. Land use Best Management Practices and sustainable use of water resources is more prudent, efficient, and cost-effective. As demands on water resources grow with a growing world population, the personal decision-making and creative problem solving skills of an informed citizenry are more necessary than ever. Sustainable use of water means taking care of water and fisheries resources—and our future.

Congress passed the Clean Water Act in 1972 to "restore and maintain the chemical, physical, and biological integrity of the nation's waters." Its goal is to make all surface waters clean enough for fishing and swimming. Since the Act's enactment in 1972, progress toward this goal has been made, but much remains to be done.