What You Need to Know

Essential Standard: 8.E.1 Understand the hydrosphere and the impact of humans on local systems and the effects of the hydrosphere on humans.

Clarifying Objective: 8.E.1.4 Conclude that the good health of humans requires:

- Monitoring of the hydrosphere
- Water quality standards
- Methods of water treatment
- Maintaining safe water quality
- Stewardship

Students need to know:

· **that water quality is a term used to describe the chemical, physical, and biological characteristics of water.**

- Scientifically, an array of chemical, physical, and biological measurements is used to define water quality. Water quality is also described in terms of the purpose for which water is intended to be used. Water that is safe to drink is called potable water, or drinking water, in contrast to safe water, which can be used for bathing or cleaning. In the United States, the Environmental Protection Agency sets maximum levels for the 90 most commonly occurring contaminants.

· **that water quality standards outline the water quality pollution control program that is mandated and regulated by local, regional and federal agencies.**

- Standards outline the goals for a body of water by identifying its uses, establishing how to protect those uses and establishing provisions to protect and preserve the water bodies in the long term. Point and non-point environmental stressors such as urban and/or agricultural runoff, industrial inputs and over-fishing can impact a variety of aquatic and land-based populations. Because the water quality of a given water body is so closely linked to the surrounding environment and land use, monitoring and regulation at local, regional, and national levels is important.

· clear water may contain odorless, tasteless, and colorless harmful contaminants.

- Water must be tested for specific contaminants such as bacteria, nitrates, arsenic and others. Natural supplies of potable water are very limited and do not exist in sufficient quantities to meet human needs. Because of this, humans have developed water treatments that process water so that it can be used for a particular purpose. Drinking water treatment requires some basic steps:

- Water collection
- Coagulation, during which lime and alum are added to the water, causing particulates to clump together.
- Next, the water is shaken to form larger clumps, called flocs.
- During the sedimentation process water stands for approximately 24 hours, which allows the clumps to settle to the bottom.
- The water is then filtered, disinfected (usually with chlorine) and aerated. The substances removed during the drinking water treatment process include suspended solids, bacteria, algae, viruses, fungi, minerals, and chemical pollutants.

· **that water is essential to life.**

- Water quality determines the sustenance of ecosystems, human activity such as agriculture, fishing, and recreation, as well as public health of human societies. Water quality supports healthy environments in which rich and varied communities of organisms can be found. The importance of monitoring and maintaining water quality cannot be overstated. Cultivating an awareness of their connection to North Carolina's hydrologic system is the first step towards developing stewardship skills and dispositions in students.

BOTTOMLINE: *Starting in 1914 the USA implemented drinking water standards for wells concerning coliform growth. In 1940 drinking water standards began to apply to municipal (city) drinking water. In 1972, the Clean Water Act was passed in the USA and in 1974 the Safe Drinking Act was formulated. The general principle in the developed world now is that every person has the right to safe drinking water. Starting in 1970, public health concerns shifted from waterborne illnesses caused by disease-causing micro-organisms, to health concerns caused by water pollution such as pesticide residues and industrial sludge and organic chemicals. Regulation now focused on industrial waste and industrial water contamination, and water treatment plants were adapted. Techniques such as aeration, flocculation and active carbon absorption were applied. In the 1980's membrane development for reverse osmosis was added and risk assessments were enabled after 1990. Knowledge about natural systems and informed decision making regarding its use are essential for the maintenance of a life-sustaining planet. The variety of North Carolina coasts and rivers shape the behavior and life cycles of its inhabitants. If chemicals, hazardous wastes, oil, etc. collect on the ground surface, runoff percolating into the soil can transfer these undesired substances into the ground water. Individual and collective actions are needed to effectively manage water resources for all. Much of the world's population lives in the coastal areas. Laws, regulations, and resource management affect what is taken out and put into the ocean. Point and non-point environmental stressors such as urban and/or agricultural runoff, industrial inputs and over-fishing can impact all aquatic populations. Environmental degradation will likely decrease the diversity of a community by eliminating intolerant organisms and increasing the number of tolerant organisms. For centuries humans have used streams, rivers and oceans as depositories of human, industrial and solid wastes. This accelerating toxic influx and nutrient enrichment causes chemical and environmental changes and major shifts in plant and animal life resulting in economic trade-offs. Technological advances have enabled us to collect data about water*

systems that have led to improvements in developing standards, monitoring water-quality, and providing treatment. The more we understand and respect North Carolina's aquatic systems, the more capable we are of making informed decisions and thus becoming good stewards of the environment. The first step in getting students to move towards stewardship is to create a personal awareness of how they are connected to North Carolina's hydrological system.

Reference: North Carolina Department of Public Instruction, Essential Standards: Grade 8 Science, Unpacked Content, September 2012 Revision, http://scnces.ncdpi.wikispaces.net/file/view/Unpacked_Content_Grade8Science_RevisedSeptember2012.docx.pdf/368725266/Unpacked_Content_Grade8Science_RevisedSeptember2012.docx.pdf