

Water quality conclusion

Focus questions	How can the health of an aquatic ecosystem be determined by the biotic and abiotic factors present in the ecosystem? How can the human impact be lessened to maintain or improve the water quality rating for an aquatic ecosystem?
Learning target	Students analyze biotic and abiotic data from lessons 1 and 2 to create an explanation for the health of an aquatic ecosystem. Students design solutions for aquatic ecosystem maintenance and/or restoration.

MS-ESS3: Earth and Human Activity

Performance expectation MS-ESS3-3	Classroom connection: This activity uses data collected from lessons 1 and 2 to design a solution to minimize human impact on an aquatic ecosystem.
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Science and engineering practices

Constructing Explanations and Designing Solutions	<p>Classroom connection: Students construct an explanation using biotic and abiotic data to support their explanation of the water health of an aquatic ecosystem.</p> <p>Classroom connection: Students design solutions to improve the health of the aquatic ecosystem by minimizing the human impact on the aquatic ecosystem.</p>
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Disciplinary core ideas

ESS3.C: Human Impacts on Earth Systems	Classroom connection: Students will determine if the data supports that human impact has affected the quality of life in the aquatic ecosystem tested.
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Cross-cutting concepts

Cause and Effect	Classroom connection: Students will analyze biotic and abiotic data to determine if the water quality assessment is caused by human impact and what the effects of that impact are on water quality.
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This lesson focuses on Constructing Explanations and Designing Solutions as a means to identify the biotic and abiotic indicators that help to determine the health of an aquatic ecosystem and the corresponding conditions that allow aquatic organisms to survive. Students will analyze collected data from lessons 1 and 2 to construct an explanation for the water quality of the ecosystem. Students can then design solutions to either maintain or improve the health of the aquatic ecosystem.

Materials

- Student handout lesson 1 data
- Student handout lesson 2 data
- Student handout lesson 3

Differentiation

Other ways to connect with students with various needs:

- **Local Community:** Students may investigate local aquatic ecosystems to conduct testing of the ecosystem and observe human activities that have impacted the testing site.
- **Students with special needs (language/reading/auditory/visual):** Students in cooperative groups can rotate tasks and utilize all students' strengths. Students can design an alternative solution by creating a model of their design solution.
- **Extra support:** Volunteer Stream Monitoring, A Methods Manual: epa.gov/sites/production/files/2015-06/documents/stream.pdf. Nebraska Department of Environmental Quality, Stream Monitoring: deq.ne.gov/NDEQProg.nsf/OnWeb/SBMP
- **Extensions:** Students can observe real-time data in Nebraska through USGS: nrtwq.usgs.gov/ne/. Students can help to solve real water problems within their community. Take part in organizations such as Give Water a Hand: erc.cals.wisc.edu/gwah/.

Student handout

2. Construct an explanation for the current water quality of the aquatic ecosystem from the collected data and your observations. Use the collected data from above and include any human activities that may have led to the water quality assessment.

Answers will vary.

3. Design a solution to improve the human impact at the aquatic ecosystem testing site. Be sure to address how this solution will maintain or improve the current water quality assessment.

Answers will vary.

Rubric for self-assessment

Skill	Yes	No	Unsure
Identifying Human Impact: I identified human activities that created an impact upon the tested aquatic ecosystem.			
Constructing Explanations: I constructed an explanation for the current water health of the tested aquatic ecosystem.			
Designing Solutions: I helped to design a solution to improve the water quality of the aquatic ecosystem and counteract the human impact on that system.			

Assessments

Rubric for assessment

Skill	Developing	Satisfactory	Exemplary
Constructing an Explanation of Water Quality	Student can conduct water quality testing and calculate water quality ratings.	Student can conduct water quality testing; calculate water quality ratings and identify the human activities that impact the water quality of the aquatic system.	Student can calculate water quality ratings, identify human activities that may impact the aquatic ecosystem and determine cause and effect relationships between human impact and environmental conditions.
Designing Solutions to Human Impact	Student can identify human activities that may impact the water quality of the test site.	Student can identify human activities that impact the health of the testing site and outline some possible steps to improve the water quality of the testing site.	Student can identify human activities that impact the health of the testing site and create a solution to improve the water quality. The solution must explain how the proposed actions will improve the water quality.

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