

<b>Title of Lesson Plan</b>	Water Quality and Pollution Web Quest
<b>Prepared By</b>	John Shribbs
<b>City and State</b>	Petaluma, CA
<b>Grade Level(s)</b>	9-12
<b>Keywords (subjects covered)</b>	Natural resources, water resources, water quality, water pollution, web quest
<b>Brief Description</b>	Students search the web (and any hard copy) to answer questions and then pick a subject area to report in-depth using a typed formal report and/or slideshow presentation
<b>Total Time Required</b>	2 to 4 weeks, depending on quality of report expectations
<b>Setting</b>	Access to computers, Internet, word processing software, and slide presentation software
<b>Lesson Objectives/Goals</b>	<p>Students will:</p> <ol style="list-style-type: none"> <li>1) understand water is a limited natural resource</li> <li>2) learn where their water comes from – not just “from the tap”</li> <li>3) understand how water resources can become polluted</li> <li>4) understand how we personally and collectively use water</li> <li>5) understand how water is collected, transported, stored, treated before use, and treated after use</li> <li>6) learn to search the Internet for information</li> <li>7) work in groups to find information, share information, and develop a presentation</li> <li>8) learn to use MLA style citations for the Internet</li> </ol>
<b>Materials Needed</b>	Computer, software, Internet, projector
<b>Standards Addressed</b>	<p><b>Earth Science, California Geology. Grades 9 to 12</b></p> <ol style="list-style-type: none"> <li>9. The geology of California underlies the state's wealth of natural resources as well as its natural hazards. As a basis for understanding this concept: <ol style="list-style-type: none"> <li>a. Students know the resources of major economic importance in California and their relation to California's geology.</li> <li>b. Students know the principal natural hazards in different California regions and the geologic basis of those hazards.</li> <li>c. Students know the importance of water to society, the origins of California's fresh water, and the relationship between supply and need.</li> </ol> </li> </ol> <p><b>Investigation &amp; Experimentation - Grades 9 To 12</b></p> <ol style="list-style-type: none"> <li>1. Scientific progress is made by asking</li> </ol>

	<p>meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop their own questions and perform investigations. Students will:</p> <p>m. Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.</p>
<p><b>Procedure</b></p>	<ol style="list-style-type: none"> <li>1) Students can either do this exercise alone or in groups. I have used this assignment as an extra credit assignment for individual students and as a group project worth 20% of the semester grade.</li> <li>2) If available take students on tour of local water bodies, sources of fresh water, city water department, water treatment plants, and analytical labs</li> <li>3) If available, invite local city/county water engineer to classroom</li> <li>4) Demonstrate the properties of water in class involving density, viscosity, conductivity, pH. Project Wet has many lesson plans for water.</li> <li>5) Look up an image on “water cycle and reservoirs” in Google images search and discuss the water cycle</li> <li>6) Watch a video on water, e.g. Three Gorges Dam in China, and discuss how science and politics get mixed.</li> <li>7) Start with everyone doing a reading and class discussion, e.g. one of the topics in Global Policy Forum, Water in Conflict, <a href="http://www.globalpolicy.org/security/natres/waterindex.htm">http://www.globalpolicy.org/security/natres/waterindex.htm</a> to students can appreciate the local, national, international, and global importance of water</li> <li>8) Students find answers to questions from the Internet or from hardcopy materials. See attached document for questions and Internet resources.</li> <li>9) Students prepare verbal report/short essays/typed answers on each section of the web quest. You can</li> </ol>

	<p>assign each group a different topic and have them teach the class on their topic.</p> <p>10) It is critical that students are assessed in process for finding the information and summarizing it verbally. Students get stuck and frustrated with finding information on the Internet and many times need guidance with key search words. The Internet resources attached tend to change addresses yearly, but can usually be found through maps and menus on the home sites.</p> <p>11) Students as either individuals or as groups pick a single topic within the topic of water resources of their choosing and write a report. These topics should be developed by the students with teacher guidance. For example, one report can compare bottled waters; another could assess the real, legal, and political battles over fresh water access by local farmers in 2 different countries, e.g. Mexico and Venezuela.</p>
<b>Assessment</b>	The assessment is flexible and can be modified to meet the needs of the students. The range can be verbal reports, written reports, slideshow presentations, written essays, or multiple-choice tests. Have the students pick one topic/questions each and have them teach each the class their topic and have class evaluate each student teacher.
<b>Literature Cited/References</b>	See attached for questions and Internet resources
<b>Forestry Tour Attended</b>	Pacific Northwest 2008

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## Water Quality and Pollution Web Quest, Report, and Presentation

This is a team exercise where a group of 3-5 students create a 10 page minimum typed document (counting only the raw text) with MLA style references. Use Times New Roman 12 point font, 1.5 line spacing, and 1-inch margins. Break the report into logical units with headings in Arial 14 point bold. Add all addendum and support data and documents after the report. Teams must sign up with teacher ahead of time and explain who, what, when, why, where, and how of their teamwork before the search begins. Teams will present their report in a PowerPoint show to the class. This project will be a major portion of the semester grade.

Turn in answers to discussion questions with MLA citation list of resources by: _____	Show teacher first draft of report by: _____	Final report due: _____	Presentation due: _____
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Listed below are web resources and discussion questions that need to be answered in the report. Do not limit yourself to the resources listed; use other resources too. Teams will be graded on teamwork as well as final product. Larger teams are expected to create larger, in depth reports. The essential question is: “What events, situations, agencies, laws, and people will impact the quality of water resources here in California in the next 50 years?” Your report needs to list what needs to occur over your lifetime for Petaluma to maintain good water resources. The Petaluma Water Department will be invited to read reports and observe presentations.

<b>Resources</b>	<b>Discussion Questions</b>
<b>Water pollution.</b> Do a web search on “water pollution types” and describe each type.	1. Describe the 6 types of water pollution. 2. What is the difference between point source and non point source?
<b>Water Wells in the Third World.</b> Go to the Oasis Design web site and then go to the <a href="http://www.oasisdesign.net/water/quality/village.htm">http://www.oasisdesign.net/water/quality/village.htm</a> link in headings. <a href="http://www.oasisdesign.net/design/examples/maruata/index.htm">http://www.oasisdesign.net/design/examples/maruata/index.htm</a>	3. Describe water quality in rural 3 <sup>rd</sup> World villages which use local well water. 4. What would you do as a Peace Corp worker in these villages?
<b>California Water Policy</b> Go to California Department of Water Resources “State Water Project –Background and History” web site and use links <a href="http://www.water.ca.gov/swp/history.cfm">http://www.water.ca.gov/swp/history.cfm</a>	5. Read history and explain how and why water is important in California politics and economy? 6. What percentage of water is agricultural or urban during wet, average and dry years? 7. Summarize the FAQ answers.
<b>California Water Sources.</b> Go to California Department of Water Resources “maps” web site <a href="http://www.publicaffairs.water.ca.gov/maps/">http://www.publicaffairs.water.ca.gov/maps/</a> and go to “all water projects” map first, then look at state and federal projects separately.	8. Do any of the water projects come to Petaluma? 9. What is the flow pattern of water in California? 10. What are the water sources? 11. What are the water destinations?
<b>Sonoma County Water Agency.</b> Review the water distribution pamphlet from our local water agency (available from teacher). Find “water facts” and “water supply” on the Sonoma County Water Agency “site map”, “your water” subheading. <a href="http://www.sonomacountywater.org/site_map.php">http://www.sonomacountywater.org/site_map.php</a>	12. What are most important water facts? 13. Where does our water come from? 14. How does faucet water get to us? 15. Is it treated? How? Is fluorine added? 16. Should we mine the Russian River for gravel and river rock, which also filter our fresh water?

<p><b>Water sources and use.</b>  Go the USGS web site on “water science”:  <a href="http://www.usgs.gov/edu/">http://www.usgs.gov/edu/</a>  Go to “water use information”, then go to  “water questions and answers”, then go to  “water use at home”.  Go to the Earth’s Water, then “menu of all of  earth water topics”.  Go to the “water use” menu. Go to the maps of  water use.  Go to surface water.</p>	<p>17. Where does our household water come from?  18. How is the water you drink made safe?  19. Compare surface water to ground water.  20. List the uses of water in order of percent used.  21. Compare California to the US as a whole.  22. What are the biggest uses of surface water?  23. Go to Activities Center and take the “challenge  quiz” and write what you learned.</p>
<p><b>Water Properties.</b>  Go to “Environment Canada”, “English”,  “Water”, and then “Water properties”.  <a href="http://www.ec.gc.ca/">http://www.ec.gc.ca/</a></p>	<p>24. Why is water magical?  25. What are the thermal properties of water?  26. Interpret the size data about the Great Lakes?  27. Compare this site to USGS and US EPA sites for  ease of finding information.</p>
<p><b>Thermal Pollution</b>  Go to encyclopedia: <a href="http://school.eb.com">http://school.eb.com</a> with  ID: “casagrande” and PW: “Ktwelve” and  search for water pollution and thermal  properties. Use ecology and lakes articles. Also  use search engines for more information. Go  to Google and search on “thermal  pollution” + “aquatic life”</p>	<p>28. Define thermal pollution.  29. How does it occur?  30. When does it occur?  31. Where does it occur?  32. Why does it occur?  33. Who or what is affected?  34. What can we do about it?</p>
<p><b>Dam Release Monitoring.</b>  Go to “Dave Harpman’s Glen Canyon Page”  <a href="http://mysite.du.edu/~dharpman/glenpage2.htm">http://mysite.du.edu/~dharpman/glenpage2.htm</a>  Go to the monitoring of Glen Canyon release  water 1999 report  <a href="http://www.gcmrc.gov/products/score/1999/score_99_water_quality.aspx">http://www.gcmrc.gov/products/score/1999/score_99_water_quality.aspx</a></p>	<p>35. What change is proposed at Glen Canyon Dam to  modify the water temperature of release water?  36. Describe the lake temperature graph  37. Describe the monitoring. What properties are  being monitored? How many sites are being  monitored for temperature?  38. In your opinion, is this a good monitoring  program? Why?</p>
<p><b>Waste water treatment.</b>  <a href="http://ohioline.osu.edu/aex-fact/0768.html">http://ohioline.osu.edu/aex-fact/0768.html</a></p>	<p>39. Describe preliminary and primary treatment.  40. Describe secondary treatment.  41. Describe tertiary treatment.  42. Summarize how waste water is treated in an  industrial plant.  43. Why are wetlands important in water treatment?</p>
<p><b>EPA Wetlands Pages.</b>  Go to the “overview” and “functions and  values” and “construction” pages.  <a href="http://www.epa.gov/owow/wetlands/facts/contents.html">http://www.epa.gov/owow/wetlands/facts/contents.html</a></p>	<p>44. What is a wetland (overview)?  45. How do wetlands clean up dirty water (function)?  46. Describe the parts of a wetland (construction).</p>
<p><b>Household wastewater systems.</b>  <a href="http://waterhome.brc.tamus.edu/texasyst/household.html">http://waterhome.brc.tamus.edu/texasyst/household.html</a></p>	<p>47. How do septic tanks work? Summarize this page.</p>

Look up “MLA citations” on Internet or go to [http://www.mla.org/publications/style/style\\_faq/style\\_faq4](http://www.mla.org/publications/style/style_faq/style_faq4).