READING WATER QUALITY REPORTS

Description

In this activity, students apply concepts and terminology learned in Background Activity 4: *What's in Your Drinking Water?* Students read their community's water quality report and find specific information through a scavenger hunt.

Student Outcomes

Students will:

- Read a water quality report from a local water supplier.
- Search for Consumer Confidence Report information in a water quality report.
- Analyze and interpret tables of detected primary and secondary contaminants.

Student Products

- *Water Quality Report Scavenger Hunt* and *Conclusion Questions*

Prerequisites

- Background Activity 3: *Source to Sink*
- Background Activity 4: *What's in Your Drinking Water?*

National Standards

Subject Area Standards Covered: *Health, Language Arts, Math, and Science.*
See Appendix D for the complete list of national education standards.

Teamwork Skills

Ask teammates for help if you need it.

Activity Timing

Time Estimate	One to Two 50-minute Class Periods
30-60 minutes	Prep Time: photocopying; obtaining local water quality reports
Day 1	Water Quality Report Scavenger Hunt
Day 2	Optional: A Comparison of Water Quality Reports

Materials

- Hydroville Journal
- Water Quality Reports from your local water supplier (one/student)
- *Water Quality Game Keys* (from BA 4)
- Other local community's water quality reports (optional)

Teacher Information

Information in this section is excerpted and modified from EPA's *Consumer Confidence Report Rule: A Quick Reference Guide*. EPA Publication #: 816-F-02-026. November 2002.

Consumer Confidence Report Rule

In 1996, the Environmental Protection Agency (EPA) amended the Safe Drinking Water Act to include the Consumer Confidence Report Rule. This rule requires public water systems to provide an annual report (sometimes called a **consumer confidence report**) to its customers. The report provides information on your local drinking water quality, including the water's source, the contaminants detected in the water, and how consumers can get involved in protecting drinking water. If you have been looking for specific information about your drinking water, this annual report will provide you with the information you need to begin your investigation.

Consumer Confidence Reports (CCRs) are issued on July 1 of each year. This annual report covers information from January 1 – December 31 of the previous calendar year. CCRs are normally mailed directly from the water supplier to the consumers. Many suppliers also post their water quality reports online.

Major Provisions Included in the CCR

According to the CCR Rule, every water quality report must include specific information. It is important to note, that not all of the required information may be found in a report. It is up to the discretion of the water supplier. See *Water Quality Report Scavenger Hunt* (WS-1) for a list of these requirements.

Detected Primary and Secondary Contaminants

Every water quality report must include a table summarizing primary (regulated) and secondary (unregulated) contaminants that were detected during the last round of sampling. This required table is usually formatted to contain the following information:

- **Contaminant or Parameter:** This refers to the particular substance that was detected, either the name of the primary (regulated) or secondary (unregulated) contaminant.
- **MCL:** "Maximum Contaminant Level" is the highest concentration of a contaminant that is allowed in drinking water and is the level above which certain contaminants are considered to be potentially harmful.
- **MCLG:** "Maximum Contaminant Level Goal" represents the concentration of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are stricter than MCLs, and not mandated by the EPA. Treatment technology required to meet MCLGs may be cost prohibitive or not available.

- **Amount Detected:** This is the amount or concentration of a particular contaminant that was detected in a sample of treated water from the treatment plant, distribution system, or taps from homes. The amount may be reported as the maximum concentration, an average from a number of samples collected, or as a range--the highest and lowest concentrations measured over the past year.
- **Likely Source:** This column lists the potential source of a particular contaminant which could be erosion from a natural deposit or surface runoff from a particular source.
- **Meets Regulations?** A "yes" in this column indicates the contaminant detected did not exceed the MCL. If a "no" appears, then the water supplier is in violation of EPA's drinking water standards. The supplier is required to retest the water and then must provide a plan to reduce the contaminant level. An explanation of the violation, length of the violation, potential health effects, and steps taken to correct the violation must also be included in the water quality report.
- **Possible Health Effects:** Lists the body system that may be affected or the common symptoms that you may expect from exposure to the contaminant.

How to Interpret Results
First, find the table of detected contaminants in the water quality report. Every contaminant listed in this table has been detected in the treated water. There are more substances that are tested on a regular basis, but if they were not detected (ND), they do not appear in the report to save on space. Just because the contaminant is present in the water does not mean it is harmful. If the concentration is below the maximum contaminant level (MCL), then it is considered safe.

Terminology

Action Level (AL)
Consumer Confidence Report (CCR)
Treatment Technique (TT)
Violation
Water quality report

Suggested Lesson Plan

Getting Started

1. Contact your local water supplier or public works department to get copies of their annual water quality report. They usually have extra copies available. In most cases you may find your community's water quality report online, but it may not be as colorful or legible as the report that is mailed out.
   - Water quality reports cover January 1 – December 31 of the previous calendar year, and the deadline for annual distribution is July 1. Try to get the most recent copy available.
   - Larger cities may have multiple water suppliers. If this applies to you, locate the water supplier for the school and use their water quality reports.

2. Read your local Consumer Confidence Report before doing the activity since answer keys cannot be provided for the student worksheets. It is important that you have knowledge of your community's drinking water sources and locations, and be able to interpret data tables of the detected contaminants.

3. For Day 2 (optional), obtain water quality reports from other communities for students to compare to their local reports.

Day 1. Water Quality Report Scavenger Hunt

Doing the Activity

1. Assign **Journal Prompt-6 (TM-1):**

   a. If you were asked to write a report on the quality of your drinking water, list the kind of information that you would include to educate the public?
   Answers will vary, but the answer should reflect an understanding of the contaminants identified in Background Activity 4.

2. Review the concepts and terminology introduced in Background Reading 4: *Is Your Water Safe to Drink?* Be certain that students understand:
   - Primary and secondary drinking water standards
   - Maximum Contaminant Level (MCL) and Maximum Contaminant Level Goal (MCLG)
   - Units of measurement used for reporting sample data (mg/L, ppm or ppb)
   - Only homes on a public water system (PWS) will receive an annual water quality report. Home owners with private wells do not receive these reports, and are responsible for testing their drinking water.

3. Tell the students that they will be reading a water quality report from their local water supplier and searching for information. Before getting started, introduce terms and data tables that students will need to know to be successful in the scavenger hunt. Show transparencies TM-2 to TM-6.

4. Discuss how to read for information by showing the following transparencies.
   a. *Reading for Information* (TM-2) summarizes several strategies to use when looking for specific information in a long text.
   b. *Reading for Information - Water Quality Reports* (TM-3) lists some of the questions students will need to find the answers for. Have students identify potential headings or subheadings where they might find the answer.

5. **Sample Tables from a Water Quality Report (TM-4 to TM-6)**
   a. Use these transparencies to practice reading and interpreting data tables of detected contaminants. There are questions after each table for the class to answer and discuss. You may also opt to hand these out to students to complete in class.
   b. It is important for students to practice reading data tables in a water quality report since there is no standard format for reporting data. Every water quality report may have a different method of summarizing the detected levels of contaminants.

6. *Table 1. Detected Levels of Primary Standards* (TM-4) lists contaminants regulated by primary standards detected in the last round of sampling from the previous year.

a. What information is missing from Table 1?
The likely source and possible health effects are missing due to lack of space. There is no standard format for reporting data in tables. Therefore, some information may be omitted.

b. What units of measurements are used to report the concentration of contaminants?
The concentrations are usually reported in milligrams per liter (mg/L) unless otherwise noted. One milligram per liter (mg/L) equals one part per million (ppm). One microgram per liter (µg/L) or 0.001 mg/L equals one part per billion (ppb).

c. How is the water sample data reported?
The data is reported as an average of all samples collected and a range (high to low levels). Maximum concentration is another way data is reported.

d. What conclusions can you make from this data?
- *The MCLs and MCLGs are the same for fluoride and nitrate, but different for arsenic and benzene.* Ideally, there should be no arsenic or benzene in drinking water because they are carcinogens. Due to lack of technology and high costs, it may be difficult for treatment plants to meet state MCLGs.
- *Benzene exceeds the MCL and does not meet EPA regulations.* You would expect to read more about this violation in the water quality report, including potential health effects and steps taken to correct the violation in the water quality report.

7. *Table 2. Detected Levels of Primary Standards in the Distribution System* (TM-5) lists contaminants regulated by primary standards detected in the distribution system.

a. Where were these water samples collected?
These water samples were collected from the distribution system. Treated water is also sampled from the water treatment plant or taps from homes.

b. How do you explain the action level for lead?
- *The Action Level (AL) means if more than 10% of water samples taken from taps in homes exceed 0.015 ppm for lead, the public water system must take action and reduce the amount by using a treatment technique.*
- A Treatment Technique (TT) is a required process intended to reduce the level of a contaminants. Levels of lead can be reduced by controlling the corrosiveness of the water.

c. Are any contaminants in violation? *No*

8. *Table 3. Detected Levels of Secondary Standards From Two Treatment Plants* (TM-6) lists secondary contaminants detected from two different treatment plants.

a. What does ND mean?
- *Not detected.* Not detected is used instead of none or zero because it means that the instrumentation was not sufficient to measure the amount of contaminant.
- If a contaminant is detected in a water sample, even though it is below the MCL, a water supplier is required to report the data. In this case, not detected was reported because it was comparing data from two different treatment plants. A public water system must include data from all water treatment plants.

b. Why do the detected levels of contaminants differ between these two treatment plants?
Treatment plants may have different levels of contaminants because of different water sources or different water treatment systems, e.g., filtration.

c. What would be done if there were any violations?
Secondary standards are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. The EPA recommends secondary standards to water systems but does not require systems to comply. However, states may choose to adopt them as enforceable standards.

9. Hand out a copy of a water quality report to each student, including *Water Quality Report Scavenger Hunt* (WS-1). If you don't have enough reports for every student, have students work in pairs and have them decide how they will both look for information and answer questions. Distribute the *Drinking Water Game Keys* (from BA 4) for students to use as a reference.

10. Introduce the idea of a scavenger hunt, in this case to search for specific information relating to the EPA's Consumer Confidence Report requirements. Remind the students that they are going to check the thoroughness of their city's water quality report to see how many of the 25 required items it contains.

11. As students find items, they earn one point and record it on the table in the worksheet. They also need to answer the accompanying questions listed in the last column. Not every item has a question.

Wrap-up

1. Students total points for every item found on the water quality report. They compare their scores to other student's scores.

2. As a class, discuss the Conclusion Questions (WS-1, pages 3-4) and ways to improve your water quality report.

3. Collect worksheets and water quality reports.

Day 2: A Comparison of Water Quality Reports (optional)

Doing the Activity

1. Hand out water quality reports from other communities and Worksheet 1. Students each read one water quality report and complete worksheets.

2. As a class, compare water quality (contaminants detected) and completeness, i.e., total points awarded for required information.

3. Discuss ways to improve the water quality reports.

Assessment

The following student products can be used for assessment:

Individual

- *Water Quality Report Scavenger Hunt and Conclusion Questions* (WS-1)

Resources

See the Hydroville Water Quality Curriculum Web Resources webpage for current links:
http://www.hydroville.org/links/wq_resources.aspx

Teacher Keys

Water Quality Report Scavenger Hunt **(WS-1)**
Answers will vary. Read your local water quality report and develop your own key based on the contents.

Pages to Photocopy

Note: Unless indicated, make one copy per student of all Handouts. For ease of photocopying, Transparency Masters appear first in the student pages.

Handouts and Transparency Masters

Day	What is Needed	Type*
1	*Journal Prompt-6*	TM-1
	Reading for Information	TM-2
	Reading for Information - Water Quality Reports	TM-3
	Table 1. Detected Levels of Primary Standards	TM-4
	Table 2. Detected Levels of Primary Standards in the Distribution System	TM-5
	Table 3. Detected Levels of Secondary Standards From Two Water Treatment Plants	TM-6
	Your water supplier's water quality report (one copy/student or copy/pair of students)	
	Water Quality Report Scavenger Hunt (one copy/student)	WS-1
2	Optional: obtain water quality reports from other communities for students to compare to their local reports.	
	Water Quality Report Scavenger Hunt (one copy/student)	WS-1

* Type = Transparency Master (TM), Background Reading (BR), Worksheet (WS), Map (M)

JOURNAL PROMPT-6

If you were asked to write a report on the quality of your drinking water, list the kind of information that you would include to educate the public?

READING FOR INFORMATION

Steps to follow when searching for specific information in an article or reading assignment:

1. Before reading, look for reference to the subject in
   - **Headings**
   - **Subheadings**
   - **Tables, Graphs, and Pictures**
     Read the text with the tables, graphs and pictures to see what information is offered.

2. Look for text in **bold type** or *italics*.

3. Identify sections that are separate from text.

   Decide what is being covered in these sections. These usually contain related information to the main ideas.

4. Once you have identified the section of text that contains the information you need, read the actual text itself.

READING FOR INFORMATION – WATER QUALITY REPORTS

If you were searching for information to answer the questions below, which headings do you think would contain this information?

1. **What does MCL stand for?**
2. **Where does your water come from?**
3. **What are ways you can conserve water?**
4. **How is treated water delivered from the treatment plants to your tap?**
5. **Are there any contaminants in your drinking water?**
6. **How is drinking water treated to make it safe?**

HEADING CHOICES

(a) Water Sources

(b) Water Treatment

(c) Water Distribution and Storage

(d) Water Conservation

(e) Detected levels of Primary Standards

(f) Detected Levels of Secondary Standards

(g) Glossary

Table 1. Detected Levels of Primary Standards

Contaminant	MCL (mg/L)	MCLG (mg/L)	Average Reported (mg/L)	Range (mg/L)	Meets Regs?
Fluoride	4.0	4.0	1.1	0.92 - 1.2	Yes
Nitrate	10	10	3.3	3.0 - 4.5	Yes
Arsenic	0.010	0	0.002	0.001 – 0.003	No
Benzene	5 ppb	0	6 ppb	4 - 8 ppb	No

Questions

1. What information is missing from Table 1?
   - Contaminant
   - MCL, MCLG
   - Amount detected
   - Likely source
   - Meets regulations
   - Possible health effects

2. What units of measurement are used to report the concentration of contaminants?

3. How is the water sample data reported?

4. What conclusions can you make from this data?

Table 2. Detected Levels of Primary Standards in the Distribution System

Contaminant	MCL (mg/L)	MCLG (mg/L)	Average Reported (mg/L)
Chlorine	4.0	4.0	2.7
Lead	TT [1] Action Level 0.015	0	90% of homes tested <0.001
Total Trihalomethanes (TTHMs)	80 ppb	0	20 ppb
Total Coliforms	< 5% of monthly samples	0	1.4%

[1] If more than 10% of tap water samples exceed 0.015 ppm of lead, water systems must use Treatment Techniques to reduce levels.

Questions

1. Where were these water samples collected?

2. How do you explain the action level for lead?

3. Are any contaminants in violation?

Table 3. Detected Levels of Secondary Standards from Two Water Treatment Plants

Contaminant	MCL (non-enforceable) (mg/L)	Taylor Plant Reported (mg/L)	Rock Plant Reported (mg/L)
Aluminum	0.05 – 0.2	0.18	0.07
Corrosivity[1]	Non-corrosive	slightly	slightly
Hardness	250	24	39
Iron	0.3	0.43	ND
pH	6.5 – 8.5	6.9 – 7.3	6.8 – 7.4
Sulfate	250	19	ND
Total Dissolved Solids	500	76.0	72.0

[1] Corrosivity is a property of water that causes it to dissolve or wear away materials, such as plumbing and pipes.

Questions

1. What does ND mean?

2. Why do the detected levels of contaminants differ between these two treatment plants?

3. What would be done if there were any violations?

Name_____
Date_____Period_____

WORKSHEET 1: WATER QUALITY REPORT SCAVENGER HUNT

Instructions

In this activity, you will search for information that should appear in Hydroville's water quality report. There are 25 items to find, but not all of them may appear in this report. When you find the information, give yourself one point, list the page number the where you found the information, and answer the accompanying question in the last column. See how Hydroville's water quality report does!

Note: As you search for these requirements, don't get frustrated if you cannot find all of them.

Water Quality Report for _____	**Points Earned (1 pt each)**	**Page #**	**Answer Question #**
A. Water System Information			
1. Name/phone number of contact person			**1**
2. Information on public participation opportunities			**2**
3. Information for non-English speaking populations			
B. Source of Water			
4. Type of water (groundwater or surface water)			**3**
5. Commonly used name and location of water sources			**4**
6. Availability of a source water assessment			
7. Brief summary on potential sources of contamination			
C. Definitions			
8. Maximum Contaminant Level (MCL)			
9. Maximum Contaminant Level Goal (MCLG)			**5**
10. Treatment Technique (TT)			**6**
11. Maximum Residual Disinfectant Level (MRDL)			
12. Maximum Residual Disinfectant Level Goal (MRDLG)			
13. Action Level (AL)			**7**
14. Variances and Exemptions			

Name_____
Date_____Period_____

Water Quality Report for _____	**Points Earned (1 pt each)**	**Page #**	**Answer Question #**
D. Detected Contaminants			
15. Table summarizing data on detected primary (regulated) contaminants that were detected during the last round of sampling (from previous year)			**8**
16. Table summarizing data on detected secondary (unregulated) contaminants that were detected during the last round of sampling (from previous year)			**9**
17. Known or likely source of each detected contaminant			
18. Health effects for any violations or levels that exceed MCLs			
19. Information on *Cryptosporidium*, radon, and other contaminants			
E. Compliance with Drinking Water Regulations			
20. Explanation of violations, length of violations, potential health effects, and steps taken to correct the violations			**10**
21. Explanation of variance/exemption (if applicable)			
F. Required Educational Information			
22. Explanation of contaminants and their presence in drinking water including bottled water			**11**
23. Warning for vulnerable or immunocompromised populations about *Cryptosporidium*			
24. Informational statements on: (award one point each) • Lead (1 pt) • Arsenic (1 pt) • Nitrate (1 pt) • TTHMs (1 pt)			**12**
25. EPA's Safe Drinking Water Hotline Number (1-800-426-4791)			

Total Points: _____/ 28 points possible

Name_____
Date_____Period_____

Conclusion Questions

A. Water System Information

1. What is the name and phone number of a contact person if you have any questions about your water quality report?

2. What opportunities are there for public participation?

B. Source of Water

3. What is the water source (or sources) from which your community gets its drinking water (surface water, groundwater, or both)?

4. What is the common name and location of this water source? Include the names and locations of all sources.

C. Definitions

5. Define maximum contaminant level goal (MCLG).

6. Define treatment technique (TT).

7. Define action level (AL).

D. Detected Contaminants

8. Look at the data summarizing *regulated* (primary) contaminants. List the contaminants that were detected during the last round of sampling from the previous year.

Name_____
Date_____Period_____

9. Look at the data summarizing *unregulated* (secondary) contaminants. List the contaminants that were detected during the last round of sampling from the previous year.

E. Compliance with Drinking Water Regulations

10. Describe if there were any violations reported.

F. Required Educational Information

11. Summarize what you learned about bottled water.

12. Summarize information on one of the following: arsenic, nitrate, lead, or TTHM.

13. After completing the *Water Quality Report Scavenger Hunt*, provide three suggestions to improve the drinking water report.

a.

b.

c.