



Case Study: *A Civil Action*

Overview

In this short, culminating activity, students view an excerpt from the 1998 film *A Civil Action*, which is based on the 1996 non-fiction account of a water contamination case in Woburn, Massachusetts. After viewing the film, students assume the role of environmental scientists and apply their knowledge of water and hazardous waste contamination to create a plan to help lawyer, Jan Schlichtmann, try the case. This activity can be used as an assessment piece to determine your students' understanding of the many variables influencing water quality studies, especially when health risks are involved.

Alignment to North Carolina Standard Course of Study for Science

This lesson addresses the Science in Personal and Social Perspectives strand along with specific learning objectives:

8th Grade Science

Objective 1.01: Identify and create questions and hypotheses that can be answered through scientific investigations.

Objective 1.05: Analyze evidence to:

- Explain observations.
- Make inferences and predictions.
- Develop the relationship between evidence and explanation.

Objective 1.08: Use oral and written language to:

- Communicate findings.
- Defend conclusions of scientific investigations.
- Describe strengths and weaknesses of claims, arguments, and/or data.

Objective 1.10: Analyze and evaluate information from a scientifically literate viewpoint by reading, hearing, and/or viewing:

- Scientific text.
- Articles.
- Events in the popular press.

Objective 3.07: Describe how humans affect the quality of water:

- Point and non-point sources of water pollution in North Carolina.
- Economic trade-offs.
- Local water issues.

Objective 3.08: Recognize that the good health of environments and organisms requires:

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

Objective 4.01: Understand that both naturally occurring and synthetic substances are chemicals.

Objective 4.08: Identify evidence that some chemicals may contribute to human health conditions.

Objective 4.10: Describe risks and benefits of chemicals.

Earth and Environmental Science

Objective 1.01: Identify questions and problems in the earth and environmental sciences that can be answered through scientific investigations.

Objective 1.05: Analyze reports of scientific investigations and environmental issues from an informed scientifically literate view point.

Objective 1.06: Identify and evaluate a range of possible solutions to earth and environmental issues at the local, national, and global level.

Objective 4.04: Evaluate water resources:

- Environmental impacts of a growing human population.
- Causes of natural and manmade contamination.

Materials

- Copy of the movie, *A Civil Action*
- TV/VCR or DVD player
- Student Worksheet (attached)
- Internet access (optional)

Duration

- One or two 40-50 minute class periods, depending on how you utilize the lesson.

Introduction

It is challenging to involve students in authentic studies regarding the contamination of our drinking water by hazardous chemicals. However, there are several historical examples of water contamination that can be used as classroom case studies.

By studying these examples, students have the opportunity to apply their critical thinking skills and develop action plans for water testing, water clean-up and pollution prevention, as well as have a historical perspective on toxic waste issues.

Love Canal in Niagara Falls, NY, is perhaps one of our country's most well known hazardous waste sites. It wasn't the first or the worst; but in 1979, the heavy chemical contamination at Love Canal and subsequent environmental health risks in the community caused President Jimmy Carter to issue a state of emergency for the town. Over 300 families were then relocated from their homes. Love Canal spurred scientists, industry leaders, government officials and grassroots activists to take a stand and act on behalf of our environment. In 1980, immediately following the Love Canal disaster, Congress asked the Environmental Protection Agency (EPA) to create the Superfund program to help address the containment and clean-up of toxic wastes that had been buried long ago.

Since Love Canal, hundreds of toxic sites have been discovered around the nation. Environmental groups, communities and the media have continued to bring the problem of hazardous waste contamination to our attention. More recently, books and popular culture movies have also addressed the issue of toxic waste as a public health concern.

One such account is entitled, *A Civil Action*. In 1996, author Jonathan Harr gave us a compelling non-fiction account of a hazardous waste site affecting young children in the community of Woburn, Massachusetts. While the book may be advanced for students in grades 6-8, small portions of the film, starring John Travolta, can provide students with a simplified visual/auditory account of the Woburn disaster and an introduction to the issues surrounding toxic waste, public health and environmental justice.

Procedure

1. Explain to the students that they are environmental scientists who are being presented with information on a new case of potential water contamination by hazardous chemical waste.
2. The students are going to watch a portion of the film, *A Civil Action*, to collect some background information on the situation. This information will be used to make decisions about how they as scientists might begin to help this community. As they watch the film, the students may want to record any information they think may be important for discussion in their science notebooks.
3. Cue the film to the very beginning where the lawyer in the case, Jan Schlichtmann, is on the air at a radio station in Boston, MA, taking phone calls from the public. He speaks with a woman named Anne Anderson, who later becomes one of the plaintiffs in the case.
4. Allow the students to view the film through Jan's meeting with the families and his walk along the riverbank after the meeting. Stop the movie just after he sees the Beatrice truck in the factory yard and smiles (approximately 14:30 minutes into the movie). Although the segment takes only a few minutes, the students should be able to gather key pieces of evidence about the situation. You may want to play the segment twice so the students can verify the information they recorded during the first viewing.

5. Next, present your students with the following questions for discussion. Students could answer these questions in a class discussion, within small groups, or individually. A student worksheet is available at the end of this lesson.

- **What is the problem? Who is affected by the problem? Who is now involved?**
- **What are some things that you already know about the case? Be careful not to confuse things that we know with things that we assume.** You may want to have your students examine their notes and distinguish the “knowns” from any “assumptions.” This is a great opportunity to discuss the use of **evidence** in science versus basing conclusions on emotion or previous experiences.
- **As the environmental scientist involved in this case, what is your job?** This question helps students focus on the fact that they are trying to determine what is causing the illnesses in the children. It may be the water—but could it be the air? The specific name for a scientist who tries to determine the cause of an illness like this is an **epidemiologist**. Before you continue, you may want to ask your students to research how an epidemiologist might approach this situation.
- **What can you do to help solve the case? Brainstorm and list the things that you would like to test.**

Possible tests:

- Air
- Water (This response could refer to river water, ground water, well water, tap water. If they name all of these then they are demonstrating an overall understanding of the ways that water can interact with a community.)
- Soil
- Family history/genetic history

6. Remind the students that they are environmental scientists considering whether or not to take this case and inform them that you have just received word from the lab that the water tests came back and the well water contains a hazardous chemical called trichloroethylene (TCE). TCE is often used as a solvent in industrial processes and belongs to a family of chemicals we commonly call VOCs (Volatile Organic Compounds). They are highly toxic and found to be carcinogenic, or cancer causing. Ask the students to reflect on the following additional questions:

- **How should we test the water to determine where the TCE came from? Where should we begin? What variables should we take into consideration?** Once you have discussed the variables, ask your students to write a short paragraph outlining their plan to test the water. Their plan should utilize the science content information they gained throughout their unit on water quality. They should point out that well water would originate from **groundwater**. They should describe their knowledge of **chemicals** moving through **groundwater** in a **plume** by stating that they need to test in a wide area.

Some additional test variables that your students should consider:

- Type of earth materials that groundwater will move through (**porosity and permeability**)
 - Slope or geology of the landforms (**watershed**)
 - Types of **chemicals** and their **solubility** in water (**ppm/ppb**)
 - Types of **chemicals** and their affect on the body (**carcinogenicity**)
 - **History** of the area: Were there industries in the area that are no longer present? Are any industries present currently?
- **How could you be sure about who caused the contamination?** Student responses should focus on the current evidence and present ideas that would be supported by additional evidence. For example, if the Beatrice Company used TCE in their manufacturing process and then disposed of the chemical by burying it in the ground on their site, we may find the highest concentration of pollution on their site and then find a plume of pollution moving outward toward the town wells. Then we may have evidence that Beatrice polluted the water. But if there is no evidence of improper disposal of TCE, or a plume that reaches the well water, we cannot accuse Beatrice of polluting the environment.

7. You can conclude this activity by asking your students “What would you do if you were the lawyer in the case—take the case or not? Why or why not? What factors would you use to help you make your decision?”

8. You can also introduce environmental justice issues by noting that disadvantaged communities often do not have access to environmental scientists and asking, “What are the implications of this difference between industries and communities?”
9. At this time, you may want to give your students more information about the outcome of the actual case. (See background information below.) You may choose to have students watch the rest of the film and compare their ideas with the methods used by lawyer Jan Schlichtmann. You may want to stop the movie and discuss the scene where Jan and the environmental scientist talk about plans to find the source of contamination.
10. You could also introduce the concept of sustainability in manufacturing by noting that the manufacturing of goods we use every day has environmental and human health impacts and posing the question, “How could environmental science be used improve the sustainability of leather making?”

Opportunities for Extension

In addition to site information available from the EPA, there is plenty of information available on the internet from the many citizens, reporters, industries, and government offices involved in *A Civil Action*. Maps of the site with the actual well and industry locations may be helpful in guiding your students through this case study. A comprehensive curriculum related to the Woburn, MA site, including 13 learning modules and resources for use in high school or college are available from [Science in the Courtroom: The Woburn Toxic Trial](#). Learning modules pertaining to contaminant hydrology, environmental science, geology, hydrogeology and human health are also available.

Students could further explore this case study by:

- Researching the defendants in the case and presenting their side of the story.
- Researching and reporting on the outcome of the case.
- Investigating a local Superfund site. Students can use the EPA website to learn about and report on one or more Superfund sites. They may be surprised to learn that a Superfund site exists nearby! A worksheet that students can use to investigate a Superfund site of interest is available for download from LEARN NC: http://www.learnnc.org/lp/media/uploads/2010/12/investigating_a_superfund_site.pdf

Background Information on the Site of A Civil Action: Woburn, MA

Woburn is ten miles north of Boston and was originally settled by the Massachusetts Bay Colony in 1640. In 1790, Woburn had a population of 1,727. In 1889 its population exceeded 13,000. Today Woburn has approximately 36,000 residents and an economic base founded on its long history of chemical manufacturing and leather tanning.

The discovery of the contamination led to a number of studies and efforts to clean up Woburn’s polluted environment. The Massachusetts Department of Public Health concluded that the city’s rate of childhood leukemia (defined as leukemia diagnosed in people up to the age of 19) was four times higher than would be statistically expected in a community of its size. In the early 1980s, the Harvard School of Public Health correlated leukemia cases with the distribution pattern of water from wells G and H to show that leukemia was most highly concentrated in neighborhoods that had received most of their water from the wells. That study has been criticized, though, because the Harvard researchers — Marvin Zelen and Stephen Lagakos — used community volunteers to interview residents in order to save money. A number of scientists have charged that the volunteers could have introduced bias into the study, although these critics have never been able to show that Zelen’s and Lagakos’s conclusions were wrong.

In 1982, a legal complaint was filed by eight families in east Woburn, Massachusetts, against three local industries for the improper handling and disposal of toxic chemicals. The complaint alleges that the toxic chemicals entered the groundwater flow system and were pumped by municipal wells G and H into the water supply of a local neighborhood, and that the consumption of the contaminated water caused leukemia, liver disease, central nervous system disorders, and other unknown illness and disease.

In December of the same year, shortly after the plaintiffs filed the civil suit against W.R. Grace et al., U.S. EPA proposed that the 330-acre area around municipal [wells G and H](#) be added to the National Priorities List (NPL). This action was based on studies of the groundwater, sediment beneath the Aberjona River, and soils across the site. The NPL is a roster of the hazardous wastes sites eligible for cleanup under the federal Superfund program. The Wells G and H Site in Woburn ranked

39th worst on the list, based on EPA's evaluation system, which included more than 1,100 sites at the time. Another NPL site, the [Industri-Plex Site](#), is in Woburn less than one mile upstream of municipal wells G and H.

According to a June 2009 press release by the EPA, clean up at wells H and G has resulted in the treatment of more than 481 million gallons of groundwater and the removal of over 4,700 pounds of volatile organic compounds. According to the clean-up narrative for this site, ongoing treatment of groundwater continues. The June 2009 press release marked the beginning of the third, five-year review of the selected clean up measures implemented at the site to ensure that they are effectively protecting public health and the environment.

Additional Resources

Environmental Reporter, Dan Kennedy

<http://www.dankennedy.net/woburn-files/>

From 1979 to 1989 Dan Kennedy worked as a staff reporter and editor for the Daily Times Chronicle, of Woburn, Massachusetts. During this time he covered the Woburn toxic-waste lawsuit, a landmark federal case brought by eight families who accused industries of contaminating their water, causing illness and death.

Science in the Courtroom

Using *A Civil Action* to Explore Interfaces Between Science, Citizen Action, Public Health, and the U.S. Legal System

<http://serc.carleton.edu/woburn/index.html>

A comprehensive curriculum related to the Woburn, MA site, including 13 learning modules and resources pertaining to contaminant hydrology, environmental science, geology, hydrogeology and human health are available.

A Civil Action

Student Worksheet

Name: _____

1. What is the problem?
2. Who is affected by the problem?
3. Who is now involved?
4. What are some things that you already know about the case?
5. As the environmental scientist involved in this case, what is your job? What can you do to help solve the case? List any tests you would like to complete.

You have just received word from a lab that the water tests came back and the well water contains a hazardous chemical called trichloroethylene (TCE). TCE is often used as a solvent in industrial processes and belongs to a family of chemicals we commonly call VOCs (Volatile Organic Compounds). They are highly toxic and found to be *carcinogenic*, or cancer causing.

6. How should we test the water to determine where the TCE came from? Where should we start? What variables should we take into consideration?

7. How could you be sure about who caused the contamination?