

Discover Drinking Water with DEQ



TOOLS FOR DISCOVERING YOUR DRINKING
WATER FROM THE CLASSROOM

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Hello. My name is Amy Williams. Thank you for your interest in learning about what DEQ has to offer your classroom. I would like to share with you today some of resources related to source water and ground water.... for use in your classrooms. Keep in mind that the examples we are providing today might be for a junior or high school level class, but we can work with you to adjust it to a level that is appropriate for your classroom. Also keep in mind that we'll be sharing this presentation with you to aid you in using the tools in the future. We can also come to your classroom to assist you to help you become more comfortable.

Who is DEQ?

- The Department of Environmental Quality ensures clean air, water, and land in Idaho and protects citizens from pollution
- 6 Regional Offices and a State Office
 - State Office - Boise
 - Boise
 - Coeur d'Alene
 - Lewiston
 - Twin Falls
 - Pocatello
 - Idaho Falls

DEQ is the state agency tasked with ensuring clean air, water, and land in the state and protecting Idaho citizens from the adverse health impacts of pollution.

We have locations across the state including our state office and a regional office here in Boise. Staff in regional offices are the service providers of the agency. Each region's staff consists of specialists in air quality, water quality, and waste management and remediation issues. They are knowledgeable about environmental issues in their particular regions and work directly with citizens, businesses, and industries to implement the state's environmental policies and programs. Keep them in mind if you ever need guest speakers for your classrooms or need environmental data or information for your lesson plans.

We work in the Ground Water program at DEQ's State Office. The ground water program is responsible for monitoring the quality of Idaho's ground water, assisting public water systems and communities in protecting drinking water at the source, and cleaning up degraded ground water.

Agenda



- Source Water Assessment Tool
- Ground Water Database
- How these tools can be used in the classroom
- Additional activities and resources
 - Ground Water Flow Model
 - Incredible Edible Aquifer

Source Water Assessment (SWA) Online Tool

IDAHO Department of Environmental Quality
Source Water Assessment Program

Source Water Assessment Summary Report:
ANCHOR BAPTIST CHURCH (PWS# ID4010248) WELL #1 00000012245

Introduction

The U.S. Environmental Protection Agency (EPA) requires the Idaho Department of Environmental Quality (IDEQ) to assess every public water system in Idaho for its relative susceptibility to contaminants that are regulated by the federal safe drinking water act. IDEQ conducts source water assessments based on a land use inventory of the delineated source water assessment area, sensitivity factors associated with the drinking water source, and local aquifer characteristics. The ultimate goal of each source water assessment is to provide data that communities can use to develop protection strategies for their drinking water sources.

The resources and time available to accomplish source water assessments are limited. Therefore, an in-depth, site specific investigation to identify each significant potential source of contamination for every public water system is not possible. The results of source water assessments should not be used as an absolute measure of risk, nor should they be used to undermine public confidence in the public water system. A particular susceptibility score does not imply that any regulations or legal actions will occur. This report is intended to generate information about public water systems in Idaho, listing or directing the data contained in this report in a form other than that in which it is presented may inaccurately portray the data.

IDEQ strongly encourages each public water system and community to use its source water assessment, combined with local knowledge and concerns, to develop strategies to protect drinking water sources. Available resources are available to help communities implement drinking water source protection programs, including EPA's Drinking Water Academy. Involving water source protection activities for agriculture should be coordinated with the Idaho State Department of Agriculture, the Idaho Soil and Water Conservation Commission, the local Soil and Water Conservation District, and the National Resources Conservation Service.

For assistance in developing protection strategies, contact IDEQ'S ROISE REGIONAL OFFICE or the Idaho Rural Water Association.

This report was completed June 29, 2011. Potential contaminant information was updated on September 29, 2011.

What Was Assessed

This report evaluates ANCHOR BAPTIST CHURCH (PWS# ID4010248) WELL #1 00000012245 located in Ada County. The system serves approximately 50 people through 1 connection.

Defining the Source Water Assessment Area

The first step of a source water assessment is to delineate the source water assessment area. The delineation process establishes the physical area



What is Source Water?

Source water is drinking water **prior** to reaching the public water system.



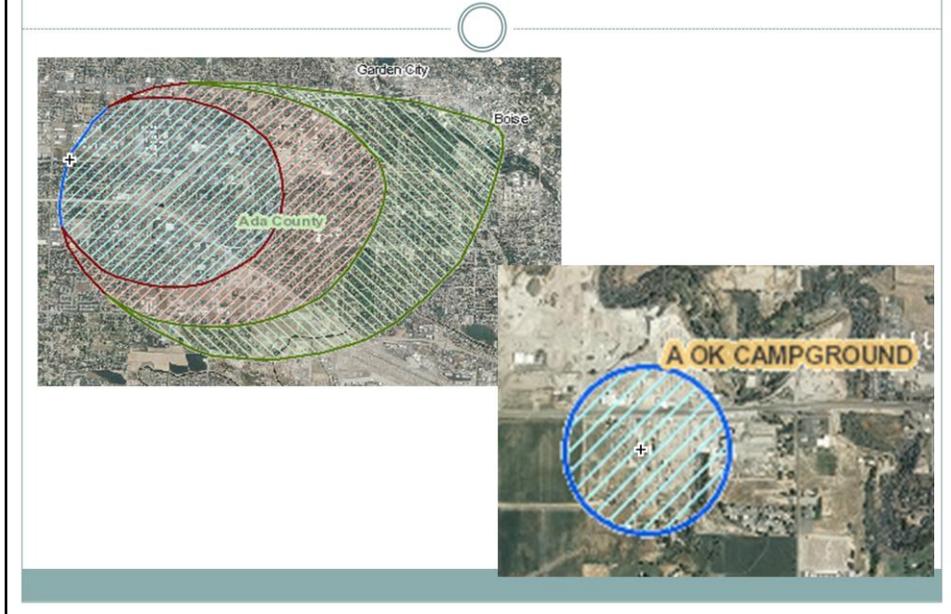
Before we jump into the tool we need to define what source water and source water assessments are. Source water is drinking water prior to reaching the public water system or treatment. Examples of source water include ground water or surface water. In Idaho, 95% of drinking water comes from ground water.

What is a Source Water Assessment (SWA)?

- Defines area of contribution/delineation and potential contaminant inventory (PCI)
- Summarizes *potential* threats to the communities public water supply
- A starting point for drinking (source) water protection efforts

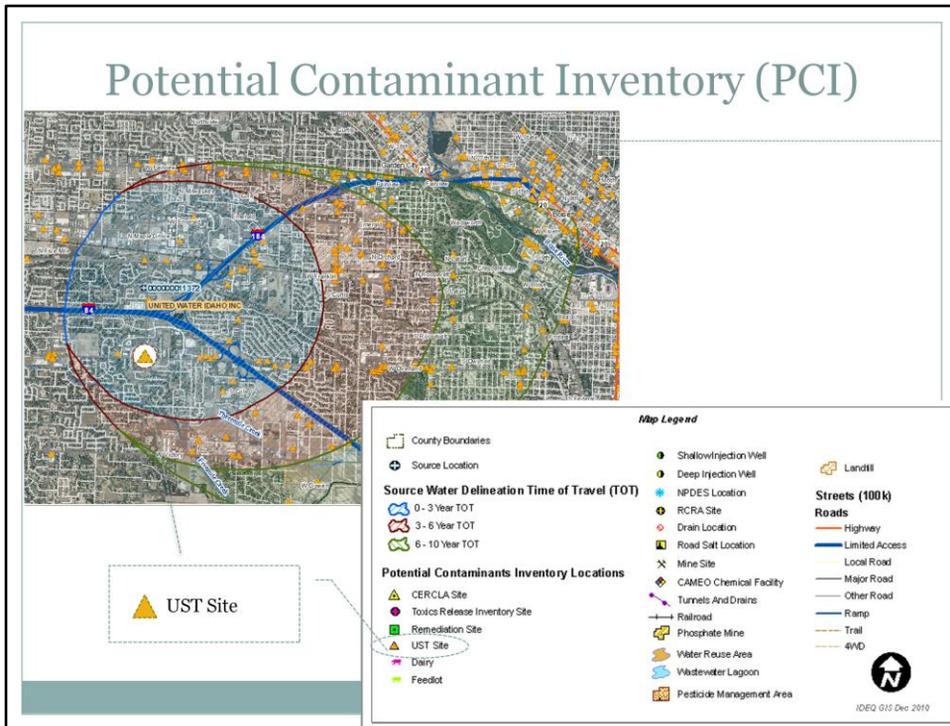
Source water assessments summarize the likelihood or susceptibility of individual drinking water sources to becoming contaminated (usually a short-term "contamination event") and serve as a foundation for public water systems to prepare source water (drinking water) protection plans and implement protection measures. It also provides the public with the current status of their drinking water system based on well attributes and system construction. Part of the assessment process includes defining the area of contribution or delineation of the source, which is that portion of the watershed or subsurface area contributing water to the well or surface water intake. During the SWA process we also develop a potential contaminant inventory or PCI which uses different databases to identify the significant potential sources of drinking water contamination in those areas such as animal feeding operations, landfills, underground storage tanks, etc.

Zone of Contribution/Delineation



We are going to be mentioning delineations quite a bit when we move into examples so we wanted to give you an idea of what they look like and what types of delineations there are. Here are two examples of source water delineations. As you can see the larger delineation is what we call a community system that serves a certain number of the same people for a certain amount of time throughout the year. It has three time of travel zones which indicates how the water is moving towards the well in each 3, 6, or 10 year time of travel zones. The smaller delineation is what we call a transient system because it serves a diverse amount of people infrequently through the year, transient systems typically have one time of travel zone that equals a 1,000 ft radius. Often campgrounds fit this definition.

Potential Contaminant Inventory (PCI)



We are also going to be talking about potential contaminants and potential contaminant inventories quite a bit during our examples, so here is an example of the delineation from above and the potential contaminants that were identified within and around the delineation. As you can see there are several underground storage tank sites. The map legend shows other potential contaminants that could appear at various sources.

Susceptibility Score

- **Ranking**
 - How susceptible is a source to contamination?
 - Final rankings can be high, medium, or low
- **Susceptibility Scores Consider:**
 - Construction of the well, spring, or surface water intake
 - Land use characteristics above the aquifer and potential contaminant sources within the delineation
 - Hydrologic and geologic conditions

As part of the source water assessment susceptibility scores are completed for each drinking water source to indicate how susceptible a source is to contamination. For each well, spring, or surface water intake in a public water system, susceptibility to contamination is scored as high, moderate, or low. Susceptibility scores take into account 1) construction of the well, spring, or surface water intake; 2) land use characteristics above the aquifer and potentially significant contaminant sources; and 3) hydrologic and geologic conditions surrounding the well, spring, or surface water intake.

SWA Online Demo

**PROVIDES EASY TO USE
INFORMATION ON *WHERE*
DRINKING WATER COMES FROM
AND
WHAT THE THREATS ARE TO
THE SOURCE**



www.deq.idaho.gov/water/swaOnline

Previously source water assessments were captured in written reports, but now the zone of contribution or delineation, the potential contaminant inventory, the susceptibility report, and the summary reports are available online to easily determine where drinking water comes from and what the threats to each source are. We are going to provide a very brief overview of how to access the site and its basic functions.



> Link to Video Demonstration on How to Navigate DEQ's Source Water Assessment Database

Ground Water Quality Data Online Mapping Application

IDAHO Department of Environmental Quality
Ground Water Quality Monitoring and Protection

MAP SEARCH LAYERS

Search by County:
Ada GO

Search by NO3 Concentration:
NO3 (mg/L) Concentration is:
greater-than
mg/L GO
CLEAR

Click On the SITE ID and Zoom to the Well. There Are 47 Wells For Ada County

SITE ID	NITRATE (mg/L)	ARSENIC	GID	COUNTY	TRS QQ	LATITUDE	LONGITUDE	WEBLINK
422	12.3	11 ug/L	EAGLE	Ada	05N01W34S06WNE	43.73	-116.439	Well Data
400	17.6	<10 ug/L	EAGLE	Ada	05N01W34S06SW	43.734	-116.436	Well Data

<http://mapcase.deq.idaho.gov/gwq/>

Now I'm going to give a brief overview of the ground water database tool. DEQ, in cooperation with the USGS and the Idaho Department of Water Resources is responsible for assessing the current condition of Idaho's ground water quality, identifying potential problem areas, and detecting trends in ground water quality. DEQ conducts regional and local ground water quality monitoring when potential problem areas are detected. DEQ also initiates its own evaluations and conducts regional and local monitoring in conjunction with other agencies.

The analytical data produced through DEQ's sampling efforts gets entered into this database to be shared with the public and other agencies.

DEQ Ground Water Quality Database

- Data collected by DEQ or contractors for Ground Water Program.
- 1,032 Well/Spring sites.
- 25,871 pieces of data.
- Over 300 different constituents.
- Data from 1987 to present.

As you can see we currently have analytical data from over 1,000 wells or springs sites in Idaho collected from DEQ staff or contractors. One of the most widespread ground water contaminants in Idaho is nitrates, so of the over 25,000 pieces of data in the database a large percentage of that is nitrate data. The database contains over 300 different types of constituents ranging from the most common such as nitrate to emerging contaminants such as pharmaceuticals and personal care products. What's exciting is that we have data that dates back to 1987 and we continue to have projects annually that contribute to the growth of the database.

Ground Water Quality Data Online Mapping Application Demo

**A COLLECTION OF GIS LAYERS AND
TOOLS THAT DISPLAYS THE LOCATIONS
OF DEQ GROUND WATER MONITORING
PROJECTS AND SAMPLING DATA
THROUGHOUT IDAHO**



<http://mapcase.deq.idaho.gov/gwq/>

So the database is a reservoir for DEQ's analytical data, and the online mapping application is a tool for making that data available for the public to use. Specifically it is a collection of GIS layers and tools that displays the locations of ground water monitoring projects and sampling data throughout Idaho



So first I want to show you how to get to the database from DEQ's main web site. It will lead you to an interactive mapping website. One of the most important tools to be aware of is the help tool, if you click on the GIS user toolbar it will explain all of the interactive tools to help you to maximize the functionality of the website and navigate effectively. The help button also explains what kind of data is available.

And now if we go back to the mapping application if we use the zoom in button we can pick an area of the state. As zoom in you'll see that more data appears.

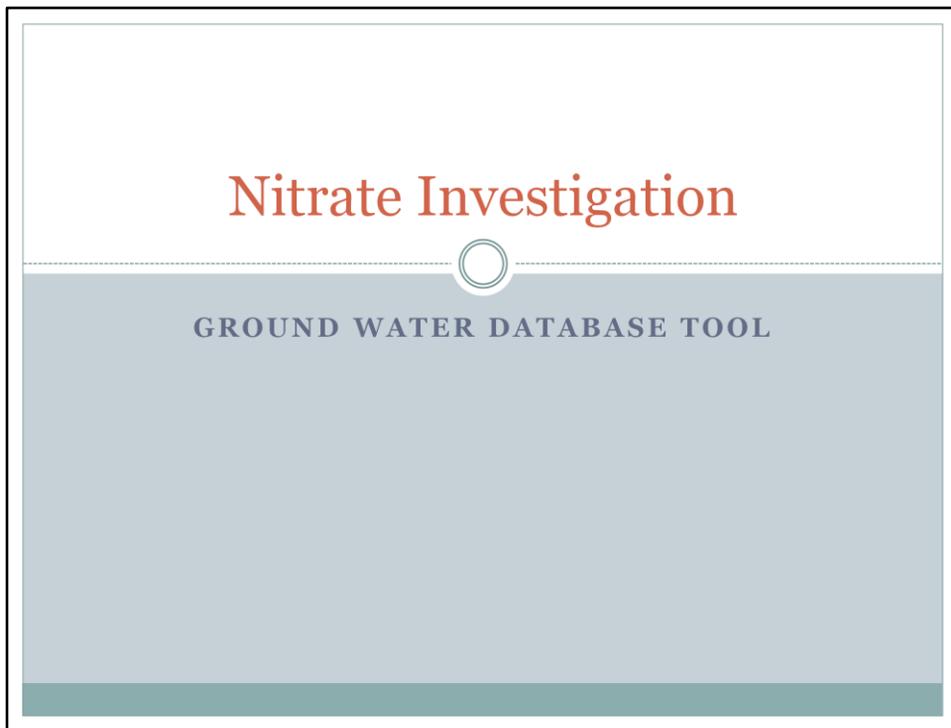
You can reference the legend for deciphering the symbols and colors on the map and turning on and off layers. There are several layers, a few I'll mention include the well layer, the delineation layer that you'll also find in the SWA Online tool as Amy mentioned, the Nitrate Priority Area layer which indicates designated areas of the state that have degraded ground water due to nitrate contamination, and lastly reports which can be really helpful in understanding where the data came from and the context of the study.

> Link to Video Demonstration on How to Navigate DEQ's Ground Water Quality Mapping Tool

Let's Use The Tools!

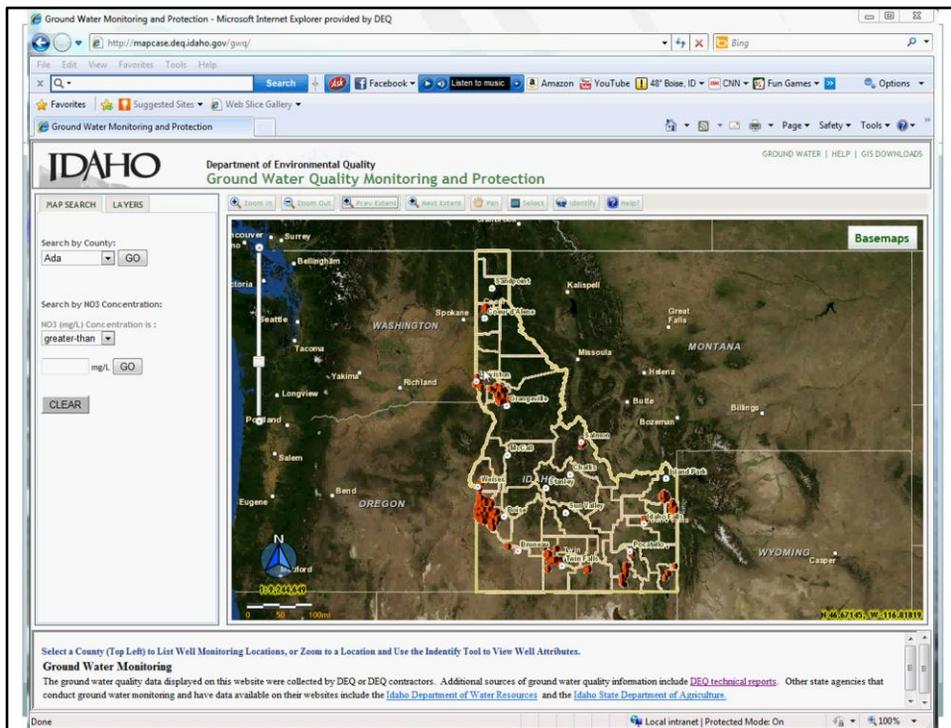
- **NITRATE INVESTIGATION**
- **SOURCE WATER DISCOVERY**

So now I'd like to present some ideas on how to use these tools in your classrooms. As we mentioned keep in mind that we have geared this towards junior or high school, but they can be adapted for younger students.



One idea is to create a nitrate investigation assignment for your students. As I mentioned nitrate is one of the most common contaminants in Idaho. It comes from a variety of sources, such as plants and other organic matter that return nitrate to the soil as they decompose. Septic sewer systems, waste from animal feedlots, and nitrogen-based fertilizers also discharge nitrates to the environment. Numerous DEQ monitoring projects targeting nitrate have been conducted in Idaho, therefore, we have set up a function on the online mapping application to query the database for nitrate over, under or equal to a certain number.

So you could have your students research what the Idaho ground water quality standard or federal drinking water standard is for nitrate and what that means and have them query all of the wells or springs in Idaho that exceed that concentration. The mapping application will populate a list of wells and springs and what the concentration is for each source. You can also export the data into an excel spreadsheet and use it for a statistics project for your students, or students could use it to build graphs, tables, or charts of concentrations over time or the geographical distribution of nitrate in their town. You could also have them reference the report related to the data to help them understand the why the study was done, the parameters of the study, or the components of a scientific report. Students could also research the health affects of nitrate by looking at health websites like the CDC or Department of Health and Welfare.



So we'll head back to the mapping application and query the database for all wells with a nitrate concentration over 10 mg/l since that is the drinking water standard for nitrate. Anything over 10 is considered a health risk to humans. As you can see those that are over 10 mg/l are highlighted. You can reference the table below as well to see all of the sources that are over the standard. You can use the export button to export the data into an excel spreadsheet as I mentioned. Going back to the table you can click on the well data tab which will show the other contaminants that were detected during the same monitoring project and you can also export this table into an excel spreadsheet. Going back to the table again you can click on the number which will zoom into the corresponding source so you can see where its located, it's geography, and if there are any wells or springs nearby.

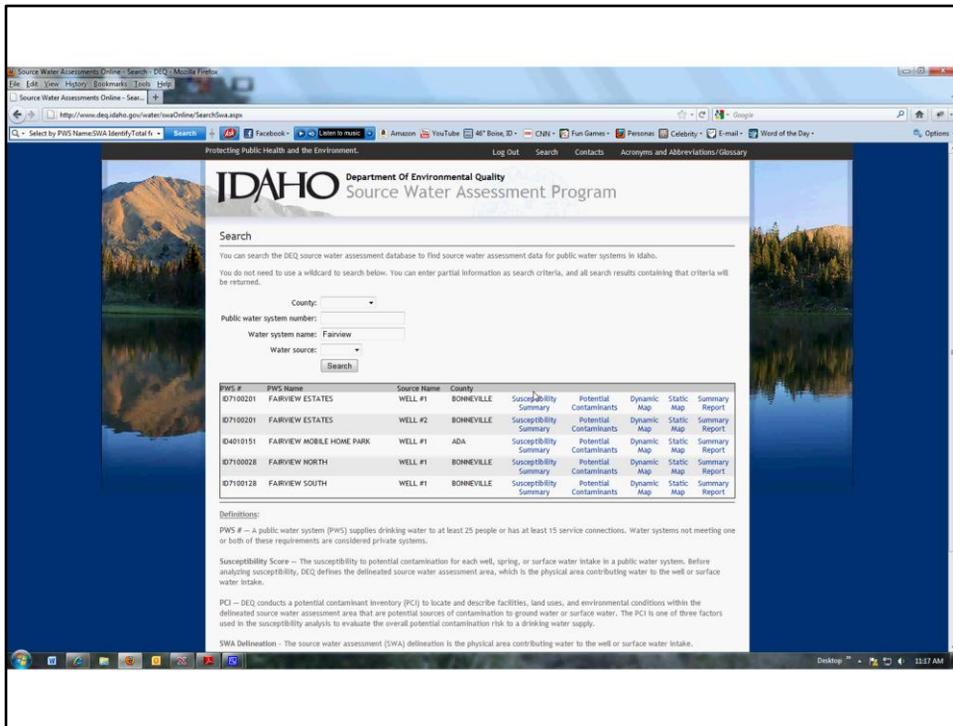
> Link to Video Demonstration on How to Navigate DEQ's Ground Water Quality Mapping Tool to Find Nitrate-Contaminated Wells

Source Water Discovery

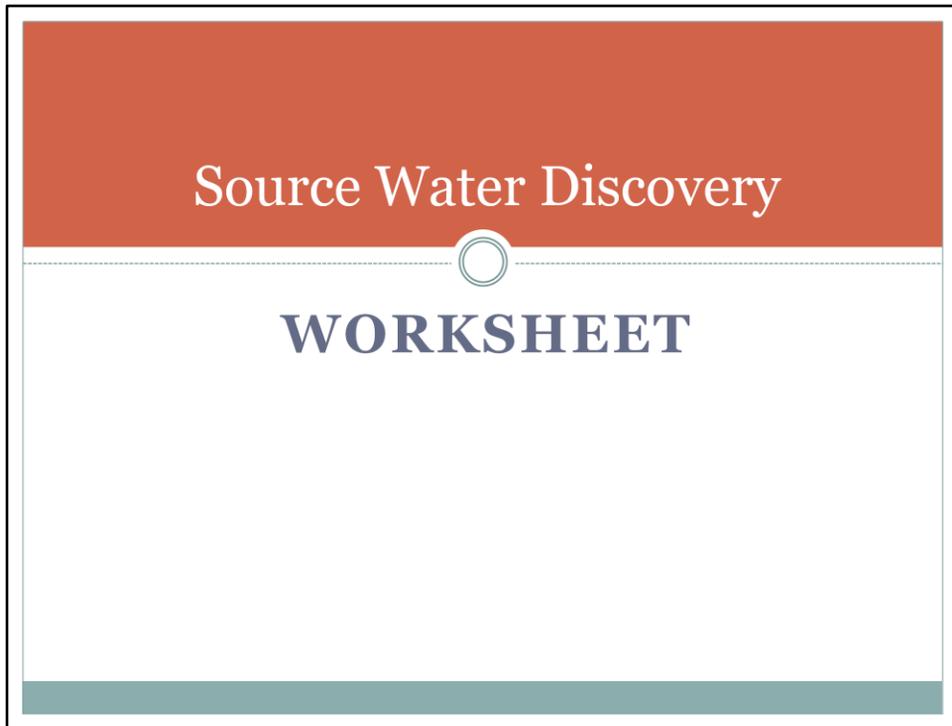


USING THE ONLINE SOURCE WATER ASSESSMENT TOOL

So the other example I'd like to go over is how to incorporate the Source Water Assessment Online tool into the classroom. I'll briefly go over how to navigate through the tool and then I'll explain a hands on activity your students can complete using this tool.



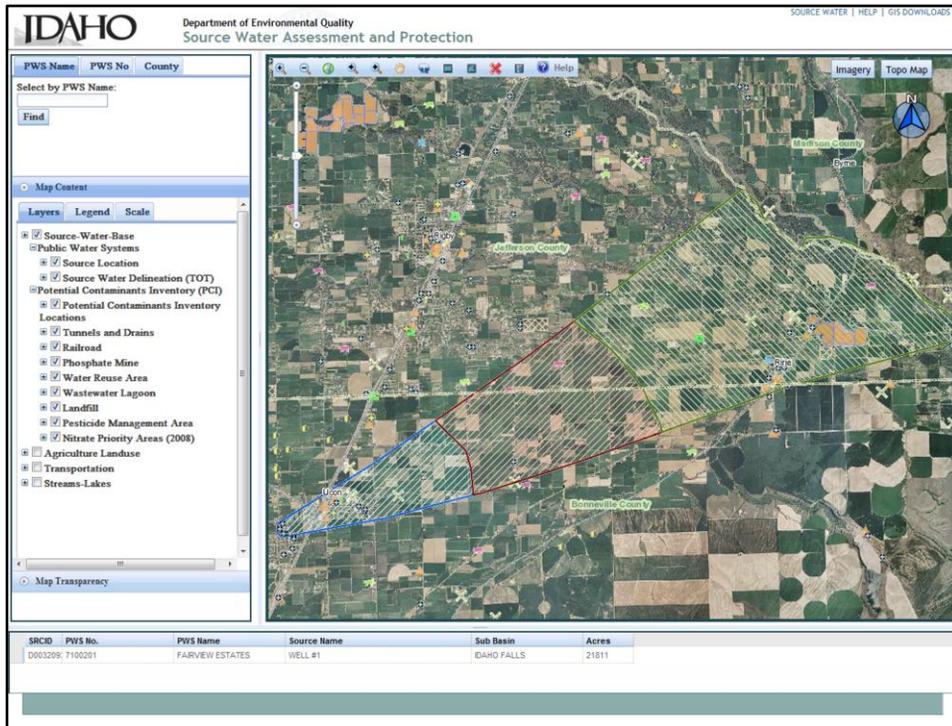
> Link to Video Demonstration on How to Incorporate the Source Water Assessment Online Tool into the Classroom



So those are the basic functions of the dynamic map and we've developed a worksheet for students to navigate through the tool and answer questions. The worksheet is intended to challenge students to learn a new tool, gain experience with GIS layers and tools, follow directions, think critically, and hopefully learn where their water comes from, that its vulnerable, and protection is important. We've printed the worksheet for you and will briefly go over it today.

> [Link to Source Water Discovery Worksheet](#)

Our suggestion is to split the class into four groups and assign them a drinking water source that resides in one of the four prominent aquifers in Idaho.

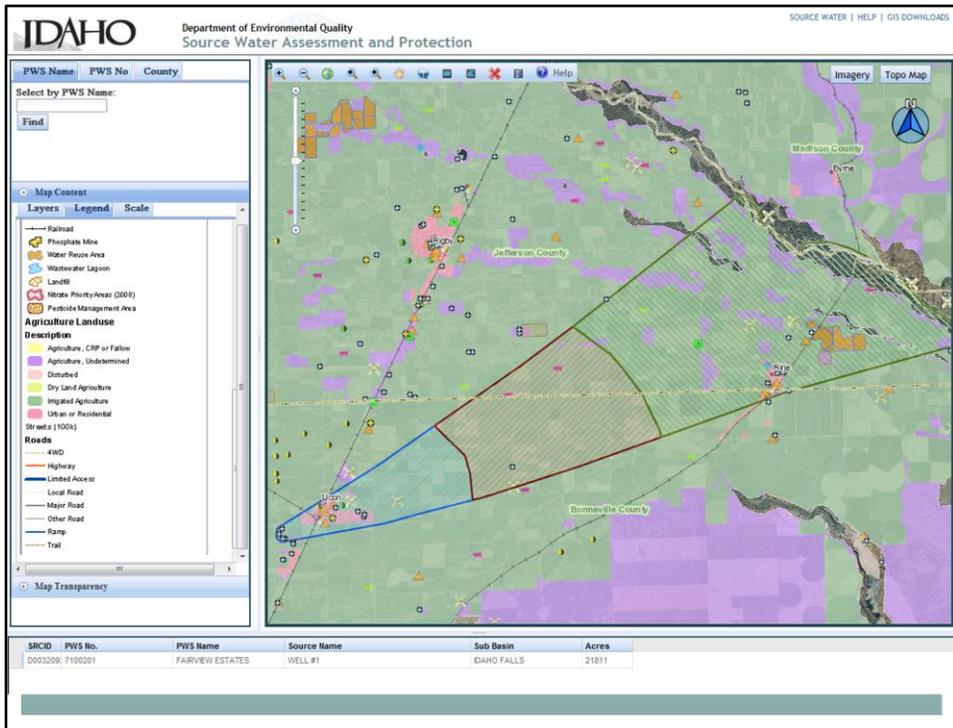


First we ask them to determine which aquifer their source resides in. This may require them to conduct some research on the aquifers and scale out to determine exactly where their source is located. Next we ask them to determine how many time of travel zones their source has, as we discussed earlier this may vary depending on what type of source it is and what the geographical features surrounding the source are. For example you can see that this source's delineation runs into a stream or river, the sources closer to the river may only have two time of travel zones. We ask them to determine the flow of ground water, which always moves towards the well so this one would be moving SE.

Zone of Contribution/Delineation



They describe the shape of the delineation, as we saw earlier sometimes they are simply a circle, others are long and skinny, short and wide or cone shaped like the one in the last slide. What the shape could indicate about the qualities of the aquifer, perhaps how fast the water is moving, how deep the aquifer is, or what may be influencing it.



We ask them to use the layers by determining if the source is in a NPA area and what the predominant land use is.

IDAHO

You are currently viewing: FAIRVIEW ESTATES (PWS# ID7100201)
 Source Number: D0032093
 Source Name: WELL #1
 Potential Contaminants

PWS Name: PWS No:
 Select by PWS Name:
 Find:

Map Content
 Layers Legend Scal

Potential Contaminants
 CERCLA Site
 Toxic Release Inventory Site
 Remediation Site
 UST Site
 Dairy
 Feedlot
 Deep Injection Well
 Shallow Injection Well
 NPDES Location
 RCRA Site
 Drain Location
 Road Salt Location
 Mine Site
 CAMEO Chemical Facility
 Tunnel and Drain
 Railroad
 Phosphate Mine
 Other Source Area

JRCO PWS No.
 D0032093 7100201

TOT*	Description of Potential Contaminant Source	Potential Contaminant(s)	Name
0-3 year	RCRA Site	Site specific	TNT CONTRACTORS
0-3 year	Deep Injection Well	IOC, VOC, SOC, Microbes	
0-3 year	Mine Site	Site specific	
0-3 year	Mine Site	Site specific	
0-3 year	UST Site	VOC, SOC	OASIS STOP N GO #1
0-3 year	UST Site	VOC, SOC	IDAHO BISHOPS CENTRAL
0-3 year	UST Site	VOC, SOC	UCON WAREHOUSE
0-3 year	UST Site	VOC, SOC	UCON MARKET
0-3 year	UST Site	VOC, SOC	UCON PRODUCE INC 1
0-3 year	UST Site	VOC, SOC	DAVE KINGSTON PRODUCE INC
0-3 year	UST Site	VOC, SOC	CLAYTON TRUCKING
0-3 year	Shallow Injection Well	IOC, VOC, SOC, Microbes	HOLST TRUCK AND AUTO WRECKING INC.
0-3 year	Shallow Injection Well	IOC, VOC, SOC, Microbes	Woodland Park sub
0-3 year	CAMEO Chemical Facility	Site specific	Ucon-Idaho Falls Bishops' Storehouse
3-6 year	Mine Site	Site specific	
3-6 year	Dairy	IOC, Microbes	Dairy
3-6 year	Dairy	IOC, Microbes	Dairy



First we ask them to determine which aquifer their source resides in. This may require them to conduct some research on the aquifers and scale out to determine exactly where their source is located. Next we ask them to determine how many time of travel zones their source has, as we discussed earlier this may vary depending on what type of source it is and what the geographical features surrounding the source are. For example you can see that this source's delineation runs into a stream or river, the sources closer to the river may only have two time of travel zones. We ask them to determine the flow of ground water, which always moves towards the well so this one would be moving SE.

IDAHO Department of Environmental Quality Source Water Assessment and Protection

SOURCE WATER | HELP | GIS DOWNLOADS

PWS Name PWS No County

Select by PWS Name:

Find

Map Content

Layers Legend Scale

Potential Contaminants Inventory Locations

- CERCLA Site
- Toxic Release Inventory Site
- Remediation Site
- UST Site
- Dairy
- Feedlot
- Deep Injection Well
- Shallow Injection Well
- NPDES Location
- RCSA Site
- Drain Location
- Road Salt Location
- Mine Site
- CAMEO Chemical Facility
- Tunnels and Drains
- Railroad
- Phosphate Mine
- Water Reuse Area
- Wastewater Lagoon
- Landfill
- Nitrate Priority Areas (2005)
- Pesticide Management Area

Agriculture Landuse Description

Map Transparency

SWA Identify

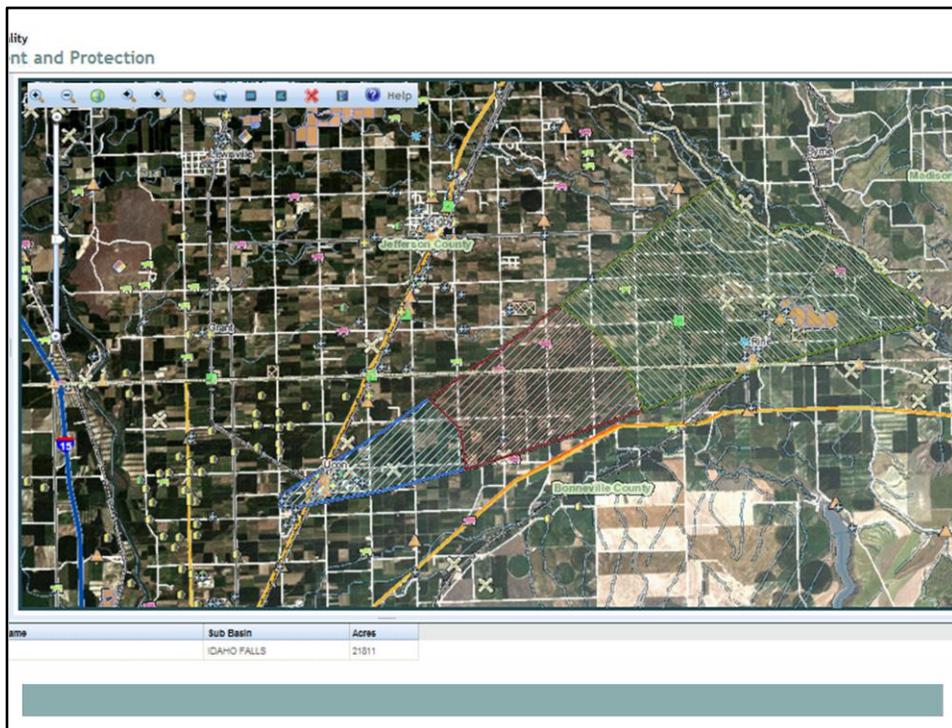
PWS SOURCE SWA DELINS PCI Location

Total features returned: 1

ID	FACILITY	TYPE	SOURCE	CONTAMINANT	HOTI	
6100645	STOP N	GO #1	UST Site	IDEQ	VOC,SOC	PCI LI

SRCID	PWS No.	PWS Name	Source Name	Sub Basin	Acres
D003209	7100201	FAIRVIEW ESTATES	WELL #1	IDAHO FALLS	21811

We ask them to use the legend or the PCI link in the main area of the tool to determine what potential contaminants are within the first time of travel. We ask them to use the identify tool to determine which contaminant is closest to the source and provide a description.



We ask them to turn on the layers to determine if roads, surface water bodies, and railroads are within their time of travel zones. Hopefully prompting that not just remediation sites have contaminants, but that even natural features like surface water bodies can impact drinking water sources.

Susceptibility Summary - WHITNEY NASHVILLE WATER WORKS (PWS# ID6210020) SF

Susceptibility Summary

For each well, spring, or surface water intake in a public water system, susceptibility to contamination is scored as high, moderate, or low. Scores take into account 1) construction of the well, spring, or surface water intake; 2) land use characteristics above the well, spring, or surface water intake; and 3) hydrologic and geologic conditions surrounding the well, spring, or surface water intake.

Susceptibility scores are specific to a particular potential contaminant or category of contaminants. Therefore, a high susceptibility score for one contaminant does not mean that the water system is at the same risk for all other potential contaminants. Deriving susceptibility scores is a screening-level step that, in many cases, uses generalized assumptions and best professional judgement.

Susceptibility Scores for WHITNEY NASHVILLE WATER WORKS (PWS# ID6210020) SPRING 2 TSP26210020									
System Construction	Potential Contaminant Inventory / Land Use				Hydrologic Sensitivity	Final Susceptibility Scores			
	IOC	VOC	SOC	Microbials		IOC	VOC	SOC	Microbials
H	H	M	M	M		Auto High	M	Auto High	Auto High

H = high susceptibility, M = moderate susceptibility, L = low susceptibility.
 Auto High - see below.*

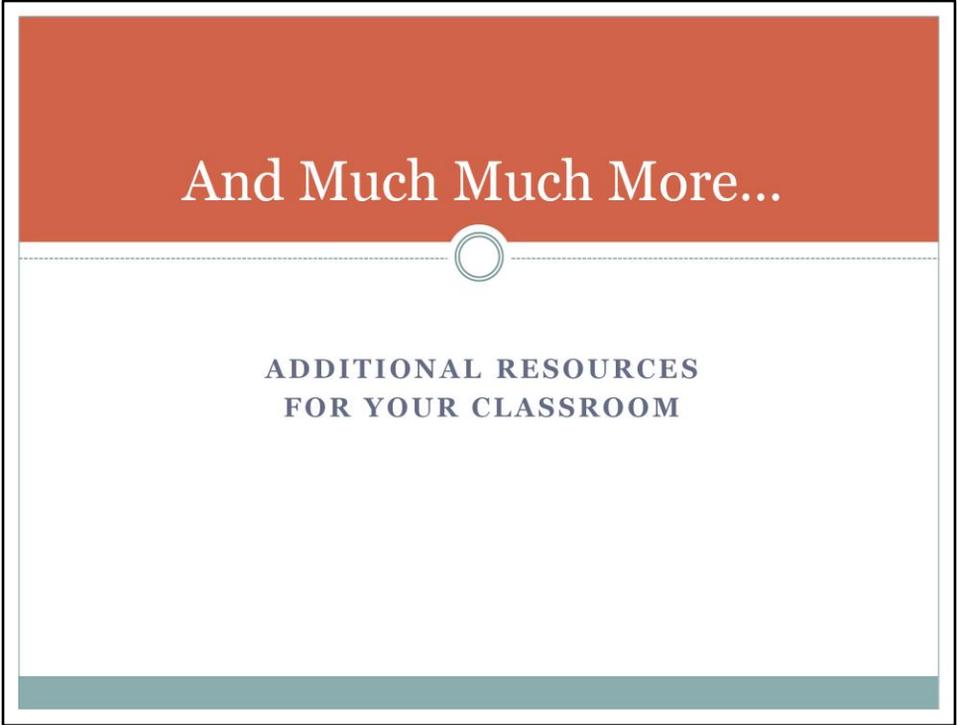
[View Report Summary](#)
[View Interactive Map](#)
[View Static Map](#)
[View PCI Table](#)
[View Score Details](#)

*Auto High Score

And lastly we ask them to determine how susceptible the source is to contamination based on the final ranking of the source. If the source received an automatic high, we ask them to investigate it further by viewing the score details.

System Construction		IOC	VOC	SOC	Microbe
Intake structure properly constructed					No
Water first collected from an underground source					No
System Construction Ranking					H
Greatest Delineated Time-of-Travel to the Source					3 years
Delineation Method					Springs
Potential Contaminant Source / Land Use - Zone 1A (≤ 50ft)		IOC	VOC	SOC	Microbe
Land Use Zone 1A	Dry Land Ag.				
Farm chemical use high		No	No	No	
IOC, VOC, SOC, or Microbial source in Zone 1A (<50ft)		Yes	No	Yes	Yes
Type of source:	Livestock, and probable application of pesticide and herbicide				
Confirmed detection of VOC, SOC, or Microbe; or IOC detection over MCL..		No	No	No	No
Detected contaminants:					
Potential Contaminant Source / Land Use Score - Zone 1B (0-3 yr TOT)		IOC	VOC	SOC	Microbe
Contaminant source present (number of sources)		2	2	2	0
Source of Class II or III leachable contaminants		1	1	1	
0-3 yr TOT contains or intercepts a Group 1 or Priority Area		Yes	No	No	No
Land Use Zone 1B	>50% irrigated ag				
Scoring		IOC	VOC	SOC	Microbe
Final PCI / Land Use Ranking		H	M	M	M
Final Susceptibility Ranking		Auto High	M	Auto High	Auto High

As you can see this source received an automatic high ranking because of the sources within 50 ft of the well.



And Much Much More...

**ADDITIONAL RESOURCES
FOR YOUR CLASSROOM**

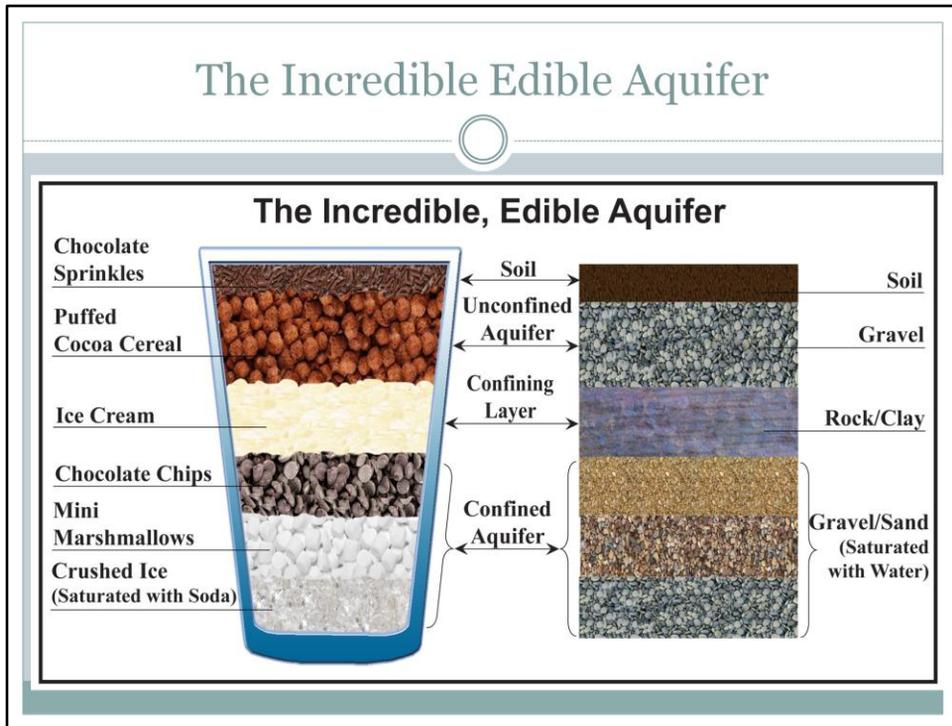
So I know we covered quite a bit in a short time, but we hope we've given you just enough to encourage you to investigate these tools on your own to see if they would be a fit for your class. As I mentioned we're available to walk you through it or assist with an activity in the classroom. Before we open it up for questions I just wanted to briefly mention a few other tools.

Ground Water Flow Model



DEQ owns a ground water flow model that we can demonstrate in your classroom to teach students about geologic formations, aquifers, aquitards, how we use ground water, the vulnerability of the resource. Adaptable to various age groups

The Incredible Edible Aquifer



Some of you may have heard about the incredible edible aquifer, which is a fun and delicious tool to help students learn about the water cycle, geologic formations, aquifers, aquitards, how we use ground water, the vulnerability of the resource. Adaptable to various age groups (but usually best for grades 4-8)

Other Activities and Lesson Plans



**[www.deq.idaho.gov/teacher-
resources](http://www.deq.idaho.gov/teacher-resources)**

Questions?

Amy Williams
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Idaho DEQ
Amy.Williams@deq.idaho.gov
208-373-0115

Thank You.

DEQ will be happy to come out to your school to demonstrate the tools or work with teachers one on one to help them become more familiar with the tools.