

LESSON PLAN

Area and/or Course: Groundwater Protection Education #2: Wells

Teacher Goal(s):

1. To help students gain general knowledge of groundwater protection in the Southern Willamette Valley.

Lesson Title: Southern Willamette Valley Wells **No. Periods:** 1 – 50 minute

Objectives:

The student will be able to (TSWBT).

1. Identify the Southern Willamette Valley Groundwater Management Area (SWVGWMA).
2. Identify the types of groundwater wells in the SWVGWMA
3. Identify the parts of a well head.
4. Understand the purpose of a well log.

Standard met by Objectives:

1. H1. Structure and Function: A systems characteristics form, and function, are attributed to the quantity, type, and nature of its components

Materials, Equipment, Audio-visual aids: <ol style="list-style-type: none">1. Computer and PowerPoint Projector2. Action Plan3. Map of GWMA4. Stickers5. Well Head models6. Abandon wells PowerPoint slides7. Well Logs	References: Southern Willamette Valley Groundwater Management Action Plan
--	--

Anticipatory Set/Introduction/Motivation/Interest Approach:

Have a map of SWVGWMA for each student and the large map posted in the classroom for activity. Have each student identify roughly where they live on the map. Students will place a sticker on the large map and use different sticker colors for domestic wells, springs, and public water users.

Public water users are typically residents within the city limits, although there are some areas within the city limits of Junction City where residents are still on domestic wells. Public water users have the benefit of having their drinking water screened on a routine basis by the city. Public water systems are required to conform to the EPA drinking water standards.

Tally the results of the activity.

Subject Matter Outline/Problem Stated (Application Points lace in throughout lesson). Modeling/Guided Practice/Checking for Understanding

Groundwater as a Drinking Water Source

When groundwater is used as a drinking water source it is typically pulled or pumped from the aquifer by a domestic well.

Domestic well records are kept by the Oregon Water Resources Board (OWRD) which is responsible for setting up the Well Construction Standards, inspecting new wells, and keeping well logs.

There are three types of wells, drilled, driven, and hand dug. The least common type of well that is found today, is the hand dug well.

Hand dug wells were typically put in by homesteaders over 150 years ago when the Willamette Valley was first being settled. Most hand dug wells are no longer in use, but occasionally one is discovered.

A driven well is one where a pipe is driven into the ground by using a heavy object or equipment. The pipe is pounded down to the aquifer and the water is then pumped out. While driving a well can provide easy access to the groundwater, it is not legal to drive your own private well.

Both driven and hand dug wells do not meet the Well Construction Standards set by the Oregon Water Resources Board. Wells in Oregon must be installed by a licensed well contractor, be inspected, and have a well log on file.

Drilled wells are the most common type of well in the Southern Willamette Valley and newly drilled wells must meet the well construction requirements set by the OWRD.

State law requires that the well casing (pipe) must be sealed 18 ft down with grout. Grout fills in the space around the casing and is typically bentonite – which is a type of clay from volcanic ash that provides the sealing around the casing. The casing height must be a minimum of 1 foot above the ground. The well is also required to be capped so there isn't a direct outlet for surface water and other potential contaminants to get

Strategy/Objectives Met/Handout Points/Student Activity/Method/ Approach

Have sample well heads for modeling, Map of GWMA, Well Log, and Table 3 from GWMA Action Plan

Why do you think that keeping well log records are important?

Maintaining well construction standards. Maintaining the safety of the water supply. Knowing locations of domestic wells.

Use the model well heads to show the different styles, and the parts of the well head, vents, screening, etc.

into the groundwater.

There are other minimum requirements for wells such as should be located greater than 100 feet from your septic system and the drain field.

Wells that are no longer in use can be large problems when we talk about pathways for contaminants to get into the groundwater. Old wells that are no longer in use should be properly decommissioned by OWRD standards so that contaminants cannot use the direct path into the groundwater. A larger problem in this area is wells that are unknown or abandoned. In many cases wells that are no longer in use are forgotten about. The OWRD predicts that there may be a significant number of unused wells serving as pathways for nitrate and other contaminants in the Southern Willamette Valley.

Local Wells and How they work

There are about 8700 rural residents in the Groundwater Management Area relying on domestic wells for their water supply and according to OWRD records about 85% of those well have a depth of 75 feet or less and are pulling water from a shallow aquifer.

Diagram well

Terms:

- Well
- Water table
- Aquifer
- Cone of depression
- Recharge area
- Interference

Abandoned well pictures slide show has what your well head would ideally look like, signs of an old well – look for pipes sticking out of the ground, strange depressions, and old windmills. There is also a diagram on how the pathway can be created either directly through the hole or along the sides of the casing.

Action Plan Table 3 & Map of GWMA

If you know that your well is pulling from a shallow aquifer – what would be a concern for you?

Diagram Well on Board or PPT. There are sample diagrams at the end of the abandoned well ppt for reference.

Break students into groups and have them work on the Well Log activity. Each group will be given two random domestic well logs from their local area.

Assignment: Compare the two well logs – how are they different, how are they similar. Do you have any initial concerns about the wells from looking at the information provided by each log.

(This is in preparation for the quality portion, seeing what students may already be aware of after the aquifer activity portion with contaminants) .

Closure/Summary/Conclusion

Wrap up activity – students may take well logs home and finish comparisons for the next class.

Evaluation: (Authentic forms of Evaluation, Quizzes, Written exam?)

Throughout lesson – questioning

Assignments: (Student Activities involved in lesson/designed to meet objectives.)

Well Log activity and connection with the Aquifer activity to see if understanding interrelationships.