Maine Farm-A-Syst

Farmstead Assessment System Fact Sheet 1

Reducing the Risk of Groundwater Contamination by…
Protecting Your Well

Most rural residents use wells to supply their drinking water and farmstead needs. If the wells are improperly constructed and maintained, bacteria, pesticides, fertilizer or oil products can contaminate groundwater. These contaminants can put your family, your livestock, and your neighbor's health at risk. Locating and controlling sources of pollution to groundwater can be difficult but is much less costly and much easier to do than cleaning up contaminated groundwater. Wells, even those not used as a drinking source, are often a direct route for contamination to enter groundwater, potentially polluting not only your well but also your neighbors.

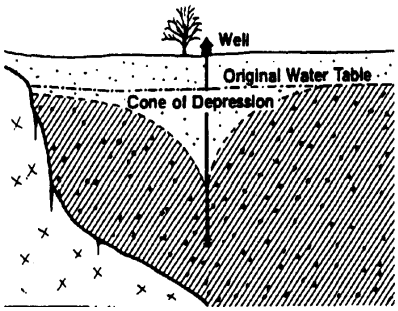
Topics Covered:

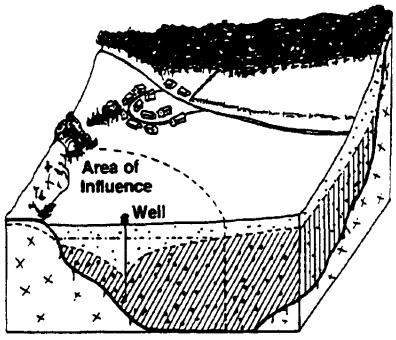
Understand Water in Your Well

When a well is pumping, groundwater flow changes direction in a portion of the watershed.

- Instead of moving toward the natural discharge area, the groundwater within the influence of the pump flows toward the well from every direction.

- The pumping well creates an artificial discharge area by drawing down (lowering) the water table around the well. This area of drawdown is called the cone of depression and the area it affects is the area of influence.





Every pumping well is surrounded by a cone of depression. When the amount of groundwater that is withdrawn by the pumping well is equal to the amount of groundwater recharge within the area of influence, the cone stops expanding.

- **The cone of depression does not always remain the same size**. If there is less rain and the well keeps pumping, the pump will pull water from a greater

distance, and the cone of depression will get deeper and wider. After heavy precipitation, with good recharge, it will get smaller.

- **Dug, driven point, or gravel packed wells**, which draw water from the surficial deposits, have a cone of depression that is generally round or oval showing that recharge is being drawn from all directions.

- **Bedrock wells** drawing water from linear fractures may have a narrow, elongated cone of depression reflecting recharge along the fracture.

- **Land use can change the size and shape of the cone of depression** and the ability of the aquifer to supply water. If there are a lot of impermeable surfaces (such as paved areas or buildings) covering a portion of the area of influence or its upland recharge area, the rain water will not be absorbed into the ground and recharge the well. Instead, the water will runoff from those surfaces and flow overland to streams instead of recharging the groundwater focusing the cone of depression for the pumping well to expand to compensate for the loss of groundwater recharge. This will increase the area of influence and could cause more problems such as new sources of contamination and there are too many impermeable surface there is the chance of a possible decrease in the yield of the well.

For more information on wells and geology refer to section 13 or the Maine Geological Survey website at http://maine.gov/doc/nrimc/mgs/mgs.htm .

WELL LOCATION

Whether a well taps water just below the ground or hundreds of feet deep, its location on top of the ground is a crucial safety factor. A well downhill from a livestock yard, a leaking petroleum tank or a failing septic system runs a greater risk of contamination than a well on the uphill side of these pollution sources.

Surface slope does not always indicate the direction a pollutant might flow once it gets into the ground. Shallow groundwater flow is often in the same direction as surface water flow. Shallow wells may be directly affected by farmstead activities. Water deep below the land surface may flow in a different direction than surface water. Flow may be affected by regional topography, pumping of neighboring wells, or other factors. Deep wells may also be polluted though they do offer more protection than shallow wells. Finding out about groundwater movement on your farm (see Contacts and References) may require special monitoring equipment.

Separation Distances

Many states encourage good well location by requiring minimum separation distances from sources of potential pollution, thus using the natural protection provided by soil as a filter. However, state well codes may not mention which farmstead activities and structures may potentially cause well contamination. When no distances are specified:

Provide as much separation as possible between your well and any potential contamination source

- if your farmstead is on highly permeable soils like sand and gravel,
- if your farmstead is on thin soil overlying bedrock,
- if the contamination source or activity presents a high risk of contamination.

In Maine, the minimum horizontal setback distance of a private water supply well from a waste water disposal field designed to treat less than 2,000 gpd (gallons per day) is 100 feet. In some circumstances the setback can be reduced if a bedrock well is used. The minimum horizontal setback distance of a private water supply well from septic tanks, lift stations, and holding tanks is 60 feet.

Written approval from the State is required to reduce the separation amounts. Your licensed well driller can help with the variance application process. The Maine Subsurface Waste Water Disposal Rules, http://www.maine.gov/sos/cec/rules/10/144/144c241.doc, provide for special setback conditions between a well and an abutter's subsequently located waste water disposal field (whether located purposefully or not). Sections 702 and 703 of the Waste Water Rules (10-144A CMR 241, pages 7-2, 7-3 and 7-4, and Tables 700.2, 700.3 and 700.4) establish conditions and requirements for setbacks between wells and proposed disposal fields. The following tables are copied directly from the rules.

DISPOSAL SYSTEM SETBACKS

Setback distances for first time systems and/or major expansion systems

Site features vs. disposal system components of various sizes	Disposal Fields (total design flow)			Septic Tanks and Holding Tanks (total design flow)		
	Less than 1000 gpd	1000 to 2000 gpd	Over 2000 gpd	Less than 1000 gpd	1000 to 2000 gpd	Over 2000 gpd
Wells with water usage of 2000 or more gpd or public water system wells	300 ft	300 ft	300 ft	150 ft	150 ft	150 ft
Owner's well	100 ft [a]	200 ft	300 ft	100 ft [b]	100 ft	100 ft
Neighbor's wells	100 ft	200 ft	300 ft	100 ft	100 ft	100 ft
Water supply line	10 ft	18 ft	25 ft	10 ft	10 ft	10 ft
Water course, major	100 ft [d]	200 ft [d]	300 ft [d]	100 ft [b]	100 ft	100 ft
Water course, minor	50 ft [e]	100 ft [e]	150 ft [e]	50 ft [e]	50 ft [e]	50 ft [e]
Drainage ditches	25 ft	50 ft	75 ft	25 ft	25 ft	25 ft
Edge of fill extension-- Coastal wetlands, special freshwater wetlands, great ponds, rivers, streams	25 ft [e]	25 ft [e]	25 ft [e]	25 ft [e]	25 ft [e]	25 ft [e]
Slopes greater than 3:1	10f ft	18 ft [f]	25 ft [f]	N/A	N/A	N/A
No full basement [e.g. slab, frost wall, columns]	15 ft	28 ft	40 ft	8 ft	14 ft	20 ft
Full basement [below grade foundation]	20 ft	30 ft	40 ft	8 ft	14 ft	20 ft
Property lines	10 ft [c]	18 ft [c]	20 ft [c]	10 ft	15 ft	20 ft
Burial sites or graveyards, measured from the toe of the fill extension	25 ft	25 ft	25 ft	25 ft	25 ft	25 ft

Notes:

[a.] Single-family well setbacks may be reduced as prescribed in Section 701.0.
[b.] This distance may be reduced to 5*0* feet, if the septic or holding tank is tested in the plumbing inspector's presence and shown to be watertight or of monolithic construction**.**
]c.] Additional setbacks may be needed to prevent fill material extensions from encroaching onto abutting property.
[d.] Additional setbacks may be required by local shoreland zoning.
[e.] Natural Resource Protection Act requires a 25 feet setback, on slopes of less than 20%, from the edge of soil disturbance and 100 feet on slopes greater than 20%. See Chapter 15.
[f.] The fill extension shall reach the existing ground before the 3:1 slope or within 100 feet of the disposal field.

TABLE 700.3
Setback distances for replacement systems and/or expansions outside the shoreland zone of major waterbodies/courses with plumbing inspector approval.
[Only if the site evaluator determines there is no practical alternative and the plumbing inspector approves.]

Site features vs. disposal system components of various sizes	Disposal Fields (total design flow)			Septic Tanks and Holding Tanks (total design flow)		
	Less than 1000 gpd	1000 to 2000 gpd	Over 2000 gpd	Less than 1000 gpd	1000 to 2000 gpd	Over 2000 gpd
Wells with water usage of 2000 or more gpd or public water system wells	300 ft	300 ft	300 ft	150 ft	150 ft	150 ft
Owner's well	100 down to 60 ft [a]	200 down to 100 ft	300 down to 150 ft	100 down to 50 ft [b]	100 down to 50 ft	100 down to 50 ft
Neighbor's wells (f)	100 down to 60 ft [f]	200 down to 120 ft [f]	300 down to 180 ft [f]	100 down to 50 ft [f]	100 down to 75 ft [f]	100 down to 75 ft [f]
Water supply line	10 ft	20 ft	25 ft [h]	10 ft	10 ft	10 ft [h]
Water course, major	100 down to 60 ft [d]	200 down to 120 ft [d]	300 down to 180 ft [d]	100 ft down to 50 ft[b]	100 ft down to 50 ft	100 down to 50 ft
Water course, minor (e)	50 down to 25 ft [e]	100 down to 50 ft [e]	150 down to 75 ft [e]	50 down to 25 ft [e]	50 down to 25 ft [e]	50 down to 25 ft [e]
Drainage ditches	25 down to 12 ft	50 down to 25 ft	75 down to 35 ft	25 down to 12 ft	25 down to 12 ft	25 down to 12 ft
Edge of fill extension-- Coastal wetlands, special freshwater wetlands, great ponds, rivers, streams (e)	25 ft [e]	25 ft [e]	25 ft [e]	25 ft [e]	25 ft [e]	25 ft [e]
Slopes greater than 3:1	10 ft [g]	18 ft [g]	25 ft [g]	N/A	N/A	N/A
No full basement [e.g. slab, frost wall, columns]	15 down to 7 ft	30 down to 15 ft	40 down to 20 ft	8 down to 5 ft	14 down to 7 ft	20 down to 10 ft
Full basement [below grade foundation]	20 down to 10 ft	30 down to 15 ft	40 down to 20 ft	8 down to 5 ft	14 down to 7 ft	20 down to 10 ft
Property lines	10 down to 5 ft [c]	18 down to 9 ft [c]	20 ft down to 10 ft [c]	10 down to 4 ft [c]	15 down to 7 ft [c]	20 ft down to 10 ft [c]
Burial sites or graveyards, measured from the toe of the fill extension	25 ft	25 ft	25 ft	25 ft	25 ft	25 ft

Notes:
[a.] Single-family well setbacks may be reduced as prescribed in Section 701.2.
[b.] This distance may be reduced to 25 feet, if the septic or holding tank is tested in the plumbing inspector's presence and shown to be watertight or of monolithic construction **.**
[c.] Additional setbacks may be needed to prevent fill material extensions from encroaching onto abutting property.
[d.] Additional setbacks may be required by local shoreland zoning.
[e.] Natural Resource Protection Act requires a 25 feet setback, on slopes of less than 20%, from the edge of soil disturbance and 100 feet on slopes greater than 20%. See Chapter 15.
[f.] May not be any closer to neighbors well than the existing disposal field or septic tank unless written permission is granted by the neighbor. This setback may be reduced for single family houses with Department approval. See Section 702.3
[g.] The fill extension shall reach the existing ground before the 3:1 slope or within 100 feet of the disposal field.
[h.] See Section 1402.10 for special procedures when these minimum setbacks cannot be achieved.

Both soil and slope can make siting a well a tricky business. Keep in mind that separation distances required by the state are minimums. You may want to choose greater separation distances depending on factors at your site. This will help provide reasonable assurance that your well will not be polluted by farmstead activities in the future. Also consider contamination sources on adjacent properties.

Whether or not drinking water is affected, groundwater contamination is a violation of Maine law.

Changing the location of your well in relation to contamination sources may protect your water supply but not the groundwater itself. Any condition likely to cause groundwater contamination should be improved, even if your well is far away from the potential source.

Simply separating your well from a contamination source may reduce the chance of pollution, but it does not guarantee that the well will be safe. Storm water and groundwater can carry pollutants from one place to another. Wells located in the path of polluted water

run a risk of contamination from overland flow washing into an improperly sealed well. Some wells become contaminated through polluted recharge at great distances.

Well Construction

Poor well design can contribute to groundwater contamination by allowing rain or snowmelt to reach the water table without filtering through soil. Wells located in pits, or without grout or a secure cap, can allow surface water to carry bacteria, pesticides, fertilizer or oil products into your drinking water supply. Proper well design reduces the risk of pollution by sealing the well from anything that might enter it from the surface.

If your well has been drilled since 1985, the Maine Geological Survey can attempt to locate the well construction.

The way in which a well was constructed, even if the design is sound, affects its ability to keep out contaminants.

Well construction information may be available from the person who drilled your well, from the previous owner, or from the well construction report. An overview of well construction and inspection can help you understand your drinking water contamination risk.

Well Casing

The well driller installs a steel or plastic pipe, called a casing, during construction to prevent collapse of the borehole. Typically, the casing extends one to two feet above surrounding land (minimum is 8 inches unless specific conditions are met), preventing surface water from running down the casing or on top of the cap and into the well. If located in a flood prone area, additional height or a vented water tight cap may be required to prevent surface water from entering the well. The space between the casing and the sides of the hole provides a direct channel for surface water (and pollutants) to reach the water table. To seal off that channel, the driller may fill the space with grout, cement, concrete or a special type of clay called bentonite, depending on the geologic materials encountered. The casing should be driven into bedrock a minimum of 10 feet. Both grout and casing prevent pollutants from seeping into the well.

You can visually inspect the condition of your well casing for holes or cracks at the surface, or down the inside of the casing with a light. If you can move the casing around by pushing against it, you may have a problem with your well casing's ability to keep out contaminants.

Well Cap

To prevent contaminants from flowing down inside the well casing, the driller installs a tight-fitting, vermin-proof well cap. The cap should be firmly installed, with a screened vent incorporated into it so that air can enter the well. Check the well cap to see that it's in place and tightly secured. Wiring should be in a conduit. If your well has a vent, be sure that it faces the ground, is tightly connected to the well cap or seal, and is properly screened to keep insects out.

Well Age

Well age is an important factor in predicting the likelihood of high nitrate concentrations. A well constructed more than 70 years ago is likely to be at the center of the farmstead; it may be a shallower well and is probably surrounded by many potential contamination sources.

Older well pumps are more likely to leak lubricating oils, which can get into the well. Older wells are also more likely to have a thinner casing that is corroded through. Even wells with modem casings, that are 30 to 40 years old, are subject to corrosion and perforation.

If you have an older well, you may want to have it inspected by a qualified well driller or pump installer who will use a well camera to see if the casing is sound. Surface checks can be preformed by a County Extension educator or a Conservation District technician.

Well Type

Dug wells and driven point wells are quite common in Maine and pose the risk of allowing drinking water supply contamination because they are shallow and often poorly protected from surface water. A dug well is a large-diameter hole, usually 2 feet or more in width and often constructed by hand. A driven point well is constructed by driving assembled lengths of pipe into the ground. Driven point wells are normally smaller in diameter (2 inches or less) and less than 50 feet deep. While the water supplied to these shallow wells may be closest to contamination sources at land surface, the large volume of water available from the unconsolidated overburden allows contaminants to be diluted, lowering contaminant concentrations in the well.

Drilled overburden wells are installed using a typical well drilling rig but are completed in the overburden rather than bedrock. These wells may range in depth up to 200 feet or more and are cased the entire depth. The water supplying these wells is drawn in through a screened interval of casing usually at the bottom of the well. Water drawn into these wells has usually followed a longer flow path, because of the well depth, which allows more opportunity for dilution and filtering of any contaminants than is afforded by dug or driven wells.

Drilled bedrock wells are also installed using a drill rig but are completed in bedrock. Bedrock wells vary in depth from less than 50 feet to 1,000 feet or more. The well is cased through the overburden and the casing usually extends 5 to 10 feet into bedrock (recommended minimum is ten feet). Below this level the well is just rock-walled borehole. In Maine, most bedrock wells are not grouted around the casing at the bedrock surface. Driller guidelines in Maine suggest a minimum of 20 feet of casing with 10 feet driven into bedrock effectively sealing out surface water.

A minimum 100 foot separation distance between wells and septic systems is required by the Maine Plumbing Code. Separation may be reduced through a variance process if well casing depth is increased in proportion to the setback reduction.

Water is supplied to bedrock wells from fractures in the rock. Because of this, the source area for the water is less predictable. If the fracture is continuous, the recharge to it may come from some distance away. If the fracture reaches the surface at a bedrock outcrop or is overlain by thin soil cover in a field, activities in the field may introduce contaminants to the groundwater. Since the groundwater is confined to the fracture, there is much less volume available for dilution. Because of this lower dilution, contaminants that reach the bedrock fractures may still be detectable in wells some distance away.

Managing and Maintaining Existing Wells

You wouldn't let a tractor run too long without an oil change. Your well deserves the same attention. Good maintenance means:

- Testing the water regularly (once every couple of years).
- Keeping the well area clean and accessible.
- Keeping pollutants as far away as possible.
- Periodically having a qualified well driller or pump installer check the well mechanics.

Existing wells were most likely located according to traditional practice at the time of construction. While these wells are functional, you may want to consider altering some farm practices to help protect your well site. Move activities such as pesticide mixing, tank rinsing or gasoline storage further from your well. You might also want to upgrade wells, install caps or extend casings. All Maine property transfer forms include language regarding underground petroleum storage tanks and well water safety.

Changing the way you manage such structures to control contaminants may help protect groundwater and your drinking water. For example:

- If your silo is too close to your well you may want to install a system for collecting any juices draining from freshly ensiled forage.
- You could install concrete curbs to direct livestock yard runoff away from the well.
- Locate short-term manure piles on clay soil or a concrete slab and protect from rain to reduce the chance of well contamination by bacteria or nitrates.
- Consider moving traffic areas and chemical or gasoline storage areas away from the well,
- Consider upgrading or better management of your septic system.

Check with your local Natural Resource Conservation Service (NRCS) for any available cost share programs and technical assistance.

Backflow Prevention

Backflow or back-siphoning from pesticide mixing tanks allows chemicals to flow back into the well through the hose.

Use an anti-backflow device when filling pesticide sprayer tanks to prevent the chemical mixture from flowing back into the well and contaminating groundwater.

Inexpensive anti-backflow devices for hoses used to fill farm sprayers may be available from irrigation or spray equipment suppliers. If you don't have such a device, keep the hose out of the tank when filling the pesticide sprayer.

Consider purchasing an inexpensive plastic nurse tank. A nurse tank is filled with water at the well and then used to fill the sprayer away from the farmstead–and away from the well. (For more information about preventing well contamination from pesticide mixing and loading practices, see Worksheet and Fact Sheet #2, Pesticide Storage and Handling.)

You should also consider anti-backflow devices on all faucets with hose connections or maintain air gaps between hoses or faucets and the water level. Otherwise, you risk having contaminated water in laundry tubs, sinks, washing machines, pressure washers, outside hydrants and swimming pools flow back through plumbing to contaminate your water supply.

Water Testing

Keep an eye on water quality in existing wells by testing regularly. Although you cannot have your water tested for every conceivable pollutant, some basic tests can indicate whether problems exist.

If your water becomes cloudy or begins to periodically pick up an odor, you may want to test your well at that time. If your water is consistently clear and 'free' from odor, you should test it annually for bacteria and nitrate/nitrite.

At a minimum, test your water for coliform bacteria and nitrate. Where the well draws from sandy materials or granite bedrock, testing once for corrosivity is also important.

A good initial set of tests for a private well also includes hardness, alkalinity, pH, conductivity, chloride, arsenic, iron, manganese. Many Maine wells have too much arsenic, radon and uranium. You should test for these substances every three to five years. In addition, you may choose to obtain a broad scan of your water quality for a number of contaminants, such as fluoride and lead. Some mail-in labs offer a screening for metals, inorganic chemicals, volatile organic chemicals or pesticides.

The results may not include contaminants that could be near your farm — the most commonly used pesticides in your area, for example. Test for contaminants that are most likely at your farmstead. Test for lead if you have lead pipes or soldered copper joints. Test for volatile organic chemicals (VOCs) if there has been a nearby use or spill of oil, petroleum or solvent. While testing for pesticides can be very expensive often $80-$100 per compound analyzed, the expense may be justified if:

- Pesticides are stored near your well.
- A pesticide spill has occurred near the well or backsiphonage has occurred.
- Your well is located downslope from croplands where pesticides are used.

You can seek further advice on appropriate tests to run from the County Extension office, Conservation District, Maine CDC Drinking Water Program, or the Board of Pesticides Control.

You should test your water more frequently if:

- There are unexplained illnesses in the family.
- There are pregnancies in the family.
- There are noticeable changes in livestock or poultry performance.

- Your neighbors find a particular contaminant in their water.
- You note a change in water taste, odor, color or clarity.
- You have a spill or backsiphonage of chemicals or petroleum products near your well or on your farmstead.
- You apply chemicals, manure, or fertilizer to fields uphill from your well.
- Your livestock operation inspectors require it.

You can have your water tested by both public and private laboratories. A list of certified labs is available from the EPA Region 1 office or the Maine Department of Health and Human Services. Follow the lab's instructions for water sampling to assure accuracy of results. Use only the container provided. It is best to take the sample on Monday and mail it into the lab immediately. This ensures that the sample is processed promptly without having to sit over a weekend.

Keep in mind that activities off your farm can affect your groundwater. Chemical or petroleum spills, changes in land use and the presence of landfills can increase the chance of pollutants getting into your water. If your water has a high nitrate or bacteria level, you may want to talk with the Conservation District, the Maine CDC Drinking Water Program, an Extension educator, or a specialist about the need for additional testing.

Record Keeping

It is important to record test results and to note changes in water quality over time. In addition to water analysis test results, you should keep records of well construction details, water sampling dates and routine maintenance of the well and pump. If your water is contaminated with pollutants (other than bacteria or nitrate) that may affect human health, the Maine Deparatment of Environmental Protection (DEP) may help pay for treatment or a new well, if the contamination is associated with a regulated activity. Call the nearest DEP district office for information.

New Wells

New wells are expensive – but they are a good investment for the future. Getting the most from such an investment means locating the well away from contamination sources and working to maintain the quality of the well. Some simple principles include:

- Follow all state recommended minimum separation distances.
- **Locate your well on ground higher than surrounding pollution sources** such as fuel tanks, livestock yards, septic systems or pesticide mixing and storage areas. Where practical, locate the well as far as possible from your fields or other pesticide use areas.
- If necessary, build soil up around the well so that all surface water drains away from it.

- Avoid areas that are prone to flooding.
- **Groundwater flow generally follows surface drainage patterns.** Unless you know the exact direction of groundwater flow on your property, locate the well so that pollution sources are between the well and the nearest stream, river or lake. Groundwater generally flows from upland areas and discharges to a surface water body. In all cases, locate your well on ground higher than surrounding pollution sources.
- Make the well accessible for pump repair, cleaning, testing and inspection.
- **Hire a competent well driller and pump installer.** Make sure the driller disinfects the well with chlorine after construction and tests the water for bacteria after drilling (as required by state law), and provides you with detailed information about the well's depth and construction.

Unused Wells

If not properly filled and sealed, these wells can provide a direct conduit for surface water carrying pollutants to groundwater without filtering through soil, or allow contaminant movement from one aquifer to another.

Many farms have unused wells. Pipes sticking out of the ground around the farmstead, or in an area where a farmstead used to be are the most obvious places for finding unused wells.
You may not know the history of your property, however, and unused well locations may not be obvious. A depression in the ground may indicate an old well. Also, wells were often drilled in basements of houses or under front steps or near old cisterns.
In addition to being a threat to groundwater, large open wells pose safety hazards for small children and animals.

A well driller or pump installer should be hired to close these wells, since effective well plugging calls for experience with well construction materials and methods, as well as a working knowledge of the geology of the well site. If you choose to do your own well abandonment work, consult a qualified well driller for advice.

Special equipment is often required to remove old pumps and piping and to properly install sealing material inside the well. Use of inappropriate materials and methods can lead to well settling, collapse and continued groundwater contamination. If plugging materials are improperly installed in a well, patching up defective work is nearly impossible.

Source Water Protection / Wellhead Protection Area

There are some laws that pertain to areas within a source water protection zone that don't apply to other landowners. Be sure to check with your local water district and municipality for local ordinances or if you are unsure if you live in a source water protection area.

Almost half of Maine's population depends on groundwater for its drinking water supply from either private or public wells. We are lucky to have some of the best water supplies in the world, and it is our job to keep them safe. Being aware of potential problems on your property that might pollute drinking water sources is important. You may not even know that there is a potential threat. Taking the time to read and fill out the applicable Farm-A-Syst sections is a great first step. From there you will sit down

with a district employee or someone trained in Farm-A-Syst to discuss some possible solutions such as best management practices (BMP) that can be applied. BMPs are a method, measure, or practice that, when correctly installed or performed, will prevent, reduce, or minimize water pollution. In this case, the focus is on drinking water supplies and the areas that provide them with water.

It is the landowner's responsibility to know local and state laws pertaining to their land, although it is hard to navigate sites and wade through the legal jargon of written laws.

If you are living or operating in a source water protection area (the surface and subsurface areas surrounding a drinking water supply for a public water system where activities can contaminate the supply) or wellhead protection area (an area used to protect groundwater, a form of source water) you should pay extra special attention. We have tried to find pertinent information pertaining to this section. You can find links to these laws along with helpful information in the following Contact & Reference section as well as in appendices A: Law and Regulations & B: Resources.

The following, authored by Maine Drinking water program, is excerpted from the document "Best Management practices for Groundwater Protection". This manual is intended for the use of local officials, public water suppliers and landowners in Maine. It is intended to encourage educated decisions, informed practice, and directed planning in regard to groundwater protection, particularly in the vicinity of public drinking water supply wells. http://www.maine.gov/dhhs/eng/water/forms/Sections/BMPv2%200A.htm

Wellhead protection is a practical method of ensuring the quality and quantity of water pumped from a public supply well is neither degraded nor diminished by unwise land use decisions.

Wellhead protection is based upon five basic premises:

1. **When water is drawn from a well**, other water is drawn from the surrounding aquifer towards the well to replace it. The volume of aquifer from which water is drawn will depend upon the unique characteristics of the aquifer, like its shape, and whether it's a sand and gravel aquifer or a fractured bedrock aquifer. These and other unique characteristics can be determined by hydrogeologic studies. The volume of aquifer involved will also depend upon the pumping rate of the well and amount of recharge to the aquifer. In simple terms, given some geologic information and a few assumptions, one can calculate and draw on a map, a "Zone of Contribution" around the well.
2. **Some water entering the aquifer** is drawn from adjacent surface water bodies such as brooks, rivers and lakes.
3. **Precipitation falling on land** is the ultimate source for all water pumped from wells.
4. **Rainwater (and snow melt)** percolating through soils can wash contaminants into the aquifer (sometimes via adjacent surface water bodies). Such contaminates may pass through the aquifer into the well.
5. **By controlling land uses in the Zone of Contribution to the well** and in the watershed of surface water bodies contributing to the well, we can protect the quality of well water.

The state of Maine currently designates two or three zones in the vicinity of the public water supply well. These are sometimes termed “Wellhead Protection Zones”, or “Zones of Capture”, or ‘Zones of Contribution”. Briefly, they are as follows:

Zone 1. Zone 1 includes land areas immediately surrounding the well. These areas must receive the greatest levels of protection, namely ownership or control by the public water supplier or community.

Zone 2. Zone 2 surrounds Zone 1, and should receive some measure of protection by land use controls imposed by local officials working cooperatively with the public water supplier and landowner.

Zone 3. Zone 3 includes a larger land area that may include the total zone of contribution to a well, or it may include the watershed up-gradient of the well. Land use controls may not be more stringent than current environmental protection regulations, though it is still worthwhile to identify Zone 3 for educational purposes and planning.

The State Drinking Water Program currently has a three-tiered scheme for classifying wellhead protection areas around public supply wells. The three tiers of wellhead protection are as follows:

1. Public supply wells in sand and gravel aquifers (gravel-packed wells with screens) must be protected by zones defined by “time of groundwater travel”. The process involves computer simulation of groundwater flow towards the well. The boundary of Zone 1 is set at a groundwater travel time of 200 days, which is based upon the expected life of viruses in groundwater. The Zone 2 boundary is set at 2,500 days (7 years), which is the time it might take to identify, study and remediate a chemical spill. Zone 3 may be designated as the contributing watershed to the well in question.
2. Public supply wells with higher yields, and obtaining water from bedrock aquifers, are protected by three zones designated by a professional based upon relative confidence that the contributing area is properly identified. Zone 1 is defined with the highest confidence, Zone 2 somewhat less. Zone 3 may be designated at the contributing watershed to the well in question.
3. Relatively small wells (e.g. those serving schools and restaurants) identify Zone 1 using a calculated fixed radius around the well that is proportionate in area to the number of people the well serves, and thus to the average yield of the well. Zone 2 is designated as a circle with a radius of 2,500 feet. There is no designated Zone 3.

Wells

Definition: Wells are structures (usually vertical shafts) used to access groundwater for extraction or monitoring purposes.

Major potential problems: Wells provide a possible conduit for contaminants originating in surface water or upper aquifers to migrate to groundwater below. Wells placed within the same Zone of Groundwater Contribution will interfere with each other, causing a reduction in the Safe Yield (amount of water an aquifer or well can yield for consumption without producing unacceptable negative effects) of both.

BMPs for wells:

1. Wellheads shall be designed such that surface water does not enter groundwater through the borehole around the well casings.

2. Wells that are no longer in service for extraction or monitoring shall be abandoned in a manner appropriate to prevent the entry of contaminants and mixing of separate subsurface water-bearing zones. This may involve the use of bentonite and/or cement grout where a water-tight seal is deemed necessary.

3. High yielding wells (for uses other than domestic purposed) will only be allowed in a WHPA if a safe yield analysis, conducted by a Maine Certified Geologist, can demonstrate that there is sufficient water for both the new well and the public water source.

Contacts and References

Who to call about…

Certified well water testing laboratories

A listing is available from the Maine Department of Health and Human Services, Center for Disease Control Division of Environmental Health, Drinking Water Program. (207) 287-2070

Interpreting well water test results

Maine Department of Health and Human Services, Center for Disease Control Division of Environmental Health, Drinking Water Program (207) 287-2070

Your County Extension office

Drinking water quality standards

U.S. Environmental Protection Agency's Safe Drinking Water Hotline. 1-800-426-4791
10:00 A.M. to 4:00 P.M. Eastern time.

Maine Department of Health and Human Services, Center for Disease Control, Environmental and Occupational Health Program (207) 287-3201

Approved water treatment devices

Contact the Maine Department of Health and Human Services, Center for Disease Control Division of Environmental Health, Drinking Water Program. (207) 287-2070

Financial assistance

For information on whether you qualify for financial assistance in replacing your well due to contamination, contact the Maine Department of Environmental Protection, Bureau of Hazardous Materials and Solid Waste Control. (207)287-2731

For information on current cost share programs for conservation practices contact your local NRCS office.

What to Read About…

Publications are available from sources listed at the end of the reference section. (Refer to number in parentheses after each publication.)

Groundwater, groundwater flow

Groundwater handbook for the State of Maine, 2nd edition, 1987, by W. Bradford Caswell, Maine Geological Survey, Bulletin 39, 135 p. (1)
Sand and Gravel Aquifer Maps (1)

Groundwater and Wells, 2nd edition, 1986, by Fletcher G. Driscoll, Johnson Filtration Systems Inc., St. Paul, MIN, 1108 p. (3)

Wells, private water systems

Groundwater and Wells, 2nd edition, by Fletcher G. Driscoll (3)

Contamination, testing and interpretation

Pilot study-Pesticides in groundwater - Final report, 1989, Maine Geological Survey Open-File Report No. 89-2, 43 p. (1)
Public Health Lab list of tests (2)
Local Extension Educator

Well abandonment

Groundwater and Wells, 2nd edition, 1986, by Fletcher G. Driscoll (3)

Publications available from

(1) Maine Geological Survey, State House Station 22,' Augusta, ME 04333.
(2) Maine Public Health Lab, State House Station 12, Augusta, ME 04333
(3) Your local public or university library

Websites:

This link will take you to the Natural Resources Conservation Service (NRCS) Conservation Practice Standards. Here you can find technical guides that are the primary scientific references for NRCS. They contain technical information about the conservation of soil, water, air, and related plant and animal resources.
http://efotg.nrcs.usda.gov/treemenuFS.aspx

Below is a link to "Manual of Best Management Practices for Maine Agriculture" put out by the Maine Department of Agriculture, Food & Rural Resources Division of Animal Health & Industry. January 2007. This resource has links to many different BMPs that apply to a farm.

http://mainegov-images.informe.org/agriculture/narr/documents/BMPManual2007.pdf
This manual doesn't have any of the actual BMPs written out. It is literally a guide that will lead you to other links.

"Is Your Well Water Safe to Drink?" A brochure identifying for what and how often you should test
http://www.maine.gov/dhhs/eohp/wells/mewellwater.htm

Facts on Well water Contaminants from the EPA
http://www.epa.gov/OGWDW/hfacts.html

Title 38: Waters and Navigation Chapter 3: Protection and Improvement of Waters
http://janus.state.me.us/legis/statutes/38/title38ch3sec0.htm

A list of the Major EPA Laws and Programs That Could Affect Agricultural Producers. June, 2007.
http://www.epa.gov/agriculture/agmatrix.pdf

Convincing Your Town to Adopt a Wellhead Protection Ordinance
http://www.maine.gov/dhhs/eng/water/Templates/Sections/Source%20Water%20Protection/model%20ord1.htm

What types of land uses have the potential to contaminate groundwater?
http://www.maine.gov/dhhs/eng/water/Templates/Sections/Source%20Water%20Protection/model%20ord5.htm
Prohibited Land Uses
http://www.maine.gov/dhhs/eng/water/Templates/Sections/Source%20Water%20Protection/model%20ord8.htm
Economic Impacts of Groundwater Contamination
http://www.maine.gov/dhhs/eng/water/Templates/Sections/Source%20Water%20Protection/model%20ord4.htm
The Model Ordinance
http://www.maine.gov/dhhs/eng/water/Templates/Sections/Source%20Water%20Protection/model%20ord7.htm

Best management Practices for Groundwater Protection
http://www.maine.gov/dhhs/eng/water/forms/Sections/BMPv2%200A.htm

See "Appendix A: Laws and Regulations" and "Appendix B: Resources" for additional links.

Acknowledgments

Update by Androscoggin Valley Soil & Water Conservation District partnered with Maine CDC Drinking Water Program. 2007-2008.

Revision Editors of Farm-A-Syst Fact Sheet #1: Susan Gammon, AVSWCD; Andrews Tolman, State of Maine CDC Drinking Water Program; Megan Wooster, AVSWCD; Susan Breau-Kelley, Maine Rural Water association.

Original Farm-A-Syst team members: John M. Jemison, Jr., University of Maine Cooperative Extension; Marianne DuBois, Maine Department of Environmental Protection; Tammy Gould, Board of Pesticides Control; Chris Jones, Natural Resources Conservation Service; Lisa Krall, Natural Resources Conservation Service; Craig Leonard, Maine Department of Agriculture;

Craig Neil, Maine Geological Survey; David Rocque, Maine Soil and Water Conservation Commission; and David Lytle, University of Maine Cooperative Extension.
Original Fact Sheet #1 Written by Craig Neil, Maine Geological Survey. 1995.