Acetochlor Herbicides

Product Stewardship for the Waters of New York

a cooperative effort between

arp

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

CORNELL UNIVERSITY FOUNDED A.D. 1865

Agenda

Watershed Concept
Watershed Hydrology • Groundwater • Surface Water
Herbicide Behavior in Soil
Herbicide Degradation
Putting It All Together
Label Use Restrictions for Atrazine-containing Products
Label Use Restrictions for Acetochlor Products that Do Not Contain Atrazine
Best Management Practices for Acetochlor Products

Acetochlor Registration Partnership

The Acetochlor Registration Partnership (ARP) holds and supports the U.S. registration of acetochlor, an active ingredient in several important agricultural herbicides. The ARP partners are Monsanto and Dow AgroSciences.

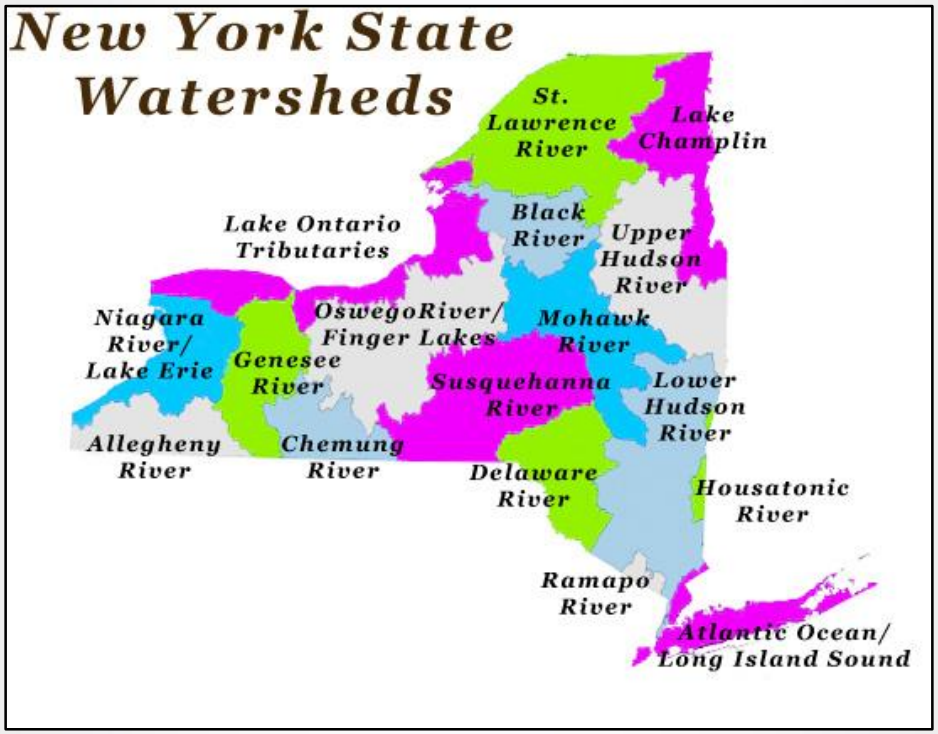
Always read the product label. Label use requirements and application setbacks are legally enforceable.

What is a Watershed?

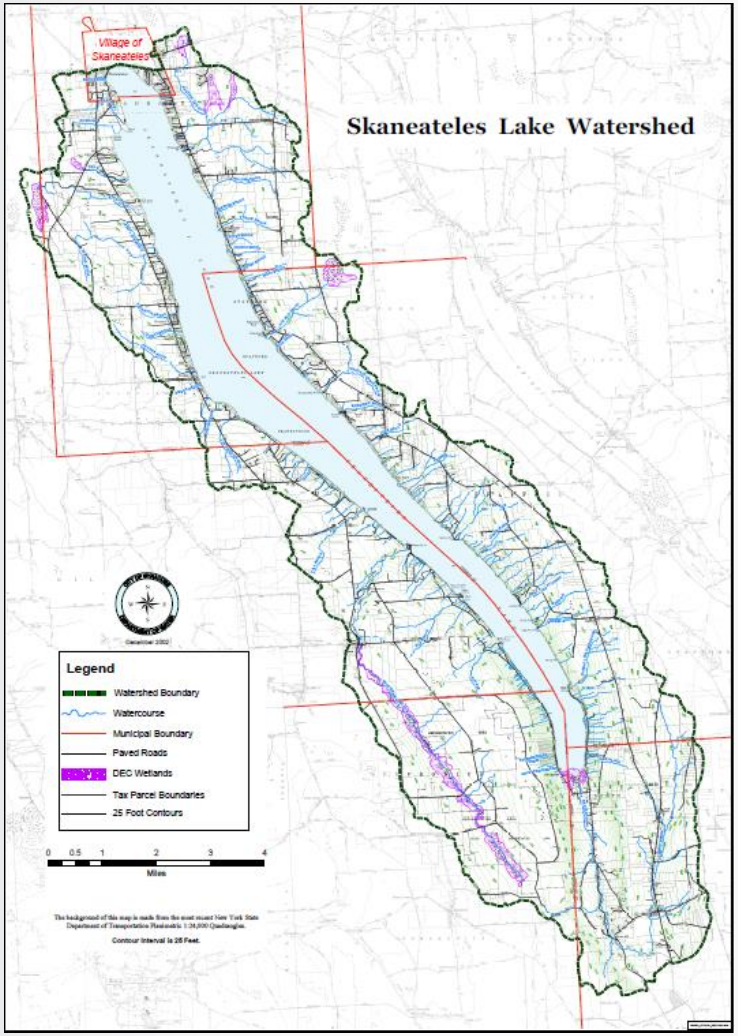
- An area of land that drains into a common waterway; lake, estuary, river, reservoir, etc.
- The continental U.S. contains ~ 2,100 watersheds
- The USGS divides the contiguous United States into drainage basins or watersheds

Watersheds of New York State

- New York State is divided into 17 watersheds
- In New York, watersheds provide drinking water to large populations of the state
- Watersheds are of varying shapes and sizes



Skaneateles Lake Watershed



Onondaga County SWCD

Much of the surface water within the watershed's boundary flows into Lake Skaneateles.

Watershed Hydrology

Groundwater

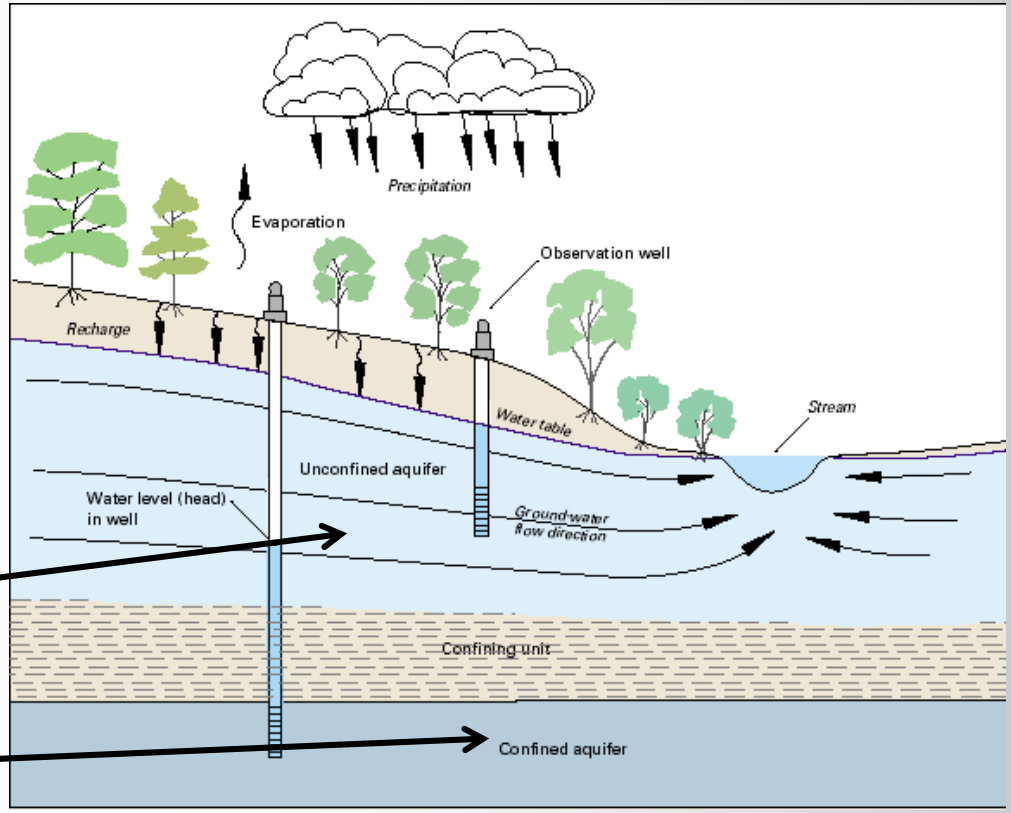
Most often occurs in tiny voids between sand and gravel or in bedrock cracks.

Depth ranges from 2 feet to more than 250 feet below the soil surface.

Aquifer Types

Unconfined aquifers have no confining layer and are open to leaching from the soil surface.

Confined aquifers are capped with an impervious layer of rock or clay. Usually resistant to leaching from the soil surface.



Long Island Groundwater[1]

All of Long Island's water supply comes from their aquifers.

There are three major aquifers in the Long Island aquifer system. They are layered on top of each other.

- Upper Glacial (shallowest)
- Magothy
- Lloyd (deepest)

The Upper Glacial aquifer is an unconfined aquifer.

All of Long Island's aquifers are recharged through precipitation.

NASA Landsat satellite image of Long Island

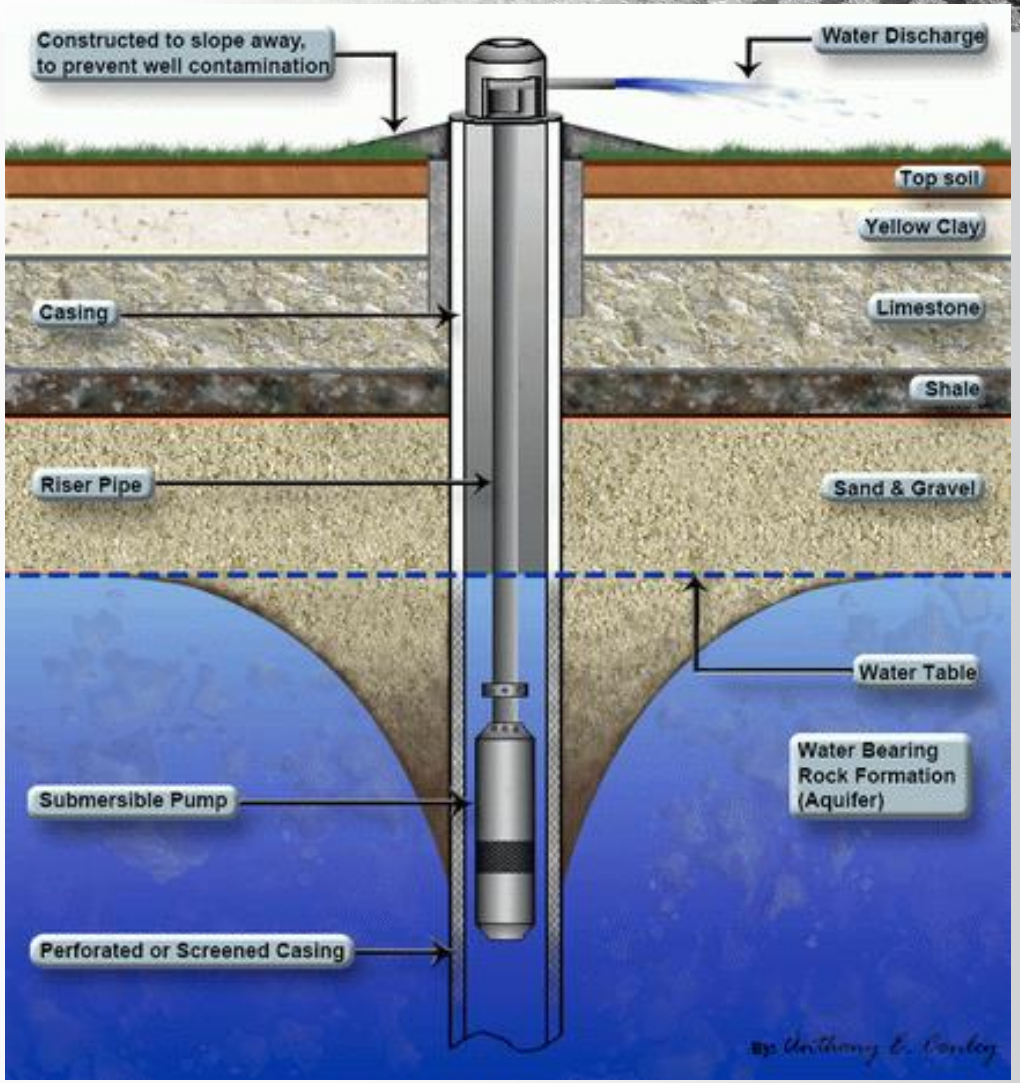
The use of acetochlor-containing products are not allowed in Nassau and Suffolk counties of Long Island.

[1] NYSDEC Website

Groundwater Contamination

Susceptible to contamination primarily through…

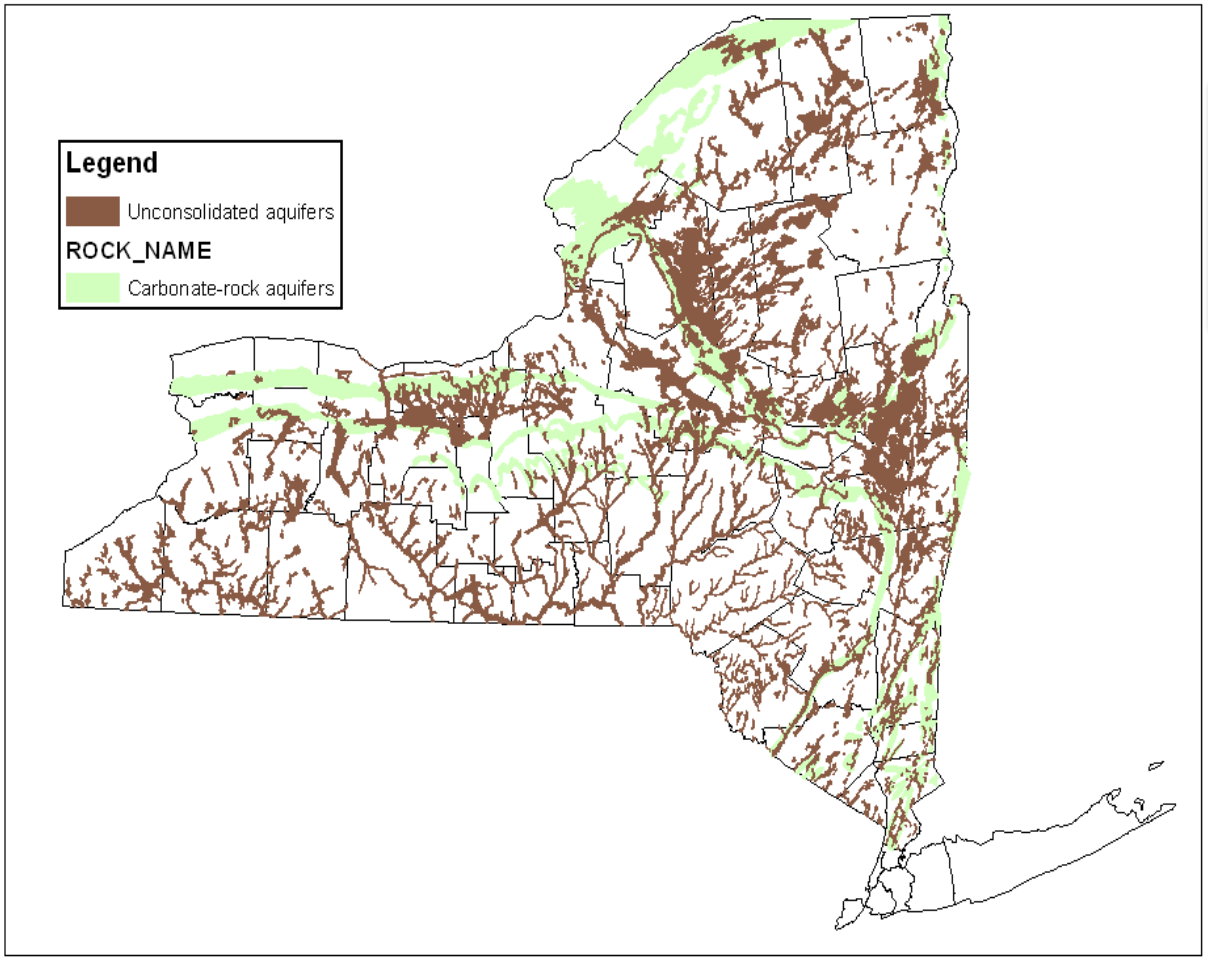
- Leaching in the case of shallow, unconfined aquifers
- Back-siphoning into well
- Cracked well casing
- Lack of well casing
- Entry through abandoned, uncapped wells or sinkholes (karst)



What is Karst Topography?

- Areas that are underlain with dissolvable/soluble rocks e.g., limestone
- Surface features may include sinkholes, disappearing streams, and caves
- Karst systems are very vulnerable to ground water contamination because of
  - Relatively rapid rate of water flow
  - Lack of a natural filtration system

New York State - Karst Topography



Areas of karst topography are shown in green

Onondaga County SWCD

Watershed Hydrology

- Surface Water
  - Rivers, streams, canals, ditches, lakes, ponds, reservoirs, retention ponds, etc.
  - May recharge groundwater by percolating downwards
  - Supports both animals and plants
    - Birds, fish, insects, amphibians, mollusks (mussels, clams) algae, plankton, etc.
  - Commonly used for drinking water, irrigation, and recreation

Surface Water Contamination

Susceptible to contamination through Non-Point Source pollution

- sediments
- fertilizers
- animal waste
- salts
- pesticides

Non-Point Source run-off can potentially impact water users in other areas of the watershed

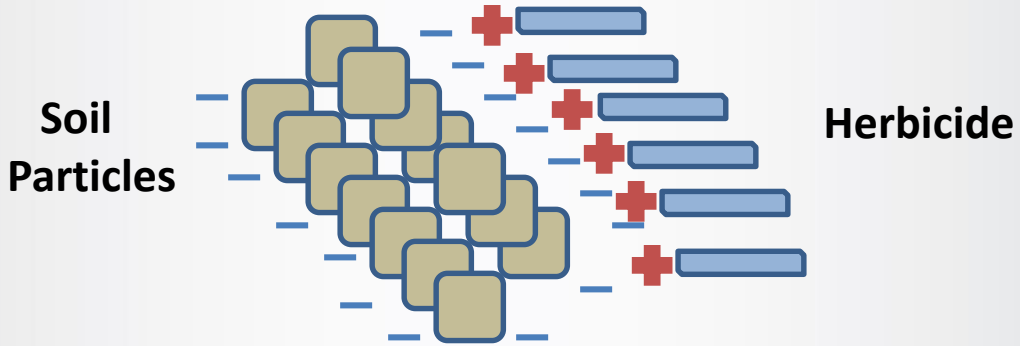
Image from NOAA Ocean Service Education

Herbicide Behavior in Soil

- Pesticide Mobility – after application, a pesticide may be…
  - Dissolved in water and be absorbed by plants
  - Dissolved in water and move as a leachate (⇩) or as runoff (⇨)
    - Water solubility is the amount of pesticide that will dissolve in a known amount of water. It is measured in parts per million (ppm) or milligrams per liter (mg/l).
    - Generally, highly soluble pesticides are more likely to move off-site as a leachate or as runoff. Two notable exceptions are paraquat and glyphosate due to their strong soil adsorption tendencies.
  - Volatilize

Herbicide Behavior in Soil

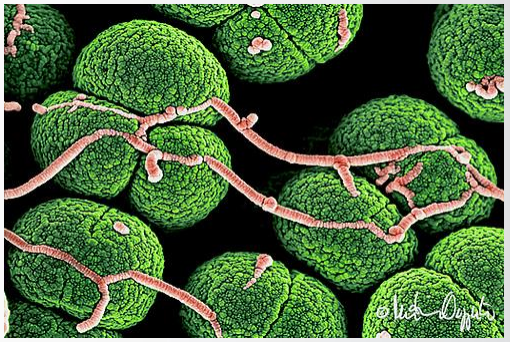
- Adsorbed onto organic matter or clay particles
  - Strong adsorption generally reduces a pesticides ability to leach through soil but, increases its potential to be moved off-site through erosion of soil particles
    - The Koc value expresses the tendency of a pesticide to bind to organic matter or soil particles. Higher Koc values mean stronger binding to soil organic matter and less potential for the compound to be transported by water.



Herbicide Degradation/Dissipation

Herbicide soil degradation occurs as a result of…

- Soil microbes
- Photolysis (by sunlight)
- Hydrolysis (by water)



Herbicide Degradation

Soil half-life is used to measure the persistence of a chemical in the soil (usually expressed in days).

- Half-life is the point at which 50% of the herbicide is broken down
- Longer half-lives generally mean longer lasting soil activity

Compound	Aerobic Soil Degradation	Reference
Acetochlor	12 days	U.S. EPA
Atrazine	60 days	U.S. EPA
S-Metolachlor	20 days	U.S. EPA
Dimethenamid	31 days	U.S. EPA
Gramoxone	3600^{+} days	U.S. EPA

Putting It All Together [1]

Compound	Soil Half-Life (days)	Soil Binding Koc	Solubility (ppm)	Leaching Potential
Acetochlor	12	165	233	Medium
Atrazine	60	160	33	Large
S-Metolachlor	20	200	530	Medium
Prowl	60	24,300	<1	Small
Paraquat	3600+	100,000	1,000,000	Small

[1] EPA

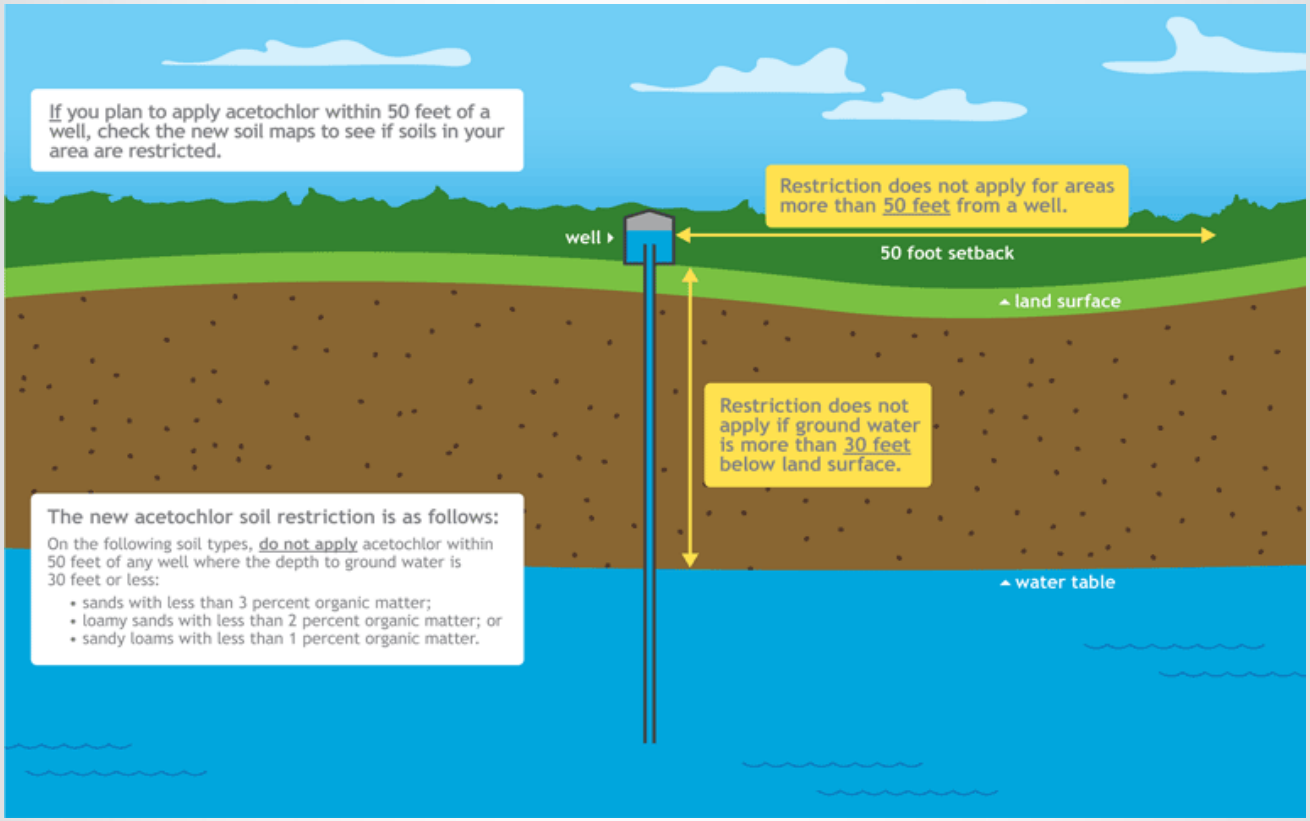
Soil Half-Life – can be used as an indicator of persistence
Koc - measures binding to organic matter. A higher number means greater binding. Determines how much will be bound to "soil" vs. free to move
Solubility - measures the propensity of a product to dissolve in water

Groundwater Protection

Label Use Restriction	Atrazine-Containing Products	Acetochlor Products w/o Atrazine
Use within 50 feet of any well, including abandoned wells, drainage wells, and sink holes.	Not Allowed	Depends on groundwater depth, soil texture, and organic matter content
Mixing, loading, rinsing, or washing of this product into or from pesticide handling or application equipment or containers within 50 feet of any wells, including abandoned wells, drainage wells, and sink holes without impervious containment.	Not Allowed	Not Allowed

Always read the product label. Label use requirements and application setbacks are legally enforceable.

Soil Label Restriction [1]

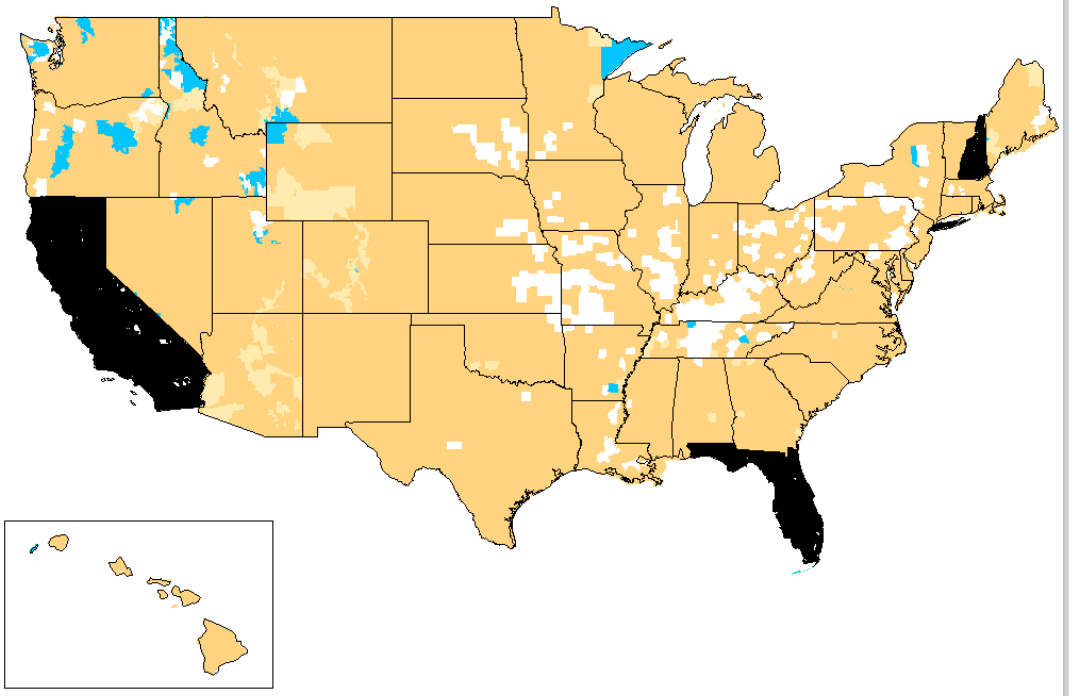


[1] For acetochlor-containing products that do not contain atrazine

Soil Maps

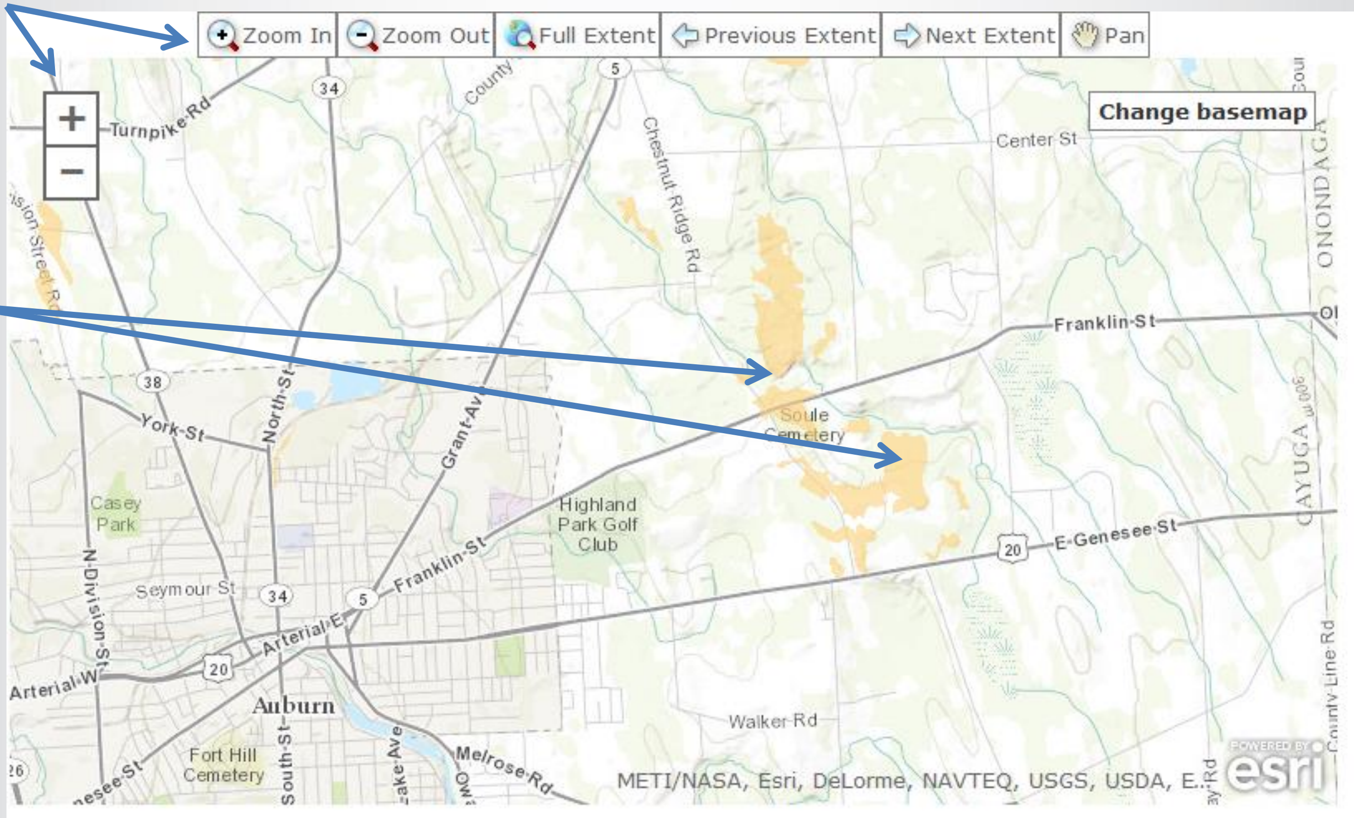
Soils with acetochlor use restrictions are shown on the map below as orange shaded areas. To see if any restricted soils are present in your area use the interactive map viewer. When the interactive map opens, any region with potential soil restrictions are shaded orange. As you zoom in to an area of interest, potentially restricted soils that meet the criteria below will appear.

- Sands with less than 3 percent organic matter;
- Loamy sands with less than 2 percent organic matter; or
- Sandy loams with less than 1 percent organic matter.



Simple map Navigation tools

Possible application restrictions



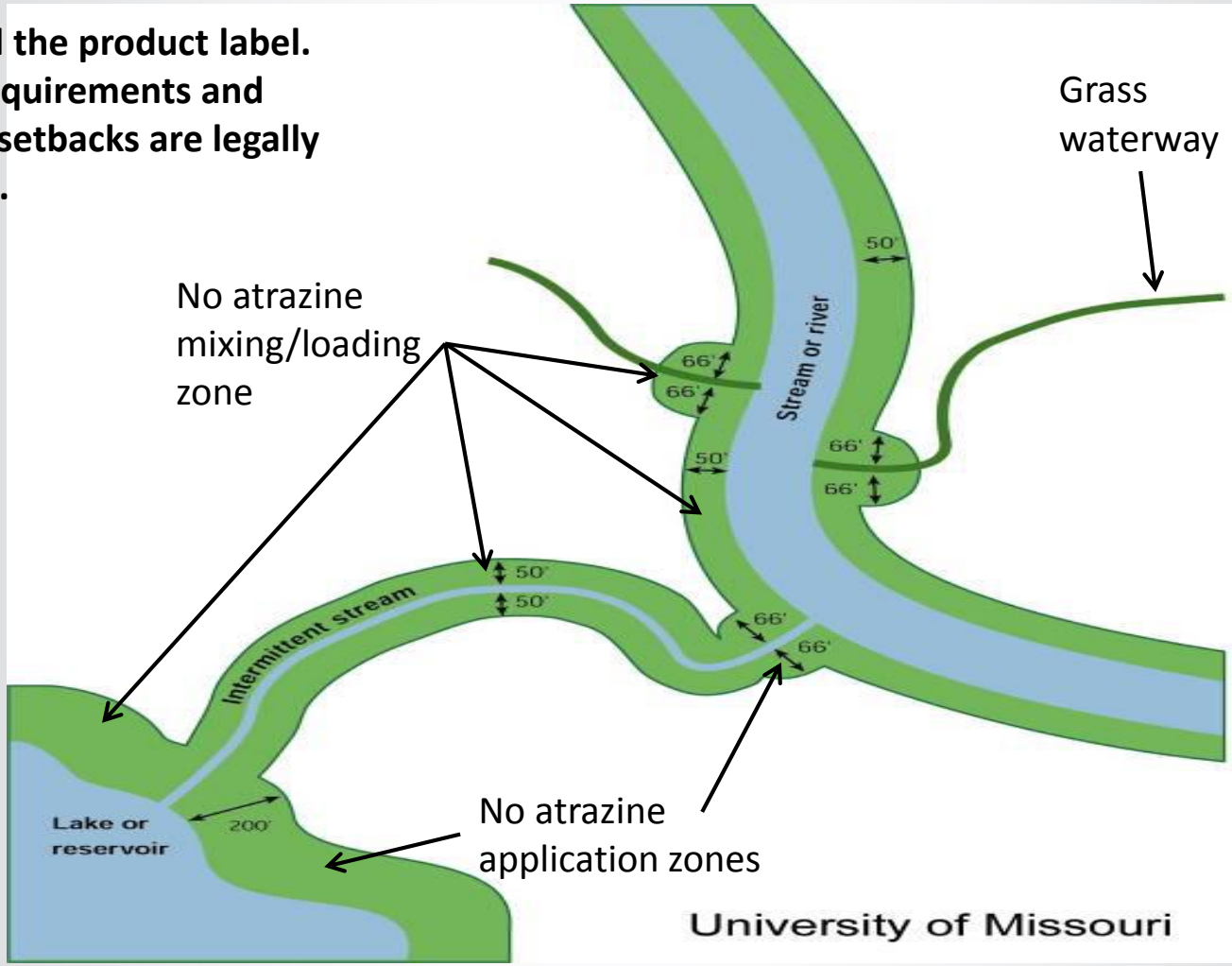
Surfacewater Protection

Label use Restriction	Atrazine Containing Products	Acetochlor Products w/o Atrazine
Mixing or loading within 50 feet of perennial or intermittent streams, rivers, natural or impounded reservoirs.	Not Allowed	Not Allowed
200 foot application setback from lakes and reservoirs	Required	See BMPs
60 foot application setback from field run off points into streams or rivers	Required	See BMPs
Use restrictions in tile-outletted fields or terraced fields containing standpipes	Yes. See the product label for specifics	See BMPs

Always read the product label. Label use requirements and application setbacks are legally enforceable.

Atrazine Setback Requirement Illustration

Always read the product label. Label use requirements and application setbacks are legally enforceable.



Recommended Best Management Practices for Acetochlor Products

- Adopt the core BMP's for "All Agricultural Herbicides" when applying acetochlor products
- Limit acetochlor applications to the lowest effective labeled rate
- Maintain an application setback from surfacewater, tile inlets, and sinkholes

Recommended Best Management Practices for Acetochlor Products

Maintain vegetative filter strips between areas where acetochlor is applied and points where field runoff enters surface water, tile inlets, and sinkholes

Recommended Best Management Practices for Acetochlor Products

- Reduce the amount of acetochlor used on a farm by using alternative weed control methods
  - Rotate use with herbicides having other modes-of-action
  - Mechanical cultivation
- Adopt conservation tillage practices appropriate for your farm's topography
  - No-till
  - Reduced tillage
  - Strip till and ridge till
- Use precision application methods
  - Auto steer
  - Auto boom shut off
  - Variable application rate technology

By following the label use requirements and restrictions and implementing Best Management Practices where possible you will play a major role in maintaining and protecting your states water resources

Questions?

The Acetochlor Registration Partnership, the New York State Department of Environmental Conservation, and Cornell University thank you for your attendance.