



Managing Pesticides to Protect Groundwater Quality

In the past few years, some pesticides have been detected in Arizona groundwater at low concentrations, generally in the parts per billion range. Currently, to the best of our knowledge, these detections do not constitute any health hazard to the general public. The purpose of our Education and Outreach Plan is to encourage users of pesticides to adopt voluntary best management practices (BMPs) that will prevent pesticide migration into groundwater, particularly in areas with shallow groundwater and coarse-textured soils.

Goal: To actively manage pesticides of concern to protect groundwater through education and outreach.

Pest Management Practices

- a. **Field Scouting.** Regularly monitor the field for both pest and predator populations. Pests include insects, weeds, and diseases.
- b. **Cultural Practices.** Evaluate whether an alternate form of biological control (such as predators, insect parasitoids and microbes) or other cultural practice may be used.
 - Consider whether varieties or crops more resistant to known pests are available.
 - Time your planting and harvest to minimize pest damage if applicable.
 - Consider the opportunity to avoid pest build-up when you evaluate crop rotation.
 - Grow crops on soil types that are most beneficial to that crop. This may help fight pest pressures.
- c. **Application.** Apply the pesticide when it will be most effective. Pests have cycles as well, which are influenced by temperature and moisture.
 - Match pesticide rates with pest conditions and pests.
 - Delay pesticide applications for impending rain activities.
 - Practice pesticide resistance management by rotating pesticides to avoid use of the same class of pesticide which can cause increased pest pressures due to resistance.
 - Consider band spraying which greatly reduces the overall amount of pesticide used.
- d. **Equipment.** Use proper application equipment in its most effective manner.
 - Make certain that your pesticide application equipment is properly calibrated and maintained. Over-application can cause harm to the crop, costs you additional money, and can be harmful to the environment. Under-application can result in poor control of the targeted pest and may lead to pesticide resistance in the targeted pest.
 - Prevent back siphoning to ensure the pesticide doesn't flow back into the water source.

- e. Irrigation Water Management.** Control the amount and timing of irrigation schedules to minimize infiltration to groundwater.
- Manage irrigation by knowing how much water needs to be applied.
 - Schedule irrigations based on the soil moisture and crop water use so as to minimize excessive application of irrigated water.
 - Adjust application amounts based on the crop demands at different stages of growth.
 - Apply irrigation water uniformly and accurately.
 - When used, chemigation equipment should be calibrated with each use to ensure accurate application of chemicals.
- f. Record Keeping.** Report all commercial pesticide applications and all applications of soil applied pesticides on the Arizona Ground Water Protection List (GWPL) to the Arizona Department of Agriculture as required by Arizona law.
- g. Storage and Disposal.** Pesticides should be handled and managed properly through appropriate storage, application and disposal.
- Consider the proximity to wells, streams, and ponds when locating storage sites.
 - Triple rinse and dispose pesticide containers properly.
 - Dispose unused pesticides properly. Diluted pesticide mixtures or rinsate are required by law to be applied to target crop.
 - Clean up all pesticide spills immediately.

ALWAYS READ, FOLLOW AND UNDERSTAND LABEL DIRECTIONS WHEN APPLYING, STORING, OR DISPOSING OF PESTICIDES

Summary of Groundwater Contamination Potential as influenced by Water Usage and Pesticide and Soil Characteristics

	Risk of groundwater contamination	
	Low risk	High risk
Pesticide Characteristics*		
<i>Water solubility:</i> Tendency of a pesticide to dissolve in water	low solubility	high solubility
<i>Soil adsorption:</i> The process that results in a pesticide being bound or adsorbed to a soil particle	high adsorption	low adsorption

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<i>Persistence:</i> The length of time a pesticide remains in the environment. It is normally measured in terms of half life or the time for half of the material to be broken down.	short persistence	long persistence
Soil Characteristics		
<i>Texture:</i> Refers to the proportion of sand, silt and clay particles.	fine clay	coarse sand
<i>Organic matter:</i> Considered the single most important soil property affecting pesticide adsorption. With soils that contain less than 1% organic matter, be aware of the possibility of leaching.	high organic matter	low organic matter
<i>Macropores:</i> Soil cracks or openings	few, small	many, large
<i>Depth to groundwater:</i>	deep (100 feet or more)	shallow (20 feet or less)
Water Volume		
<i>Rain/Irrigation</i>	small volumes at infrequent intervals	large volumes at frequent intervals

* *Information about pesticide characteristics can be obtained from the product manufacturer or other sources of information including the EPA and the Internet.*

Arizona Groundwater Protection List (GWPL)

The Arizona Department of Environmental Quality (ADEQ) provides an annual updated list of pesticides and active ingredients that are considered to have the potential to leach into groundwater. This list is available on the ADEQ website at www.azdeq.gov. The GWPL enables ADEQ to focus its statewide groundwater and soil monitoring activities on the active ingredients requiring monitoring and testing. If any of these active ingredients are detected in groundwater or soil as a result of agricultural activities, ADEQ may, depending on the level of concentration, require registrants to modify the recommended product use patterns or may cancel the registration to prevent further groundwater contamination.

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Detected Pesticides in Groundwater

ADEQ conducts regular groundwater monitoring in two areas of Arizona (Yuma and Buckeye areas) that are considered most likely to have pesticides detected in groundwater based on cultural practices, pesticide usage, shallow groundwater and coarse-textured soils. Results of groundwater monitoring have detected the following pesticide active ingredients in Arizona groundwater. Even though these concentrations are very low, users of these detected pesticides are encouraged to implement the voluntary BMPs.

Active Ingredient	Type of Pesticide	Common Brands	Manufacturer	Concentration Range (parts per billion)
Atrazine	Herbicide	Aatrex AL Steadfast ATZ	Syngenta DuPont	(0.02 – 0.36)
Dimethomorph	Fungicide	Acrobat Forum	BASF	(0.02 – 0.28)
Diuron	Herbicide	Ginstar EC Velpar Alfamax	Bayer DuPont	(0.02 – 0.30)
Imidacloprid	Insecticide	Provado Admire Gaucho	Bayer	(0.02 – 1.64)
Methoxyfenozide	Insecticide	Intrepid	Dow	(0.02 – 4.10)
Prometryn	Herbicide	Prometryn 4L Caparol 4L Cotton-Pro	Loveland Syngenta MANA	(0.02 – 0.96)

* Detection limits are 0.02 ppb (ug/l)

All pesticide active ingredients that are placed on the Arizona Groundwater Protection List (GWPL) are designated as “*Pesticides of Interest*”. (POI) Those pesticides that have actually been detected in groundwater are described as “*Detected Pesticides of Interest*” (DPOI). Those pesticides that occur in groundwater at levels that may be of potential risk to human health or exceed EPA health standards (such as MCL or HAL) are described as “*Pesticides of Concern*” (POC). No pesticides in Arizona groundwater belong to this category.

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