From Water Quality, Quantity and Security Initiative Strategic Plan

Groundwater Quality

The quality of California's water resources has been a major concern for the last half century. Public attention to this slow but insidious problem peaks periodically when faced with significant groundwater quality problems often associated with drinking water in urban areas. For the past 30 years, industrial and urban land uses have been broadly monitored and regulated. Prevention, detection, assessment, and remediation of industrial groundwater contamination from, for example, industrial waste seepage, solvents, petroleum product storage tank leakage, and poor landfill construction, as well as groundwater contamination from mining sites have been a major focus of regulatory agencies.

Also receiving attention are agricultural impacts on groundwater quality. Some examples include the selenium contamination in drainage water from San Joaquin Valley drainage 30 years ago or the periodic concern about the loss of irrigated land from perched, high-saline groundwater.

Studies conclude that the net salt accumulation in the San Joaquin Valley total approximately one-half million tons per year in the form of dissolved salts in both shallow and deep groundwater. Salt imports by infiltration into the valleys are governed by rainfall, surface water, and groundwater pumping; whereas salt exports are from drainage, bottom flux towards deep groundwater, and lateral flows to the San Joaquin River. Already, significant areas of irrigated land, in excess of 100,000 acres, have been removed from production due to encroaching sub-surface salinity. Studies project this will continue unless substantial changes in irrigation policy and practice are adopted.

Nitrate is California's most ubiquitous groundwater contaminant. Nitrate is a natural part of the nitrogen cycle in the environment, and nitrogen is essential to global food security, but too much nitrate can affect human health. Intensive agriculture and human activities have increased the occurrence of nitrate in the environment. Nitrogen contamination of groundwater and its effect on drinking water, public health, and other uses has been a concern for many decades, but only over the past five years has California legislatively moved to regulate agricultural sources of groundwater quality degradation (primarily nutrients and salts) under its four-decade-old Porter-Cologne Water Quality Control Act.

Preferred areas for research and extension

Topics common to agricultural and urban land uses:

- Characterization of materials of concern in groundwater recharge from irrigated land uses (nutrients, pesticides, pathogens, sediments, emerging contaminants).
- Impact of current and alternative irrigation delivery methods on movement of contaminants in recharge.
- Mitigation strategies to minimize movement of contaminants in recharge, including both structural and non-structural management practices.

- Management of recycled water contaminants in urban and agricultural irrigated lands recharge, including emerging contaminants, pathogens, salts, and nutrients into surface waters.
- Minimizing leaching of pesticides through the use of integrated pest management practices.

Topics specific to production agriculture:

- Effective monitoring methods to assess nitrate and salt leaching to groundwater that improve production agriculture's ability to respond to potential groundwater contamination.
- Improved management practices for confined animal farming operations (CAFOs) and their accumulated manure to minimize leaching of salts, nutrients, pathogens, and emerging contaminants such as antibiotics.

Topics specific to urban environments:

- Assess and develop urban landscape management practices that reduce leaching of salts, nutrients, pesticides, and emerging contaminants into groundwater.