

## Seawater intrusion challenges coastal communities

Residents of many Washington coastal communities are worried about excess salt in their diets. It's not potato chips that concern them – it's their well water. According to US Geological Survey studies, pure ground water resources in seven counties are threatened as population growth leads to overdrafting of freshwater aquifers. When aquifers close to the sea are overdrawn, underground saltwater can "intrude" on drinkable groundwater, rendering it unusable.

Seawater intrusion is a shift in the natural equilibrium between fresh and saline ground water. Under natural conditions (see figure 1), aquifers in hydraulic continuity with saltwater are kept pure by the outward pressure of freshwater flowing toward the sea. Ground water recharge is unimpeded by impervious surfaces such as asphalt parking lots.

As freshwater is pumped from the aquifer, seawater is induced toward wells (see figure 2, next page). In ad-

vanced stages, excessive pumping throughout the basin overdraws the aquifer, and saline ground water invades seaward wells (see figure 3). This process is extremely difficult and expensive to reverse.

While the causes of seawater intrusion are related to water *quantity*, the effects can be measured in terms of water *quality*. Scientists use chloride concentrations as an indicator of seawater intrusion. Although the chloride concentration of seawater is approximately 19,000 milligrams per liter (mg/l), seawater intrusion can occur when a concentration of 100 mg/l is reached. This fact underscores the sensitivity of coastal aquifers to contamination. (Note: Salty taste in water is not evident to most people until a 250 mg/l concentration is attained;

the WA Department of Health has established 250 mg/l as a secondary maximum contaminant level for chloride in drinking water.)

### How bad is the problem?

Seawater intrusion was first reported in Elliott Bay as early as 1922. A 1978 U.S. Geological Survey study of Washington's coastal zone concluded that seawater intrusion was a moderate, but widespread problem in Clallam, Jefferson, Pierce, Thurston and Whatcom Counties. Conditions in San Juan and Island Counties were classified as severe but localized. Accelerated sea level rise due to global warming is expected to compound the problem in a number of coastal areas.

### What's being done?

The Growth Management Act requires local governments, particu-

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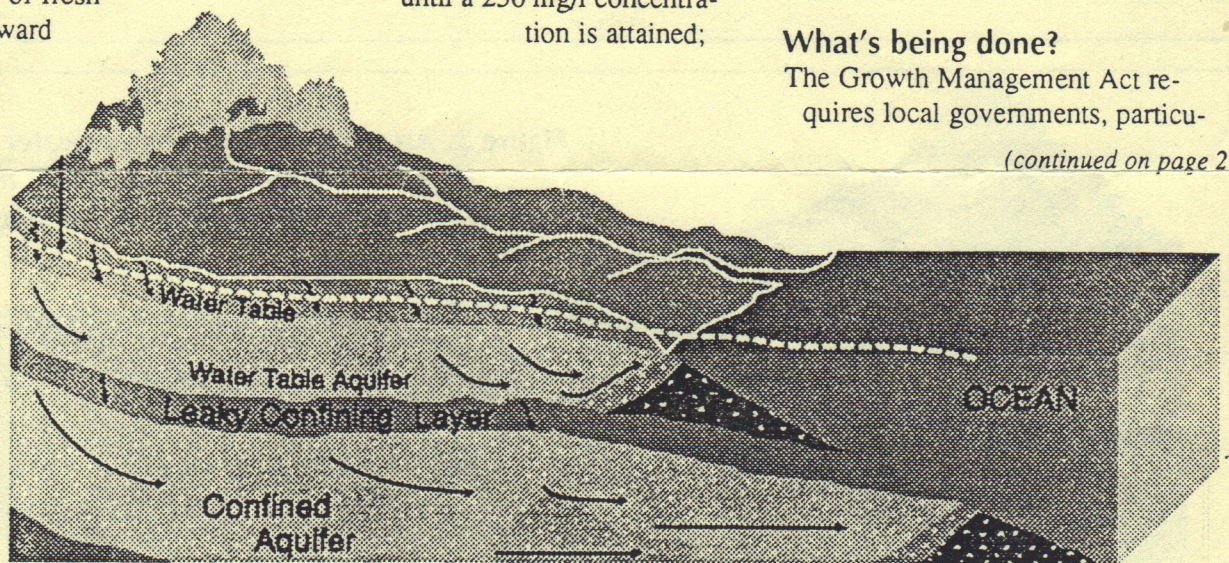


Figure 1. Generalized diagram of an aquifer in hydraulic continuity with the sea. Fresh and saline groundwater meet at a dilution zone. Arrows indicate pressure gradient causing freshwater movement toward sea.