Groundwater Issues in the Osoyoos Basin:

What we Know and Don't Know

Osoyoos Lake Water Science Forum

Gwyn Graham, P.Geo.
Environment Canada

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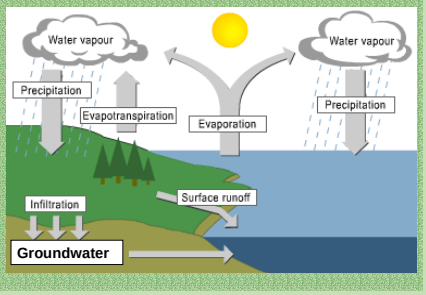
Hydrogeology: The Study of Groundwater

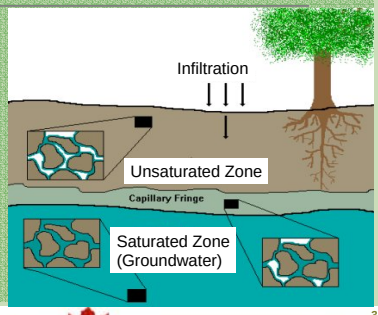
The Hydrologic Cycle



Hydrogeology – Basics

- Aquifer:

Geological formation (rock or sediment) that can yield water in significant quantities.

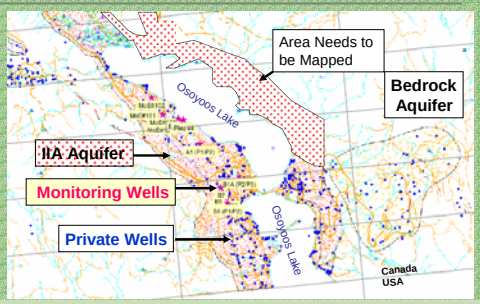


Osoyoos Aquifers

How were they formed?

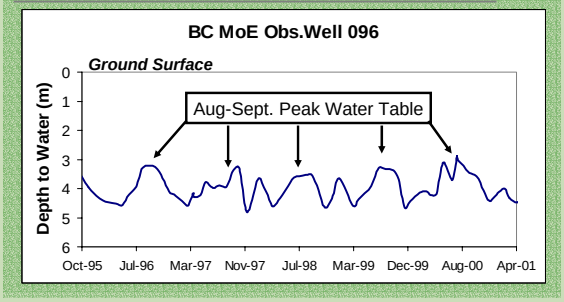
> 20,000 yrs ago ~ 15,000 yrs ago Today

Osoyoos Aquifer Map (BC MoE)

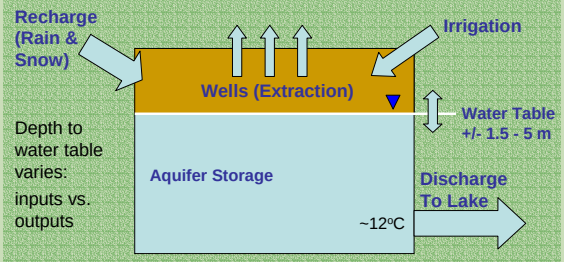


Source: BC Water Resources Atlas

Seasonal Variability - Water Levels



Explaining Water Table Variability…



Groundwater Flow Rates

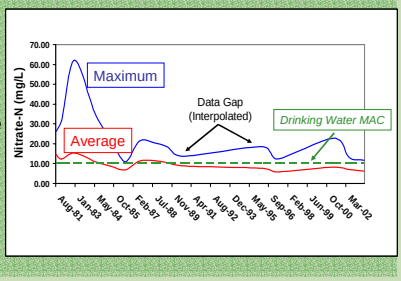
- Groundwater flow rate ranges from ~ 125 to 1250 m/yr (30 cm to 3.5 m per day); takes ~ 1 to 10 years for water to move through aquifer.
- Large range due to variability in aquifer properties (variable sediment sizes, e.g. silty-sand to gravel).
- Groundwater flow direction is primarily perpendicular to the Lake (groundwater discharges to Osoyoos Lake)
- Current groundwater discharge estimates are unreliable due to a number of uncertainties/unknowns:
  - *Aquifer properties, aquifer thickness, role of bedrock aquifer, quantity of irrigation return flow, private well use and estimation of natural recharge rate.*

Groundwater Quality

- Environment Canada sampling at 10 sites: 1989 to 2007
- Primary Water Quality Concern is Nitrate (high in some areas of aquifer)
  - fertilizer and septic sources
- A few pesticide have been detected at very low concentrations (*Herbicides)
- University Research Project investigating groundwater quality and tile drain effects

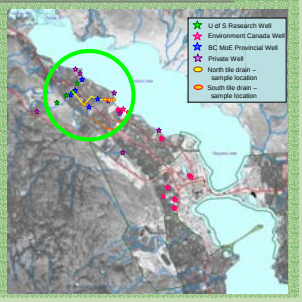
Nitrate Concentrations

- General decrease in Nitrate concentrations over time
- Moderate degree of annual variability
- Data primarily reflects West Side Aquifer



Tile Drainage and Ground Water Quality

- Research:
  - University of Saskatchewan (2006 and 2007)
  - AAFC (1997 – 2002)
  - Environment Canada
- Aquifer not as extensive in northern rural Osoyoos
- Tile drainage systems installed for drainage of groundwater
- Nitrogen-Isotope analyses to confirm nitrate sources



Summary of Key Points

- **Local Aquifers contribute groundwater flow to Osoyoos Lake**
- **Groundwater flow is relatively slow (1-10 yr residence time) compared to surface run-off**
- **Aquifer is vulnerable to contamination**
- **Nitrate levels have been moderating over time**
- **A few pesticides (mainly herbicides) detected at very low concentrations**
- **Long-term aquifer monitoring is important in terms of implications to drinking water quality and lake water quality**
- **More work needed to improve current estimates of aquifer properties and overall groundwater discharge to the lake**


Contact Information
Gwyn Graham, P.Geo.
Senior Hydrogeologist
Environment Canada
Pacific & Yukon Region,
201-401 Burrard St.
Vancouver, B.C.
V6C 3S5
Email: Gwyn.Graham@ec.gc.ca
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Environment Canada
www.ec.gc.ca