

Testing the H60 concept: Using tracers to study snowmelt contribution to the freshette hydrograph

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Rationale

- **H60 concept:** in IWAP, allowance for disproportionate contribution of upper 60% of catchment area to snowmelt peak flows
- Assumes fairly direct & immediate link between snowmelt & appearance of water in stream
- **PLAN:** test H60 using tracers, to measure lag between snowmelt & surface runoff

Method

- Spike snowpack with chemical tracers: deuterium as heavy water (D_2O) and Chloride
- Both tracers are conservative – move through system (without being retained by soil or vegt)
- Measure time of melt of spiked snowpack
- Sample streamwater to measure when tracers from particular location leave catchment
- Time lag between melt & discharge indicates route & residence time

Study locations

2004 season; 3 small, higher elevation catchments

- Dennis Creek, Upper Penticton Creek LTRI
- Redfish Creek, near Nelson
- Bear Skull Creek, north of Big White

2005 season

- Dennis Creek, Upper Penticton Creek LTRI
- Redfish Creek, near Nelson
- Cotton & Elk Creeks, near Cranbrook

2006 season; large operation scale catchments

- Pearson Creek, above Joe Rich
- Upper Chase Creek

Dennis Creek snowpack, April 2005



Temperature recorder (flagged) and tracer (ice cubes) added to snowpack



Results

- Both tracers work - are detectable in streamwater
 - Produce discrete spikes in concentration
- Thus far, short lag between melt & appearance in streamflow

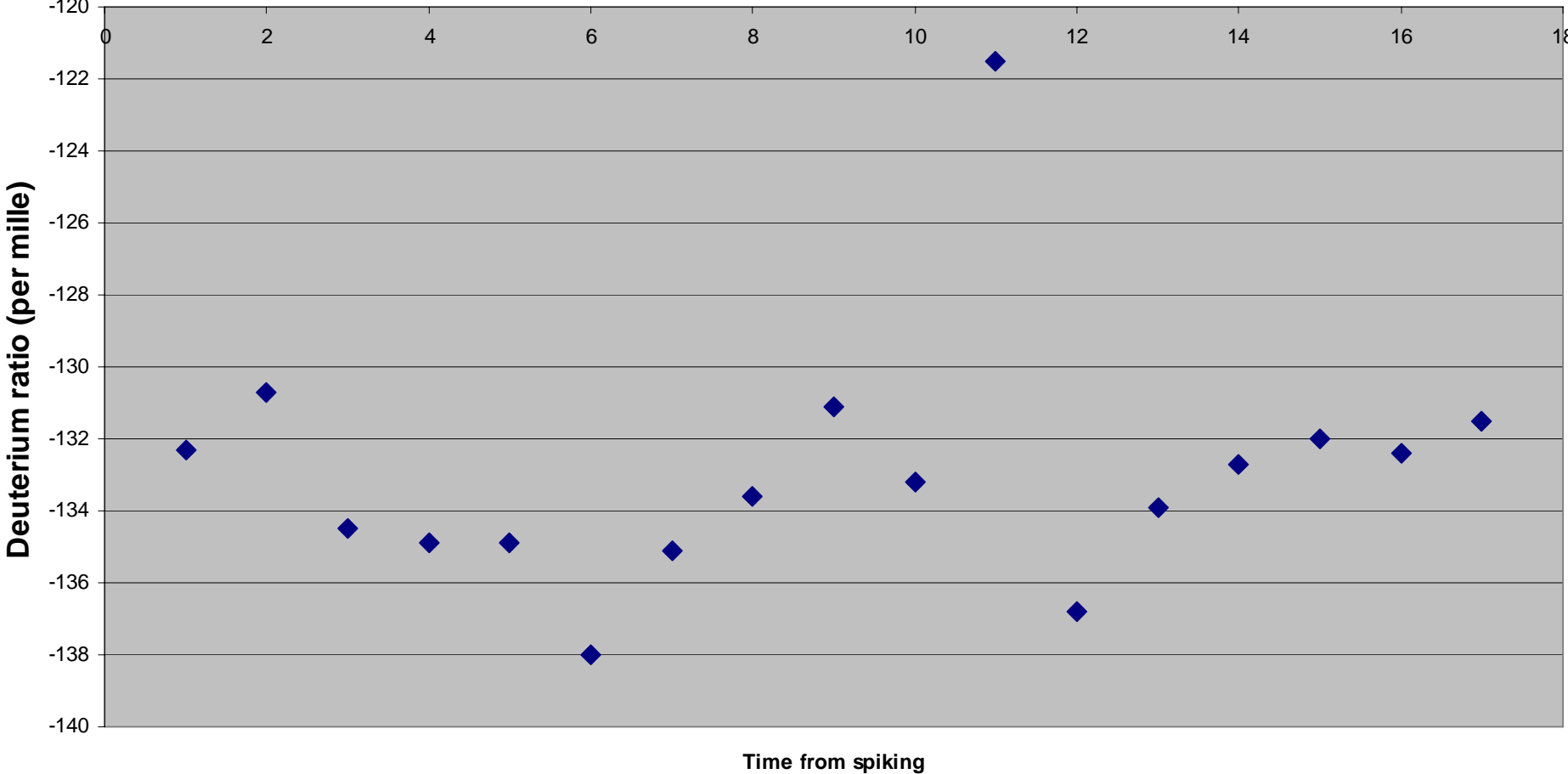
Non-results

- Await additional deuterium results to clarify discharge pattern
- Have not determined snowmelt time yet (logger failure)
- Have not linked snowmelt to hydrograph
- Need to still measure actual distance to stream (travel distance to stream)

What next?

- Small catchments – want to scale up to operational scale; to get realistic altitudinal range
- Introduce tracers earlier in season (2005)
- Use tracers in combination to mark several locations within catchment
- Better monitoring of melt

Dennis Creek Deuterium



Determining timing of snowmelt using temperature probes in snowpack.

Hourly temperature of probe placed in snowpack, Cotton Creek

