Homolog-Specific Mass Balance Assessment: Preliminary Findings

Dave Dilks
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Summary

• Draft homolog-specific mass balance analysis underway for 2014 and 2015
  – Results are generally consistent between years
  – No new sources identified

• Fingerprints estimated for previously suspected sources
Outline

- Background
- Mixed flow in Trent to Greene reach
- Preliminary results
- Next steps
Background

• 2014 and 2015 synoptic surveys were intended to support mass balance assessment
  – “Where do we see concentrations in the river larger than what would be explained by known loads?”

• Originally conducted using total PCB concentrations

• Now being extended to consider individual homologs
2014 Sampling Locations

SPOKANE RIVER

Synoptic Sampling Locations

- Flow gage
- Permitted discharge outfall

Map showing sampling locations along the Spokane River and its tributaries.
2015 Sampling Locations
Reaches being Analyzed

• 2014
  – Lake Coeur d’Alene to Post Falls
  – Post Falls to Barker
  – Barker to Trent
  – Trent to Greene
  – Greene to USGS Gage

• 2015
  – Barker to Mirabeau
  – Mirabeau to Trent
  – Trent to Greene
Trent to Greene Issue

• Mass balance assessment best suited for reaches that either:
  1. Gain groundwater
  2. Lose to groundwater
     but not reaches that both gain and lose

• Trent to Greene contains mixture of losing and gaining sections
Trent to Greene Issue
Trent to Greene Issue

• Original mass balance for Trent to Greene was conducted solely on “net” groundwater flow

• Potentially inaccurate
  – Implicitly assumes that groundwater concentrations entering the river are identical to concentrations that previously left the river
Trent to Greene St. Reach

- Original analysis provides some counter-intuitive results
  - Negative loading of some homologs
More Rigorous Treatment

- Sub-divide reach into pieces
  - Trent to Inland Empire Paper
  - Inland Empire Paper to Upriver Dam
  - Upriver Dam to Greene
More Rigorous Treatment

- Sub-divide reach into pieces
  - Trent to Inland Empire Paper
  - Inland Empire Paper to Upriver Dam
  - Upriver Dam to Greene
- Calculate each piece separately
More Rigorous Treatment

• Sub-divide reach into pieces
• Calculate each piece separately
• Make alternate assumptions about groundwater behavior
  – a. Incoming groundwater is “old”
More Rigorous Treatment

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  - a. Incoming groundwater is “old”
  - b. Incoming groundwater is “new”
More Rigorous Treatment

• Sub-divide reach into pieces
• Calculate each piece separately
• Make alternate assumptions about groundwater behavior
  – a. Incoming groundwater is “old”
  – b. Incoming groundwater is “new”
• Results from a. and b. should bound the true solution
Preliminary Results - 2014
Incremental Load (mg/day)

- No surprises from Lake Coeur d’Alene Barker Rd.
  - Total PCB load was small
  - Load of each individual homolog small, as well
Preliminary Results - 2014

Incremental Load (mg/day)

- Barker Rd. to Trent load shows a distinct signature
- More detailed analysis of Trent to Greene reach doesn’t resolve negative load issue
Preliminary Results - 2014
Incremental Load (mg/day)

- Strong di- and penta- signal
Preliminary Results - 2015

Incremental Load (mg/day)

- Distinctly different signal when dividing Barker Rd. to Trent Bridge into two sections
  - Penta- through hepta- upstream of Mirabeau
  - Tri- and tetra- downstream of Mirabeau

![Graphs showing incremental load](image-url)
Preliminary Results - 2015
Incremental Load (mg/day)

- Still seeing loss of lower chlorinated homologs between Trent and Greene
- Still penta- load between Greene and USGS gage
Preliminary Results – 2014 & 2015

Incremental Load (mg/day)

- Hexa- load above Mirabeau in 2015 could be anomalous or ephemeral
- Penta- load above Mirabeau observed both years
- Tri- and tetra- signal below Mirabeau observed both years
Preliminary Results – 2014 & 2015

Incremental Load (mg/day)

- Hexa- load above Mirabeau in 2015 could be anomalous or ephemeral
- Penta- load above Mirabeau observed both years
- Tri- and tetra- signal below Mirabeau observed both years

Barker to Trent Bridge

- Hexa-load above Mirabeau in 2015 could be anomalous or ephemeral
- Penta-load above Mirabeau observed both years
- Tri- and tetra- signal below Mirabeau observed both years
Preliminary Results – 2014 & 2015

Incremental Load (mg/day)

- Hexa- load above Mirabeau in 2015 could be anomalous or ephemeral
- Penta- load above Mirabeau observed both years
- Tri- and tetra- signal below Mirabeau observed both years
Preliminary Results – 2014 & 2015

Incremental Load (mg/day)

- Consistently seeing loss of lower chlorinated homologs between Trent and Greene
- Consistently see penta-load between Greene and USGS gage
Summary

• Results are generally consistent between years
  – No “new” sources identified
  – Fingerprints estimated for previously suspected sources

• Some questions remain
  – Load above Mirabeau: Ephemeral or anomalous?
  – Loss of tri- and tetra- below Trent?
  – Source below Greene?
Next Steps

• Compare homolog patterns for “unknown” loads to homolog patterns for groundwater samples