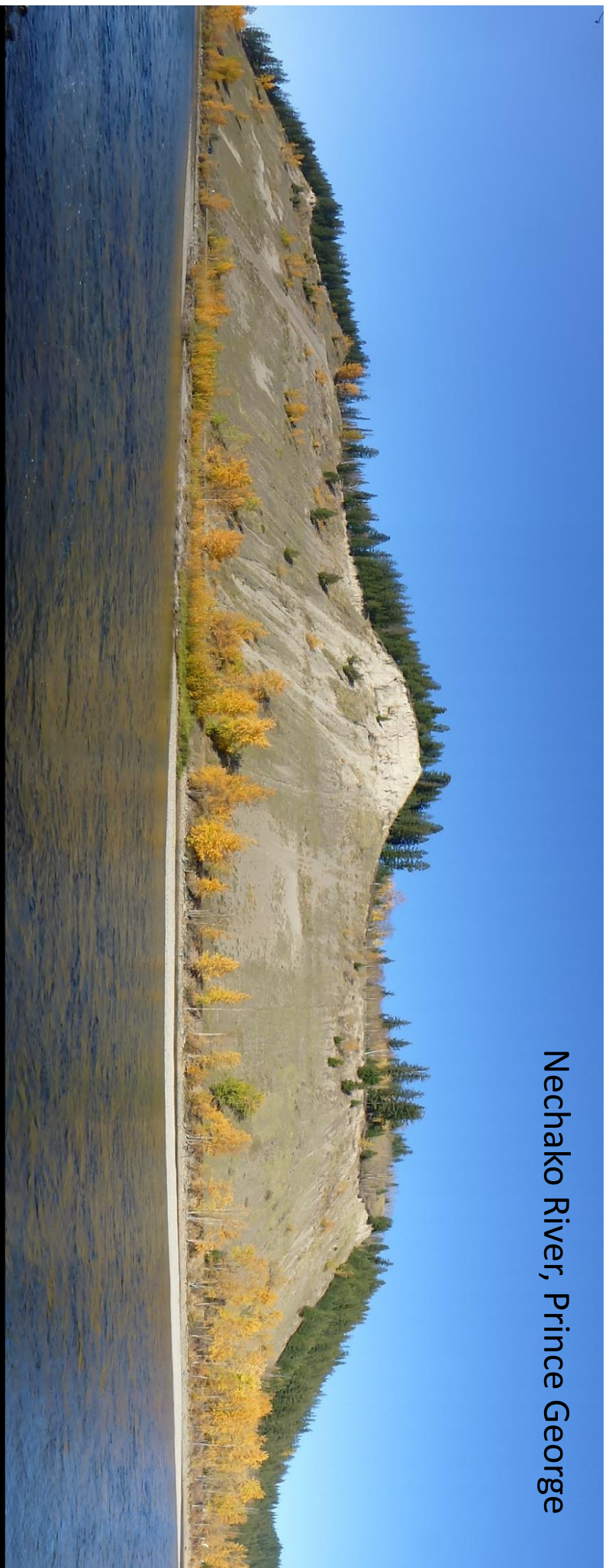


Nechako River, Prince George



Determining the sources of fine-grained sediment in the Nechako watershed

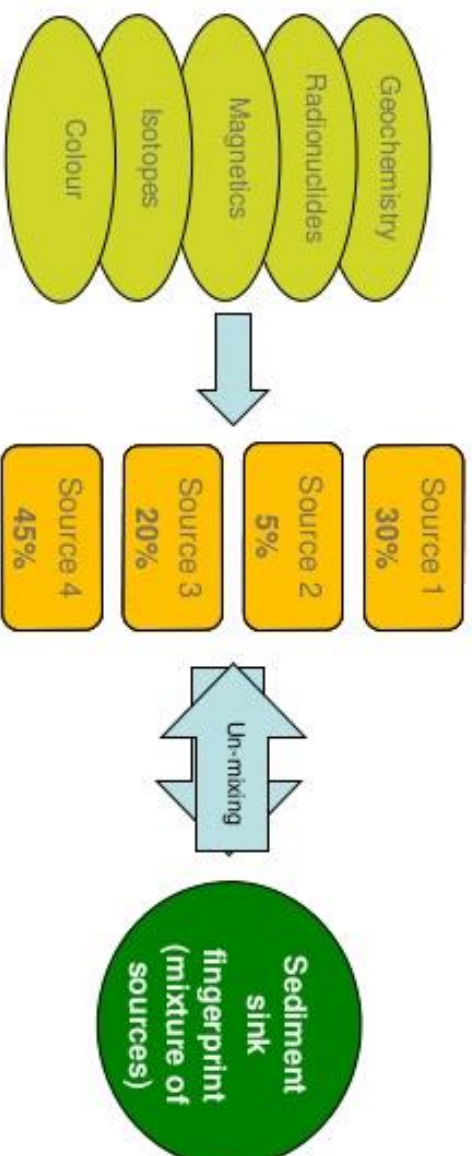
Phillip N. Owens, Ellen L. Petticrew, David Gateuille,
Barry Booth, Todd French

**Research objective:
identify sources of fine-grained sediment, especially
in areas of important salmonid and sturgeon habitat**



Nechako at Vanderhoof spawning areas

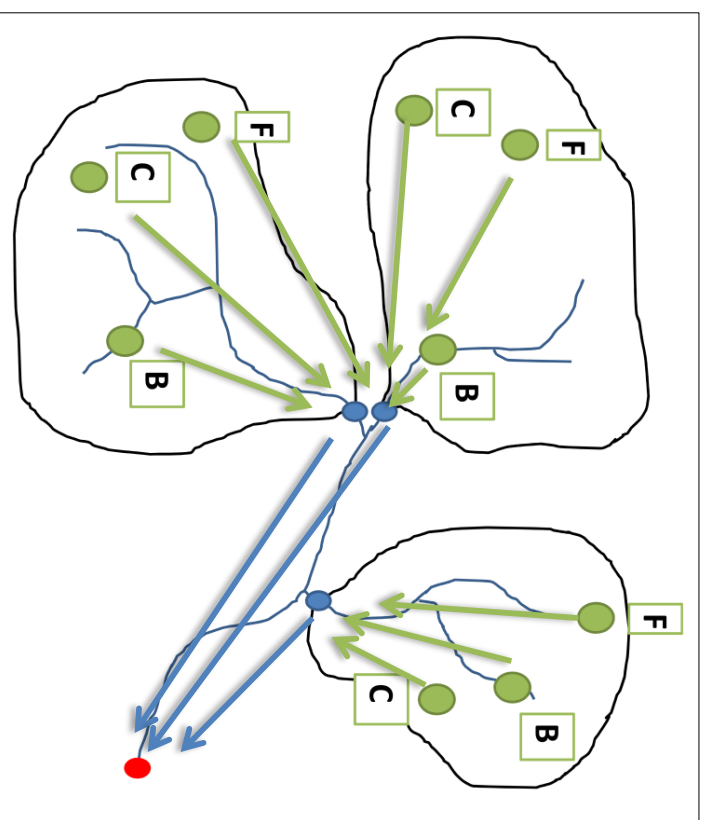
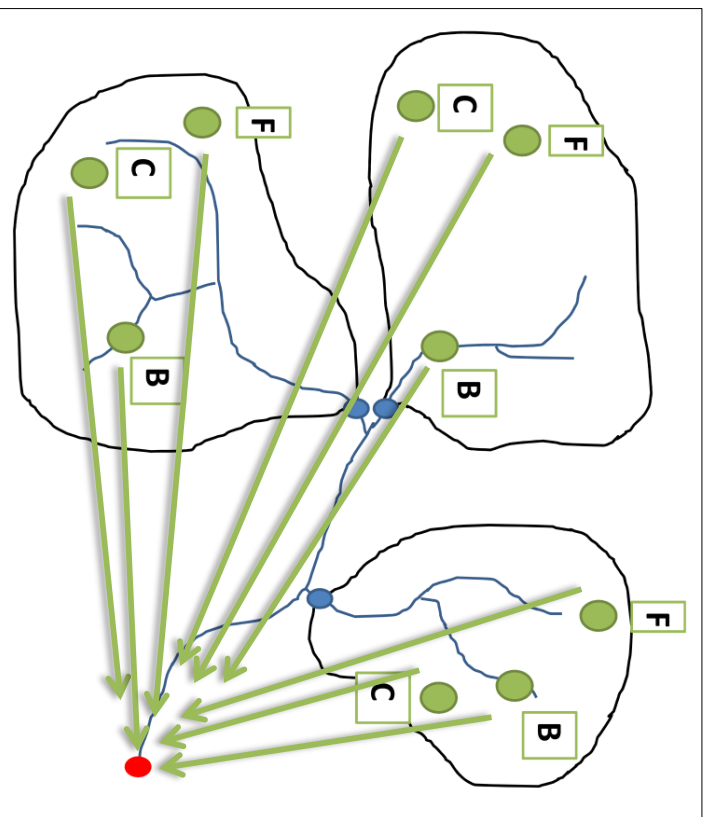
Sediment source fingerprinting



The Irish Agriculture and Food Development Authority

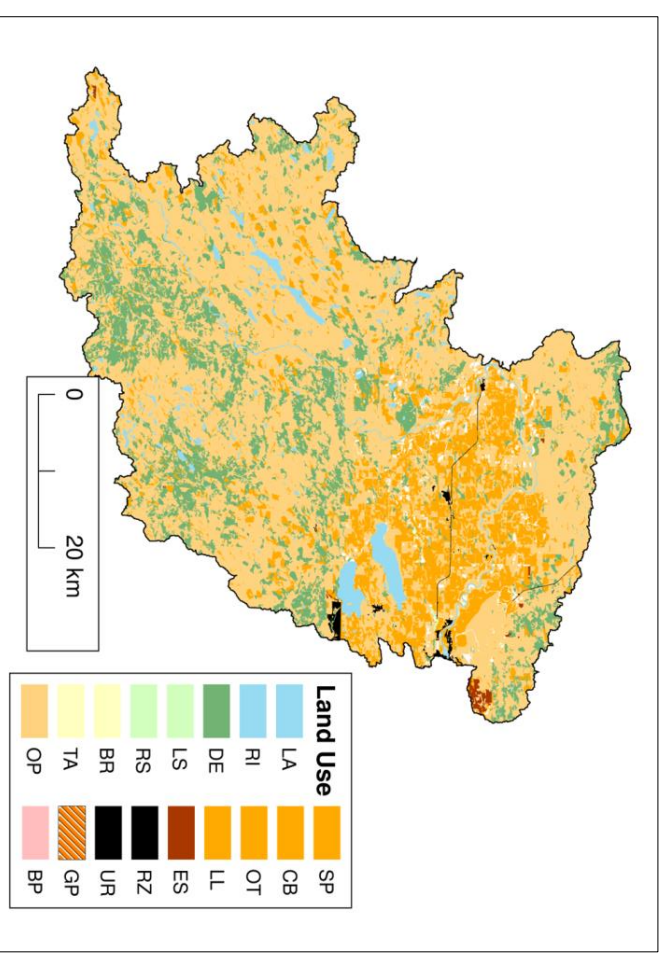
Sampling strategy: Sediment

- Direct approach
- Nested approach



Sampling strategy

- Focused study area:
 - 3360 km²
- What have we been collecting:
 - Suspended sediment samples (>150 samples to date)
 - Soil samples (100)
 - Bank samples (39)
 - Other (22)
 - Sediment cores (5)



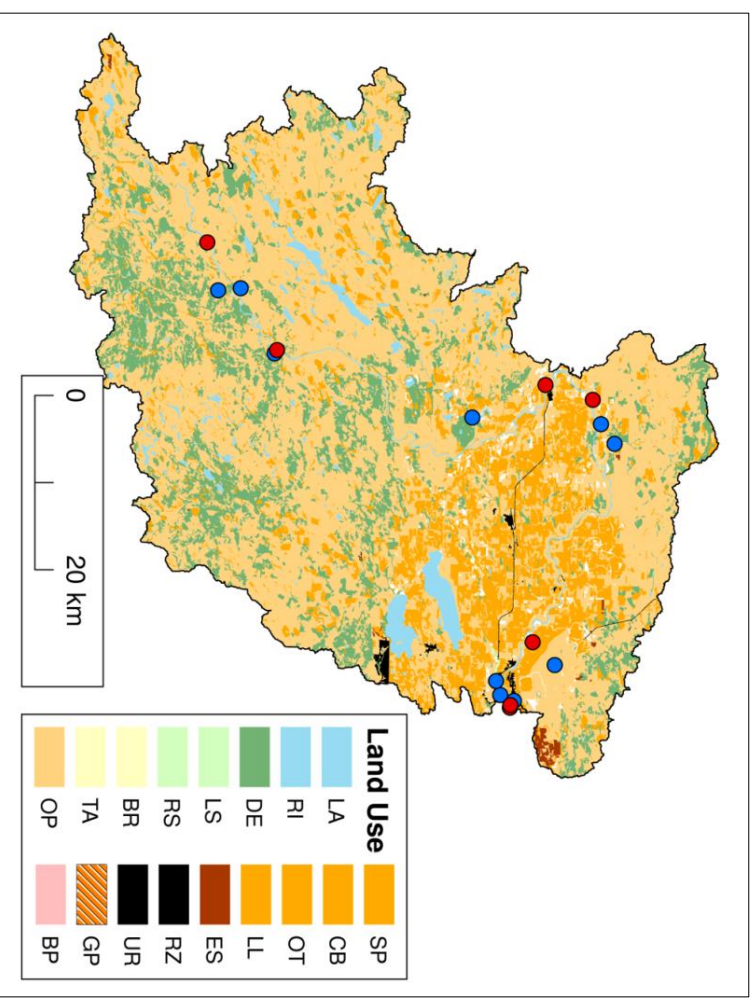
Sampling: Sediment

- Time-integrated sediment samplers installed and emptied every 2 weeks



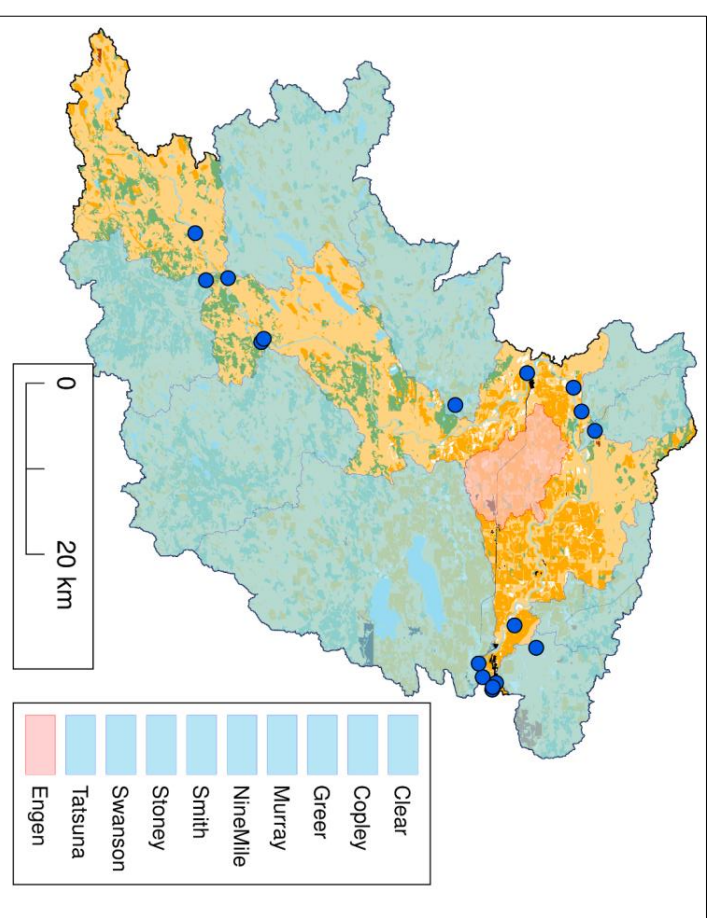
Sampling: Sediment

- 6 sites along the Nechako mainstem
- Longitudinal gradient
 - Background
 - Upstream woodland
 - Agricultural lands
 - Urban Area
- Some key tributaries



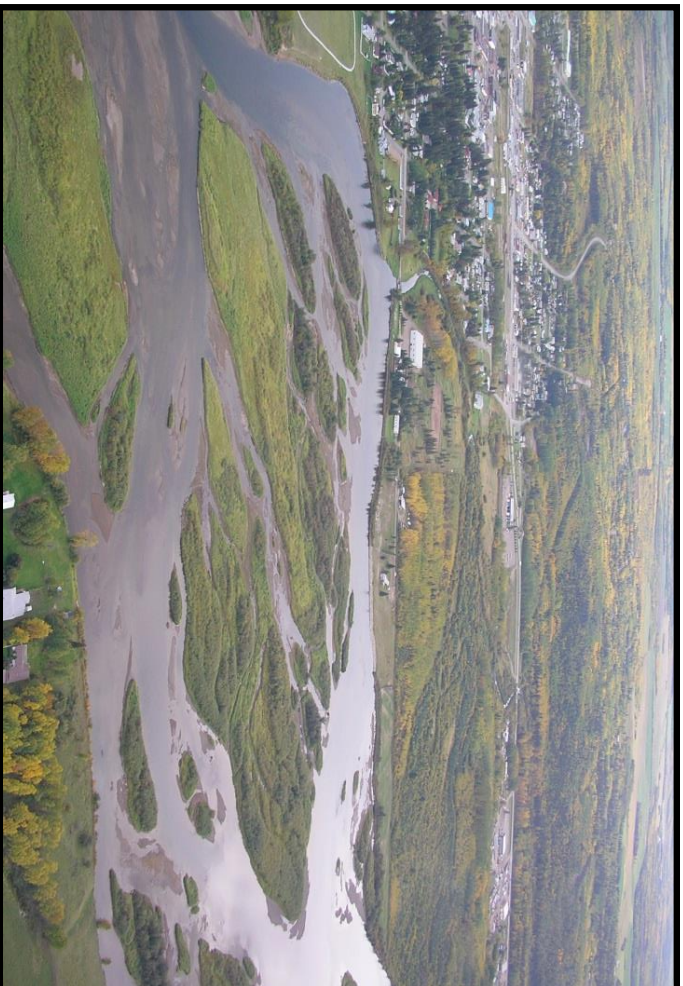
Sampling: Sediment

- Samplers in 9 key creeks
 - Sediment from contrasting sub-watersheds in terms of land use and location
 - Total drainage area: 2200 km² – 65%



Sampling: Floodplain sediment cores

- Reconstructing sources over last 50-100 years
- 5 Sediment cores



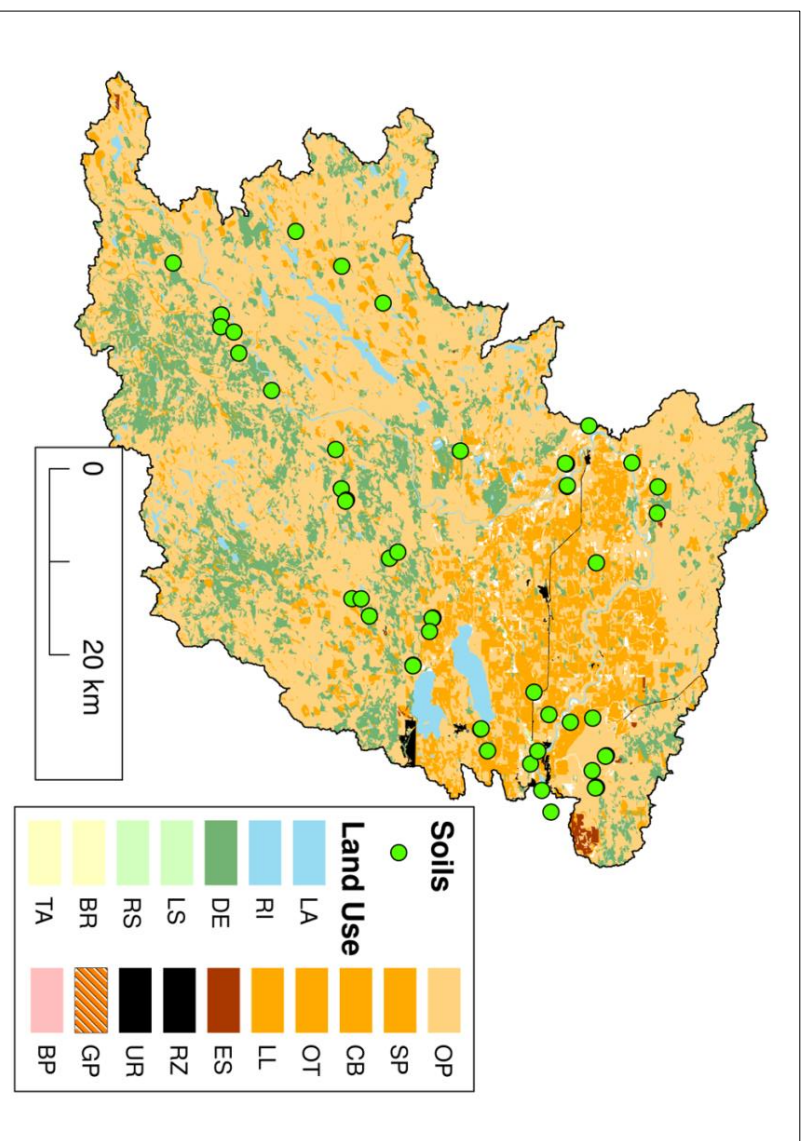
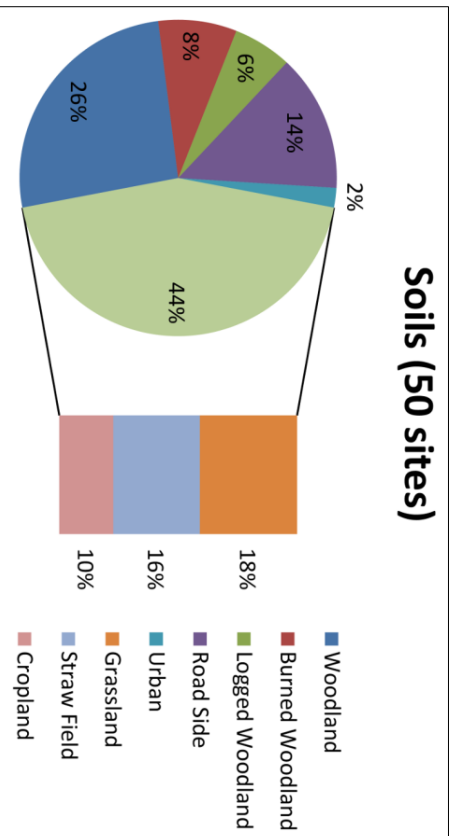
Sampling: Sources – Soils

- 50 soils were sampled representing contrasting land use and location within the watershed
- Topsoil/sub-surface
- 10 sub-samples collected per field and mixed together to form a composite sample



Sampling: Sources – Soils

- Soil samples collected representing various land uses



Sampling: Sources – woodland soils

Pristine Woodland



Burned Woodland



Sampling: Sources – Agricultural soils

Grassland

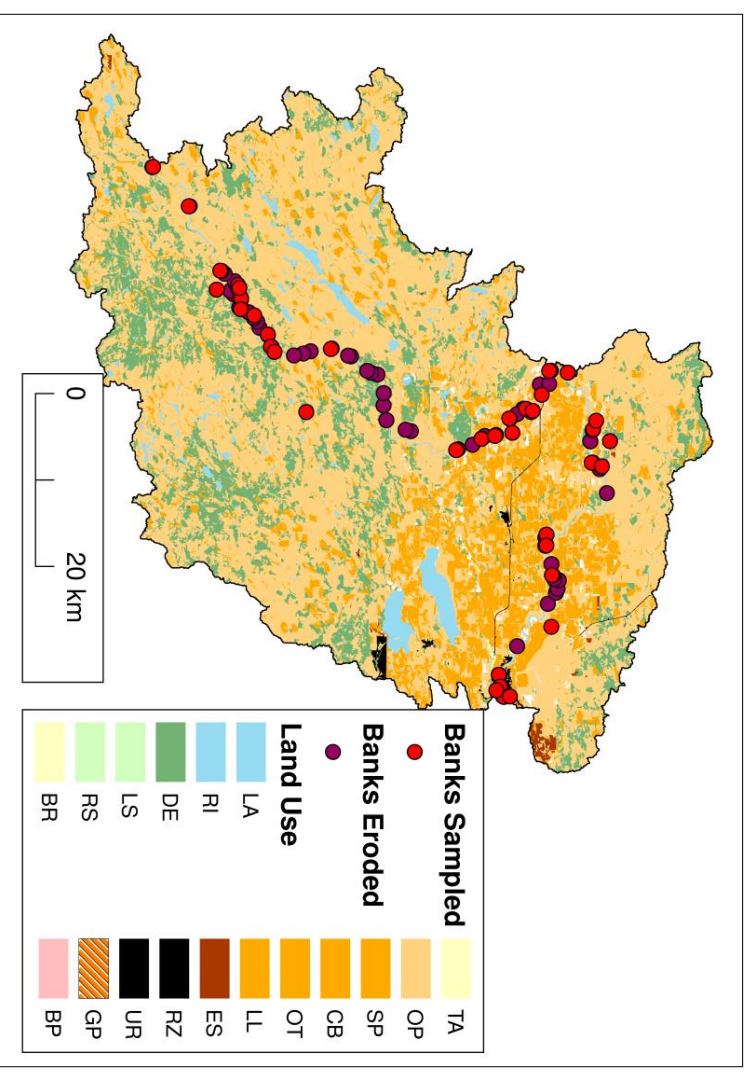


Cropland



Sampling: Sources - Banks

- Areas of active bank erosion
- Sampled various kinds of banks
- 30 samples collected along the Nechako mainstem
- 9 samples collected in the creeks



Sampling: Sources - banks



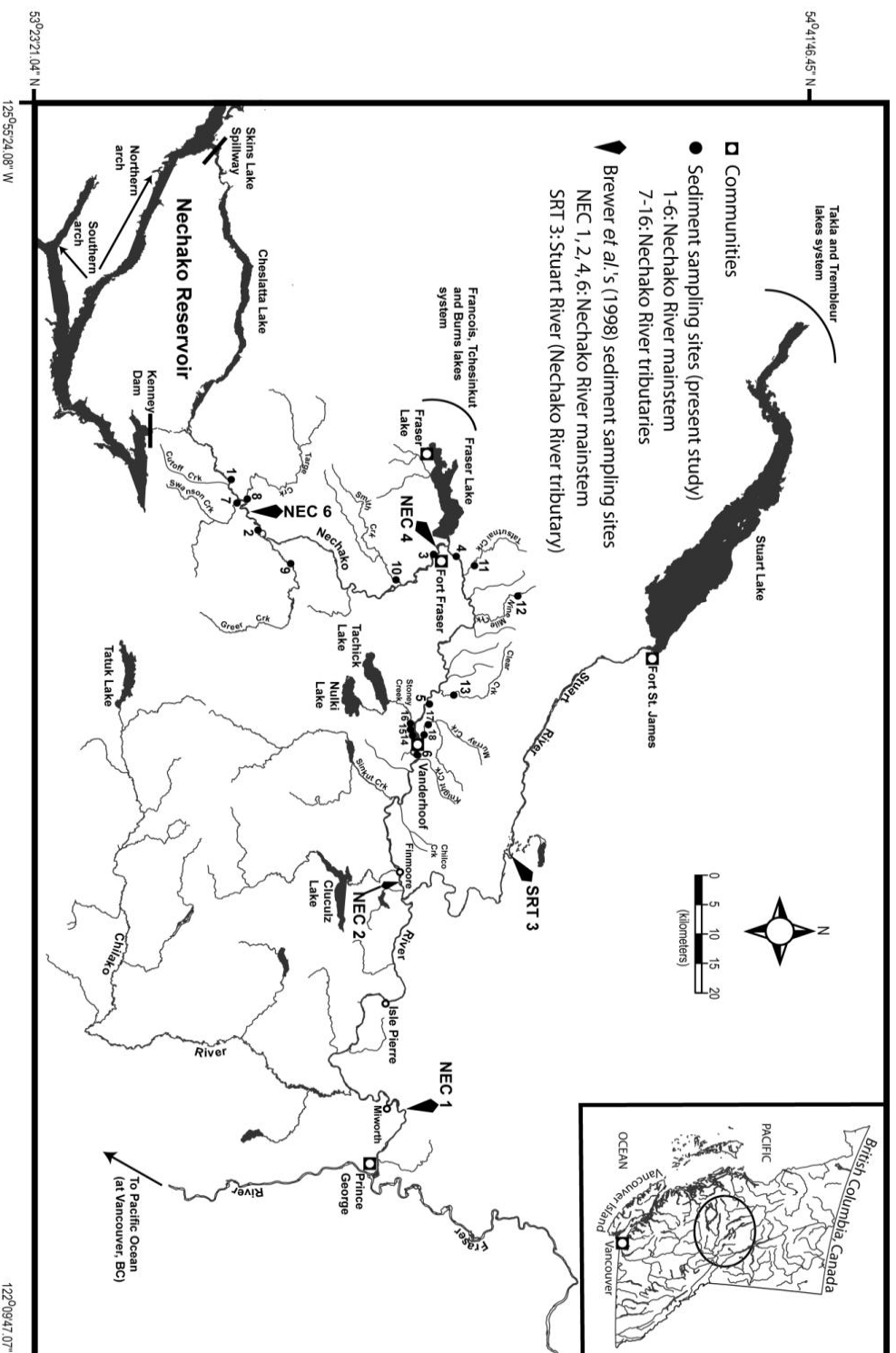
Analyses: Geochem, FRNs, particle size, OM



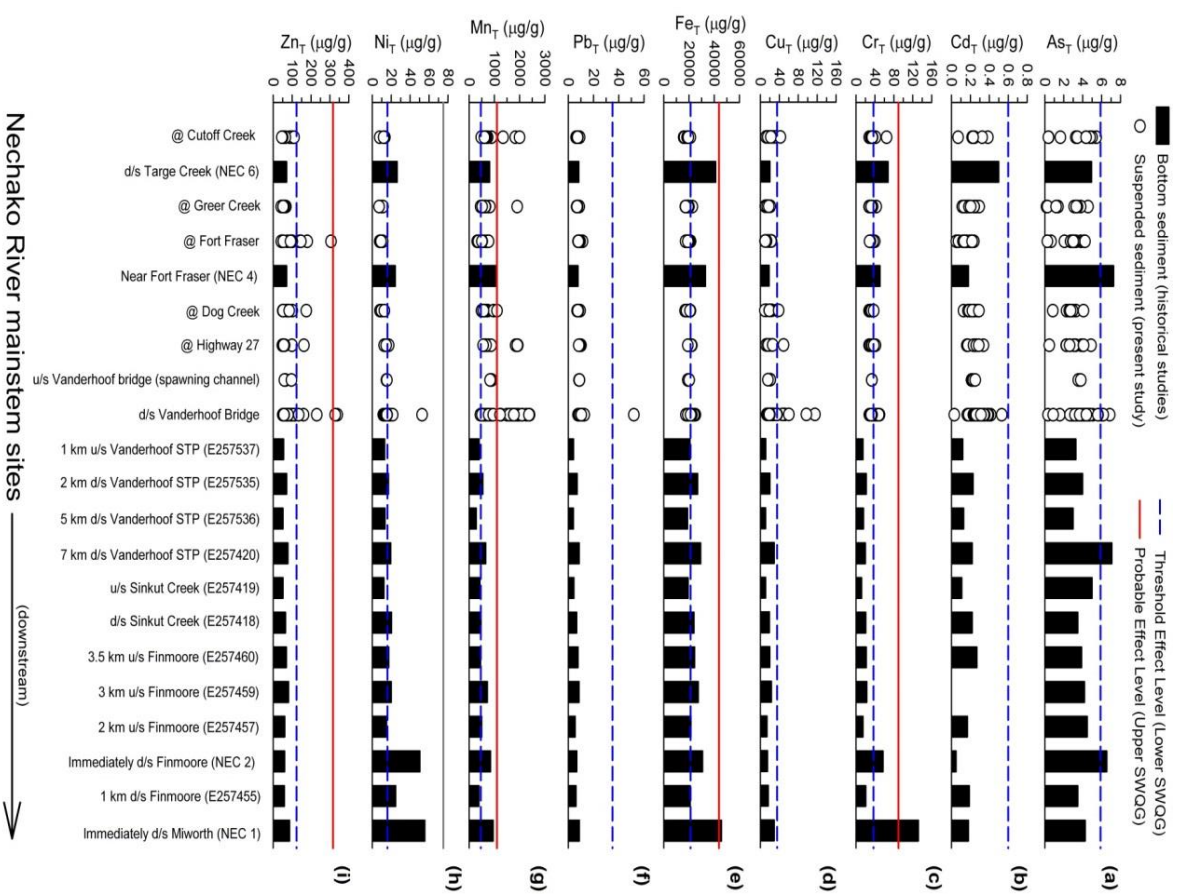
What did we find?



Added value work - sediment quality assessment



Sediment quality - metals



Sediment quality – PCBs

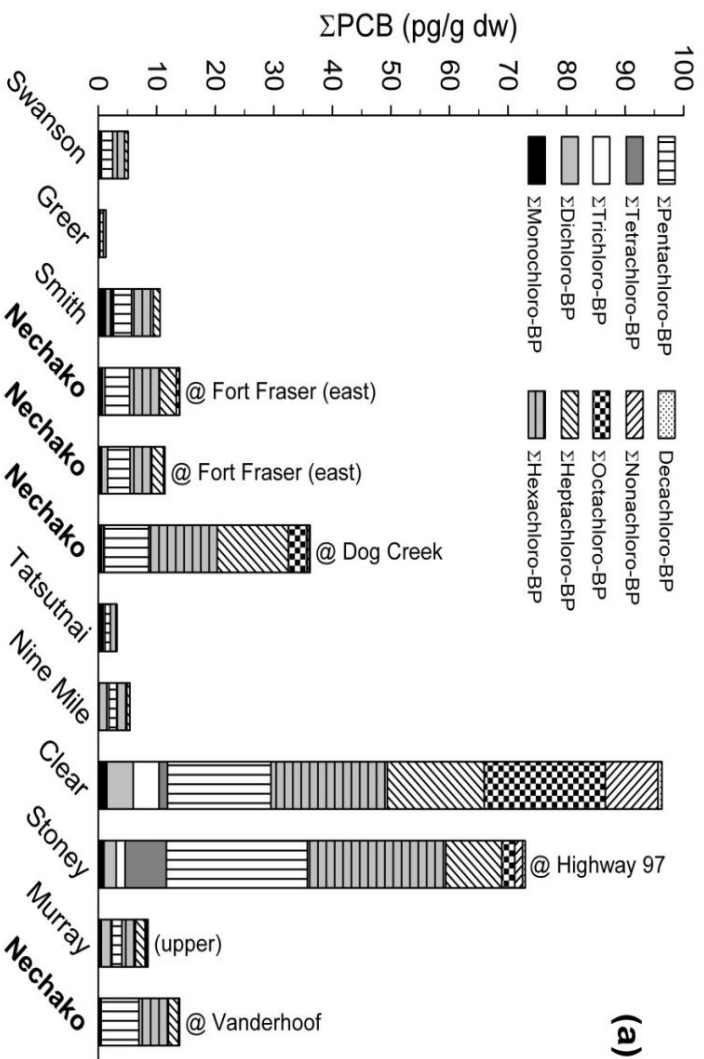


Table 1. Interim sediment quality guidelines (ISQGs) and probable effect levels (PELs) for total PCBs and Aroclor 1254 ($\mu\text{g}\cdot\text{kg}^{-1}$ dw).

| | Freshwater | Marine/estuarine |
|------------|------------|------------------|
| Total PCBs | | |
| ISQG | 34.1 | 21.5 |
| PEL | 277 | 189 |

Present land use

| Map site reference (Figure 1) | Sub-basin | Drainage area (km ²) | Major landuse characteristics (% drainage area) | | | | | | | | | | |
|--------------------------------------|-----------------|----------------------------------|---|-------|-------|--------------|--------------|---------|-------------------|------------------|------------------|-----------|-----------|
| | | | Agriculture | Urban | Roads | Σ Cleared | Exposed land | Wetland | Coniferous forest | Broadleaf forest | Mixedwood forest | Shrubland | Grassland |
| (a) Nechako River mainstem | | | | | | | | | | | | | |
| 1 | @ Cutoff Creek | 1,427.79 | 0.64 | 0.15 | 0.67 | 1.46 | 0.47 | 2.37 | 76.78 | 0.96 | 1.59 | 10.52 | 0.21 |
| 2 | @ Greer Creek | 2,593.79 | 0.52 | 0.14 | 0.66 | 1.32 | 0.55 | 3.06 | 80.70 | 0.84 | 1.03 | 8.25 | 0.24 |
| 3 | @ Fort Fraser | 3,192.97 | 1.34 | 0.19 | 0.75 | 2.28 | 0.54 | 3.44 | 78.07 | 1.39 | 1.01 | 9.31 | 0.27 |
| 4 | @ Dog Creek | 9,799.79 | 1.38 | 0.41 | 1.03 | 2.82 | 0.75 | 2.77 | 68.78 | 2.83 | 4.71 | 11.59 | 0.14 |
| 5 | @ Highway 27 | 10,320.60 | 2.51 | 0.45 | 1.10 | 4.06 | 0.71 | 2.79 | 67.71 | 2.97 | 4.47 | 11.97 | 0.14 |
| 6 | @ Vanderhoof | 11,160.49 | 3.55 | 0.53 | 1.14 | 5.22 | 0.71 | 2.85 | 66.85 | 3.03 | 4.22 | 11.90 | 0.14 |
| (b) Nechako River tributaries | | | | | | | | | | | | | |
| 7 | Swanson Creek | 224.38 | 0.15 | 0.02 | 0.32 | 0.49 | 0.05 | 3.35 | 92.66 | 0.27 | 0.22 | 1.62 | 0.01 |
| 8 | Targe Creek | 346.70 | 0.00 | 0.00 | 0.88 | 0.88 | 0.93 | 2.95 | 82.04 | 0.63 | 0.30 | 7.92 | 0.68 |
| 9 | Greer Creek | 409.23 | 0.55 | 0.16 | 0.50 | 1.21 | 0.66 | 4.95 | 87.76 | 0.41 | 0.21 | 3.04 | 0.16 |
| 10 | Smith Creek | 227.94 | 3.33 | 0.24 | 1.13 | 4.70 | 0.77 | 6.39 | 65.87 | 3.34 | 0.82 | 15.75 | 0.95 |
| 11 | Tatsutnai Creek | 68.16 | 1.96 | 0.21 | 1.48 | 3.65 | 0.12 | 1.87 | 81.14 | 0.93 | 0.25 | 13.41 | 0.11 |
| 12 | Nine Mile Creek | 66.06 | 1.20 | 0.08 | 1.75 | 3.03 | 0.10 | 3.81 | 72.94 | 1.09 | 0.45 | 20.31 | 0.01 |
| 13 | Clear Creek | 84.08 | 14.38 | 0.81 | 2.08 | 17.27 | 0.11 | 2.78 | 63.99 | 1.72 | 0.49 | 15.45 | 0.00 |
| 14-16 | Stoney Creek | 585.14 | 15.01 | 1.12 | 1.58 | 17.71 | 0.56 | 3.95 | 57.04 | 4.24 | 0.56 | 10.90 | 0.20 |
| 17, 18 | Murray Creek | 119.71 | 30.68 | 2.20 | 1.43 | 34.31 | 0.74 | 2.51 | 49.61 | 2.04 | 0.39 | 11.72 | 0.01 |

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