

Community Involvement in University Research

Arsenic in Groundwater

Environmentally Sensitive Area Assessment

Genomic of Pathogens

Soil Erosion Monitorin Nepal

Wetlands Honduras

Building Bridges



Hans Schreier, Land & Water Systems Program, UBC

Arsenic and Health Issues

Chronic effects include:

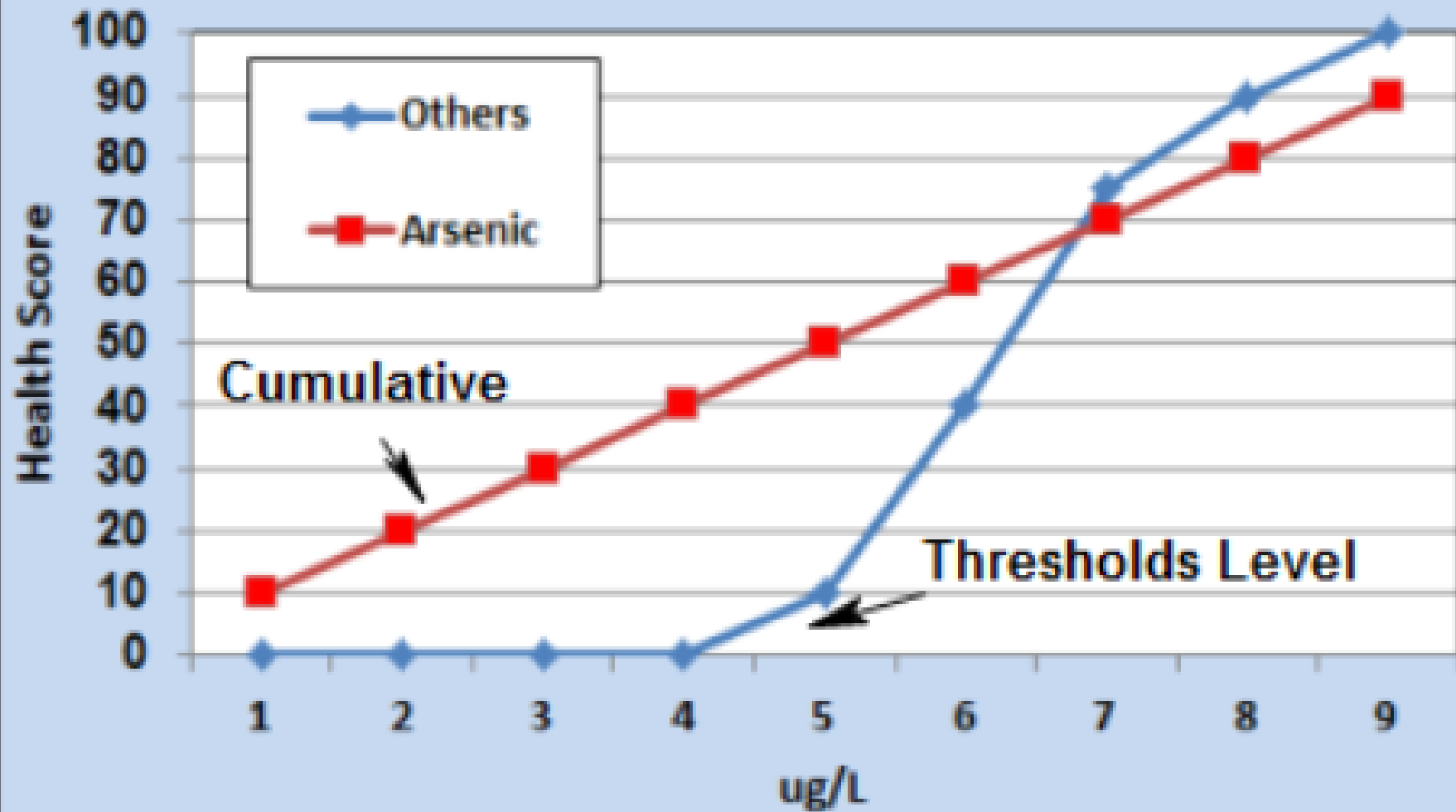
- wart-like lesions on hands and feet after 5-10 years
- anaemia
- cancers including skin, lung, liver and bladder

Occur after long-term exposure to low levels of arsenic (down to 0.0003 mg/L), the level of "essentially negligible" health risk.



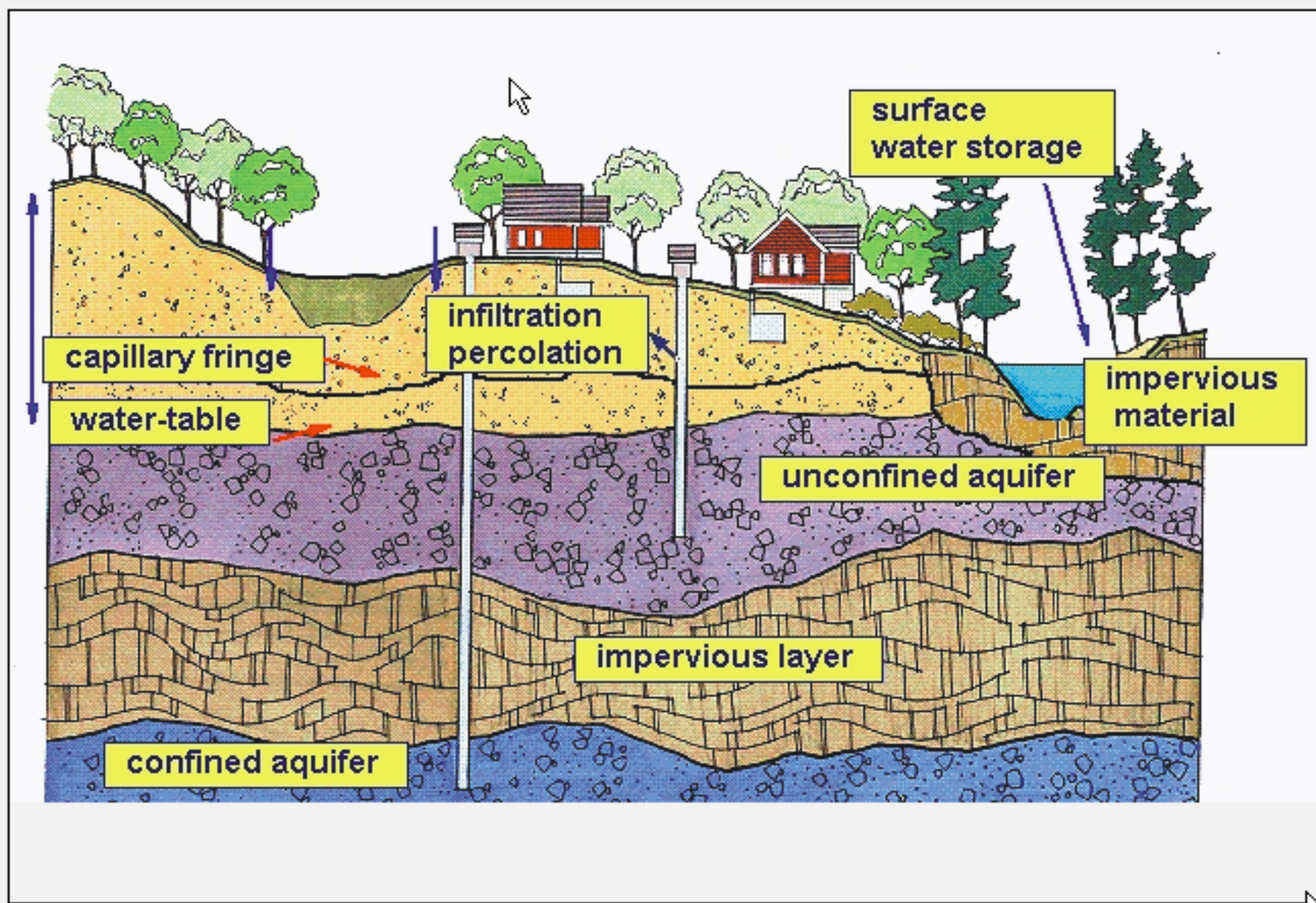
Victims of chronic arsenic exposure in Bangladesh

Threshold versus Cumulative Effects



Likely Source of Arsenic: Volcanic Intrusions into Igneous Rocks

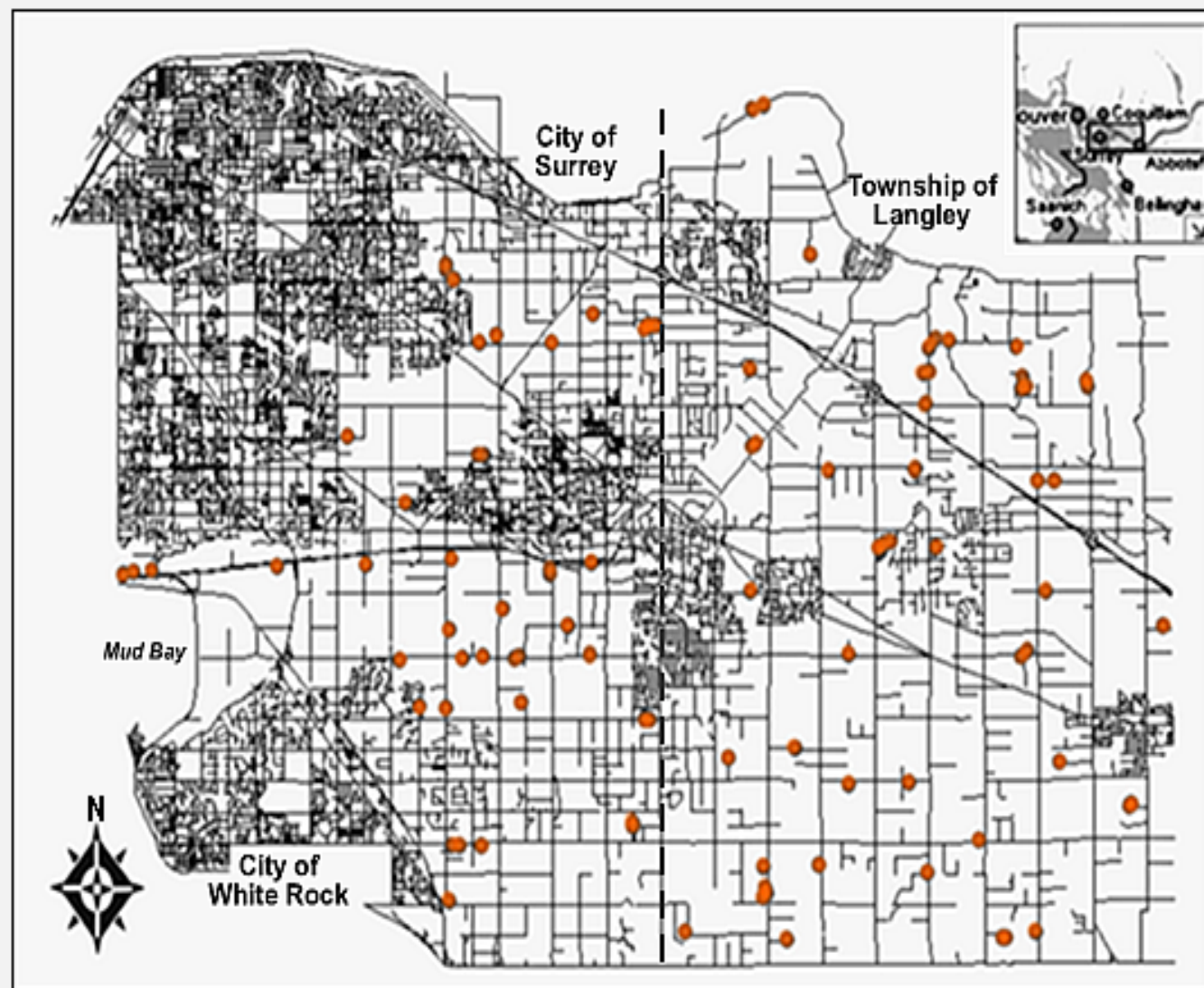




98 Private Wells

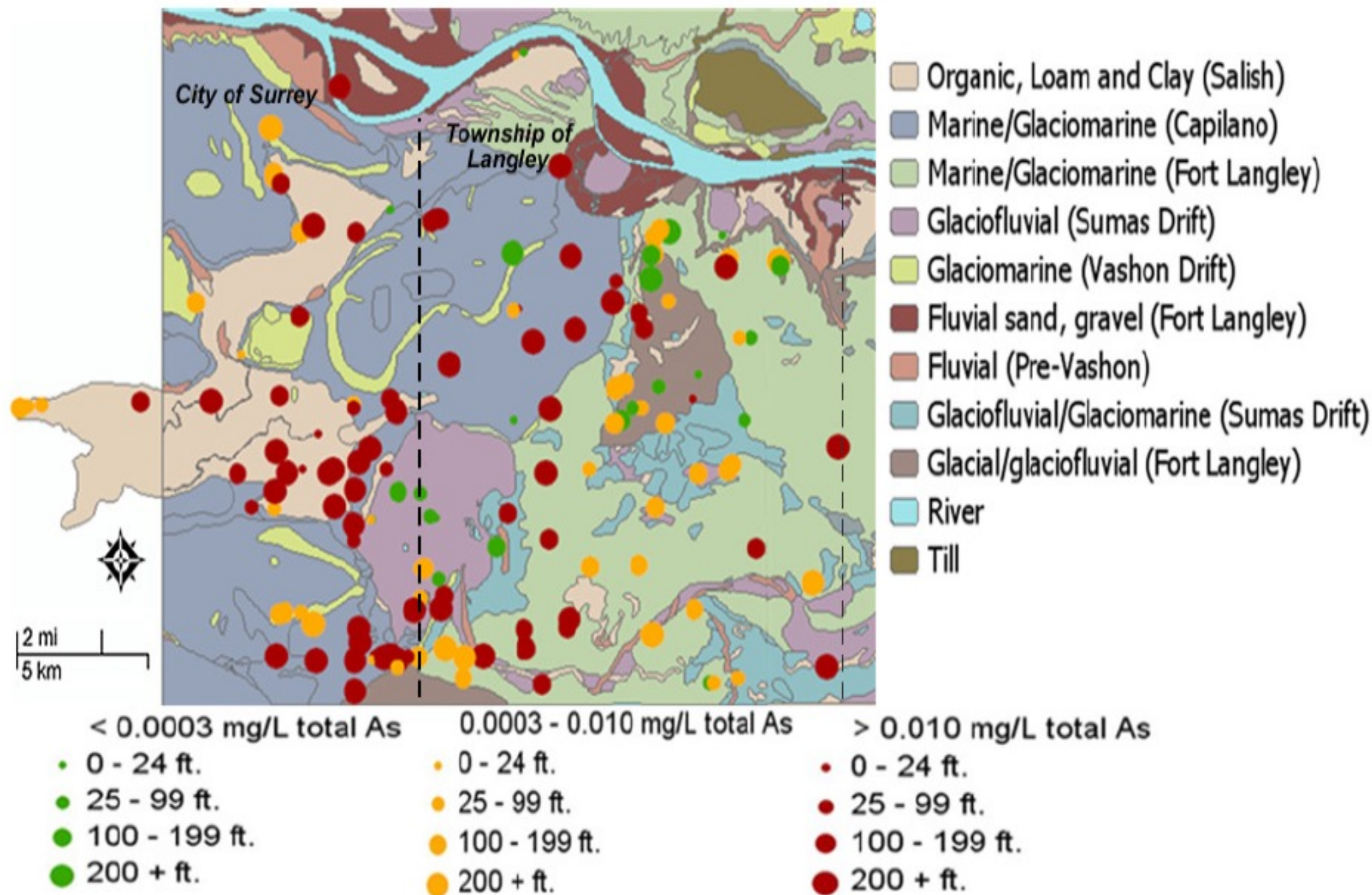
- BC Water Resources
Atlas Mapping Service

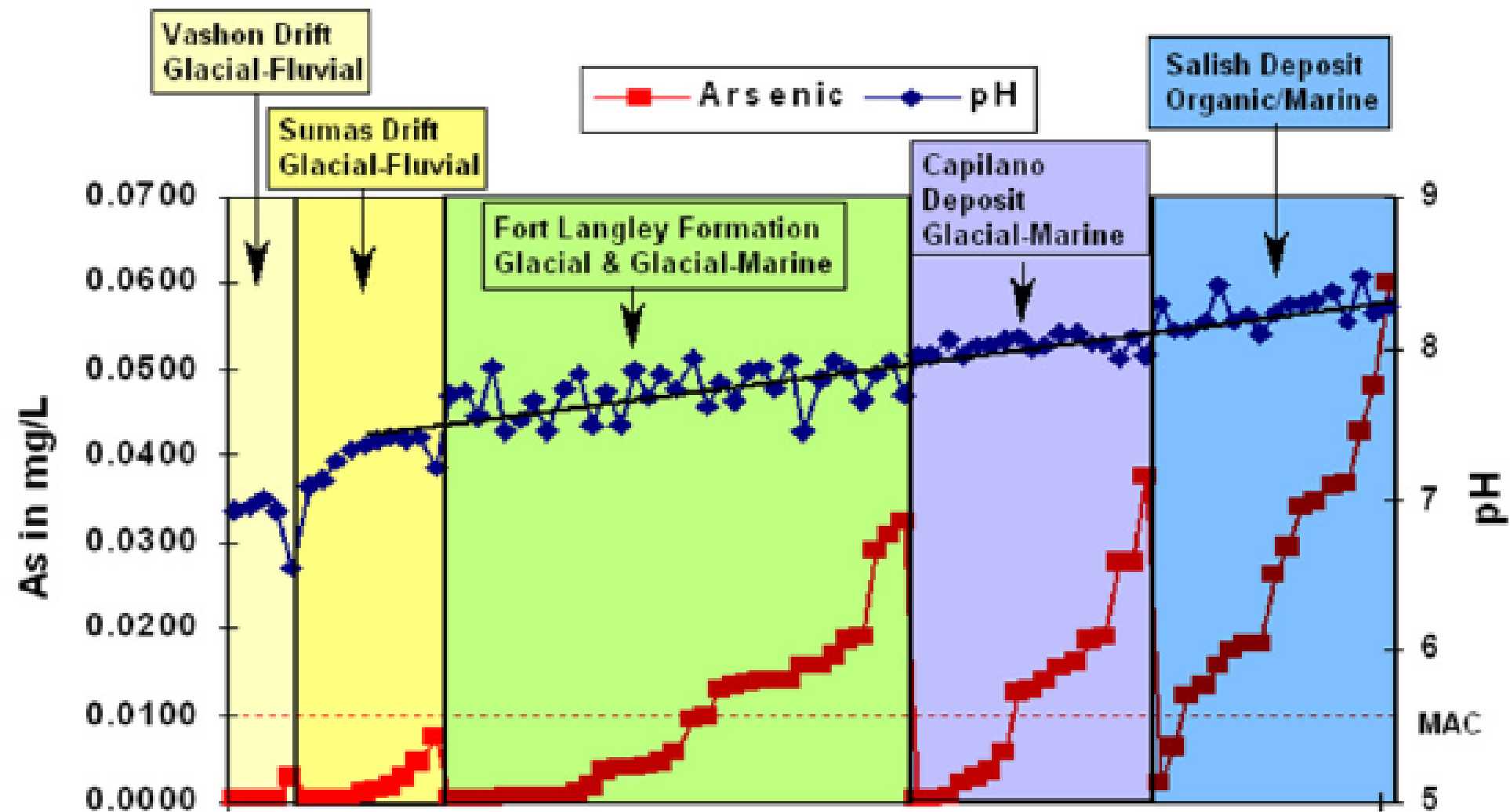
- BC Ministry of
Environment Water
Well Application



☑ Mail Out

	Surrey	Langley	Total
# letters sent	175	311	486
# responses	36	62	98
% response rate	20.6	19.9	20.2





Samples sorted by Surficial Materials

Results

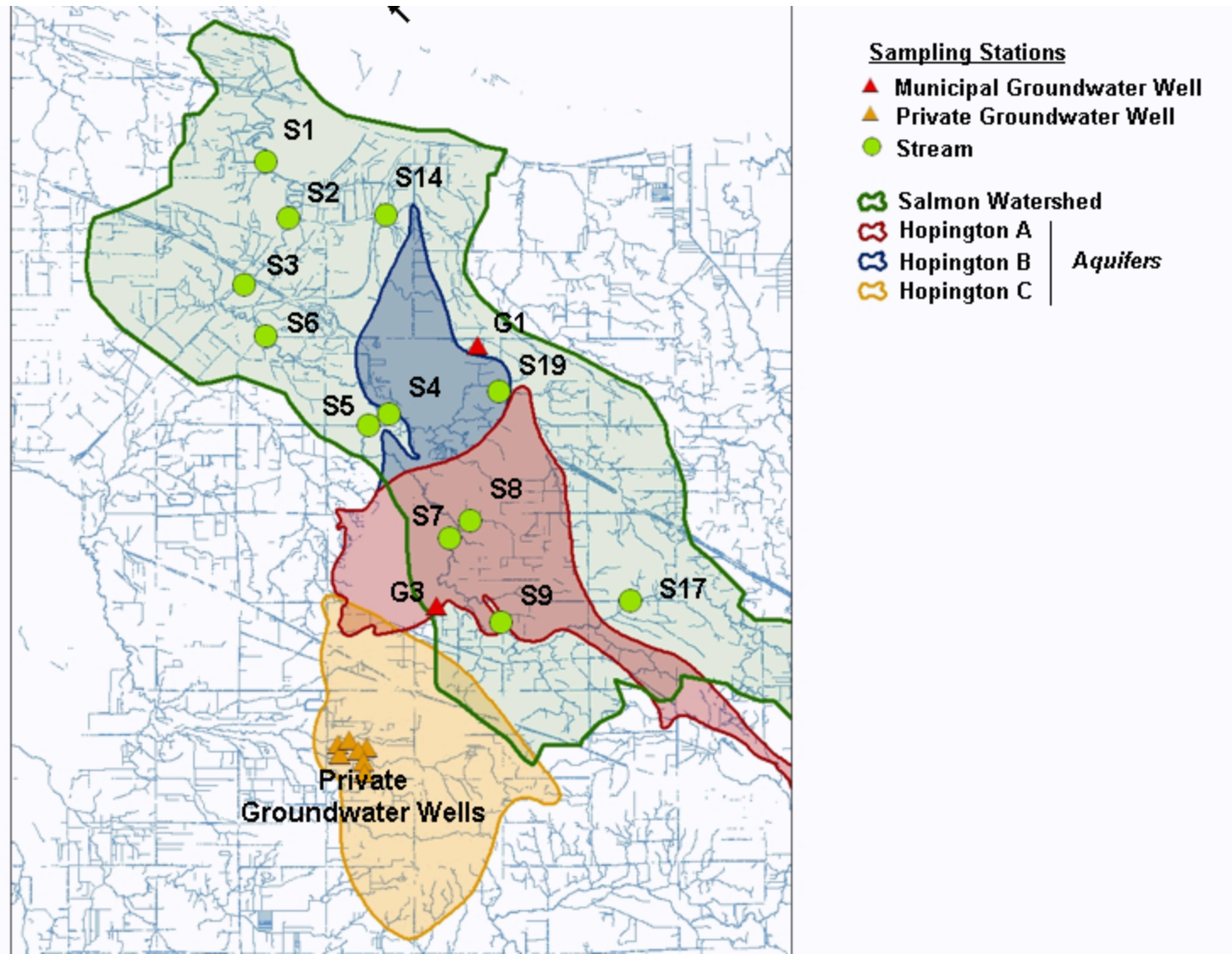
	Total As	Total Pb	Total Coliform	E. Coli
Mac	0.010 mg/L	0.010 mg/L	< 1 count/100ml	< 1 count/100ml
% Exceeded	43%	4%	51%	6%
Maximum	0.060mg/L	0.035mg/L	2410/100 ml	17/100 ml

Mac = Maximum Acceptable Concentration

	Total Na	Total Cl	Total Fe	Total Mn	Total Cu
AO	200 mg/L	250 mg/L	0.3 mg/L	0.05 mg/L	1.0 mg/L
% Exceeded	15%	10%	18%	29%	1%
Maximum	0.060mg/L	0.035mg/L	2410/100 ml	17/100 ml	17/100 ml

AO = Aesthetic Objective

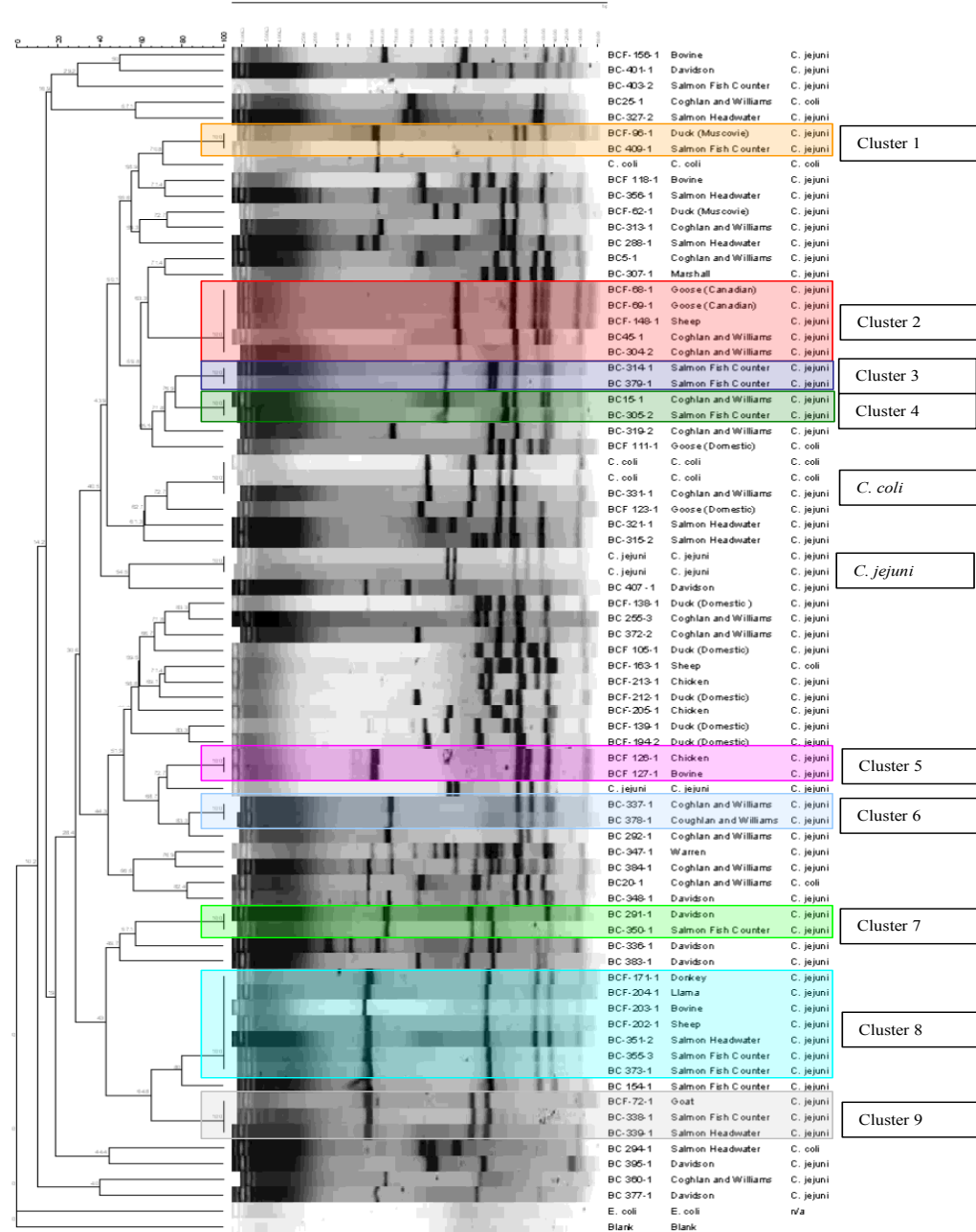
Genome Assessment of Pathogens in Scat Samples, Groundwater & Streamwater in the Salmon River Watershed

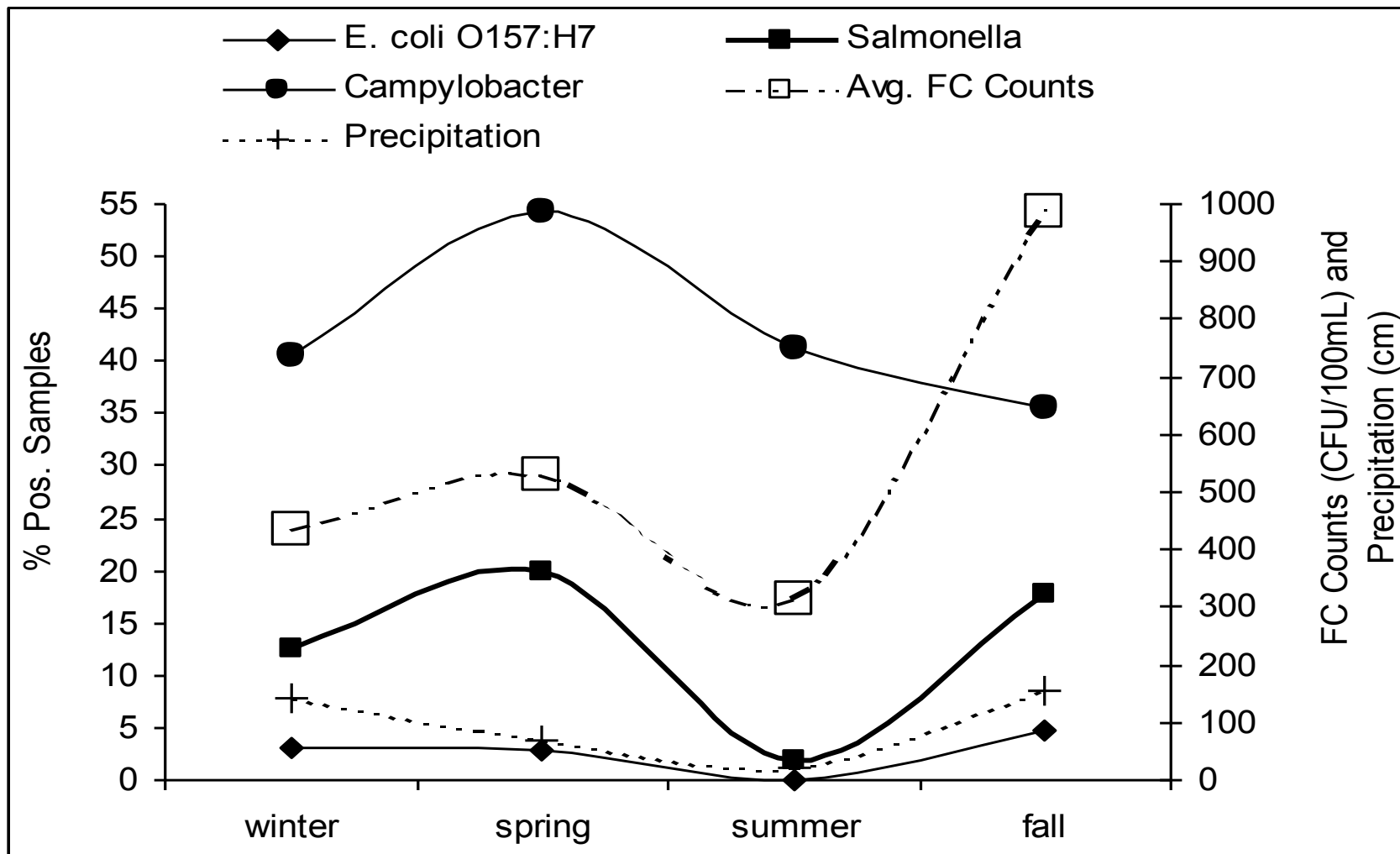


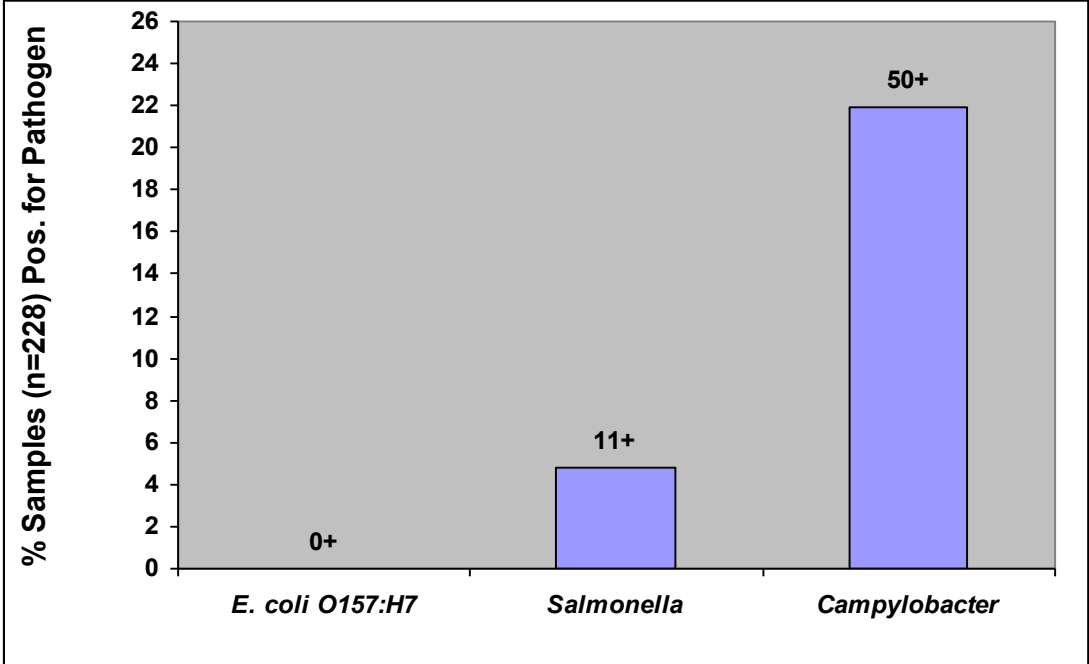
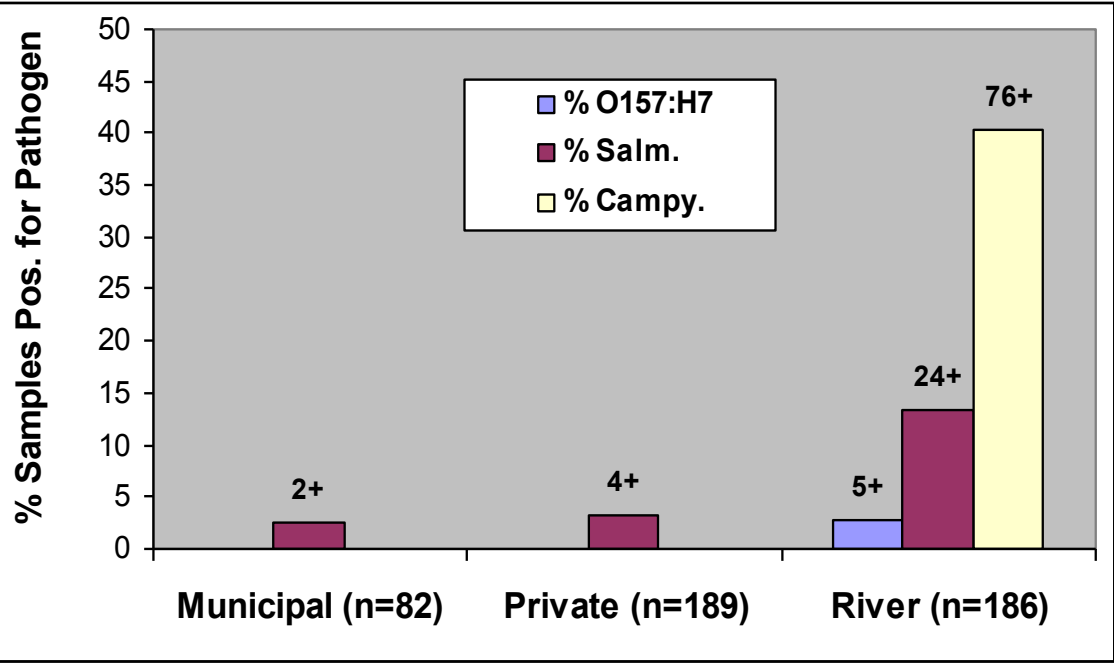
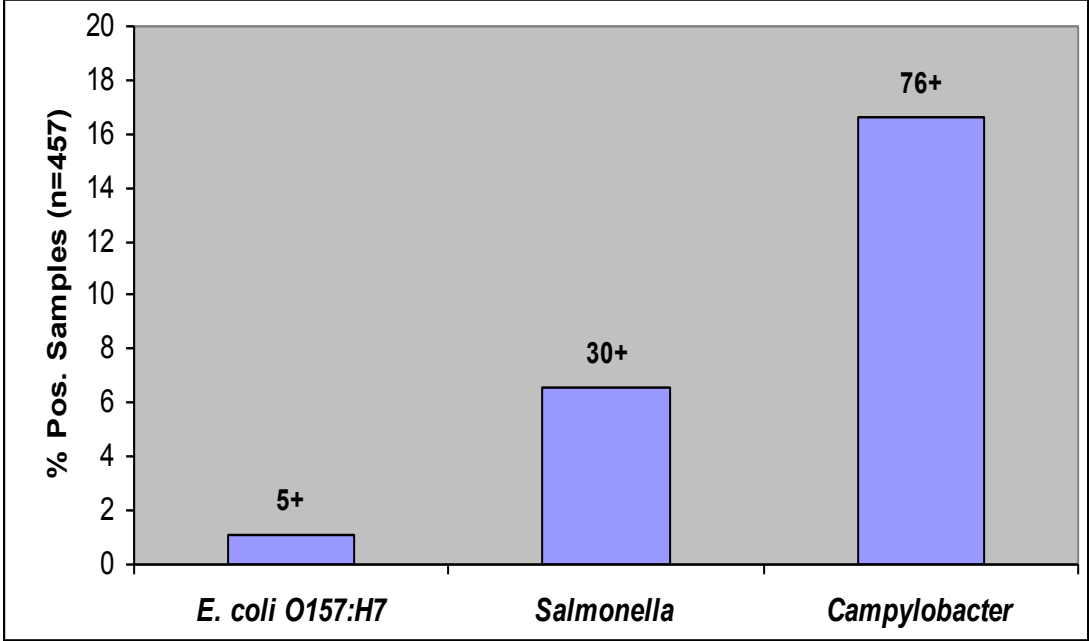
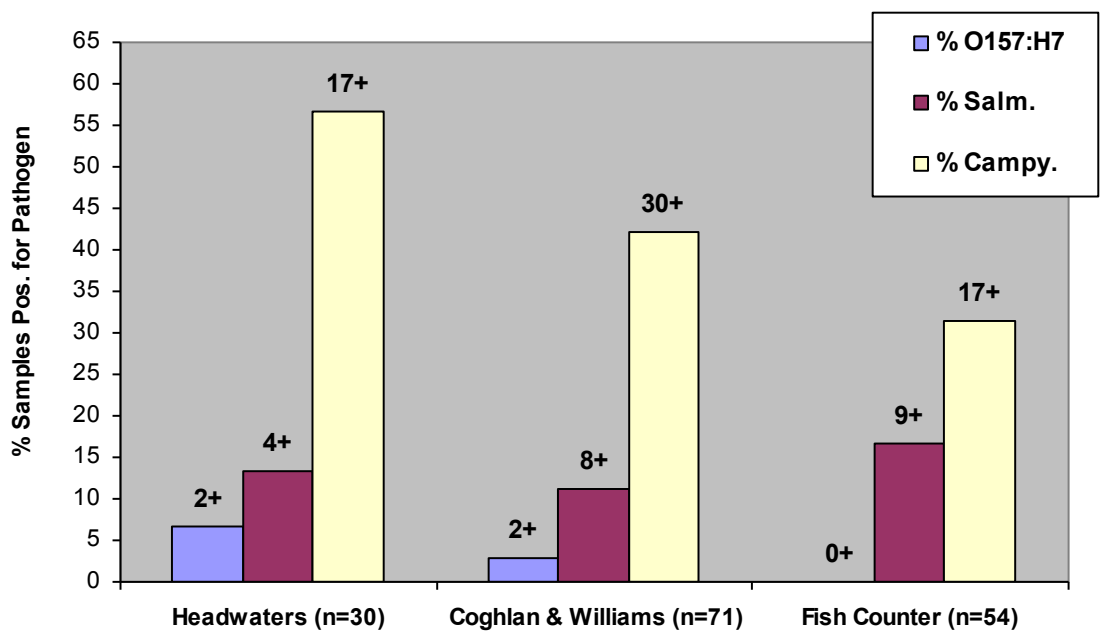
Source	% <i>Salmonella</i> (No. Pos.)	% <i>Campylobacter</i> (No. Pos.)
rabbit (n=11)	0 (0)	0 (0)
rat (n=1)	0 (0)	0 (0)
horse (n=23)	0 (0)	4.3 (1)
dog (n=17)	5.9 (1)	5.9 (1)
llama (n=10)	0 (0)	10 (1)
alpaca (n=9)	0 (0)	11.1 (1)
sheep (n=42)	4.8 (2)	11.9 (5)
goat (n=13)	0 (0)	23.1 (3)
cattle (n=33)	0 (0)	24.2 (8)
chicken (n=17)	0 (0)	29.4 (5)
sewage (n=11)	54.5 (6)	36.4 (4)
goose (n=13)	15.4 (2)	38.5 (5)
duck (n=23)	0 (0)	52.2 (12)
pig (n=5)	0 (0)	80.0 (4)
Totals (n=228)	4.8 (11)	22.0 (50)

Box (75-100% 100% 10-100% 10-100%)
BC GEL 1

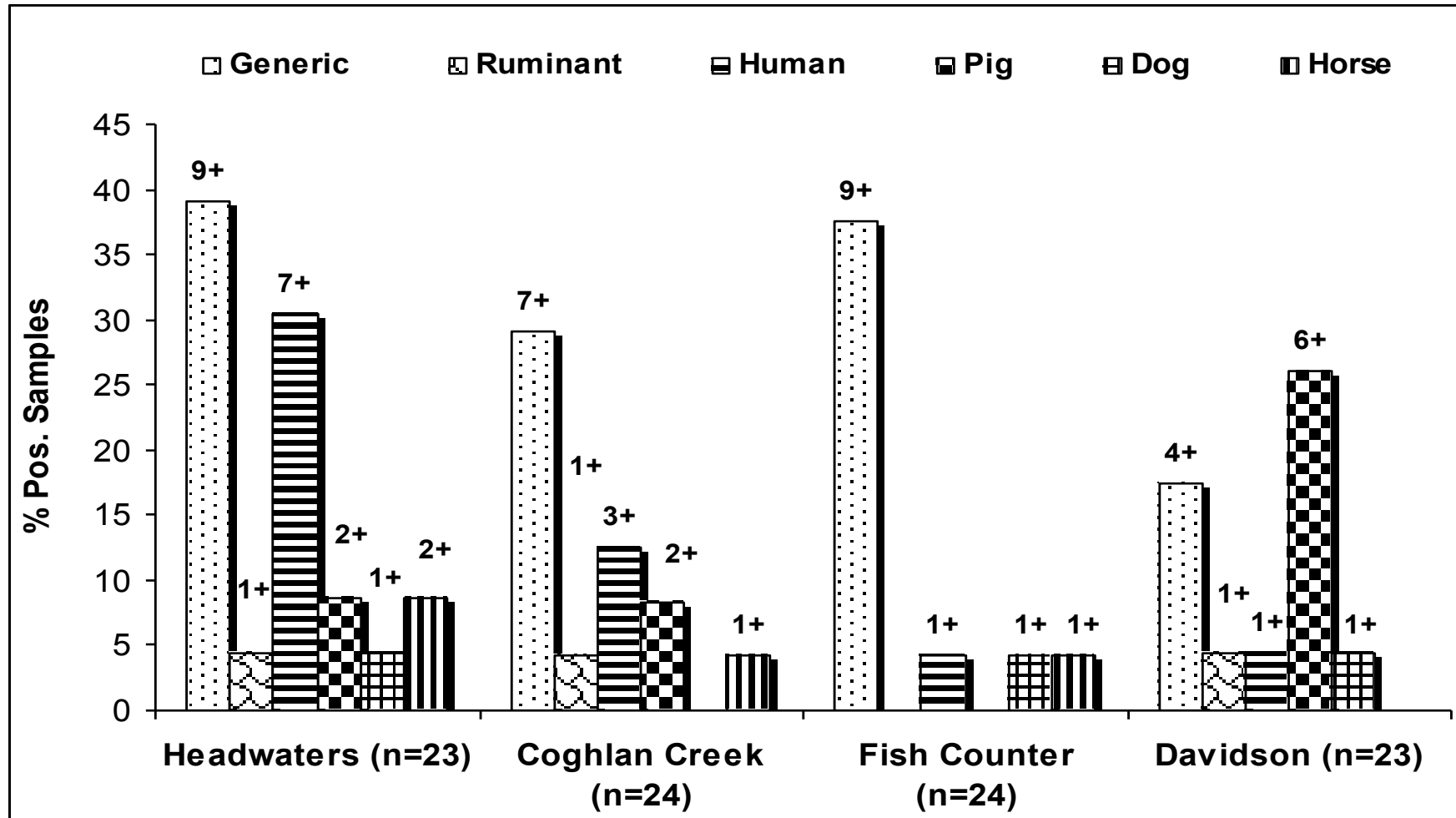
BC GEL 1



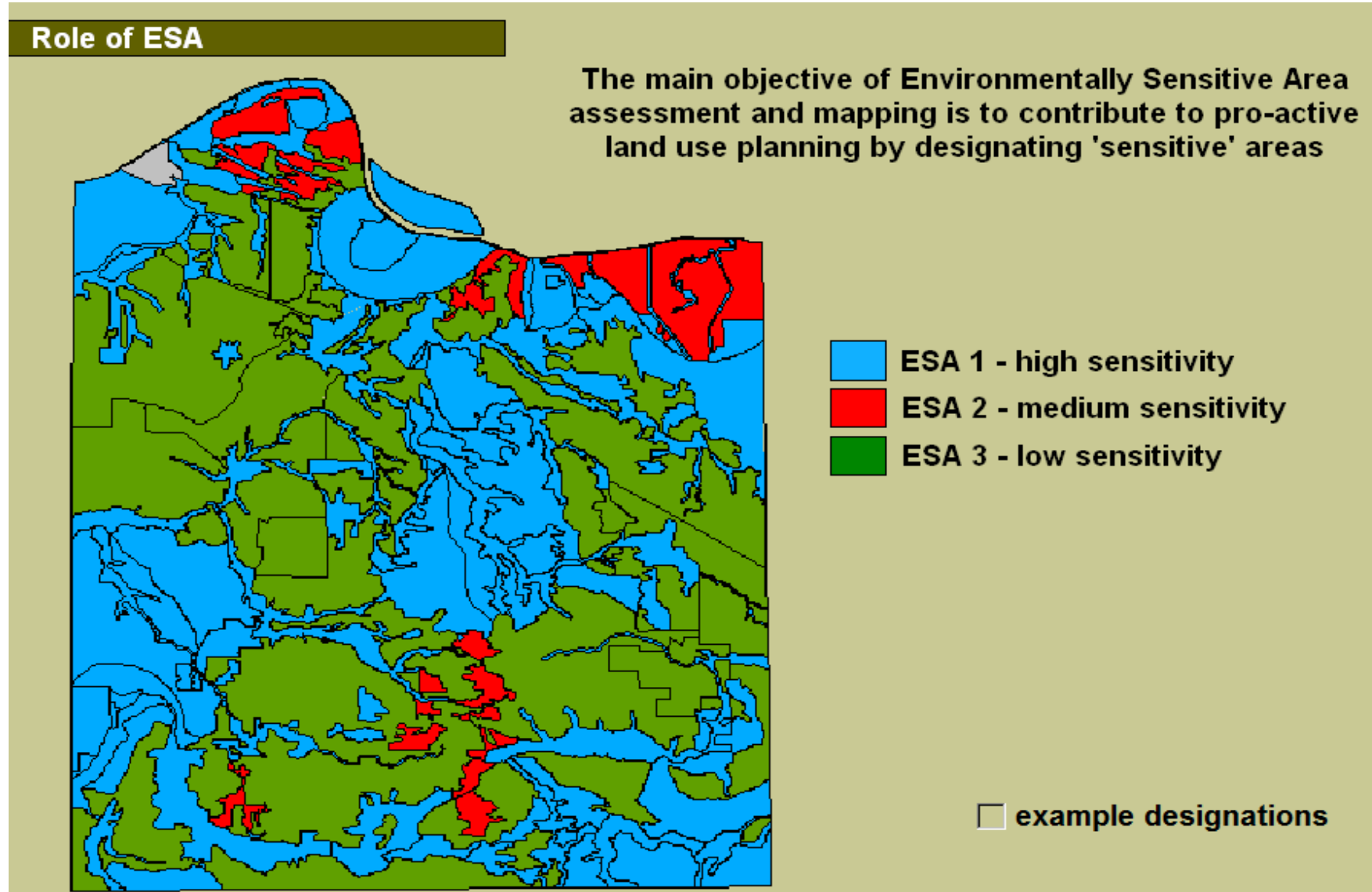




Generic Host Specific Bacteroides Markers In Water In different Parts of the Salmon Watershed



Environmentally Sensitive Area Assessment in Langley, B.C.



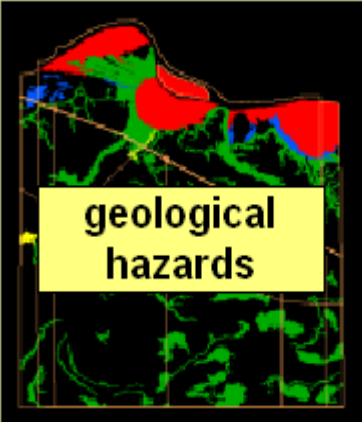
- ☐ public health
- ☐ cultural landscape value
- ☐ heritage / historic site
- ☐ geological hazard
- ☐ rarity of landforms / species
- ☐ size
- ☐ location (adjacency)
- ☐ connectivity (wildlife)
- ☐ fragility
- ☐ diversity
- ☐ representativeness

ABC	importance	constraint
C	✓	✓
C	✓	
C	✓	
A		✓
AB	✓	
ABC	✓	
ABC	✓	
B	✓	
AB		✓
B	✓	
AB	✓	

A = abiotic
 B = biotic
 C = cultural

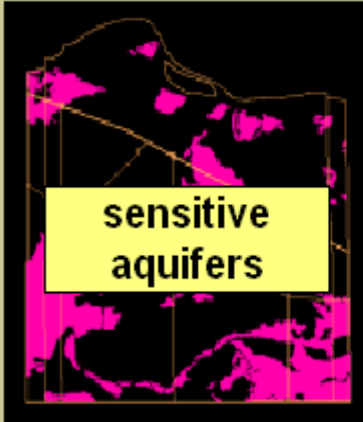
7 indicators

abiotic



**geological
hazards**

A map of a region showing geological hazards with red and green areas on a black background.



**sensitive
aquifers**

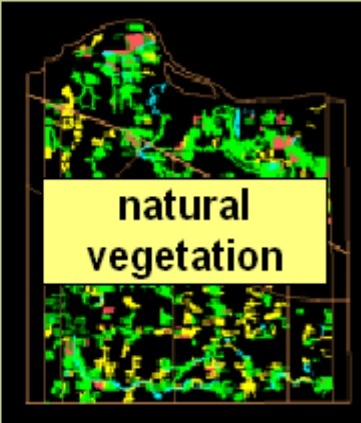
A map of a region showing sensitive aquifers with pink and black areas on a black background.

biotic



**fish
habitat**

A map of a region showing fish habitat with blue, red, and black areas on a black background.

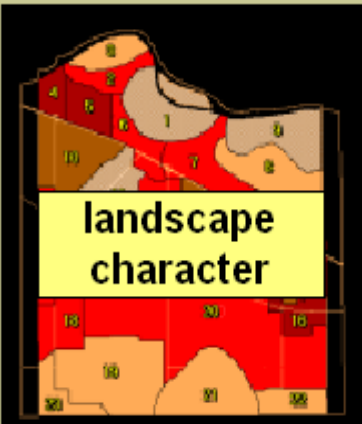


**natural
vegetation**

A map of a region showing natural vegetation with green, yellow, and black areas on a black background.

**birds and
wildlife**

cultural

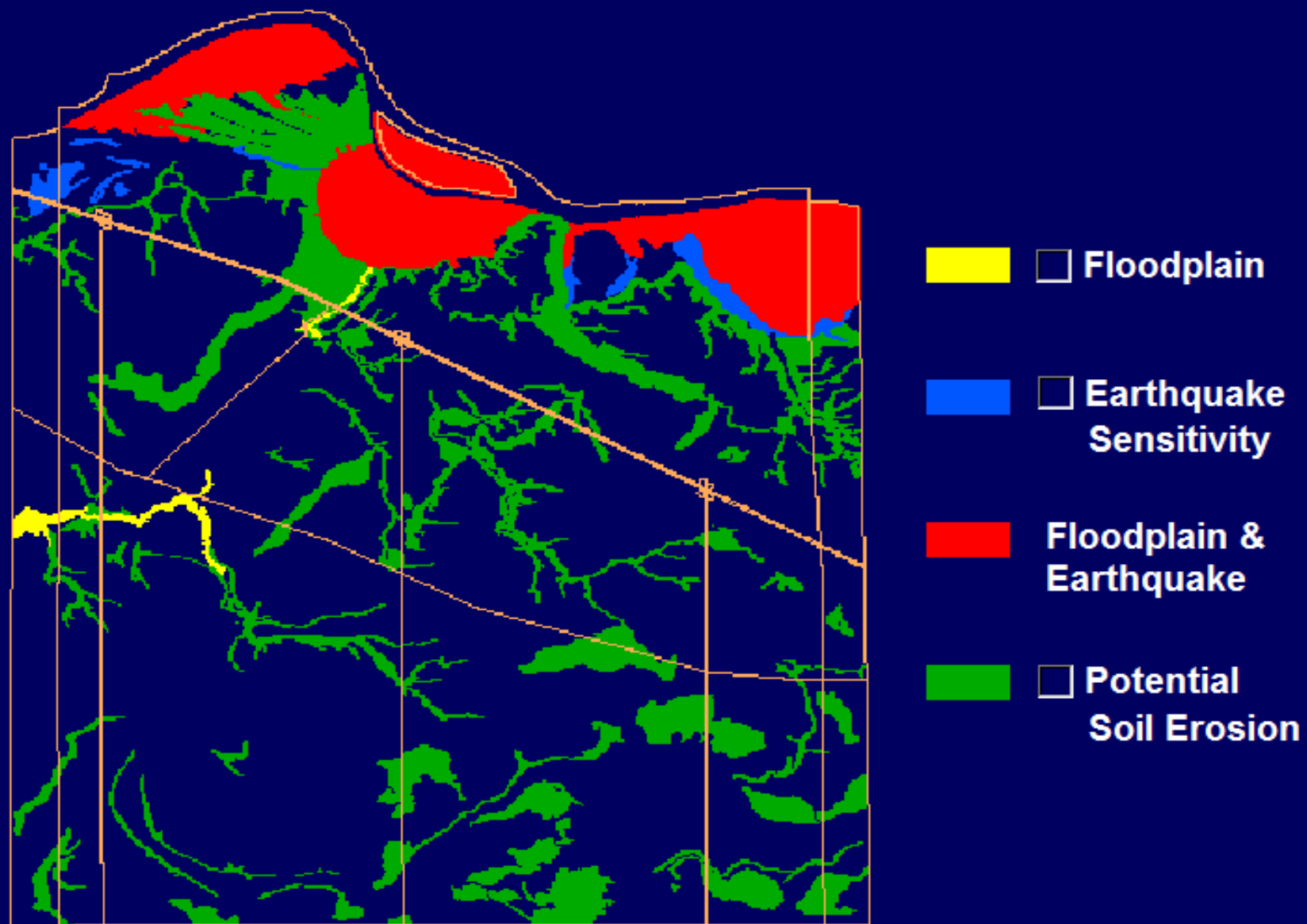


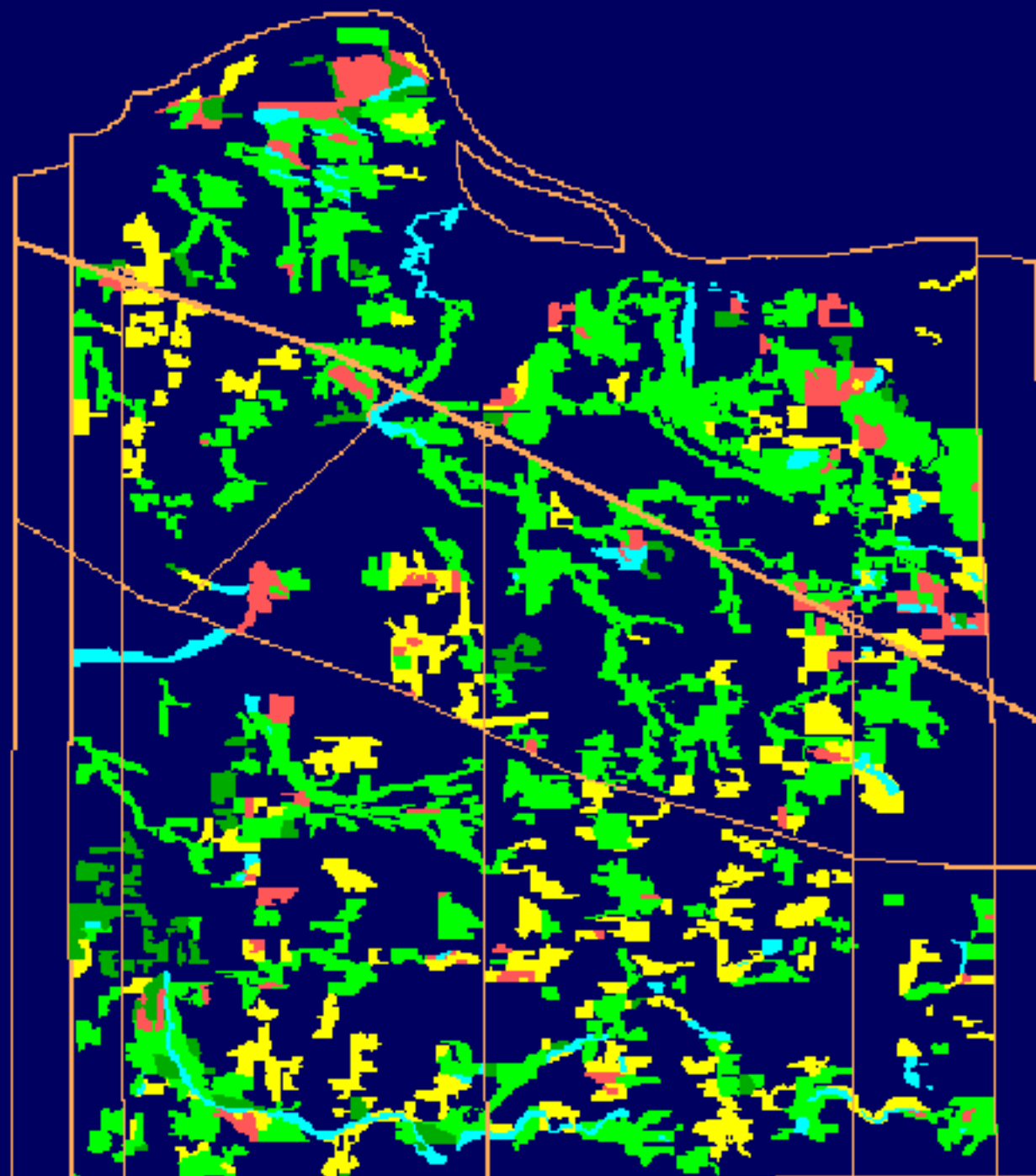
**landscape
character**

A map of a region showing landscape character with red, orange, and black areas on a black background.

**historic
features**

Geological sensitivity



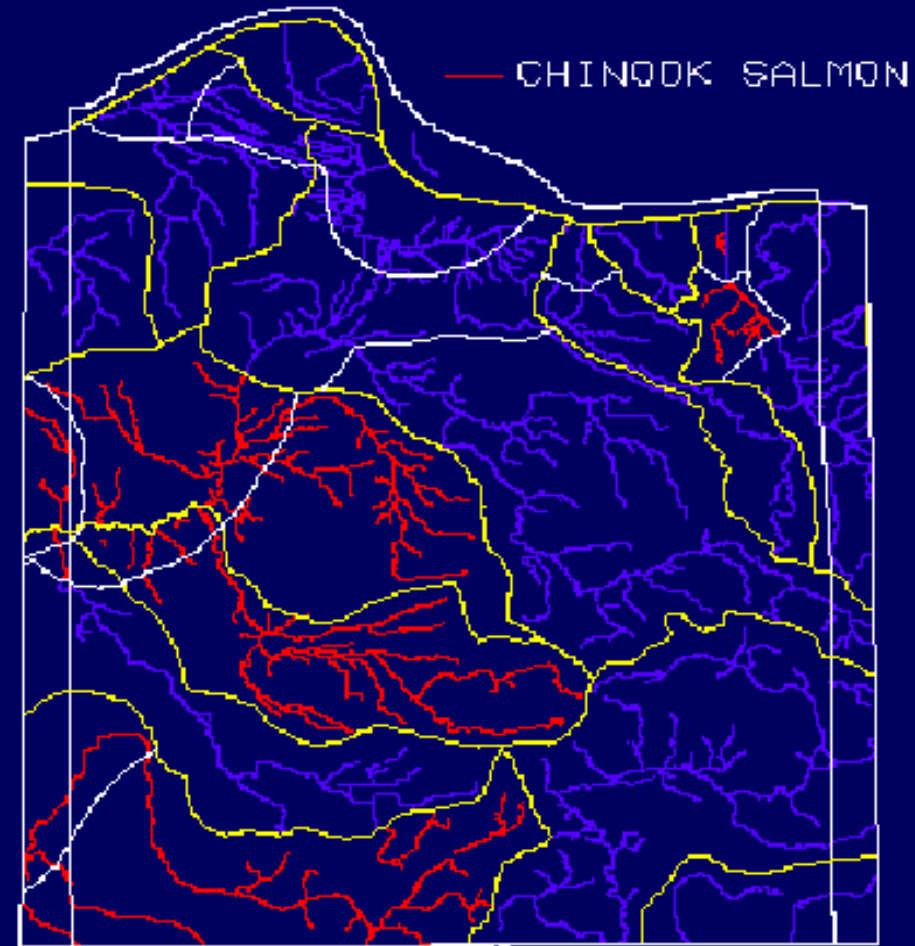
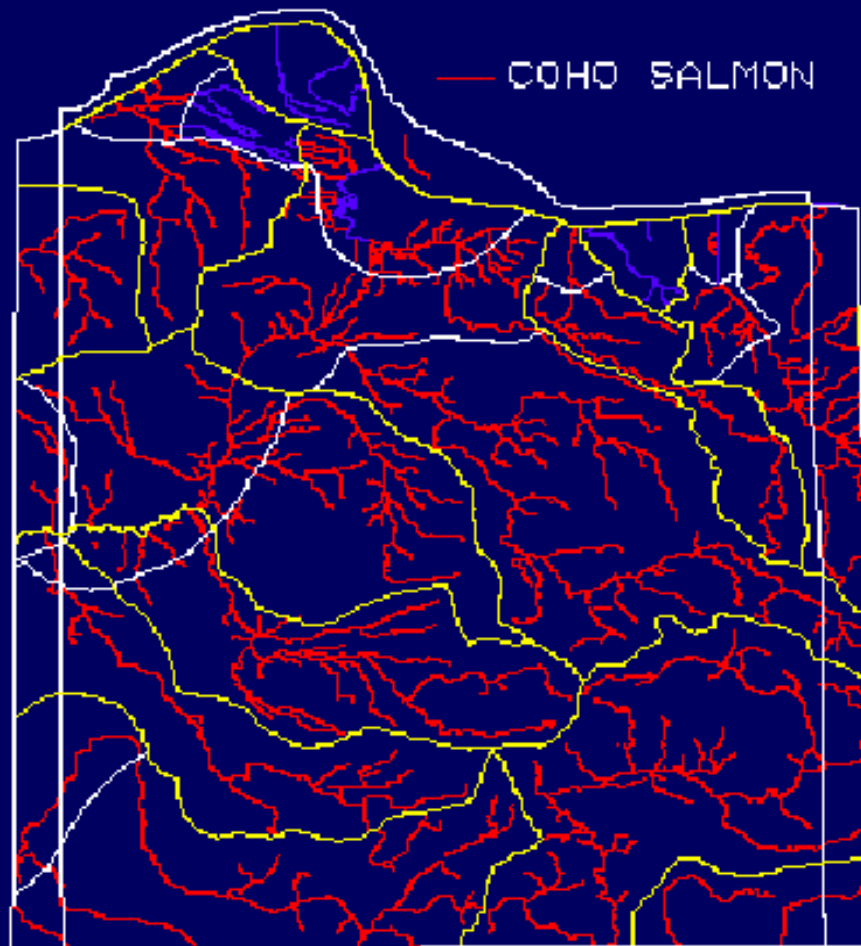


- Wetlands
- Shrub
- Deciduous forest
- Mixed forest
- Conifer forest



Fish distribution

- coho and chinook are 2 important salmonid species found in the Township
- gravel substrate, consistent stream flow supplied by groundwater and good instream cover (boulders, logs, cutbanks) provide excellent spawning and rearing opportunities



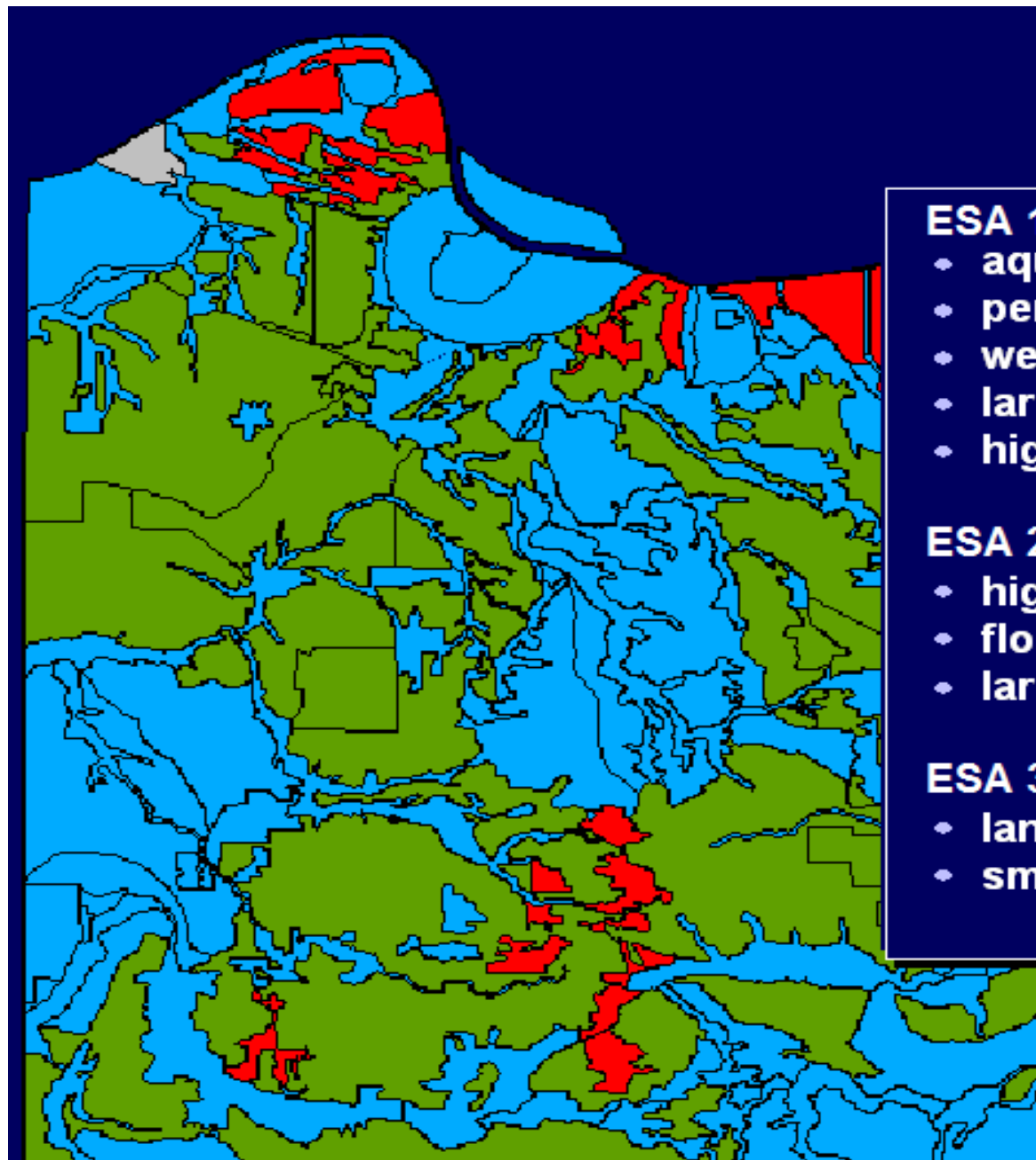
Applying criteria

one of these 3 criteria or 4
or more criteria in total

this criterium or 3 more
criteria in total

one or two criteria
not highlighted under
ESA 1 or 2

	ESA 1	ESA 2	ESA 3
public health	☒	☐	☐
cultural landscape value	☐	☐	☐
heritage / historic site	☐	☐	☐
geological hazards	☐	☒	☐
rarity of landforms/species	☒	☐	☐
size	☐	☐	☐
location (adjacency)	☐	☐	☐
connectivity (wildlife)	☐	☐	☐
fragility	☒	☐	☐
diversity	☐	☐	☐
representativeness	☐	☐	☐



ESA 1

- aquifers
- permanent water courses
- wetlands
- large undisturbed natural areas with
- high species diversity

ESA 2

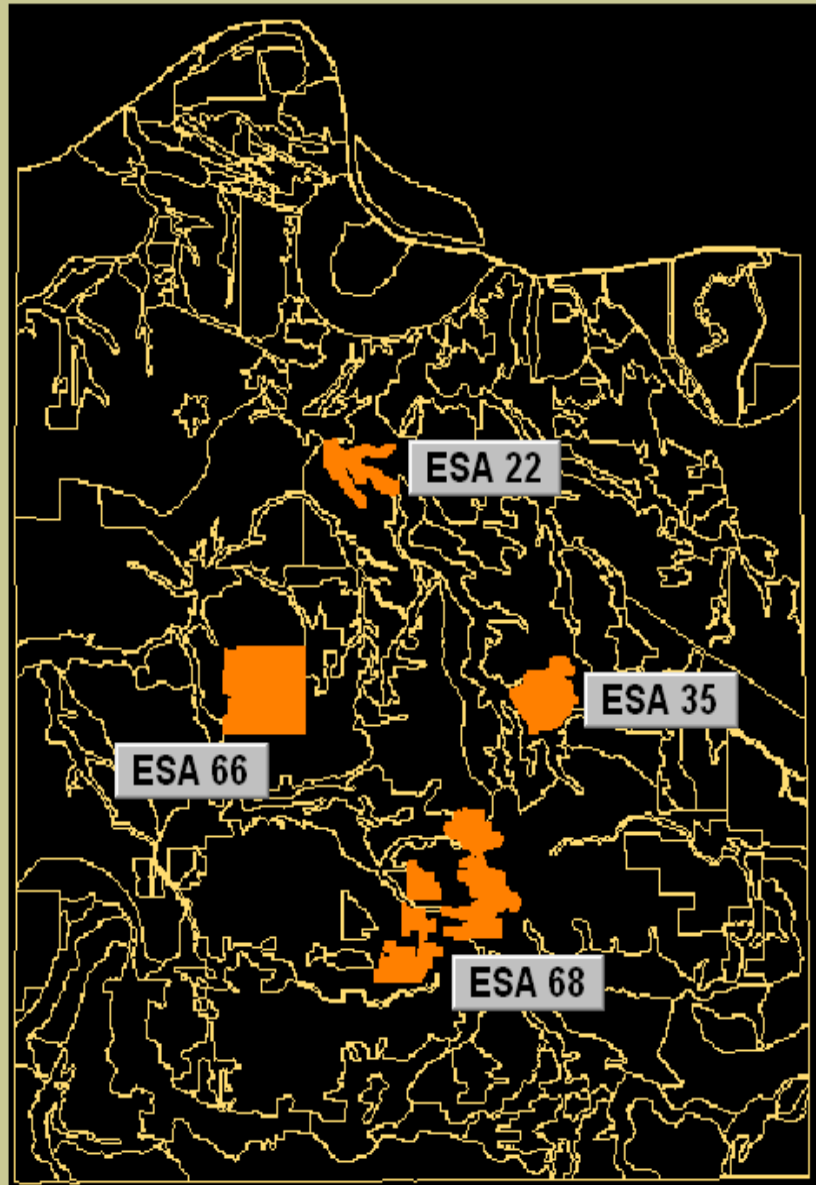
- highly erodible soils
- floodplain areas
- large forested natural areas

ESA 3

- lands in the Agricultural Land Reserve
- small natural areas in neighbourhoods

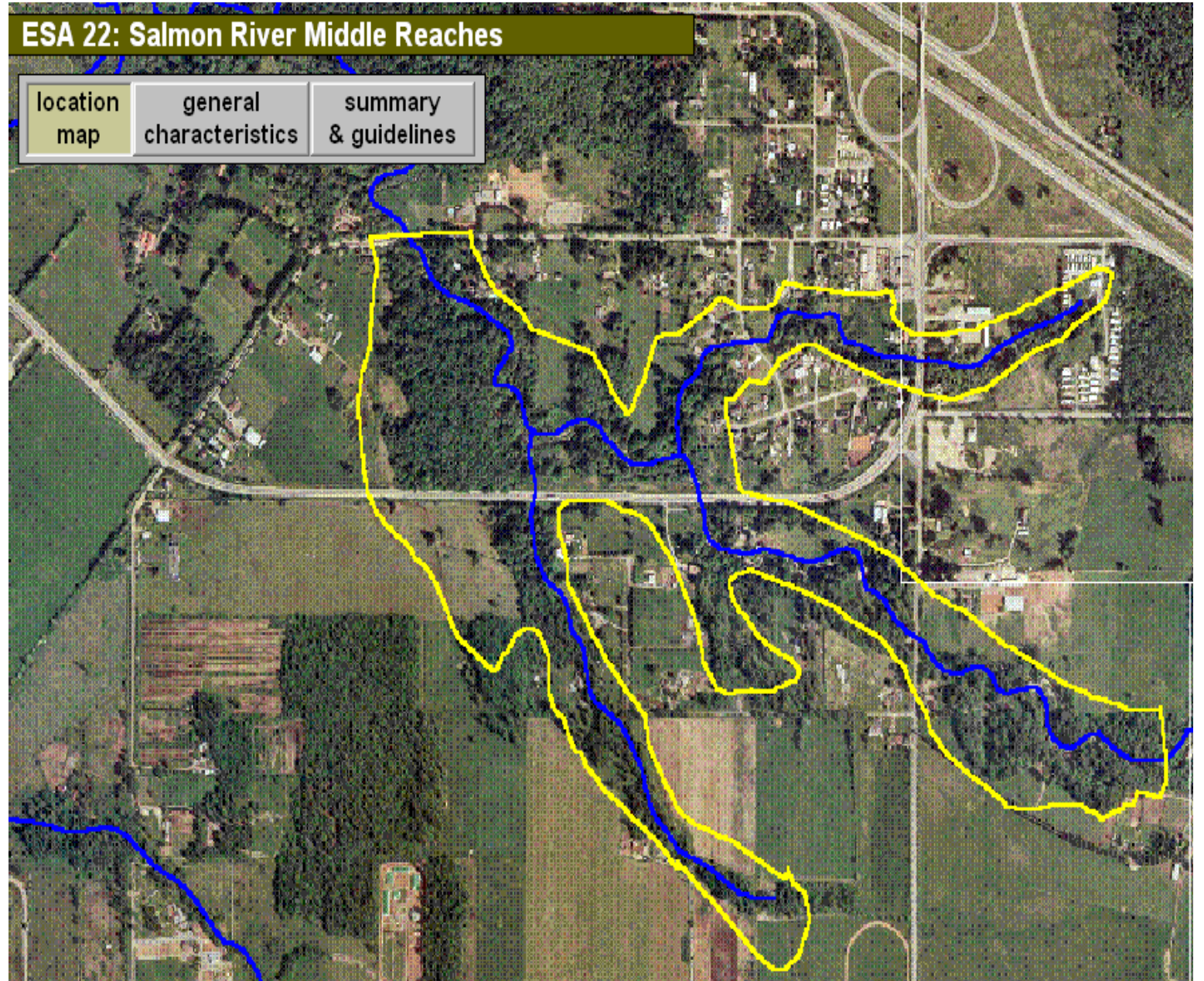
☒ example designations

Example ESAs



ESA 22: Salmon River Middle Reaches

location map	general characteristics	summary & guidelines
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ESA 22: Salmon River Middle Reaches

location map	general characteristics	summary & guidelines
General	ESA desig'n	ESA 1
	type	watercourse, forest
Abiotic	landform	dissected stream system
	surficial	marine
	groundwater	-
	slope	2 - 5% undulating to 30 - 60% hilly
	size	70.5 ha
Biotic	vegetation	mixed forest; riparian
	birds	birds of prey - high, songbirds - high
	fish	salmonids = 3, other = 2, total = 5 habitat for salmonid spawning and rearing
Cultural	land use	stream system
	visual zone	06 - Upland Rural Residential Zone 12 - Nickomekl Headwaters
Criteria fulfilled	fragility	permanent watercourse
	fragility	erosion along watercourse

ESA 22: Salmon River Middle Reaches

location map	general characteristics	summary & guidelines
Summary The middle reaches of the Salmon River include the mainstem and associated tributaries from 72 Avenue to approximately 236 St, flows over marine deposits and the vegetation adjacent to the river is primarily mixed forest. The diversity of songbirds and birds of prey is estimated to be very high. The land use surrounding this section is mostly agriculture with some rural residences. The river provides excellent spawning and rearing habitat for salmonids. A few non-salmonid fishes reside in mainstem and tributaries.		
Management guidelines	watercourse	maintain a leavestrip of natural vegetation (30 m in high density urban, otherwise 100 m) from the top of the slope break of a permanent watercourse
		maintain a leavestrip of natural vegetation on either side of the intermittent watercourses
		restrict access by livestock to watercourse to prevent nutrient additions, disturbance of bank and vegetation and siltation of the watercourse
	fish habitat	restrict residential development adjacent to watercourse to protect high value salmonid spawning/rearing habitat
		protect riparian habitat (i.e. streamside vegetation)
		remove or reduce the detrimental effects of barriers to fish migration (i.e culverts, pumping station)

On Farm Erosion Plot Study over 10 Years

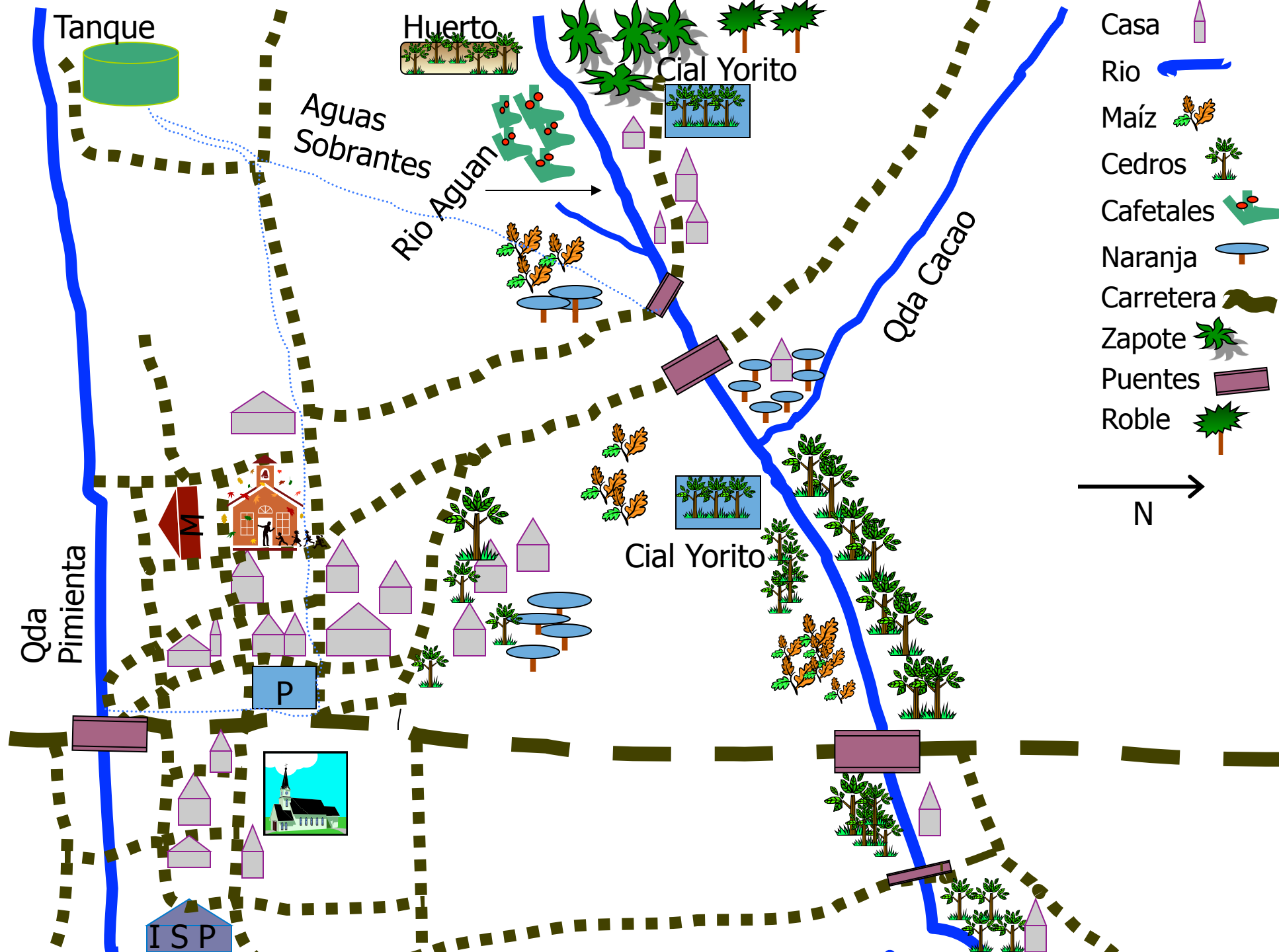




Youth Involvement in Honduras for: Stream Monitoring, Source Water Protection and Constructing Wetlands













Building Bridges in Nepal









