Foothills Stream Crossing Program

April 2010

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Foothills Stream Crossing Program

1. Overview of FSCP
2. Inspection process
3. Watershed remediation planning
4. Watershed and stream crossing prioritization methods
5. Regulator collaboration
6. Future plans

Goal

- **"…to help companies and crossing owners manage stream crossings in the long term…"**

Objectives

- Develop an industry-driven approach
- Establish a standardized stream crossing inspection process and protocols
- Establish a system to identify priorities for maintenance and replacement
- Coordinate watershed level remediation planning
- Monitor results

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Current membership (crossing owners)

- BP Canada
- CN (inactive)
- CNRL
- ConocoPhillips
- Devon
- Hinton Wood Products, West Fraser Mills
- Imperial Resources (Esso)
- Suncor Energy (including Petro Canada)
- Talisman Energy
- Shell Canada (including Duvernay)

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Current membership (support)

- Fisheries and Ocean Canada
- ASRD Public Land and Forests
- ASRD Fish and Wildlife
- Alberta Environment
- Foothills Research Institute
- Alberta Chamber of Resources
- Alberta Conservation Association

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Overall Progress to Date

- **2005–**Developed and approved Stream Crossing Inspections Manual
- **2006–** Completed just over 300 field inspections
- **2007–** Developed a collaborative watershed management strategy for two basins to test cooperative remediation process
- **2008–** Inspected all crossings and collected baseline fisheries data in test basins
- **2009-** Remediated 52 crossings and completed all member crossing inspections

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Inspection priorities

- **Safety**
- **Water quality**
- **Fish passage**

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Fish Passage

Sedimentation

Safety

Inspection Protocol

FISH PASSAGE PARAMETERS

Hang height (0.01m)	Riffle Crest depth (0.01m)	Outlet drop (0.01m)	Effective depth of pool (0.01m)	Backwater in culvert (%)	Substrate in culvert (%)	Substrate Type	Culvert slope uniform?	Fish barrier present?

CULVERT PARAMETERS

Type	Culvert Material	Road surface material	Diameter (0.01m)	Length (m)	Height of fill over culvert (m)	Bankfull channel width (0.01m)	Bankfull channel depths (0.01m)			Armour Inflow	Armour Outflow

BRIDGE PARAMETERS

Type	Total deck length (m)	Deck Width (# of lanes)	Decking material	Decking pattern	Curb type	Road surface material

Abutment type	Abutment functioning?	Wingwalls functioning?	Armour	Bankfull channel width (0.01m)	Bankfull channel depths (0.01m)			Bankfull width under bridge (0.01m)

PERFORMANCE AND SAFETY

Blockage of opening (%)	Cause of blockage	Grader markers/Bridge reflectors

Bridge signs	Structural problems

EROSION AND SEDIMENTATION

1. Preliminary Inspection

Evidence of sedimentation?	Source of Sediment

2. Ditch Inspection

Location	Length	Drainage improvement type
R. Dwnstrm		
R. Upstrm		
L. Dwnstrm		
L. Upstrm		

3. Sediment Source Inspection

Location	Length	Width	Veg. cover class	Remediation type
R. Dwnstrm				
R. Upstrm				
L. Dwnstrm				
L. Upstrm				
Above Inlet				
Above Outlet				

4. External Sediment Sources (road, bridge deck, etc.)

Rating:		Source/Action:	

FISH PASSAGE PARAMETERS								
Hang height (0.01m)	Riffle Crest depth (0.01m)	Outlet drop (0.01m)	Effective depth of pool (0.01m)	Backwater in culvert (%)	Substrate in culvert (%)	Substrate Type	Culvert slope uniform?	Fish barrier present?

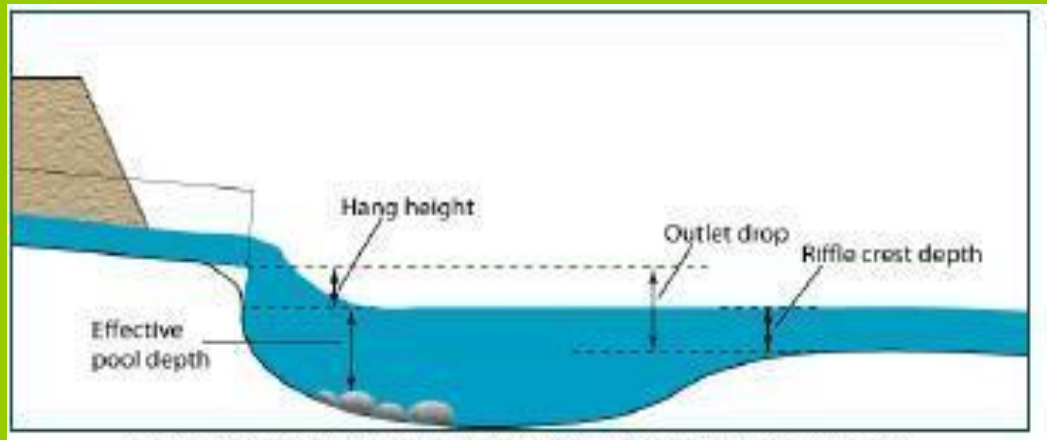
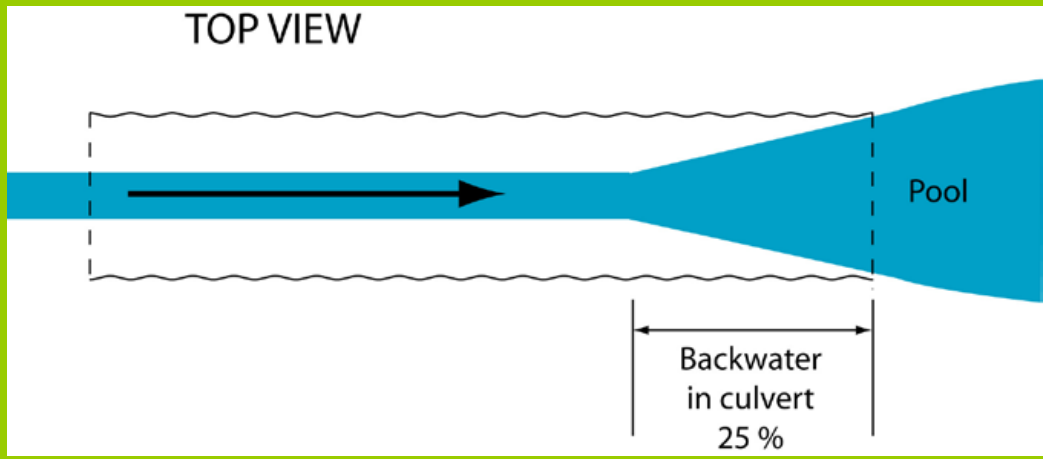


Figure 1. Measuring the hang height, effective pool depth and riffle crest depth



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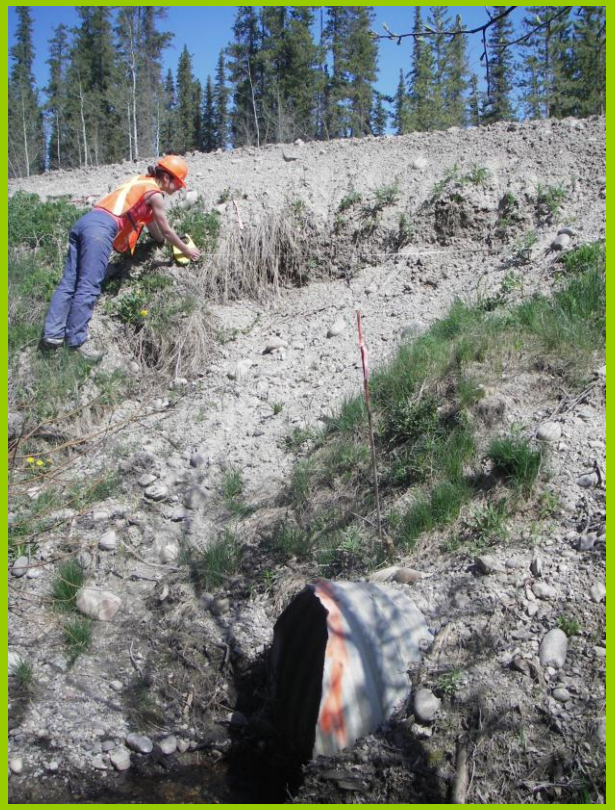


Remediation process

- Stream crossings present a large scale problem due to various factors
  - Changing construction standards
  - Older crossings which have changed owners many times
  - Lack of crossing inventories and data.

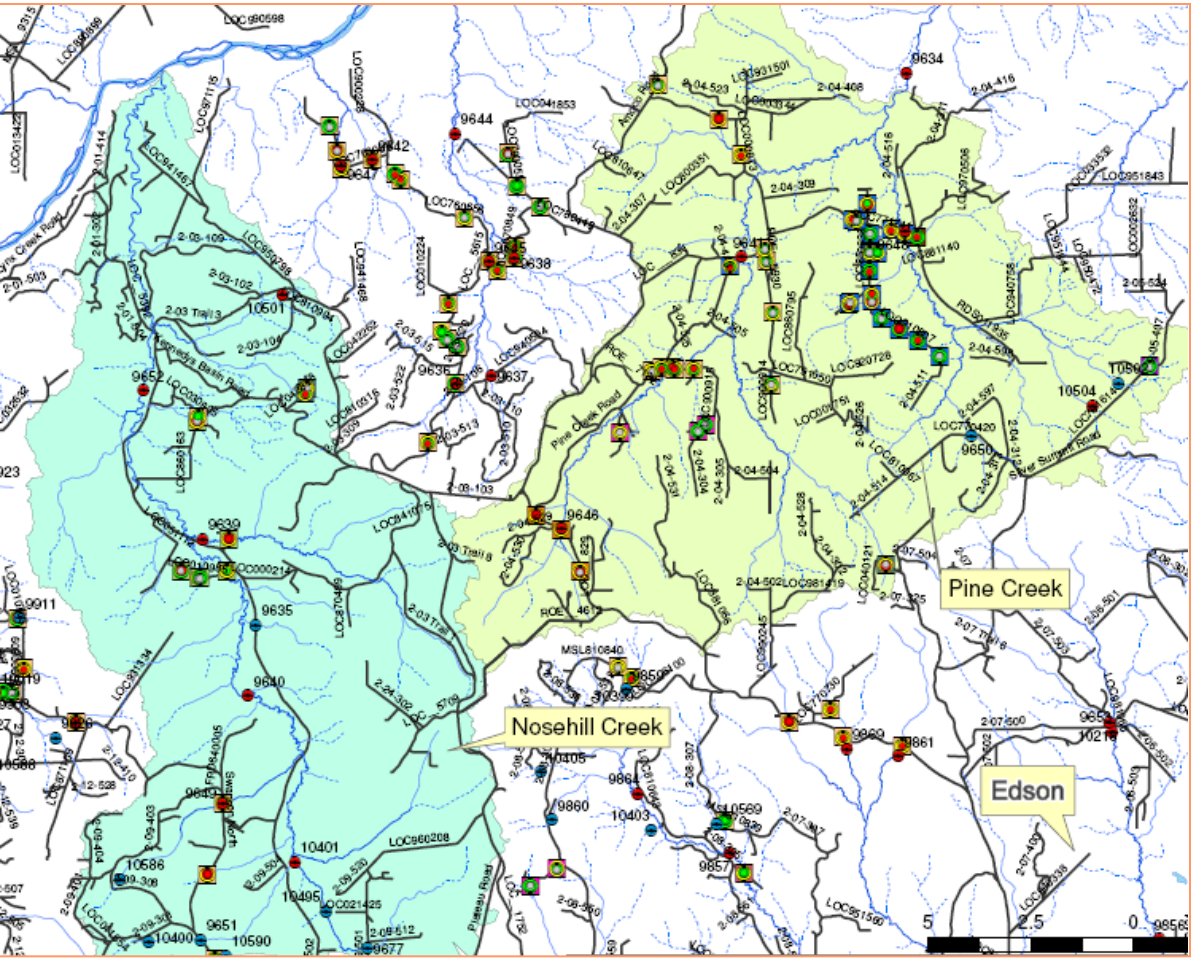
- Designed to coordinate collaboration between companies and regulators

Proposed Remediation Plan

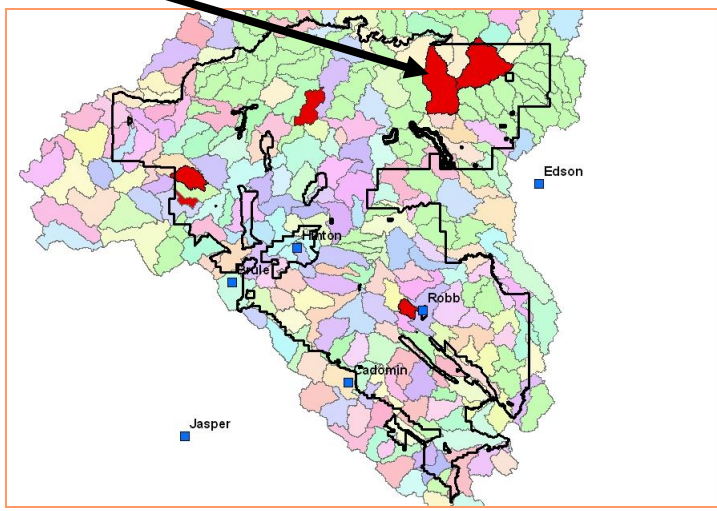
Watershed: Pine Creek

Disposition No.	Crossing No.	Owner	Legal Location					UTM Coordinates		Fish Prob. Rating	Fish Species	Year Inspected	Crossing		Stream Class (as per CCP)	Timing Restrictions	Summary of Current Problems (Recommendations)	Proposed Remediation	Timing	In Stream Activity	Work Completed	
			Twp	Rge	Mer	Sec	QS	Easting	Northing				Type	Size (m)							Description	Timing
Amoco Road	3249	SemCams (non-member)	57	19	5	34	NW	516320	5980648	Low	NO DATA	2006	C	0.48	C	July 15 - September 1	Outlet is rusted and water leaks out before the end Hang height present, but fish presence is unlikely	Investigate extent of damage at rusted outlet and repair as required.	2011			
LOC 000687	3250	BP Canada Energy Co.	57	19	5	34	SE	517796	5980044	Medium	NO DATA	2006	C	0.60	C	July 15 - September 1	Monitor for increase in severity Requires silt fence Requires diversion ditches Requires ditch blocks Road beginning to slump over inlet Scouring at inlet suggests inadequate drainage Consider replacing culvert with a larger one Monitor inlet for blockages Requires sediment barriers and/or markers (from road grading) Fish barrier: outlet hang height = 0.16m, outfall drop = 0.24m, non-uniform culvert slope = 3.78%	Installing sediment control barriers Install grader markers Repair slumping fill slopes Fish barrier removal date is TBD due to its lower priority	July 2009	N	Constructed diversion berms. Cleaned, armoured and marked culverts.	Sept 2009
LOC 000673	3251	BP Canada Energy Co.	57	19	5	26	NW	518361	5979145	High	RNTR	2006	Two C	0.90	C	July 15 - September 1	Road requires sediment barriers and/or markers (from road grading) Requires silt fence Gullying on fill slopes (channeling water from road) Fish barrier: outlet hang height = 0.17m, outfall drop = 0.27m, uniform culvert slope = 2.15%	1)Install sediment control barriers Install grader markers 2)Backflood culverts	1)July 2009 2)Sept 2010	1)N 2)Y	1) Constructed diversion berms and marked culverts.	Sept 2009
LOC 952268	3252	ConocoPhillips Canada Ltd. (formerly Burlington)	57	19	5	4	NW	515251	5972417	NO GIS DATA AVAILABLE	NO DATA	2006	C (with secondary culvert for overflow)	0.50	C	July 15 - September 1	Requires vegetation cover seeding Requires sediment barriers and/or markers (from road grading) Requires ditch blocks Requires silt fence Requires rip rap armour Hang height present, but fish presence is unlikely	As per recommendations	To be scheduled between June 15 and Sept 30, 2009	N	Completed all recommendations except for vegetation seeding	Sept 2009
Pine Creek Road	3253	BP Canada Energy Co.	57	19	5	9	NE	516170	5973921	Low	NO DATA	2006	C	0.30	C	July 15 - September 1	Requires sediment barriers and/or markers (from road grading) Stabilize and repair gullying/slumping on fill slopes Remove grader berm on right downstream to allow water entry into ditch	Installing sediment control barriers Mark culvert Repair slumping fill slopes	July 2009	N	Repaired culverts ends. Marked and armoured culvert.	Sept 2009
Pine Creek Road	3254	BP Canada Energy Co.	57	19	5	10	NW	516479	5974023	Low	NO DATA	2006	C	0.50	C	July 15 - September 1	Requires vegetation cover seeding Requires sediment barriers and/or markers (from road grading) Repair crushed inlet Fish barrier: outlet hang height = 0.8m, outfall drop = 0.8m, non-uniform culvert slope = 10.04%	Installing grader markers Seeding exposed soil Installing sediment control barriers Repairing damaged culvert (Hanging culvert will not be mitigated due to a low probability of fish presence and higher priorities in other areas)	July 2009	N	Repaired culverts ends. Marked and armoured culvert.	Sept 2009
ROE 007122	3255	BP Canada Energy Co.	57	19	5	10	NW	516676	5974007	High	MNWH RNTR	2006	Two C	1.80	C	July 15 - September 1	Stabilize and repair gullying/slumping on fill slopes Monitor for increase in severity Reset culverts to improve drainage or monitor situation for safety and performance Requires sediment barriers and/or markers (from road grading) Fish barrier: outlet hang height A_o 0.34m and B_o=0.24m, outfall drop A & B= 0.4m, non-uniform culvert slope A_o 0.7% and B_o 4.25%	Replacing culverts with a clear span bridge	July 2010	Y		

Nosehill and Pine Creek Watersheds



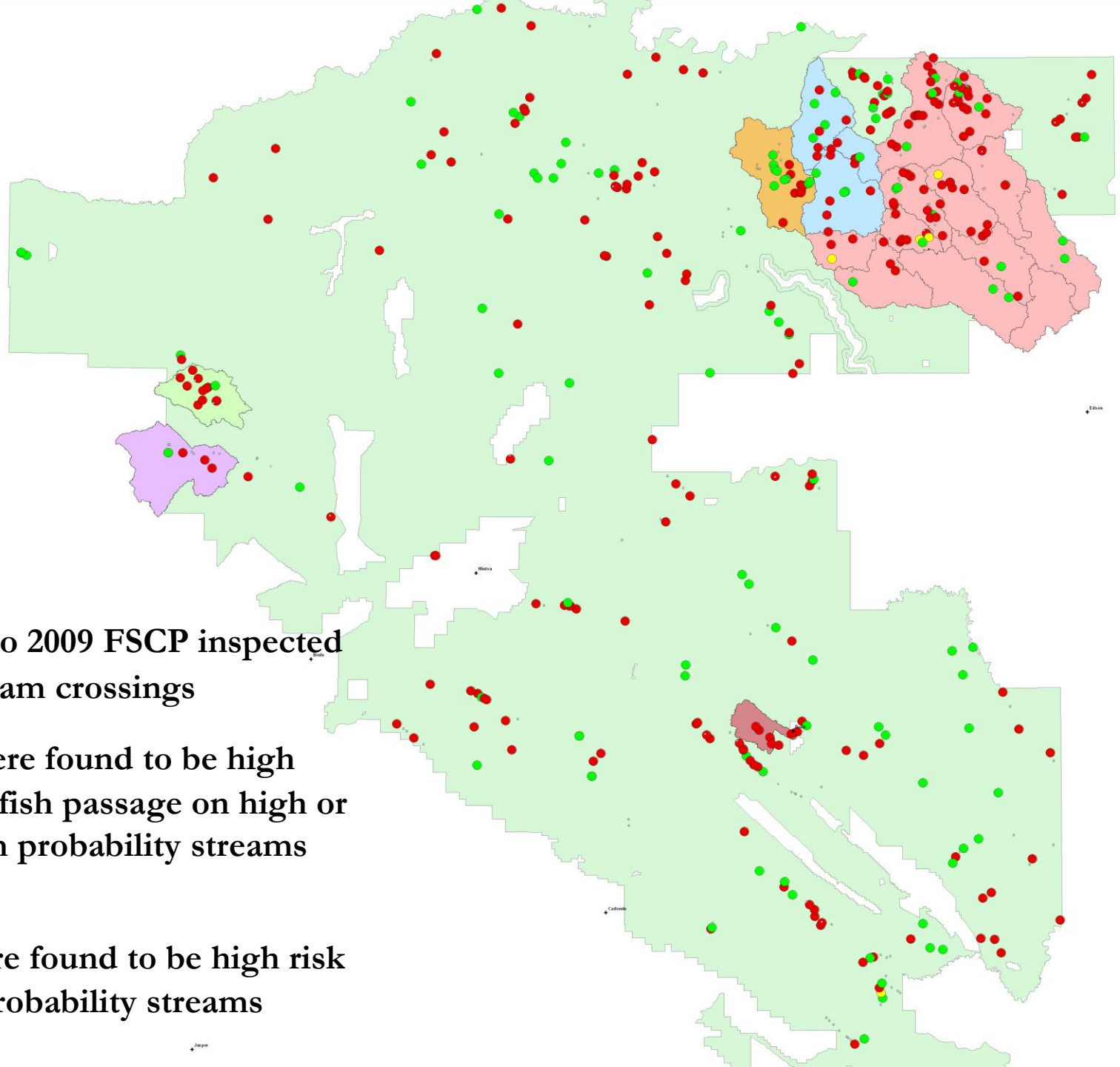
- 89 total crossings
- 84 crossings required sedimentation mitigation
- 17 crossings were barriers to fish passage
- ~50km of blocked fish habitat



***71% of crossings belong to FSCP member companies**

Remediation Plan Updates

- Updates from all but one company
- One non member company has provided updates
- 3 additional watershed plans are being developed
- Edson watershed will be a priority in 2010
- Significant improvements will be seen by summer 2012 in Pine and Nosehill watersheds.



- 2006 to 2009 FSCP inspected 512 stream crossings
- 156 were found to be high risk for fish passage on high or medium probability streams (30%)
- 84 were found to be high risk on all probability streams (16%)

Footprint Reduction

2009

- 47 (of 51) crossings had sedimentation issues addressed
- 5 crossings were mitigated for fish passage opening 29km of fish habitat opened (63% of recommended fish passage repairs)

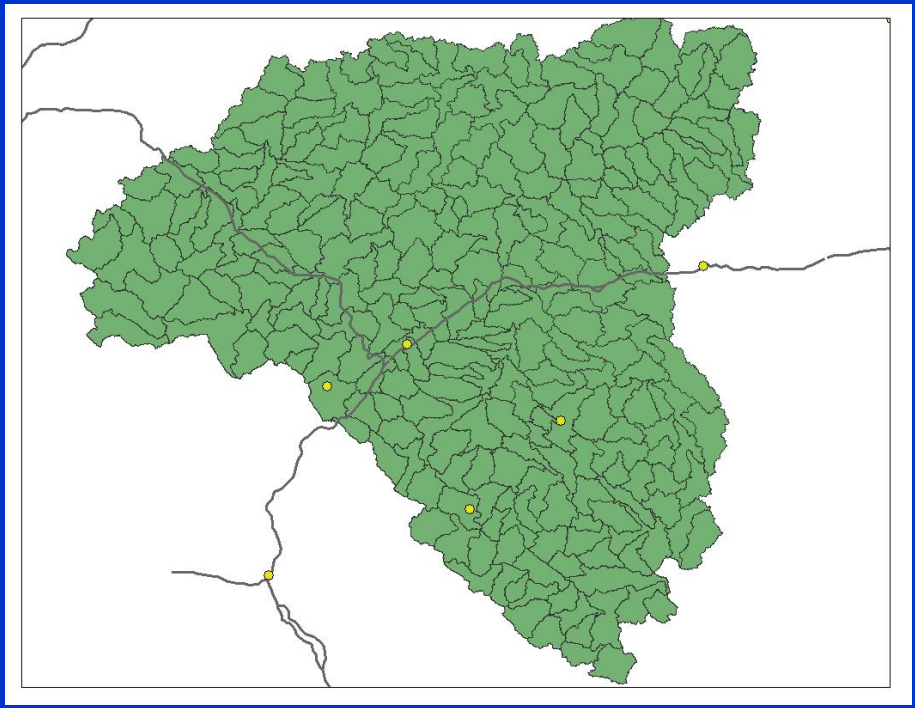
2010

- Remaining 4 crossings at risk for sedimentation will be repaired
- Planned repair to remaining fish barriers will open 15km of fish habitat

Why do we prioritize

- Large landscape scale problem
- Maximize environmental benefits with available funds
- Allows for collaboration between companies and the regulators
- Allows for planning over time

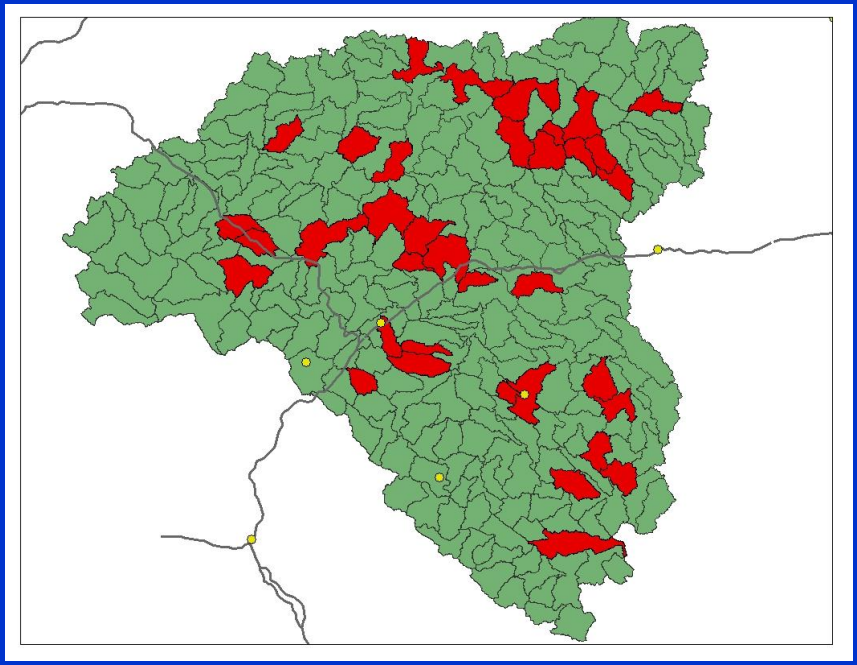
Watershed Prioritization (Work in progress)



- **266 delineated watersheds**

- Next Step
- Select for watersheds with greater than 1km of blocked stream

Watershed Prioritization (Work in progress)

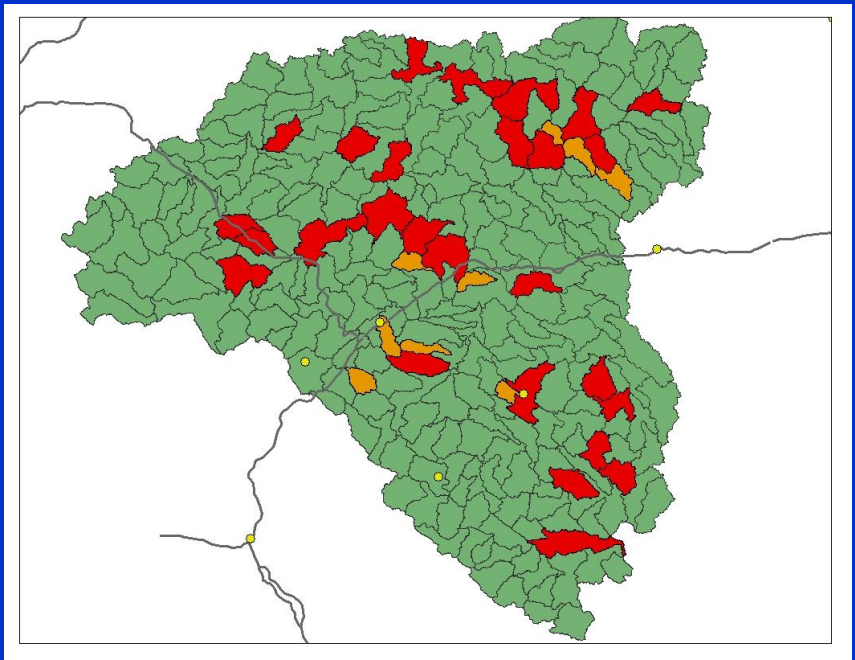


– Greater than 1km blocked stream

Next Step

- Select for watersheds greater than 50km^2

Watershed Prioritization (Work in progress)

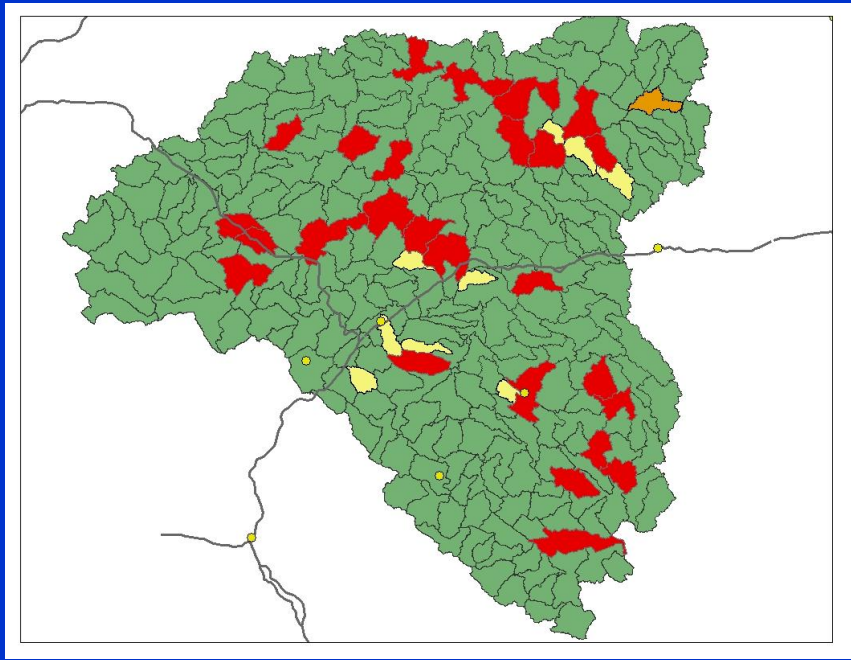


- > 1km blocked
- > 50km^2

Next Step

- Select for watersheds with confirmed fish presence

Watershed Prioritization (Work in progress)

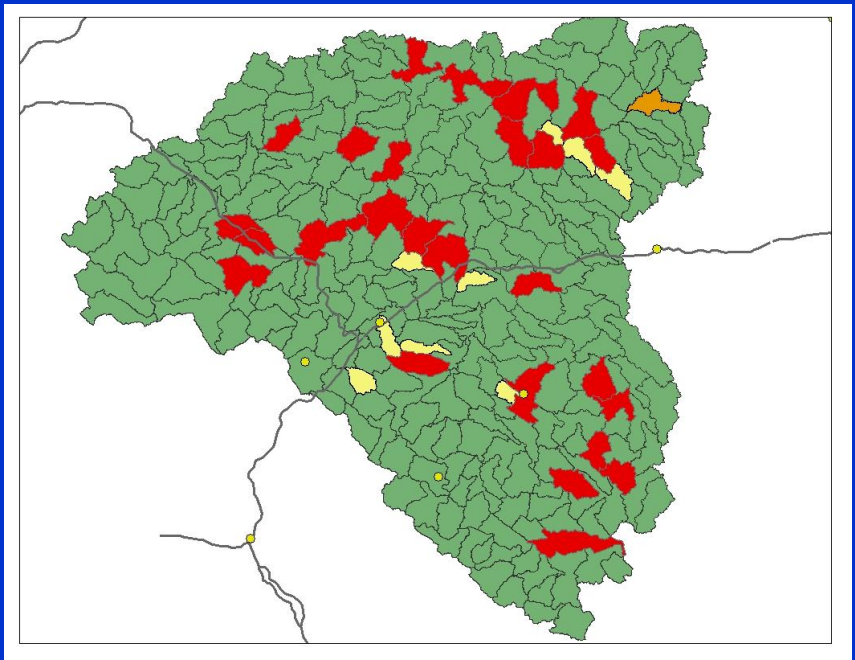


- > 1km blocked
- > 50km^2 area
- > Confirmed fish presence

Next Step

Select for watersheds with 3 or more high sedimentation risks

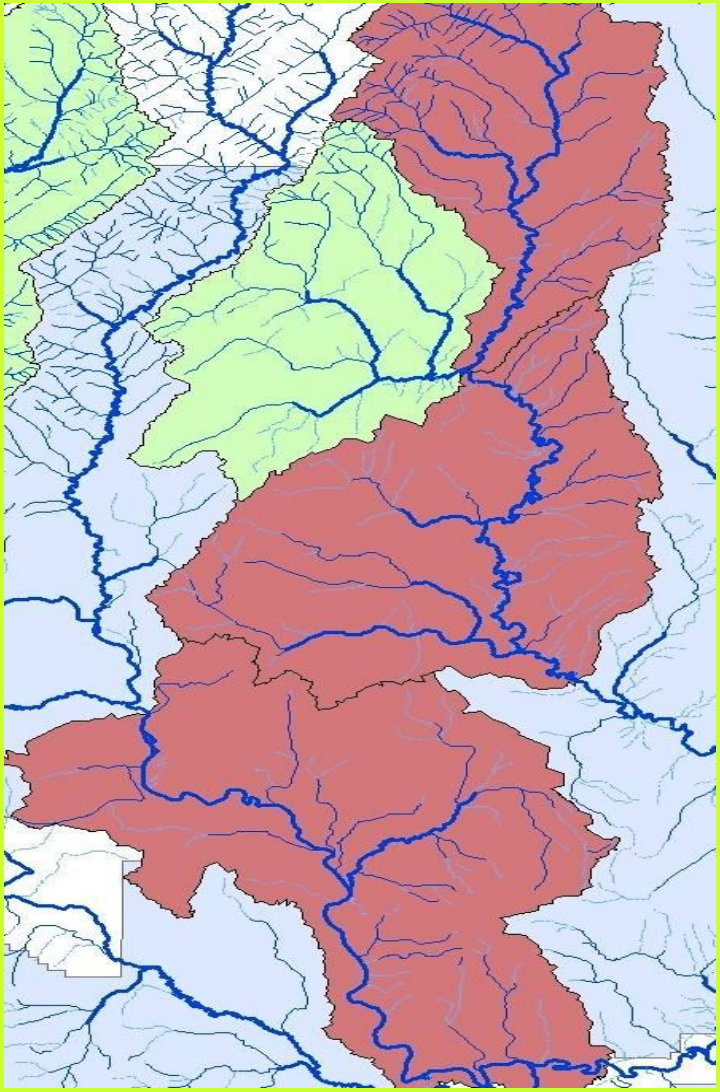
Watershed Prioritization (Work in progress)



- > 1km blocked
- > 50km^2 area
- > Confirmed fish presence
- Containing 3 or more high sediment risks

Fish Probability Model

- Drainage area
- Basin slope
- Basin elevation
- Percent wetlands
- Reach elevation
- Reach slope



Fish Probability Model

Pros

- Prioritizes a huge number of crossings and watersheds
- Quick
- Easy to use
- Best available management tool

Cons

- Uses best available data but some gaps are present
- Only extends to FMA border
- Like all models, not 100% accurate

Company Deliverables

- Current Inspection Reports
- Maps of crossings
- List of highest priority crossings
- Shape file of crossings
- Fish inventory results
- Fish Probability Model layer file

FOOTHILLS STREAM CROSSING PROGRAM - Inspection Output Report 3141

1.0 SITE INFORMATION

Crossing Owner: YELLOWHEAD COUNTY

Crossing Number: 3141

Road Name: Rock Lake Road

Inspection Date: 04-Jul-06

Inspection Objective: Initial Inspection

Immediate Attention Notification? No

Site Comments: None

Structure Type: Culvert

Stream Type: Small Permanent

Basin: Wildhay River 4

GPS UTM: E 429673.82 N 5930509 NAD 83

Legal Description: SE-27-52-1-W6M

Access Directions:

Method	Description:	Comments
truck	NW- km 44.5 -On Hwy 40N	Turn left

2.0 RATINGS OF CROSSING

Safety/Performance Risk Rating:	Erosion/Sediment Risk Rating:	Fish Passage Risk Rating:
Medium	Low	High

2.1 SUMMARY OF SUGGESTED REMEDIAL MEASURES

3.0 CULVERT PARAMETERS

Number of Culverts: 1

	Culvert Type	Culvert Material	Road surface material	Armour Inflow	Armour Outflow	Height of fill (m)
A:	Round	Steel (Corrugated Metal)	Gravel	Vegetation	Vegetation	3.00

	Culvert length (m)	Culvert diameter (m)	Channel width upstream (m)	Right Depth (m)	Centre Depth (m)	Left depth (m)	Culvert to Channel Width Ratio
A:	50.00	1.20	3.90	0.31	0.22	0.22	0.31

Culvert Comments: None

4.0 BRIDGE PARAMETERS

5.0 FISH PRESENCE AND PASSAGE

	Hang Height (m)	Riffle crest depth (m)	Outfall drop (m)	Effective pool depth (m)	Backwater in culvert (%)
A:	0.17	n/a	0.17	0	0.00

	Substrate in Culvert(%)	Substrate Type	Culvert Slope	Culvert Slope Uniform?
A:	0.00	None	11.97	No

Field Assessment of Fish Presence: Fish Bearing

Fish Presence Probability (model): High

Bull Trout Probability in Surrounding Drainage Basin (model): High

Drainage Area (km^2): 15.2 **GIS Stream Gradient (%):** 3.87

Blockage Present? (see safety section for details): Yes (fish barrier only)

Fish passage comments: Slope is not uniform creating a velocity barrier for fish. Hang height present.

Fish Passage Risk Rating: High

6.0 SAFETY AND PERFORMANCE

	Blockage Estimate (%)	Blockage Type	Bridge Signs Present	Markers or Reflectors?
A:	0	None	n/a	No

Safety and Performance Comments: None

Safety/Performance Risk Rating: Medium

7.0 EROSION AND SEDIMENTATION

7.1 Preliminary Inspection

Evidence of sedimention?
No

Erosion Comments:
None

7.2 Ditch Inspection

Location	Length (m)	Drainage Improvement Type
R. Downstream	n/a	None
R. Upstream	n/a	None
L. Downstream	n/a	None
L. Upstream	n/a	None

Total Ditch Length (m): n/a
Ditch Comments: None

7.3 Sediment Source Inspection

Location	Length (m)	Width (m)	Veg. Cover Class	Remedial Measure
R. Downstream	n/a	n/a	n/a	None
R. Upstream	n/a	n/a	n/a	None
L. Downstream	n/a	n/a	n/a	None
L. Upstream	n/a	n/a	n/a	None
Fill Inlet	n/a	n/a	n/a	None
Fill Outlet	n/a	n/a	n/a	None

Soil Loss Index: 0
Sediment Source Comments: None

7.4 Risk Rating of Unmeasured Sediment Sources (bridge deck, road, etc.

Rating: Low **Source:** n/a

7.5 Overall Erosion/Sediment Risk Rating

Rating: Low

Refer to McCleary, R.C. Spytz, H. Schindler and R. Anderson. 2006. Stream crossing inspections manual. Version 1. C.R. Barney (Editor). Clear Lake Ltd. Edmonton, AB.

Downstream.

Inlet.

View of road left.

Outlet.

View of road right.

Upstream.

Problems/Concerns?

- **How to get non-members on board, both industry and government?**
- **The magnitude of the problems including the number of crossings and the cost of remediation.**
- **The balance between industry driven solutions and being in compliance.**

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Summary

- Good example of “integration”
- Consistent with Water for Life Strategy
- Strong support and cooperation from industry, FRI, ASRD and DFO
- Results oriented and continuous improvement
- Potential to expand across Alberta

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Thank you

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