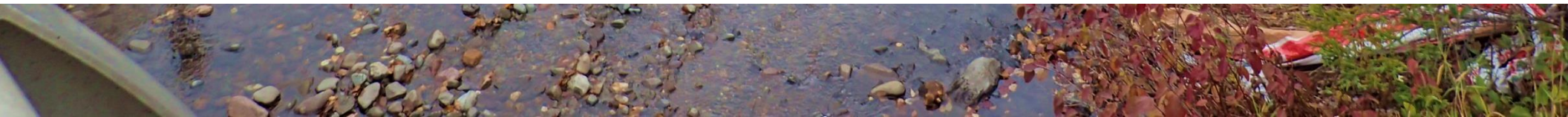
SALMON HABITAT CONSERVATION

SOUTH BROOK, NEWFOUNDLAND AND LABRADOR



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ACKNOWLEDGEMENTS

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Resource Innovations Inc.
Town of Pasadena

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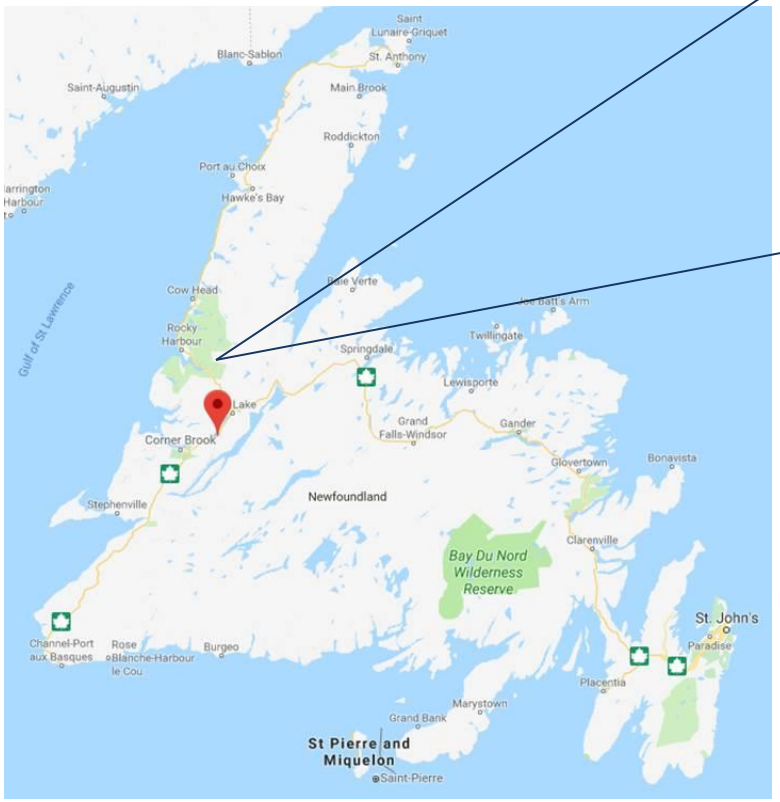
SOUTH BROOK

South Brook is a waterway found in the community of Pasadena, NL. This brook is approximately 17km in length from its outlet in Deer Lake, to its head waters. A part of the Humber River watershed, South Brook is a forth order stream, with 19 tributaries, creating a watershed size of approximately 60km².



South Brook is a scheduled salmon river with a known population of Atlantic salmon. Brook trout are also found within this waterway. A variety of landscapes are found within this watershed including land use designated for forestry, agriculture, and municipal development.

Logging has historically taken place within this watershed. Current timber rights within this watershed are owned by Corner Brook Pulp and Paper Limited. South Brook was historically used to drive timber in the spring from forested areas to Deer Lake, later to be transported via the Humber River to a pulp and paper planted situated in Corner Brook.

There are records of historical quarries within this sub-watershed. These quarries were historically used to harvest rock for the building of the Deer Lake Power Station. This brook is not utilized for hydroelectricity, and therefore there are no related dam structures along this brook fragmenting connectivity.

Commercial farming is minimal; however, an agricultural farm is located within the sub-watershed. Some residents may also grow small hobby farms on their properties. Most soils in this area are acidic by nature and low in available nutrients. Regular

application of agricultural limestone, commercial fertilizers and/or farm manures can be needed to support optimum growth levels for crops and to supplement the essential plant nutrients in the soil.

Biota

Some or all of the following species may be found in this watershed: Atlantic salmon, three-spine, nine-spine and black-spotted sticklebacks, brook trout, rainbow smelt, American eel, mummichog and banded killifish. A variety of waterfowl as well as mink, otter, beaver can also be found in the general area.

South Brook is a scheduled salmon river (Catch and Release only), as stated in the 2017/18 Fisheries and Oceans Angler's Guide.

Urbanization

South Brook flows through the Town of Pasadena. The population of Pasadena is 3620. There is no cabin/cottage development throughout this sub-watershed, however there is a large RV park located in the adjacent sub-watershed. Residents obtain water from a public water supply from a separate sub-watershed (Blue Gulch Brook). A portion of the South Brook watershed is designated as a reserve/back-up for public water supply usage (Transmission Brook).

The Town of Pasadena operates municipal sewage infrastructure. Sewage treatment takes place through use of a sewage lagoon located adjacent to South Brook.

There are no waste disposal sites in this watershed. Historically there have been waste disposal sites adjacent to South Brook; however they have since been decommissioned.

Pasadena is home to a variety of industries. The Pasadena industrial park is found in close proximity to South Brook. This industrial park includes industries such as retail operations, mechanical repair operations and fuel services. Other industries found within the watershed include forestry and agriculture operations. There is also a variety of road networks throughout this watershed, with various stream crossings. The Trans-Canada highway runs through this watershed. Road networks for the Town of Pasadena are found within this area as well. Forest access roads are found throughout this watershed, with North Harbour road running adjacent to the majority of South Brook. There are 8 stream crossings along South Brook; these crossings may include bridges and/or culverts. This area is also heavily used by ATVs and Snowmobiles, with maintained trail systems throughout the reach of this brook.

This watershed area is very popular for a wide variety of outdoor recreational activities including hunting, fishing, snowmobiling, ATVing, canoeing, boating, swimming, cross country skiing, etc.. Pasadena Beach, located at the mouth of South Brook, was previously designated as a provincial park.

There is also a wooded walking trail located along South Brook. Ski and Nature trails are also located along South Brook, and are in operation during the winter months. A portion of a large snowmobile trail network also runs along this brook.

There is also a sports complex located near South Brook which contains baseball diamonds, a skateboard park, and a dog park.

OBSTRUCTIONS

Aquatic connectivity is the network created by streams, rivers, and lakes as they flow into one another and eventually reach the ocean. Aquatic connectivity is important as fish migrate through waterways on route to spawning grounds, feeding areas, or seasonal habitat. When this connectivity is interrupted they become barriers to migrating fish populations; fish species found within these waters may no longer be able to access important spawning grounds, food, or other important resources.

South Brook is approximately 17km in length from its outlet in Deer Lake to its head waters. With 19 tributaries, creating a watershed size of approximately 60km², obstructions on South Brook, particularly the lower limits, can limit access to significant upstream habitats.

Obstructions can be caused by a buildup of detritus, created by local fauna, or be anthropogenic structures such as collapsed culverts. The entire length of South Brook was surveyed by foot. Nine obstructions were identified along South Brook. None were anthropogenic structures.

The severity of the obstruction was classified as either a full obstruction, or partial obstruction. Full obstructions were classified based both on their width and their height. A full obstruction was documented as any blockage which extended 80% of the stream width, and was found at a height greater than 15cm above water level. All other obstructions found within the waterway were classified as partial obstructions as fish passage would not be completely impeded.

OBSTRUCTIONS		
Latitude	**Longitude**	**Partial/Full**
49 1'11.30"	57 37'2.50"	Partial
49 0'55.20"	57 36'49.50"	Partial
49 0'50.90"	57 36'41.50"	Full
49 0'50.60"	57 36'43.70"	Partial
49 0'33.59"	57 52'25.21"	Partial
49 0'7.69"	57 36'7.32"	Full
49 0'5.30"	57 36'4.30"	Full
48 59'40.20"	57 36'10.20"	Partial
48 59'28.30"	57 36'9.20"	Full
48 59'27.40"	57 36'7.10"	Full
48 59'3.30"	57 36'20.10"	Full
48 58'53.10"	57 36'24.50"	Partial
48 58'42.30"	57 36'31.30"	Partial
48 58'36.01"	57 36'31.54"	Full
48 58'32.34"	57 36'34.45"	Full
48 58'27.62"	57 36'39.64"	Full

EROSION

Areas of substantial erosion have been documented on South Brook. As stream banks erode siltation increases, interfering with recreational fish species. Silt fills small spaces between stream bed rocks decreasing nesting areas. Without adequate nesting areas fish eggs become unprotected sources of prey.

As stream bank erodes vegetation is lost. Overhanging vegetation creates a canopy over the water providing shade, cooling and regulating water temperatures. Overhanging branches and grasses also provide a food source for aquatic insects, which in turn become a food source for recreational fish. The root systems for this vegetation also aid in the prevention of erosion along stream banks, holding the soil together within root networks.

Initial bank stabilization assessments on South Brook were performed by foot, through visual observation. Further information was recorded for assessment within a reach if two of the following criteria were documented;

- Streambank slope appeared greater than 60^{o};
- Streambank possessed less than 50 percent vegetative cover, or,
- 80 percent of streambank rock composition appeared less than 6.4 centimeters in diameter.

If two of these three criteria were observed within a reach, a further more detailed Bank Stabilization Field & Score Sheet was completed to assess the potential risk for streambank erosion within the reach. A bank stabilization score sheet was developed based on three previously developed rapid geomorphic assessments including; Pfankuch Stream Reach Inventory and Channel Stability Evaluation, Ozark Stream Erosion Potential Index, and Channel-Stability Ranking Scheme.

The Bank Stabilization Score Sheet assessed each reach based on eleven criteria, each criterion being assigned a specific score. The total value of the scores assigned determines if it is considered low, medium, or high risk for further or potential erosion to occur within the reach affected.

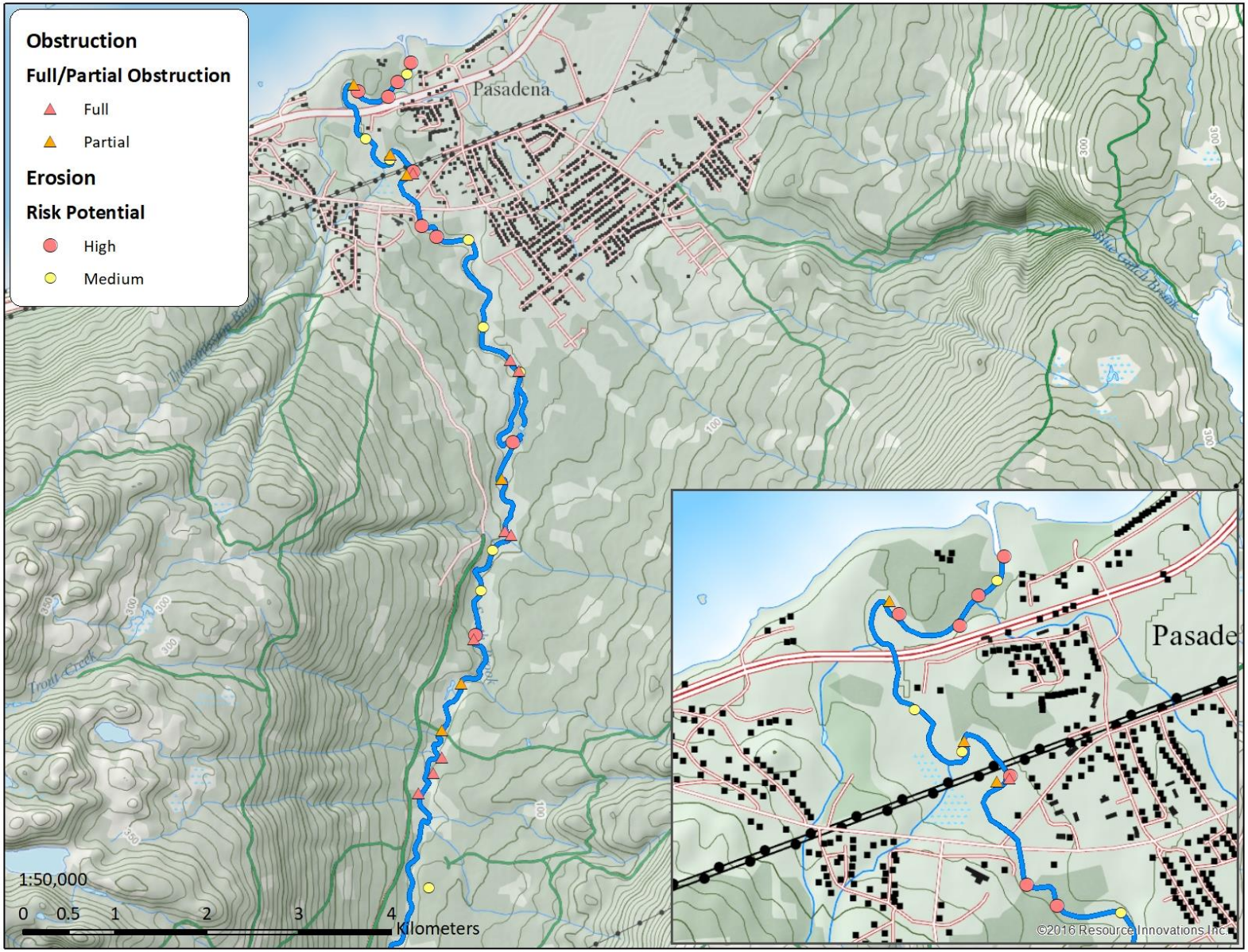
The eleven criteria which were assessed included;

- bank height, determined through either use of a measuring tape or a clinometer
- bank angle
- degree of incision,
- relative elevation of normal low water calculated by dividing water depth by bank height
- degree of constriction

- relative decrease in bank width from up to downstream
- dominant curvature of the waterway within the reach
- percentage of canopy coverage along the streambank
- percentage of stream bank protected (protection through rock, downed woody debris, and vegetation)
- percentage of each bank with fluvial deposition
- type of erosion visible along each streambank
- percentage of each streambank showing instability
- primary rock composition of both the streambank and stream bed.

Low risk reaches had values between 0-30, medium risk between 31-61 and high risk reaches included and value equal or greater than 62.

EROSION POTENTIAL				
Latitude	**Longitude**	**U/S Length (m)**	**D/S Length (m)**	**Risk Potential**
49.02122	-57.6118	20	50	High
49.02046	-57.61216	25	10	Medium
49.01999	-57.61306	10	10	High
49.01903	-57.61398	35	40	High
49.0194	-57.61691	20	20	High
49.01632	-57.61616	60	70	Medium
49.015	-57.61386	10	10	Medium
49.01423	-57.61151	20	30	High
49.01073	-57.61069	20	40	High
49.01007	-57.60923	50	40	High
49.00984	-57.60613	30	35	Medium
49.00424	-57.60471	75	50	Medium
49.00135	-57.6011	15	15	Medium
48.99685	-57.6018	30	60	High
48.98992	-57.60379	40	40	Medium
48.98731	-57.6649	40	50	Medium
48.98449	-57.60545	10	20	Medium
48.98449	-57.60545	50	30	High
48.96827	-57.61	10	50	Medium


Obstruction
Full/Partial Obstruction
Full
Partial
Erosion
Risk Potential
High
Medium
Pasadena
Trout Creek
1:50,000
0 0.5 1 2 3 4
Kilometers
Pasade
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WATER QUALITY

The quality of water in our streams and brooks impacts the life they support, including Atlantic Salmon during annual migration.

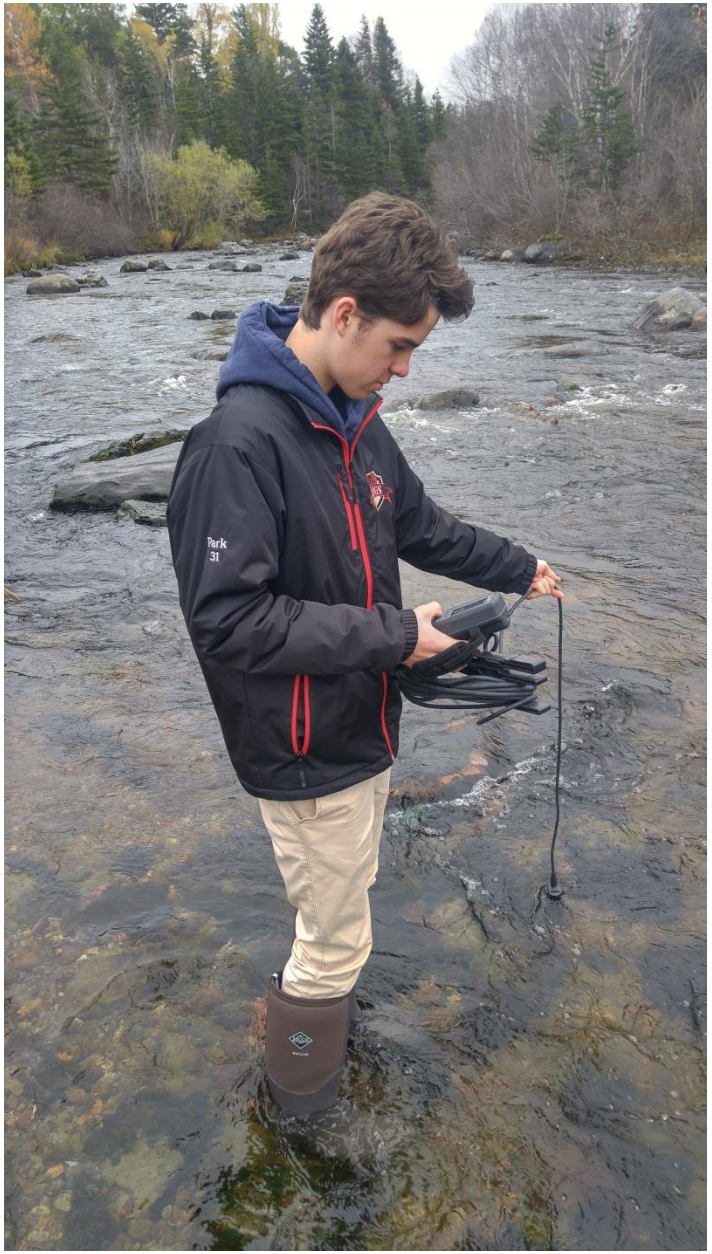
Ongoing and frequent monitoring allows for early detection of changes to these ecosystems. Monitoring over an extended period also allows for the detection of slow emerging trends; changes that may not be detected with sporadic monitoring.

Such monitoring is crucial for South Brook as portions of it are in close proximity to potential pollution sources such a as sewage lagoon, residential areas, commercial, and industrial zones, and areas heavily used recreational purposes.

A monitoring site has been established on South Brook at N 49.01157, W 57.61099. nine parameters were monitored:

- Water Temp
- DO (%)
- DO (mg/l)
- Cond
- Sp Cond
- Salinity
- Total Dissolved Solids
- pH
- pH (mv)

All physical parameters will be measured in the field using a YSI Professional Pro hand held Water Quality Meter. Standardization of the meter will be performed bi-weekly based on the meter's operating specifications.



	D.O. (mg/L)	D.O. (%)	Spec. Cond. (µs/cm)	Cond.	Sal. (ppt)	T.D.S. (ppm)	pH	pH (mV)	Water Temp. (°C)
06/13/2017	10.80	96.4	75.1	53.9	0.03	48.75	7.60	-72.1	10.3
06/29/2017	10.41	99.2	91.9	71.2	0.04	59.80	7.61	-72.2	13.2
07/06/2017	11.90	115.0	94.5	74.1	0.04	61.75	7.44	-69.6	13.6
07/17/2017	9.90	119.0	123.6	121.1	0.06	80.60	7.63	-92.2	24.0
08/01/2017	12.60	124.0	131.8	105.0	0.06	85.80	7.38	-76.8	14.3
08/17/2017	10.33	103.2	126.2	103.5	0.06	81.90	7.50	-95.0	15.4
09/01/2017	9.80	99.0	134.3	111.0	0.06	87.10	7.60	-83.0	15.9
09/14/2017	9.73	97.0	67.2	55.0	0.03	44.20	7.37	-67.7	21.0
10/03/2017	12.41	106.9	88.4	60.8	0.04	57.20	7.45	-75.9	8.7
10/19/2017	12.80	106.1	70.8	46.5	0.03	46.15	7.09	-55.5	7.2
10/31/2017	13.35	115.3	93.1	64.4	0.04	60.45	7.45	-82.6	9.0
11/08/2017	13.80	100.9	65.3	39.5	0.03	42.90	7.51	-85.5	4.1
11/22/2017	14.07	98.0	74.3	39.7	0.03	48.75	7.87	-103.1	0.6
12/06/2017	8.89	62.2	92.7	49.7	0.04	60.45	7.68	-101.5	0.8
07/17/19	9.80	108.0	114.2	104.0	0.05	74.10	7.74	-46.2	20.4
	8.10	95.0	101.3	97.9	0.75	65.65	7.97	-67.7	23.3
	11.20	110.0	125.7	100.6	0.06	81.90	7.82	-52.1	14.6
	10.10	99.0	134.0	106.8	0.06	89.05	7.65	-92.1	14.1

RECOMMENDATIONS

Awareness

South Brook is a significant waterway, 17km long with 19 tributaries, creating a watershed size of approximately 60km². It is a scheduled river. In a region rich with waterways many are not aware of the significance of South Brook , the issues and potential.

Further research is required to properly assess the health of this waterway. Existing and future research needs to be more readily shared with stakeholders and the public.

Prioritization

Western Newfoundland is home to many important fish bearing waterways. Several of these have been actively researched, restored, and monitored for decades. Other lesser known waterways, such as South Brook, despite their significance have not received the same level of attention.

Organizations need to be encouraged to focus on some of the lesser known fish bearing waterways. Funding organizations need to make resources available for work on these neglected rivers.

Salmonid Monitoring

South Brook is a scheduled river. There is no regular monitoring of salmon population or health.

A multiyear salmonid monitoring program needs to be established to determine the population of salmonid utitilizing South Brook, and whether population is increasing, stable, or decreasing.

Obstruction Removal

Obstructions are common on South Brook, restricting access to upstream habitat. All observed obstructions have been caused by beavers or erosion. Concern has been expressed that in removing these obstructions to allow fish passage habitat for other species could be destroyed.

All major stakeholders need to agree on an approach to opening up fish passage without detrimentally impacting habitat of other species. The underlying cause of some of the obstructions (erosion) should be proactively addressed.

Erosion Remediation

Streambank erosion is common on South Brook. Erosion does not appear to be caused by urban sprawl, but by the natural undercutting of embankments. Such erosional events are detrimentally impacting habitat and creating obstructions to fish passage.

Areas where erosion is taking place should be remediated using natural means.

Erosion Prevention

There are numerous areas along South Brook that are highly susceptible to future erosional events. Preventing erosion in these areas will minimize impact on fish habitat. The cost of remediating is greater than the cost of preventing.

Areas where there is high potential for erosion should be proactively reinforced.

Leachate Monitoring

A municipal sewage lagoon is located in close proximity to South Brook. Concerns have been expressed about potential leaching.

A regular and multi-year monitoring program must be established to measure bacterial levels in South Brook near and downstream from the municipal sewage lagoon.

Urban Sprawl

The Town of Pasadena is a growing community. As the community grows efforts must be made to maintain a buffer between residential/commercial/industrial development and South Brook.

Pasadena is an outdoor activity hub. South Brook lends itself to multiple recreational pursuits such as fishing, walking trails, and snowmobiling. The impact each activity could have on the waterway needs to be considered.

Municipal leaders and residents must be engaged in a discussion of activities permissible in and bordering South Brook. Protection measure should be incorporated into municipal development plans.

Illegal Fishing

Vast expanses of South Brook are remote, and out of public view. There are numerous reports, including from enforcement personnel, of illegal fishing activity taking place.

Salmonid organizations, municipal leaders, fishers, etc. must call for greater surveillance and enforcement patrols on South Brook.

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