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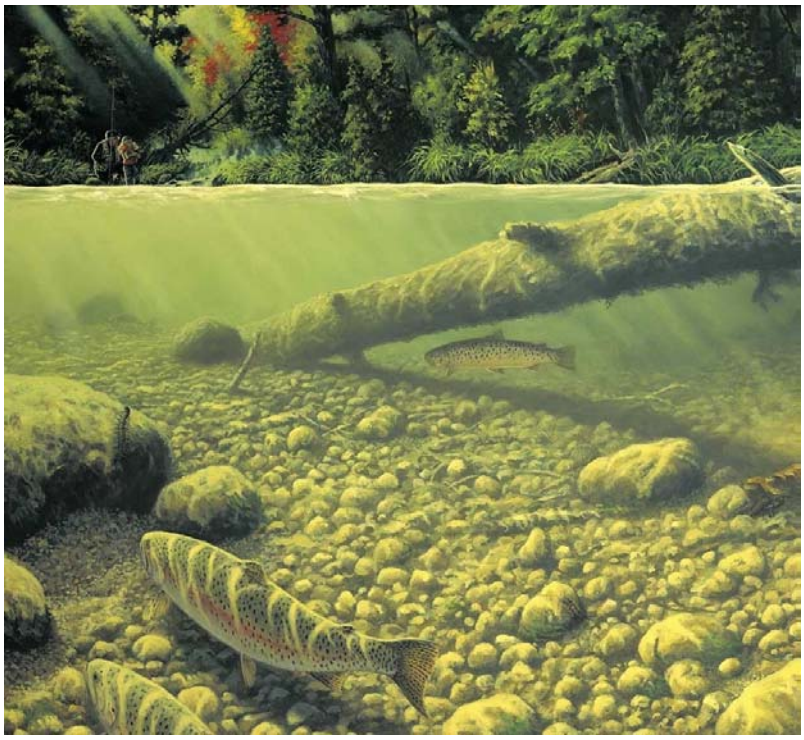
Fish In The River



Final Report

June 30, 2000

EXECUTIVE SUMMARY FOR FISH IN THE RIVER

June 30, 2000

This project was conceived this winter in response to a request for proposals sent out in Nov. 1999 for the Environmental Stewardship and Public Education Program for the Columbia-Kootenay Basin. The intention was to begin a dialogue about the state of the fisheries and other natural resources in the valley, and to explore ways to promote their health. The project provided information to people who want to learn more about the Slocan River fish population and other environmental issues, as well as collect information from residents.

In the past, The Slocan River system supported higher populations of diverse species of fish than it does now. There are a number of reasons for the decline of the fish. Two easily identified problems are dams built on fish migratory routes, and the removal of riparian vegetation.

Thanks to funding from the Columbia Basis Wildlife Compensation Program, Forest Renewal and Provincial Government Ministries, a sizable number of research studies have been done on the Slocan River system. Much of the content of these works and recommendations for restorative work are unknown to the public. Their work represents some of the information we have summarized and disseminated.

We had as many venues as possible for reaching out to the residents. During the period of the project had a website (which will continue until Dec.),an information Kiosk, newspaper articles, Small meetings in resident's homes, a brochure, and public meetings. Our final report is a compilation of as much of this material as possible.

We intend that this information will be used by interested residents in creating projects for enhancing the Slocan Fishery in the coming years.

This project was funded by Fisheries Renewal B.C., and went from Jan. to the end of June 2000.

The steering Committee was Lyn Cayo, Anni Holtby, Tom Bradley, Leslie Mayfield, and Jennifer Yeow.

If you are interested in becoming involved please contact Anni Holtby at Selkirk College or write Susan Eyre at C1, S4, RR#1, Slocan Park, B.C., V0G-2E0.

Publishing History

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THANK YOU !

The Fish in the River Working Group extends an "Enormous Thank you" to all the people who contributed their experience and knowledge so generously. With all the enthusiasm and high regard for the Slocan River Fishery, it seems we should be able to restore healthy bull and rainbow trout populations to this river system. To be sure there are daunting hoops and hurdles, however through this compilation of combined knowledge from all sources, the puzzle pieces should come together in some cohesive pattern, so we are able to see what the next step is. For myself, the picture keeps unfolding and the knowledge pouring in makes me more and more wondrous at how finely the entire ecosystem interrelates. The deadline has come, for the Final Report, and this is what we have gathered to date. I can hardly wait to read it!

First we thank Fisheries Renewal B.C. for making this project possible. It has been invigorating to work at a job so positive and beneficial for our local community. Thank you to Chris Beers, for being our right- hand person and a great resource of information.

We thank the people who had the vision to create this process, bringing it into reality, producing decent-paying jobs, and upgrading our skills for we local people.

We thank the Fish in the River Working Group Team. We had a very challenging time of keeping our focus at the beginning, while loosing one of our team to a hit and run accident, Teresa Shanks - thanks Teresa for your wonderful enthusiasm! We miss you! We lost two of our co-ordinators to full time jobs, understandable too. Thank you Sandi Derow and Rita Corcoran for your dedicated work and understanding. Thank you to Tom Bradley, who set up a communication network via the e-mail that is so efficient, that it sped interaction up light years. I wish every group could be so connected ! We thank the First Nation People, the Sinixt, for working with us after a rocky start with miscommunications in the beginning. Heartfelt apologies to them for any initial difficulties, and thank you for their knowledge and experience. Thank you to the Fish in the River Working Group who just got more and more excited with the knowledge we absorbed and experience we gained through all the wonderful resource people we met.

Thank you to Anni Holtby, Jennifer Yeow, Lyn Cayo, Tom Bradley, Leslie Mayfield, Susan Eyre, Miriam Mason-Martineau, Shemmaho Daystar, and Gabi Sittig. Thank you to Nolan Bradley for an excellent interactive Website www.fishintheriver.org, and to the people who have contributed to the discussions. For the latest and most thought-provoking insights on fisheries-check this site out! Thank you to Ryan Wilson for his contributions to discussion and his boundless enthusiasm for fisheries. Thanks to the Spicer Center for providing us with the space for our organizational meetings.

We thank all of the Fisheries Biologists, who answered our endless questions, and added to our body of knowledge so far beyond the asking - Not once did we feel the bureaucratic pinch, rather, we are a team in this, altogether, for "the love and fascination of fish and their environment". Thank you ! to Pete Corbett, Steve Arndt, Bob Lindsay, Colin Spence, John Bell, Randy Lakes, Jay Hammond, Steve Matthews, Chris Beers, and Luce Paquin for your dedication and education.

Enormous thank you to all the local people who shared their experience and knowledge of this beautiful valley - lifetimes of witnessing the river and all that effects it and its watery inhabitants. These day- to -day experiences bring theory and studies closer to solid knowledge, and point out the missing puzzle pieces. The Fish in the River Working Group thanks all the generous people who gave phone interviews, opened their homes to interviewers, and hosted "kitchen table meetings". The knowledge database has greatly increased because of you! Finally, thank you to all the people who attended the public meetings. We appreciate your enthusiasm for the Slocan River Fishery.

The Fish in the Rivers' Final Report is for the people of the Slocan Valley to read, ponder, and decide what the next positive action would be to create a healthy ecosystem for a balanced fish population of all species in the Slocan River.

Fish In The River
Final Report

TABLE OF CONTENTS

Fish In The River
Final Report

1 Introduction

At the turn of the last century, the Salmon, the Sturgeon, the Dolly Varden, and the Steelhead Trout from the Pacific had a free run of the Columbia, Kootenay, and Slocan Rivers. The construction of the Grand Coulee Dam on the Columbia River in Washington State, USA, cut off the anadromous fish migration from sea to headwater. With the construction of the Brilliant Dam on the lower Kootenay in 1942, the migrating Dolly Varden and Bull Trout were impounded, greatly affecting the Kootenay and Slocan Rivers along with the Little Slocan, Koch Creek, and Lemon Creek.

Further cumulative impacts could have been from the closure of the Cominco Fertilizer Plant in Kimberley and the construction of the Duncan and Libby Dams.

Detailed assessments of the status of the sportfish stocks began in the 1980's (see chronological summary in the appendix), and stocking programs and management strategies were attempted as the fish population continued to decline, leading to closure in 1994.

Fish in the River is a grass roots group of volunteers and paid workers. We are funded by Fisheries Renewal to do a project that started in January 2000 and ends on June 30 2000.

The project was intended to initiate a dialogue about the state of the fisheries and aquatic habitat in the valley, and explore ways to promote their health.

It was to gather and give out information to the public, find out what are the problems, possible solutions, and assess the amount of support in the valley for any restoration projects on the Slocan River and it's tributaries.

To this end we have held KT meetings, where people came together for informal discussions. We found that many landowners are interested in improving the situation.

We wrote newspaper articles and published them in the "Pennywise" and the "Valley Voice", and produced numerous handouts.

An interactive website was created for people to send in their questions, expertise, opinions, and theories. Please continue to interact at our website/www.fishintheriver.org

We have had information kiosks at various locations in the Slocan Valley, and were able to spark many impromptu discussions.

Fish In the River created an informative brochure to explain some of the fisheries issues and announce the public meeting dates, and website address.

Two public meetings were held on June 12th and June 14th at Winlaw and Passmore, which generated yet more input.

An Open House was held June 30th, 2000 in Winlaw to present the final report.

Much support was found in the valley, and the possibility exists of ongoing restoration work, education, and strategic planning.

There will be in the future work projects for local people, for example improving the spawning grounds and fish habitat, and doing other restoration work.

This would be a new project, with new funding by a different source. Some of the people of this current group will want to continue, and there is room for interested persons to join the team.

~

2 Reaching Out To The Slocan Valley Residents – Kitchen Table Meetings

2.1 Introduction

Fish in the River was created to get as much information about the Slocan River from as many sources as possible. One of the ideas we came up with for this to happen was to have small meetings in people's homes, which we called Kitchen Table (KT) Meetings. The idea behind this was to create an informal atmosphere where people could bring forth their observations, ideas and concerns. And bring them forth they did!!

Shemmaho Jephi Sioux and Miriam Mason Martineau conducted the meetings. We held 12 altogether, from Shoreacres to Slocan, with 78 people participating. As wide a range of ages and life experience was represented as possible. Most people were property owners along the river, but not all. Many people had lived here all their lives, but one participant had been here less than two years. People were guaranteed anonymity if they wished; and conversely, some people's names will be sure to be mentioned, some as often as possible. Many residents are especially keen to do something, rather than continue talking and doing more studies. There seems to be no lack of energy, good will, creativity, know-how, information, and even equipment to get things going.

Each KT meeting had it's own ambiance, and came up with it's own consensus of ideas and solutions. There was virtually no controversy within each meeting. If we put all the KT groups together it might be a different story, as they each had some unique ideas, solutions, and frameworks for decision-making.

The KT Meetings were, on the whole, lively, imaginative, and generative. We have a few ideas that most everyone agrees with. In our discussions about the causes for the decline of fish and aquatic life in the Slocan River, three major themes emerged. All agreed that the dams are the major initial cause. The salmon, prior to the dams, had contributed, with their dead bodies, nutrients into this system that fed the whole ecosystem, not just the aquatic one. There was consensus that, without the free migrations of the salmonid family, of which trout are one, the whole fabric of life in the Columbia River system has been rent; the old days are gone and cannot be brought back. Trout are, like canaries in mines, an indicator species, which means the absence of trout indicates to us that our river is in BIG TROUBLE. Trout need cold, clean (not silted), well-oxygenated water to thrive. With the caution that we are focussing on trout as an indicator and not as a sport fish, all residents participating want to rehabilitate the river system so that trout, and their habitat, thrive. The second cause, which spawns all causes, is human settlement and human activities.

There was general agreement on several ideas that would benefit fish, and would be projects that people would be interested in developing. In no particular order, they are 1) reduce sedimentation, 2) planting and restoration activities such as planting along the banks with local plants, and 3) create spawning channels that are as natural as possible. These ideas all came up in every meeting, contained in the concepts that we must keep the bigger, interconnected picture (ecosystem) in mind: how and why the tributaries are an

integral part of the river system, and what protection, restoration these tributaries may need, and that local people must conceive and carry out the projects. The following summary contains all the comments on these subjects, and all other subjects.

Hi, my name is Shemmaho, and I was responsible for organizing and conducting the KT meetings from Pedro Creek south. I had a lot of fun, and got to meet lots of people I did not know, living on Perry Siding myself. One area of knowledge and concern that seemed unique to the south end was the local dams and their effects. Another concept that seemed unique to the south end was the idea of Stewardship Agreements that would protect the work we would be doing, or give the river back to the wild, and protect that.

Through organizing and facilitating the KT meetings between Winlaw and Slocan I, Miriam, was able to meet and hear from many diverse groups of people in the valley. I really appreciated this. Whilst there are many different opinions and impressions, I also got a clear sense of just how deeply many residents in this area feel connected to the river system and its fish. A few points that came up repeatedly and that seem to be unique to the area between Winlaw and Slocan included 1) the change in river flow due to the sand dam at Lemon Creek that resulted from CP Rail's excavation of the creek and sedimentation from logging activities, which has had many effects on fish habitat north of the dam, and 2) concerns around the Slocan mill, such as a thin layer of oil created by a leak in the mill's loading device that seems to be effecting the pinheads and microscopic organisms, and the effect of fiber filling in holes and under rocks in the river.

2.2 Summary Of Kitchen Table Meetings

Number of Kitchen Table Meetings held: 12 held May/June 2000 between Shoreacres and Slocan City, plus a statement from a group that had to cancel their meeting, but came up with a joint statement.

Number of residents involved: 78

General response to the meetings: Very positive, appreciative of being listened to, giving input in a casual, comfortable setting. A lot of information came forth, as well as enthusiasm and support. Many residents are especially keen to do something, rather than continue talking and doing more studies.

The summary has been structured into the following categories: Information/Impressions; Possible Causes and Concerns; Solutions and Ideas; Questions. It is a compilation of ideas, opinions, bits and pieces of information, suggestions, concerns and anecdotes that residents shared in the kitchen table meetings or through a general statement they came up with.

In general, it seems that, although there is record of a few Dolly Varden being present in the Slocan River, trapped by the dam, and that char hybridized, what many residents call Dolly Varden are in actual fact bull trout. Also, while most residents use the term 'squafish', the correct name for this fish is 'Northern Pike Minnow'. We have, however, chosen to relate the summary of the KT meetings as close as possible in the language of

the residents participating in the meetings. We feel this conveys best the atmosphere of the meetings, and allows the reader to almost 'sit in' on the lively and engaged conversations. The KT meetings do not pretend to bring forth scientific facts; rather they served as a way to collect and bring together the many impressions, feelings, motivations and insights that local people living close to the river have about this system and its fish.

2.3 Information/Impressions

2.3.1 General Comments

1. Water is the connector. From the smallest ephemeral streams to the main river, and it connects us, the people who live in Hills with people in Vallican. That leads you to the natural understanding of a community-based ecosystem approach and it would be nice to see that used not only to bring fish back into the river but people back together in this valley.
2. It's a shame … the river -- 27 miles long, all natural, not polluted-but the fish don't want to stay.
3. Varying perspectives on road building and logging: some say they are the primary cause of sedimentation, others say they used to be and are now not a cause of major concern. And yet again others say they are a major problem, but there is nothing you can do about it.
4. Also varying views on agricultural activity: some say it is an important factor in river bank devegetation, others say there is now a lot less agricultural activity than there was when the fish were plenty.
5. I think it is a political question rather than a biological one. Let's figure out what we want, and then resolve it by figuring out what we need to do to have that.
6. If we want to have trout in the river everyone knows what we have to do, so fine, let's do that.
7. We can't relax. They do have plans for more dams, and they had the plan for the Grand Coule many years before it was built because of the war effort. The Hugh-Keeleyside was next, to control the water flow to that big dam, and all the rest have followed to increase power, decrease brownouts in major centres, and control water flow.
8. Eagles and osprey seem to get far more suckers and squafish than trout.
9. You can't restore a healthy fishery in the Slocan River unless you change both logging practices and logging rates.
10. After the lead shot was banned there was less hunting than there used to be -- now the duck and geese population has increased.
11. Vegetable oil creates a foam sheet with beads which then clings to woody debris and starts to rot. Petrochemical oils form a sheet.
12. There used to be hundreds and hundreds of frogs.
13. Log jams are ideal for winter habitat and hideaway from birds.

14. Things are changing and new data is coming in all the time, and the 'experts' are understanding that their hard-held beliefs are not coming out in results. They are starting to have some respect for the long-lived locals.
15. So many people have to come to agreement. We must create consensus opinion so the government will fund it. They want no controversy. Amongst us we want native trout. Let's see who else besides fishers want that.
16. The people formed the Columbia Basin Trust (CBT). It is our responsibility to see that it remains grassroots.
17. We are looking for a way that we as a community can stand for what we want.
18. We have opportunities we didn't have before, because government recognises that nothing can be done for the river without support on the local level.
19. I've been involved in a lot of restoration, and when people focus on the main stems and big rivers in watershed restoration, forgetting that if you don't take care of the headwaters -- small streams where active logging is occurring -- then you blow out all that work every spring.
20. Guys from Simon Fraser talked to John Braun as if he was a little kid!!!
21. (Talking about a spawning channel). You might as well forget that dream because fisheries would never go for that. Hird had his spawning channel -- fisheries flipped out because he had eastern brook trout. Hird's theory was this. Rainbow trout are real lazy fish. They feed at whatever is at eye level and up. They hang around about 3 feet of the bottom. Brook trout feed off the bottom. So they would eat whatever the rainbow miss! Fisheries told Hird if they found one brookie in the river that they would shut him down. And he had wonderful stock.
22. Re spawning: None of the specialists seem to know what the other specialists are doing.
23. Look how hard hit this whole area is by supplying power, originally for the lower mainland, and now Kelowna. All the power we get here now is subcontracted from B.C. Hydro. The power generated at West Kootenay is shipped to the Okanagan.
24. Take the overflow away with the new dam and fishery below will die from lack of oxygen. They expect to build it at a favourite fishing hole, halfway between the old Doukhabor bridge and the Brilliant dam, right above that big rock. This is a CBT project.

2.3.2 The river, or other waterways

1. Some individuals often have impression of the river as sterile; while remembering it as vibrant and alive.
2. Changes in the river: less structure (like fallen trees) in the river because of higher peak flows, which also last longer, and more turbidity over a longer period of time.
3. Just in the few years the new bridge on the little Slocan has been in, you see how much material is being deposited every year, changing the course of that river.
4. River is getting wider and wider due to erosion.

5. The old-timers considered the major drainage in the Little Slocan as Airy Creek, and called the Little Slocan just from the Lake to where it enters Airy Creek, and called the river Airy Creek to where it enters the Slocan River.
6. A large log jam that had been on the Little Slocan for many years, was disrupted unnaturally when Mike Zimmer went into the river with a machine and took some logs to stabilise the slide.
7. Hoder creek has a lot of siltation now -- it used to be red with red fish.
8. Bannock Creek that feeds into the Little Slocan is all silted.
9. Lemon Creek was changed from a braided delta into a single channel that is the same breadth across and depth. It was done by a large excavator after the flood in 1968 by CP Rail.
10. The small 6 inch to 1 ft wide streams that never freeze up could perhaps have a few 1000 fry in them happily overwintering.
11. The health of the river is dependent on the health of the tributaries feeding it.
12. Many individuals agree that the river seems to be warming. A few, however, say the summers were hotter in the 50's when the fishing was good.
13. There was supposed to be a ladder built when the Brilliant dam was built, and it was not. Below the dam is some of the best fishing in B.C.
14. People used to catch fish where the fields were, not just where there was shade. Winlaw creek used to dry up after a fire up the creek. It has not dried up for the last 10 years.
15. The river is not significantly different, and there used to be lots of fish.
16. Before the river was closed all the fish were gone, even the squafish and suckers.
17. River is quite vegetated from Lemon Creek northwards.
18. Slocan Lake and Goat Creek make up for a large percentage of the water in the river.
19. In the last few years, around Appledale, the rocks in the river have a slime on them they never used to have, even in the swift water, where it used to be clean. It was first noticed ten years before the closure of the river.
20. Slocan Pool is becoming more of a swamp.
21. There used to be a period when the river would ice over, so thick you could run sleighs on it. Last time I remember ice-skating on the river is 1978, last ice was six years ago. The experts say that the water has warmed up 6° since the Hugh-Keeleyside Dam.
22. The Little Slocan has lots of possible spawning grounds.
23. All the big changes in the riverbank around here are from people.

2.3.3 Fish

1. Coarse fish live on the same food as sport fish, but they like the conditions we are creating -- warmer, slower water, more light, etc.
2. According to a biologist in Winlaw the Slocan River is the only river in the world that has sculpins (shortheads); these could be endangered if not protected.

3. The Dolly Varden are in really bad shape.
4. Toxicity of fish went down quickly when Celgar quit dumping PCB's.
5. Bull trout are stream spawners, rather than river spawners.
6. Trout feed at the top end of the pools in the river. The squafish and suckers feed at the bottom.
7. Shiners were abundant and important food fish for big rainbows. Where have they gone, and why? They disappeared when the Kokanee did.
8. There were more than one kind of shiner, perhaps at least three.
9. Whitefish travel in schools and are easier to catch than rainbows. They used to be bigger (22 feet as opposed to 16"), and more plentiful.
10. I used to catch bullheads, which stay on the very bottom of the river. There is still the odd bullhead.
11. Other kinds of trout were caught -- speckled, perhaps eastern brook.
12. Used to catch squafish and can them up. Would take same bait as trout, only from the very bottom. There are less squafish now.
13. Less bullheads, also less whitefish than there used to be.
14. The suckers are more plentiful than ever, and ENORMOUS!!
15. The salmonid family of fish, which includes rainbow and bull trout, are migratory, and must have a system that accommodates this trait. The fall was the best time to fish for trout, as they were moving then.
16. Native trout in this river were 18-20 inches, 3/4 lb.
17. In the fall of 1999, a kid caught three different types of trout in the pool above the piers, and it didn't take him very long, using a fly hook.
18. Trout numbers have increased a little since closure; Dolly Varden (bull trout) and kokanee have not responded yet.
19. Used to catch the biggest fish from mid-July to mid-October, when the water is warmest.

2.3.4 Location of fish

1. There is quite a little school of whitefish at the mouth of the little Slocan right now.
2. There were cutthroat back in the tree farm.
3. The rainbow trout spawn just below the lake (the lake catches a lot of the siltation).
4. Only the brook trouts and the Dolly Varden spawn up in Lemon Creek.
5. We caught two trout this year, just 500 meters below the new Passmore slide, before it happened, when we were fishing for whitefish. This used to be very rare, because you use different bait for whitefish than trout. (Maybe the trout were very hungry.)
6. Dolly Varden were caught at the mouth of the Little Slocan this fall. They were waiting for the Kokanee to come up.
7. Kokanee used to spawn up Lemon Creek, Koch Creek and Hoder Creek. Last Kokanee one informant saw spawning up there was in the little creek that flows into the bottom end of the Little Slocan (where the island is?).

8. At present the best spawning grounds are just below the Little Slocan Lake and Slocan Lake, where there is no or less siltation.
9. In summer of 1999, big trout were seen between Winlaw and Perry's Bridge. They were probably going to spawn.
10. In the fall the Dolly Varden would come to Trozzo Creek. In a pool by the highway it would be black with fish come to spawn, when there was a bridge there, not a culvert. Trozzo has become smaller with people drawing off it for domestic water. Road building did damage to the mouth of Trozzo Creek. There is now a sandbar where there used to be a pool.
11. The Dollys went up in the spring and came down in the fall.
12. Wall-eye are already in this system, in the Arrow Lakes. They are predators of squafish and suckers, as well as trout. Dollys, although predators, are not as aggressive.
13. More than 50 years ago, people saw sturgeon in the river, near the big log jams.
14. There were Kokanee 7 miles up Lemon Creek at the falls in the autumn. Also at Larsen's jams.
15. Whitefish used to spawn in Oct. & Nov. in the pool by Harry Sookerukoff's place near Shoreacres.
16. The fish stayed in the deep pools and only the people with casting rods could catch them. This is probably still true, and the snorkel surveys don't see them.
17. The native trout have a deep red colour. They are hatching in the Slocan River.
18. The day they built the canal in1974, the native fish went up to the Slocan Lake, and the fishing was dead in the river within a few years.
19. The fish used to migrate from Slocan Lake, down to the Pool, and spawn in the spring, at Shoreacres and Koch's Siding, and Winlaw Creek, then go back up again in the fall.
20. There are a lot of chub at the Pool and at the mouth of the river. After labour day the water cools, the chub leave, and the rainbow start to run.
21. Also sculpins, which are an endangered species.
22. Rainbow that used to run up here had the coloration of the biggest fish in the picture of the small lake fish in the D.O.E. (Department of Environment) literature.
23. Some Gerrard trout were seen spawning in the river, just below Slocan City.
24. Rainbow spawned right by Don Paul's place in Shoreacres.
25. Fish that used to migrate are staying in the Pool now.
26. Kokanee hang out around slough at Bill Tarasoff's. Perhaps they spawn there or in Glade Creek or McPhee.
27. Trout are territorial. They claim a deep pool (some are 20 ft. deep at low water), and stay there.
28. All the creeks had lots of brook trout.
29. Speckled trout will only be in creeks. They require shallower, swifter water, more oxygen and cover.

30. Big Trout are predators to squafish.
31. Dolly Varden, char and bull trout are all names for the same fish, or rather can be used interchangeably for the same fish. So depending who you are talking to, they may be calling any of those three fish one or the other of those names! According to Harry, there are two Dollys. In Argenta they have a flat, long head. The Dolly is shorter and has orange spots. The bull trout are white inside, the Dolly has red meat.

2.3.5 Other Aquatic Life

1. Clams (mussels) were everywhere, black ones. Lots at Perry's -- you can still find shells. Also at Claybrick (just downstream of Trozzo Creek). People used to feed them to chickens.
2. Helgamites are still here and seem as plentiful as ever. Also periwinkles. Fly hatches are out of this world: chromanids, mayflies, stoneflies, salmon fly, black helgies. Harry thinks this is true because there are no fish to eat them. The fish eat them just before they fly, when they are still in the stage just under the surface of the water.
3. There has been a huge decline in the mosquitoe population. This may have to do with draining of swamp areas and chanelling of side channels.
4. Cottonwoods that started in 1986 are now 30 feet tall; so they grow fast!
5. Otters are new here. They make holes in the banks, and contribute to them falling in.
6. Muskrats have always been here.
7. The trout eat the bugs once they have hatched and are on the surface of the river; the whitefish turn the rocks over and eat the bugs before they hatch.
8. Chromanids (a type of fly) hatches are more prolific because of the warmer water.
9. Even at the Pool there are no shiners now. Just a few at the mouth of the Slocan where it drains into the Kootenay. One informant thinks they are young squafish, and they used to be called sunfish. They used to be used as bait.

2.3.6 Stocking

1. There were a few years they threw in some steelhead into the Pool without many people knowing about it. They were 10-12 lbs., and hung around all winter. They must have had some old stock and just dumped them into the river.
2. West Kootenay Power used to stock the Pool, as part of the deal to dam the river, and they stopped after the Canal was built by Hydro -- could be some inter-company hunting of responsibility that ends in no one taking it.
3. West Kootenay Power's contract to stock ran out, and so did the fish.
4. If you stock a fish here it is going to go into the lake.
5. Someone suggested stocking with brown trout. They are not migratory, come from Germany, require colder water, more oxygen, and are harder to catch than rainbow.
6. Before fisheries, local fish growers were letting fingerlings go into the river. This was around 50 - 60 years ago. This was common knowledge among the fishers, that has been a well-guarded secret from fisheries, and that no one would admit to today, to keep people's memories untarnished.

7. Stocked trout's fins are white, with a grey cast.
8. A fish truck bound for the Okanagan sprang a leak 3 - 5 years back, and they dumped the fish between the dams.
9. About 6 years ago, Ron Milton was stocking the Little Slocan with Gerrard trout (mature brood stock) and had published it in Pennywise. As fast as they put them in guys were "hammering it out". The fish would bite anything -- they had no survival savvy. A few got away.
10. Stocked fish are easy prey because they never had to learn to run and hide.
11. As long as I remember, every spring they would bring in two tankers of fry, 20,000 fish. These would migrate to get food. They quit doing the planting because they moved the hatchery from here (Cottonwood Falls).
12. When you stock fish at 3-4", survival rate is only 10 out of 100, so if you plant 1,000 fish, you only get 100. There were seagulls that came the last time they stocked fingerlings, and over two days 500 gulls ate 90% of the truckload. When they stocked fish 6-8" long, they did better.
13. Stocking eggs? The suckers and coarse fish are going to clean up all the eggs. You'd need about a mile of stream that is fenced off for propagation purposes.
14. Blackwater trout have been stocked here, in Crescent Valley two years ago, and near Winlaw. They are spawning somewhere, because one person caught some this spring and they were full of eggs. Needless to say, they released the fish.
15. They used to stock at a place in Shoreacres that was grassy and a good place for the little fish to hide until they got big enough to enter the Pool, with enough bugs for them to eat. The landowners there now have denied access, saying people would ruin it, dump garbage, etc.

2.4 Possible Causes And Concerns

2.4.1 Diversion to flow

1. The dams had and have a huge impact on the entire ecosystem.
2. The largest single cause of the decline of sport fish in the Slocan system is the dams on the Columbia River system, and the fact that salmon no longer come to spawn here.
3. Since the dams the water levels are different, and the fish don't remember where to go.
4. When they built the canal they screwed up the feed line. Once the Canal was built, West Kootenay Power did not feel they had responsibility for stocking anymore, because Hydro was getting their water. "You want fish, Go talk to Hydro."
5. Change in erosion patterns stemming from clearing of river bank vegetation.
6. After a serious flood in 1968 CP Rail chanelled Lemon Creek from the river to the highway. They gutted it so it is now the same depth and width everywhere. Sedimentation flowed/flows down the creek and built/builds up at the mouth of Lemon Creek, which has resulted in a large dam that has changed the river flow. It

changed the river from a fast running river to a slow moving one. The water that backed up flooded the area south of Slocan. The large area of warm, shallow water is now ideal habitat for bugs, squafish and suckers. According to one resident the big marsh is now 2/3 larger than 40-50 yrs. ago. It has expanded to become almost a second lake (1-3 feet deep). This broad shallow area just south of Slocan has become a perfect area for flood control.

7. With the damming at Lemon Creek the water that floods further north allows all the little pockets and shallows on flooded land to be filled with fish. The small fry and minnows get stuck there when the water retreats and they die. The mortality rate is huge -- 80-90%, or even 99%.
8. Another result of the damming at Lemon Creek is that the debris, instead of creating habitat along the river banks, gets washed up on to land where the river floods.
9. A further result of the delta forming at Lemon Creek and the water being backed up into a shallow "lake" south of Slocan is that the flood which lasts from beginning of May till end of August floods the area where there is an island (which appears when water recedes) for too long. It is too wet for too long, and the cottonwood and cedar are not growing. They are dead and there is no new growth.
10. The bridges crossing the flood plains (example of Perry's bridge) require that the river gets dammed with the roads leading up to the bridges. Example of this is the bridge on
11. The pilings (large trees pounded in the river) for the river drives when they used to transport the logs down the river effect and influence the river flow. This should be mapped and entered into the data.
12. It is better to leave the woody debris in the river, rather than cleaning it up and putting nice rocks in. Taking debris out changes the flow of the river.
13. After the damming in Lemon Creek the water was forced over and now has been moved to the side and up (near Lemon Creek Lodge).

2.4.2 Nutrients

1. Construction of the dams cut off the salmon, thereby cutting off an essential source of nutrients
2. First noticed in late 60's, early 70's between Slocan and Lemon Creek: Algae on the rocks and the spaces underneath the rocks where bugs (helgamites) used to settle are filled with something: fiber from the logs? Ash from the burner? Both? Now there are no more bugs for the fish (whitefish turn the rocks over and eat the bugs, trout and other fish eat the bugs off the surface of the rocks). The mill opened in 1964/65.
3. Accumulation of manure-sewage, septic, and animal fields.
4. Biologists shouldn’t have missed the fact that the food the fish used to eat is missing.
5. Bark debris from log booms uses up a lot of oxygen. It could also be leaving heavy metals in the water.

6. Gerry Oliver's study two years ago was testing to see if upping the nutrient levels a tiny bit would make a difference, and it did. The nutrient level is not so low that it does not support adequate insect life.
7. On a semi-microscopic level: the spilling of oil from the log loading devices at the mill creates a thin layer that kills the pinheads as soon as they hatch, plus many microscopic creatures. The loader has been leaking for 20 years, about 50 gallons/day (even if it is canola opil, it is still oil). The debris at Lemon Creek and the flood plain area just after Slocan act as a filter, so the lower valley is not effected by the oil.
8. The Little Slocan River does not seem to be bringing in the nutrients it once did. It runs pretty tan, maybe due to logging.
9. There has been no fire in the valley for the last 70 years. Fires can create new habitat, they burn organic rotting material and put gases into river.

2.4.3 Sedimentation

1. With logging higher up all the water drains at once, bringing with it silt. Since the 1970's, there is more silt from Little Slocan and Lemon Creek. Lemon Creek and Little Slocan exemplify what effects logging has had on sedimentation and how that effects habitat for the fish.
2. The river is not clear anymore from where the Little Slocan enters the main stem.
3. Many folks empty the silt out of their water boxes in the summer, releasing sediment into the streams and creeks.
4. The highway, the railway and all the work done in the lower reaches of many of the potential spawning streams have turned the formerly divert braided streams into ditches. There are no more pools or ponds and resting spots for the fish. Erosive material now gets carried directly into the river instead of settling in the old flood plains.
5. Other kinds of logging than clear-cutting would be better. Kalesnikoff does good logging. Leaves seed trees, does not burn, the ground is prepared for the seeds.
6. Little feeder creek on back road was logged and then ran brown, where it had previously been clear, and where the others on the same slope continued to run clear at the same time.
7. Many slides reported: above Judy Laret's in Slocan Park, Upper Passmore slide, new Passmore slide, slide opposite the new slide. All have contributed to the water being silty.
8. We never used to get murky water in the lower river until June.
9. When CP Rail excavated Lemon Creek for flood control, the sedimentation that normally would have precipitated out in the delta region, now flows directly into the river, building a dam and changing the flow of the river between Lemon Creek and Perry Siding.
10. Up until the end of the 80's the logging roads were built by side casting the bank material, sometimes into a creek. An example of this is Mulvey Creek, which is now

full of silt. Now they end haul the material out. Effects of older road building techniques can be seen in Lemon creek and Mulvey Creek.

2.4.4 Overfishing

1. Bull trout are very susceptible to overfishing as they will bite anything.
2. Fish are usually caught when they are at spawning age. Ideally younger fish would be caught. Overfishing can get to a point of no return when the balance is disrupted.
3. Not much policing. Lemon Creek, up near the falls is still getting overfished.
4. In the 30's the fish were strip mined by the Japanese: between Lemon Creek and Slocan there were 15,000 - 20,000 Japanese who did not have much to eat.
5. People wanted more 'game' fish than 'trash' fish. This set things off balance. Overfishing is when there is a fisherman every 10 feet along the river. It is also when people take home many, many fish to freeze.
6. Closing the river is a problem rather than helping, because people are now not culling the suckers and squafish.
7. There are more people fishing than in the old days, and they take lots home to freeze. “I quit fishing 15 years ago because we couldn’t catch 15 fish in an hour anymore, just one or two.”
8. Poaching goes on.
9. The river was very over-fished in the '70s.
10. Even now with the closure, some people still sneak in, and others are not aware that creek fish are connected to the river.

2.4.5 Predation/competition

1. There are now more natural predators, with the comeback of the osprey, otter, eagle, kingfisher and heron.
2. Kingfishers winter here now, whereas they didn't used to.
3. There are more osprey here now, because of the ban on DDT.
4. There is hardly any habitat for small fry. If they stay in the mainstem, they get eaten.
5. There are more ducks and geese. The geese probably destroy/disturb habitat. The geese eat the roots on the island south of Slocan.
6. There are lots of mergansers now, and where there are ducks, there are fish, because that is what they eat.
7. Squafish eat the eggs.

2.4.6 Human activities

1. Human settlement along the Slocan River (by Europeans).
2. Logging along the Slocan River banks, side channels and tributaries.
3. Human habitation and agricultural use leading to erosion of river banks, less habitat for fish, rise in river temperature due to clearing of riverside vegetation.
4. Humans change a lot by just effecting one piece of the ecosystem.

5. The roads put in in the 50's/60's are the main reason for siltation. Now there are more roads, but they are built better.
6. Road building on private land (many new, big roads in last 15 years).
7. Salt and oil going into the river from all over the place, including our low maintenance bridges.
8. Urbanisation of the countryside. Everyone wants to tidy up their section of the river.
9. Shredded bark from the logs being stored in the lake is suffocating the fish.
10. Slocan Forest Products (SFP) had a big dip pond full of PCBs, where they dipped loads of lumber bound for Europe. It was shut down when it was proven to be carcinogenic.
11. SFP messed up spawning beds right below Slocan City with shredded bark.
12. The number of people in the valley has greatly increased, leading to increased human impacts.
13. After the mill had been in place about 10 years, algae began to form on the bottom of the river from the slime growing on the logs (that became water clogged and sank). The gravel bed became covered with a layer of brown slime.
14. The major holes (approx. 25 ft. deep holes) between Lemon creek and Slocan have become filled with tangled masses of water logged saw logs. The holes then filled in with sand and are now about 6 feet deep. These holes used to be amazing fishing holes, being cool and shady in the summer, warmer in the winter for the fish to overwinter.
15. Overlicensing of all the streams, which used to be the small feeder streams. Water diverted for domestic use and irrigation changes the habitat (including winter habitat) in these streams. Winlaw is a good example: in 1960 there used to be less than 15 water boxes, now there are over 80 water licenses.
16. The oil from trucks and chainsaws eventually ends up in the river, effecting the insect population. One of the bases of the food chain are the mosquitoes.
17. Some of the oil could be kreosote dripping off the logs in the hot summer (at the bridge).
18. Herbicides sprayed by CP Rail (spike) so it would kill all the green, would have gone into the river and effected the bugs and fish.
19. The CP Railway diverted many creeks. The culverts are often 2 feet too high where they come out, thus cutting off many excellent sanctuary streams.
20. Stocking the river with fish has not been successful because they come out of a concrete tank and do not know how to deal with running water and finding their own food.

2.4.7 Temperature

1. The underground water forms an essential part of cooling the river system. We need to be aware of this when building roads on the slopes. Each time underground water gets brought to the surface through disruption, it warms up and its cooling ability is weakened.

2. No shade cover and a shallower river due to sedimentation lead to the river warming.
3. When Steve Arndt did his study on the temperature of the river he did it over two years. A few individuals felt this was not enough data to state that the river was too warm and felt this overall statement was being used as an excuse not to do anything about the river.
4. The water backed up by the dam at Lemon Creek warms up by about 5°-10°. After Lemon Creek it gets cooled again from the creek water.
5. The dams also backed up large amounts of water in this small valley, which change the climate to less severe winters, warming of waters and more predator fish in the back waters.

2.4.8 Government policy/bureaucracy

1. Government has been a challenge to deal with.
2. Many rehabilitation projects to date have been challenging because of the red tape involved and the short-term approach by government. Locals feel they need a long-term commitment from government to actually make a rehabilitation project or an egg hatchery project successful.
3. With each year of closure government gets funding for further studies.
4. We need a project, not another study.
5. Allowable acceptable risk is a problem.

2.4.9 Globally

1. Climate changes: Global warming may be having an overall effect on why the river is warming. The snowpack will decrease, precipitation in winter will increase possibly resulting in floods in the fall. British Columbia is warming faster than elsewhere around the globe.
2. Global warming could have more effect than or activities. Trout may become extinct, or move further north.
3. Acid rain may be releasing heavy metals into the river system.

2.4.10 General

1. Many cumulative factors seem to be involved.

2.5 Solutions And Ideas

2.5.1 In relation to government

1. This river does not need to be studied more. Rather we need to be proactive and do something.
2. We need a government official who is an avid fisherman to move into the valley.
3. Ministry of Environment (MOE) and residents could mutually come up with criteria that need to fulfilled. The public could meet whatever criteria, if the criteria are

clearly specified. Then the condition from the residents would be that they receive a guarantee from government for cooperation: not for more studies, but for long-term action.

4. Could get funding for a 3-4 year period, with a clear budget outline. If criteria are not met, funding could be cancelled. Or could get funding for 3 months at specific time every year for 4-5 years (with guarantee that funding not be cut off mid-way, unless criteria are not being met). Or just a guarantee from government to let it happen - and fundraising can happen locally. Many residents are willing to donate time, energy and equipment.
5. Put together a rough sketch outline of a proposal for a project plan. Then you wait till you get commitment from MOE. And then a detailed outline of action plan is put together.
6. Find out what latitude MOE has, and then work with that.
7. Calculate all the money that has gone into studies and compare it with the results.
8. We need new guys in the Ministry of Environment.
9. Since dams and logging have the most impact, we could have the most impact by changing logging plans for small streams.
10. All we can do without government approval is plant trees.
11. Make sure that the new dam that the Columbia Basin Trust is building has appropriate fish ladders, so fish can travel both ways safely. They plan to spend $40,000,000 in the next little while, and there is no fish ladder in the plan. Let's say they can't turn the new generator on without a fish ladder.

2.5.2 On a personal level

1. Ask ourselves the question: How are our lives, our lifestyles effecting the river? What can I do in my personal life to help the ecosystem recover?
2. How do we contribute, as a bioregion, to global warming here? Look at our personal contribution (driving cars etc.).
3. There are way more people in the world, and in the valley, than when the salmon were 100 lbs.
4. Nowadays the average fisher is more conscientious than people used to be. Let us at the river -- to steward it and to watch others.
5. Become aware of how much water is being diverted from the tributaries and side channels through domestic use and irrigation.

2.5.3 Human activities

1. Fence cattle and horses back from the river and the side channels. This needs to be done valley-wide, rather than property by property.
2. Stop paying Kootenay Power bills (dams).
3. Put nutrients back in river: Catch coarse fish, grind them and put them back in river as a fertilizer.

4. People could have restrictive covenants put on their land that borders the river or a tributary stream. A third party would hold and monitor such a stewardship agreement.
5. Could throw straw and hay down so that we expose dirt to slow siltation.
6. If the valley was used for tourists it would make more $$ for the government than logging. If they left the trees and repaired the river, and advertised its recreational qualities.
7. Stop logging on unstable slopes that could result in more sedimentation of the river.
8. Eliminate pesticides.
9. New rings for the barco at the Slocan mill (so that the oil from the loading device does not leak anymore).

2.5.4 Political

1. Small streams and creeks are not protected under the Forest Practices Code. But fact is that they actually need more protection; they are sensitive and their input is critical in the warmer months, so it is important to protect them from becoming seasonal.
2. Stop roads from going in to the headwaters of creeks, and change the way logging is done.
3. Create a log certification system for the valley.
4. Have a gate-opening program (of the dams) that would flush nutrients through the system.
5. Core drill at the base of the dams to let nutrients through.
6. Public movement to revoke the treaty that was signed with the United States that commits Canada to giving the US water.
7. Public pressure for an ecosystem-based approach to the watersheds that feed the Slocan River system.
8. Ministry of Forests agree to halt all logging in tributaries feeding into the Slcoan River. RDCK agree to call for halt of logging on private land which effects tributaries.

2.5.5 Education

1. Many new people are moving into the valley. They need to be educated about the situation of the Slocan River.
2. Put up signs along the river to educate visitors, newcomers and residents about this fascinating and sensitive system.
3. Educate residents about not emptying the silt from their water boxes into the creeks.
4. Make a large mural with a visual history of the Slocan River, to show its intricate, large, interwoven reality, with images (before - now - after).
5. Promote idea that the Slocan Valley can be a model, an example of sustainability in how we interact with our ecosystem.
6. Look at cumulative effects of all our activities.

7. For children: make a program, that is entertaining and dramatic, like ”Free Willy” to teach kids about fish and what they need, so they won’t make the same mistakes we did.
8. Promote boycotts in countries that buy lumber from this valley.
9. Educate people that catch and release is cruel to the fish.
10. You could fish with a fly and not a hook and have lots of fun just getting hits.
11. Promote the idea of a vision of a healthy river as a place where all members of the community can come together.
12. Ask people to call the 'squafish' by its proper name: Northern Pike Minnow.
13. Encourage the creek monitoring program to encompass all the creeks.
14. Research the river flow, the physics of it.

2.5.6 Restoration (to provide habitat, stabilize river bank and side channels)

1. Springer Creek should be restored: it runs in a cement channel underneath the mill. It needs to have ladders put in place so the fish can move through the culvert, and gravel put in.
2. Hird, Gwillim, Trozzo and Winlaw Creeks could be good spawning creeks.
3. Plant willows along river banks.
4. Plant hedges.
5. Plant cottonwood trees.
6. Plant evergreens, hawthorns, cranberries.
7. Reestablish a forest rather than just willows.
8. Research what the original indigenous ecosystem was and then replant accordingly.
9. Support for regrowth of riparian zones regardless of funding.
10. Plant enough willows so that there are enough left even if beavers cut some into the river (f.ex. each landowner plants 1000 willows).
11. One thing we could do is put everything from hay to large woody debris back along the river, which will create to some extent the fertilisation we got from dead fish.
12. Plant bushes on new gravel bars. Just shove cottonwood sticks into the gravel and they will grow.
13. Get funding and hire youth or locals to work on river and side channel restoration.
14. Create incentives for landowners to restore river fronts (such as tax breaks).
15. Restore the little side channels for spawning, winter habitat for small fry and hatcheries.
16. Restore the larger creeks for spawning and habitat.
17. Get local people who care and know about the situation to restore the side channels and develop them into hatcheries. The locals could be the wardens of such projects. And they could be monitored by experts who come through.
18. Major stream restoration needs to happen right up to the head waters.
19. Remove sediment from the river to increase the river flow.

20. Lemon Creek has beautiful gravel for spawning beds.

2.5.7 Fish

1. Fish ladders to bring fish up through the dams.
2. Lower the existing culverts so fish can swim up them into side channels.
3. Bucket the fish up to bypass the culverts. Or build ladders through the culverts.
4. Even if they did blow up the dams, the spawning beds are gone. We'd have to put in spawning channels.
5. Egg hatcheries: you have to start with the eggs so that the fish adjust to the environment. You could introduce spring spawning rainbow trout. The fry need to hatch in the side channels so they are imprinted with the chemical Ph of the water; they know the water. In the side channels they can be protected from predators. Hatching in the natural environment, they will know how it is to be in running water and learn how to catch bugs.
6. Make ponds and hatcheries that are privately owned and run in the side channels flowing through private property.
7. Stock eggs in tributaries like Trozzo and Hird Creeks.
8. Fence off part of the river so that fish can breed, keeping away not only human activities, but natural predators. (This is a description of a spawning channel.)
9. Across the line they have squafish hunting day, we could do that to deplete the number of them.
10. Survey that uses local fishers to report observations, similar to the stream monitoring program. It would be more consistent because the data collectors live here.
11. Try and find out what is going on before stocking the river. It is hard to find out what is going on with the river closed.
12. Open the river to fishing: could have limited licensing, monitoring, killing of too abundant species, small limits.
13. The secondary channel across from the new slide could be a location for a spawning channel. Also along the Bluffs by Springer Creek.
14. Stock fish that are at least 6" in length at Shoreacres, in the grassy area.
15. Stocking: certain lakes that are narrow and small enough so that the fish would not really escape would be ideal for stocking: Beaver Lake, 6-Mile Lakes, Box Lake, Bear lake, Summit Lake, Little Slocan Lake. Otherwise better not to stock.
16. A fish derby: prize goes to whoever gets the biggest and most squafish.
17. Get the squafish with sling shots, dynamite.
18. A cookbook with recipes for squafish.
19. Remove barriers to juvenile trout into cooler tributaries during low water.
20. There should be more policing at strategic places, especially at the falls (Lemon Creek, Hoder Creek).
21. If ever there is an opening for fishing it should be restricted to the local people, especially for their children.

22. Use a fish wear to remove a large portion of what is seen as the threatening predator fish. Then net out the trout and remove the bottom feeders.
23. Get a scrubber and attach it to the back of a boat and scrub the rocks to get rid of the algae that is gathering on the rocks and gravel. Would have to do the whole river else further down the river would end up with even more algae!

2.5.8 General

1. We need to stop the negative impacts as much as possible.
2. We need to think in long-term time frames (200 - 300 years).
3. Taking an active role in reversing the problems gives people a sense of doing something positive. Maybe we should just leave it alone, and not do anything.
4. Find out what culture in the world eats squawfish and develop that market.
5. Use coarse fish for fertiliser.
6. Let's get a chronology of events-never mind causes -- just what happened when.
7. Apply the Precautionary Principle: If you don't know for sure, don't do it.
8. Award funding for fisheries studies to the Sinixt Nation.
9. Mother Nature is always in flux -- she will heal and take care of herself.

2.5.9 Concerns about some of the suggested solutions:

1. Concerned about introducing non-native species into the river.
2. Fishladders at the dams would be very expensive. You would need a screen to guide the fish to the ladders -- but then the screens would get plugged with debris.
3. Concerned about stocking the river with fish -- seems to be a band-aid solution rather than addressing the underlying problems.
4. Even if you revegetate the river bank, in the summer when the sun is the hottest, the tall trees wouldn't shade the river.
5. If you do something on the river it is liable to affect a lot of properties so people have to agree it is okay.
6. Concerned about restoring the river and side channels and forgetting the tributaries: support for restoration as long as the large picture is acknowledged and kept in mind. Else many residents are concerned that it is a band-aid approach.
7. Why put fish in the river if the habitat can't support them?
8. If spawning channels are implemented, they must be as natural as possible. Fish must be fed naturally, not with corn and pellets. From fry they start out with plankton, then as they grow they eat different vertebrae, then they go to stoneflies. They must learn to swim in a current, and the channel must be constructed so that the fish can return to it after being released.
9. Fish ladders would also introduce non-native fish into the river system.
10. Funding seems to depend on not challenging status quo too much (this was mentioned in relation to the logging in the tributaries).
11. Some strong concerns about adding fertilizer to the river, it being another human impact that is unnatural.

12. Revegetation of side channels involves dealing with a lot of private property. Newcomers who have not witnessed all the interference and changes may resist changes to their newly bought land.
13. Dilemma: our interference and ignorance has led to problems. Can we rectify by interfering more?
14. Some hesitancy around fish hatcheries and bringing in fish guts.
15. We can't just remove the suckers -- they too are part of the ecosystem.
16. Government has not been reliable in upholding their commitments (example: not giving eggs after Hird Creek restoration, wrong sized net given to catch coarse fish).
17. A lot of red tape and application that stops people from proceeding.
18. You can't do anything unless Ministry of Environment say you can … and they won't let you do anything.
19. Government holds a tight grip on permits.
20. Make sure landowners would not get tied up in more legislation and laws on their land through having a side channel rehabilitation project and/or hatchery happening on their land.
21. Concerned that if Fish In The River is a liaison between government and the public the same thing might happen as has happened before: you get involved and the government backs down.
22. Grant money should be spent effectively - many residents are frustrated by so much money going into one study after the other instead of something really being done. Helicopter project lead to conclusion that a good spawning area is at the Slocan Bridge. Local residents had already pointed this out prior to the costly study.
23. Concern about pulling certain fish out of the river, preference of natural control.

2.6 Questions

1. How are people in the U. S. getting dams breached, like on the Columbia, Snake, and Mississippi? Who are the organisations spearheading this? How did they justify economy of the environment versus THE ECONOMY? How is lack of fish hurting the country's pocketbook?
2. What is the end result of fisheries studies of the last 10 years?
3. This river was chosen for all those studies as being one most capable of restoration; why? What is it we are trying to achieve? Are we thinking very long-term? Must we?
4. How do you do a fish count?
5. How are we going to make some kind of comprehensive picture that we can understand?
6. Is every river in the province in the same condition as the Little Slocan?
7. Did the salmon spawn in the Okanagan? If they did, how important is cold water?
8. What kind of effluent comes out of, or has come out of, the mill?

9. What would happen if a lot of residents got together and said that they want to plant willows on small streams in logged off areas, because tree planters only plant up to 2.7 meters from the creek?
10. How can fisheries influence the Forest Practices Code, that small streams may be protected?
11. What does the government use the money for that they get from logging? Is there another way to generate that revenue? How much of it is used to alleviate the problems that logging causes?
12. Who buys the wood from this valley?
13. Why up the nutrient level in the river if there is not enough suitable habitat for the young fish to survive the winter? They need clean gravel to snuggle in, and log jams.
14. What are the objections to the introduction of nutrients into the system?
15. When SFP shut down the dipping pond full of PCBs, where did that liquid go? How was it disposed of? Did it end up in the river, and on the parking lot?
16. There is a kind of grass they are planting in N. Washington (on Sheep Creek below Patterson), along the banks that has 6' long roots, and stabilises the banks. What is this grass?
17. When was the last stocking of fish in the river? In the system anywhere?
18. Where do shiners spawn?
19. Why are there more squafish?
20. How do you get the nutrients to cycle through the system with the dams? What about the gene pool of the fish getting smaller and smaller?
21. Has anyone ever done a study on how/whether heavy metals may be effecting the river?
22. What habitat do sculpins need?
23. What are we trying to get back to? We need a clear idea of this. What will be our indicators/criteria to know when we have "succeded"?
24. Does the mill in Slocan have any runoff that might change the alkalinity of the river?
25. Does the runoff from people's septic fields effect the river and change what grows along the river banks?
26. Have there always been lots of squafish (northern pike minnows)?
27. What is under the rocks? Is it fiber, ash, algae? If it were just sediment it should have happened 100 years ago.
28. Where do the fish go? This is a closed system here. There must be a problem with the juvenile survival rate.
29. Have the creeks that now run dry ever been checked for what kind of phosphorus they would feed into the river?
30. Are the fry being killed by the membrane of oil over the water surface just south of Slocan? And what about the tiny creatures the fry live on?

31. What are the natural predators of the different fish? There must be a natural predator for the squafish and the suckers.
32. What kind of minerals do fry and adult fish need to survive in streams, ponds and rivers?
33. Are we getting contaminated fish from the Kootenay River, from the sewage in Nelson?
34. What happened with the GPS studies?
35. Could the areas where the water has backed up because of sandbars and become warmer have a connection with the increase in algae?
36. Gwillim Creek is a fairly fast running creek that is totally protected and yet also has algae. Could this be caused by a rise in temperature or by airborne pollutants?
37. Has anyone researched what changes occurred in the watersheds in Salmon Arm after the fire. How did the fires effect the water?
38. What is with the fish that were introduced at the pool down where the Slocan River flows into the Columbia? One resident heard through the grapevine that MOE used to throw hybrids in there at the pool.
39. When was the temperature study done?
40. What money is generated from selling fishing licenses in the stores between the junction and Slocan?

2.7 Conclusion

The KT meetings brought forward a wide array of concerns, insights and bits of information regarding the Slocan River system. With this collection we hope to further the efforts in this valley towards a sustainable river system with healthy fish.

We would like to thank all those residents of the Slocan Valley who took the time to partake in a kitchen meeting! Thanks to those who hosted the meetings! This is your project -- the information, impressions, concerns and ideas you brought forward form an essential part of the Fish In The River Project.

Several residents offered to be contacted in the future -- be it for further information or to take part in a restoration project. These individuals can be reached through the KT meeting contact person: Anni Holtby at Selkirk College, 359-7564.

3 Conversations from the Fish In The River Website /www.fishintheriver.org

3.1 The Topic: Rainbow Trout as an indicator of the health of the Slocan River.

Pete Corbett:

Healthy does not imply directly trout, especially since this system has been so altered. Healthy does imply a functioning ecosystem, given the irreversible changes to habitat (i.e. dams = loss of salmon).

I do not believe that the resident trout population was much more than what we have today and the so called crash was really about a population falling back into its carrying capacity after a severe nutrient loading (fertilization from Kimberly) was removed. The coastal rivers where salmon and steelhead are still plentiful do not necessarily support a great trout fishery (rainbow and/or coastal cutthroat trout). The competition for resources is pretty severe when there are multiple species of salmon in your river, filling most of the ecological niches.

The upper portion of the river (Lemon Creek to Appledale) supports what I would consider to be a very good trout population. The river is also the coldest at this point and is also in a "natural condition" with many braided sections created by extensive logjams. I think we are using trout as a symbol to improve the overall health of the river ecosystem, which includes old growth cottonwood and cedar riparian habitat with no channelization or riprap to protect property values. The river must flow where it must, ever changing. Rivers are very dynamic and we as humans are attempting to reduce them to something static, which we can control. We must let the natural processes restore the river. They are resilient and will heal but first we must get the riparian habitat back to a natural state, for birds, fish (non-sport fish included) and the full assemblage of flora and fauna.

Randy Lake:

Healthy Rivers and Indicators: You can remove every rainbow from a healthy river, and the river is still technically healthy.

Rainbow are one of the most resilient species of salmon, and this is evidenced by their ubiquitous distribution on this continent and introduced areas around the world. Low rainbow populations occur from many influences, including "limiting factors" such as NUTRIENT availability at the primary production level (NUTRIENTS -> algae -> insects - > fish -> people).

Mountain whitefish are common in the Slocan, Kootenay, and Columbia Rivers, and are very sensitive to pollutants. Past reductions in mountain whitefish populations (and subsequent recovery) have been associated with industrial contaminants (i.e. Columbia River). Mountain whitefish are a multi-faceted environmental barometer. When the environment changes in an unhealthy way, they exhibit changes in relative age structure within the population, lower life span, and gross indicators of disease. They are able to

compensate for increased mortality wit age, by reproducing younger and faster, causing a change in population age structure. Growth rate and survivorship of previously handled individuals within this species has been shown to change simply from capturing and tagging them.

Tom Bradley:

I am comfortable with rainbow trout as an indicator species. If we have rainbow, we have some semblance of a cool water fish habitat river.

Most people I have heard speak on the subject implicitly or explicitly recognize the value of a functioning river ecosystem, and are interested in having trout as part of it. "Trout" is an effective hook to get people involved. It links directly to a lot of issues, and also adds a sense of urgency. Act now or ...

But a river with no salmon, no rainbow, and just whitefish, chubbs, suckers and squawfish could be a reasonably healthy, but very altered ecosystem. (At that point, I want to throw in small mouth bass from a truck, but then, I fish in Ontario.) I think an ethical difficulty is that we technoeuropean types already did unto the Columbia system, and that what is left is grotesquely altered, ecologically speaking. We are not trying to "save a natural system" here.

Rita Corcoran:

Since the construction of the dams our river has been in a drastically different state. To decide what is "healthy", while the dams are still in place seems like an exercise in verbal gymnastics. First we dammed the rivers and then we cleared the valley bottom and on and on it goes. So we now need to look at our compromised present situation and make the best of it. I don't believe that regarding rainbow trout is the best indication of a healthy river. We could also regard bull trout and mountain whitefish as indicators. However, whenever we concentrate on one species I think we lose the overall picture of the entire ecosystem. The problem is too complex to isolate and focus on one species. By doing so potentially leads us to believing the situation is "fixed" by merely reintroducing that one particular species. If we want to focus on one species, lets look at the human species and the lifestyle we present-day North Americans lead, which creates all these "problems" in the first place. How about we learn the lesson from "requiring" the vast amounts of energy that caused us to build the dams in the first place. The more people take, the less every other species is left with.

3.2 The Topic: Biodiversity in a healthy river.

Biodiversity of aquatic insects and fish is important to the Slocan River. Even the 'evil' northern pike minnow (formerly northern squawfish) is important. Yes, they eat an occasional trout, but many more trout grow beyond a size where they can be eaten by consuming vast quantities of northern pike minnow fry. It's a give and take situation, of which the trout are probably the net benefactors. Increased northern pike minnow and

decreased rainbow trout populations in the Slocan River, are likely an effect of dam impoundment and increased water temperature which favors northern pike minnow and other minnow species, but inhibits rainbow trout populations.

Sculpins, being bottom dwellers and 'cryptic' in color are less known but very abundant residents of the Slocan River. They eat some rainbow trout eggs, and love insects. They are also prey for larger rainbow trout (a common theme). The Slocan River is the only River in the world to have a common presence of a sculpin species called "Shorthead Sculpin". They exist throughout the river and it's tributaries. A few areas below the Slocan River have tiny 'pocket' populations of shorthead sculpin which may have originated from individuals emigrating from the Slocan River (Beaver Creek, Norns Creek, and the Kootenay/Columbia River confluence). One remnant population was found in the Kettle River (in a 100 metro section) which joins the Columbia River on the U.S. side of the border. They appear to survive well in the entire Slocan River, just as it is, but do poorly elsewhere. Shorthead sculpin are listed as "Threatened", and will be upgraded to "Endangered" if their habitat is changed by human activity in the Slocan River (COSEWIC).

White sturgeon also live in the Slocan River system, and I have seen individuals captured for study which were 2 metros long. They commonly feed in Slocan Lake, and may use the Slocan River as a conduit to Brilliant reservoir (Kootenay River) to feed. Dam impoundment has limited their movements and it is likely the present population consists of adults already in the system when Brilliant Dam was built. No evidence of spawning and juvenile fish exist, and our population of white sturgeon will likely march into extinction as the local population gets older and dies. Formerly, they could move to the Columbia River to use the limited spawning areas, and additional fish moved into the Slocan system to feed and grow. Young fish are no longer found in the Canadian portion of the Columbia River despite active spawning, and it is likely they also will march into extinction, unless we can create conditions favorable to juvenile survival (?).

Bull trout are a "species of concern" in Canada and the U.S. They are in low abundance but persistent in the Slocan system. They prefer free flowing rivers with a wide availability of habitat. Bull trout have been caught near the river mouth in Brilliant reservoir. Juveniles have been observed using creek mouths for holding/rearing habitat in the fall and winter. This is normal juvenile behavior, and we should consider the mouths of each creek as a 'bull trout zone' during the fall and winter seasons (they like shallow pools with surface turbulence). Maybe habitat enhancement could focus on bull trout juveniles for the first100 metros of stream. Adults likely spawn in the Slocan River mainstem, which has favorable gravel sizes for bull trout spawning. Bull trout are most likely limited by dam impoundment and the low nutrient availability in the Slocan River system. An unimpounded population would be free ranging, sometimes feeding elsewhere, and seasonally abundant in the Slocan system when spawning or just 'moving through'. However, this is no longer reality. It seems we have a diversity of aquatic insects and fish, but the balance has shifted to favor minnow species. How can we create an abundant and balanced insect and fish population while working with strictly resident populations of fish? Fall season nutrients are a remote possibility, or...?

3.3 The Topic: Stocking Versus Nonstocking Fish In The Slocan River

By Ryan Wilson of Silver Valley Trout Farm

The difference between provincial hatchery systems of the past and the Silver Valley Trout Farm that Don Hird started 30 years ago is a difference of approach. The provincial hatchery has to provide an enormous amount of fish to supply province wide need. This pressure leads to over crowding which leads to stress which leads to disease, which in turn in a provincial system, leads to treating this disease. The Silver Valley Trout Farm approach is to manually pick the eggs therefore no fungicide is needed. Fish are not crowded and therefore not stressed. No treatment is required. Don't over crowd the fish then you don't have to treat unhealthy fish. The trout farm has already got an excellent reputation for providing pond and lake ready fish that can feed naturally on insects because they were raised in a natural state, not in a concrete or stainless steel sterile feed trough. River stocking has gotten a bad reputation because of a fundamental mistake which is trying to introduce a foreign, although rainbow, fish into the Slocan River. These fish are not native and fisheries biologists and technicians have, in the past, failed to realize the enormous complexity of trout needs. I don't pretend to fully understand this complexity myself, and therefore try to err on the side of caution. Hatchery operations should be site specific. Habitat can not be ignored and is fundamental to the Slocan River health. But, as you create more habitat you will increase all fish species, even though it may be designed for rainbow. In August of this year another fish count has been scheduled. I look forward to this important data. As I look forward to an end to this river's closure, which has lasted since 1994, so that our children may once again belong to this beautiful river and be a part of increased awareness and respect for our waterway through angling. If it is found that there has been a dramatic increase in rainbow trout population I will bow out of this public debate and be glad in my heart that I may continue to supply private individuals with pond and lake ready healthy fish. If it is found that there has been no significant increase in rainbow trout population due to all the other effect on their habitat already covered in the many years of reports commissioned for our river. I will ask for the public's support on continuing this friendly debate with the Ministry of Environment. I will ask for the Ministry of Environment's help on determining the best cooperative approach to be involved. A more moderate approach could be a simple hatchery box along the Slocan River with native brood (spawning fish) provided with the cooperation of local clubs, individuals, and the Ministry of Environment. The brood could be released afterward without harm back into the main river, this could be a catalyst to the rainbow's re-introduction to the top of the pools of the Slocan River system. Lack of rainbow trout, not lack of habitat, not lack of squawfish (pike minnow), whitefish, and suckers is the reason for this river's closures and with this enormous predation and competitive pressure the rainbow need a helping hand. I really appreciate being able to participate in this fascinating debate brought more into the public arena by the Fish in the River group.

ADDITIONAL WEBSITE INFORMATION HANDOUTS IN APPENDIX

4 Newspaper Articles Written For Fish In The River

4.1 Lost Abundance – Tales Of The Slocan River

Written by Susan Eyre for Fish in the River Working Group
Spring 2000

How two young lads, Don Hird and Harold Avis, once speared a dog salmon so heavy that they couldn't pull it out of the river is a story that I never tire of. If you have only seen the river the way it is today, it is hard to imagine what it was like when the salmon runs were on. Try to envision 18,000 chinook salmon spawning in the river in one year. That's 18,000 fish, weighing 28 to 36 lb. apiece. Divided among roughly 1400 valley residents, that would come to 13 fish each. Of course, there were also the bottom feeders, and the burbot, the coho, the steelhead, the Kokanee, the sturgeon, the bull trout and the rainbow trout populations, – and don't forget the freshwater mussels ! The river water would be thrashing with spawning fish, and foragers frantically gulping exposed eggs. Overhead, the air would be filled with eagles, ospreys and lake gulls, dodging down to clean up what the people, bear, cougar, and weasel didn't eat. Noisy, smelly, fertile – dinner was on for all!

Decaying salmon carcasses (bless their almighty fragrance!) were the glue that tied the forest, animals, fish and river together. The marine phosphorus and nitrogen released to the river ensured abundant aquatic insect life, which in addition to salmon carcass snacking, provided plenty of food needed to rear healthy fry. Those salmon bodies consumed by foraging animals and birds also contributed nutrients to the roots of trees, promoting healthy growth. The trees stabilized the river banks, shaded and sheltered the fish, kept the water cool, and were home to more insects, that fell in to feed more fish. Such mutual benefits are called a "symbiotic relationship".

With the completion of the Grand Coulee Dam in Washington state in 1936, the salmon ran no more. The vast reduction in nutrients from the loss of the salmon carcasses contributed to the downward spiral of the entire ecosystem of the valley. And in the River today – fish for only a few …...

The "Fish in the River" working group welcomes people to come forward with their stories of how the river used to be, and also their comments and theories as to how the current situation could be improved. You don't need a college degree to contribute – it's your experience that counts. The knowledge we have amongst us, the experienced and the educated, is the resource we can use to improve the Slocan River fishery.

Thanks to D & D. Hird, Benny and Vi Lister, residents past and present, of Slocan City, and Colin Spence, B.C. Environment-Kootenay Region, Nelson for passing on the article" An Estimate of Historic and Current Levels of Salmon Production in the Northwest Pacific Ecosystem: Evidence of a Nutrient Deficit in the Freshwater Systems of the Pacific Northwest." By T. Gresh, J. Lichatowich, and P. Schoonmaker

4.2 Good Enough To Call It Home

Written by Susan Eyre for Fish in the River Working Group

When we are flocking to the beaches to enjoy the 23^{o}C water, the trout have stopped eating and growing, have left for cooler waters or turned belly-up. Trout grow the healthiest at temperatures between 10^{o} to 16^{o}C --- too darn cold for us humans to swim!

Cold creek water is a top priority for a trout residence.

Trout require clean, clear silt- free water. Silt blocks up the spaces between the gravel and the rock, suffocating fish eggs, killing off insect larvae and blocking fry from swimming up, out of the gravel to the water. Who wants to breathe in dirt and pollution? - not a trout!

Trout density and weight are directly related to the amount of available cover in streams. Well- vegetated overhanging stream banks provide shade, water temperature control, erosion control and predator cover. Logjams-large or small, boulders clusters and the pools created by them are home sweet home to the trout.

Sources:

Slocan River Summer Temperatures in 1997 and 1998: Implications for Rainbow Trout Distribution and Production, by Steven Arndt, M.Sc., for Columbia Basin Fish and Wildlife Compensation Program, Nelson, B.C.

Slocan River Overview Fish Habitat Assessment and Restoration Process, 1998, by Michael Zimmer, Sheri Petroveic, Kenji Kage, of Timberland Consultants,, Slocan, B.C. for Slocan Forest Products, Slocan Division

4.3 Overview Of The Slocan River Fishery

Written by Susan Eyre for Fish in the River Working Group/Spring 2000
Funded by Fisheries Renewal B.C.

Rainbow and bull trout are popular sport and food fish. Many people want the fishery to be restored to sustainable population levels so the fishery can be reopened. Most of us have noticed that there is a ban on fishing in the Slocan River, with the exception of a whitefish opening / Feb.1 to April 15/00. Why no fishing? - The decision was made by the Ministry of Environment to see if the present trout population could stabilize and increase. However densities of cacheable trout have increased only marginally since the closure in 1994. Historically, the river supported Rainbow and Bull trout, and since has been stocked with Eastern Brook trout, Blackwater Quesnel rainbow trout, and numerous non-native strains of rainbow trout.

In this article we'll look at key habitat requirements for a healthy trout population. This understanding can create a baseline for Slocan river residents to observe the river. Our observations and experiences combined with the technical data gathered on the Slocan River, should give us an understanding of the challenges we are dealing with, and indicate some positive directions we residents could act upon to provide a healthy trout habitat.

Water temperature and quality, cover, and nutrition are the main considerations.

Fish are cold-blooded, their body temperature is set by the temperature of the water they inhabit. Body temperature determines the " metabolic rate"- the fish's "cost of living". The metabolism affects the fish's swimming performance, its health, and its reproductive abilities. The water temperature directly affects the health of the fish. Trout require cold clean water.

The desirable temperature range for juvenile trout is 7-15^{o} C. Adult fish achieve optimum growth at 15 ^{o} C. Lethal temperatures for trout are from 24 -28 ^{o} C.

In 1998, the Slocan River reached water temperatures of 24 ^{o} C---For almost 40 days, the river water averaged 20 ^{o} C !---I enjoyed it immensely
When the river temperature reaches a balmy 20 ^{o} C, the trout are hopefully retreating to cooler waters. Trout can starve to death in warm water because hunting bugs requires more energy than the bugs provide in nutrition. If the juvenile trout aren't able to gain enough weight because of water temperature stress, they won't survive the winter. The lack of juvenile trout in the Slocan River system is a #1 problem. Access to cool water and shelter in the side channels and tributaries is a must for their survival.

Trout need clean, oxygen-laden, silt-free water. Also a clean gravel river bottom is important because it houses incubating fish eggs, aquatic eggs and larvae. If the gravel gets paved over with silt, from roadbuilding, or a slide or whatever, - the fish and insect eggs suffocate. Silt irritates fish gills and it cuts down on visibility for food sources and predators. Murky water promotes weed growth, which in turn depletes the water of oxygen necessary for fish egg and aquatic insect life development.

Trout density and weight are directly related to the amount of available cover in streams. Take logjams for example, the more cover and good habitat, the more plentiful and larger the fish. Boulder clusters, overhanging bank cover and deep pools help ensure juvenile rainbow and bull trout survival. From mountain -top to river, tree and brush cover is very important to keep water temperatures cool for trout and provide that necessary large woody debris. A sandy or grassy stretch of river may be appealing to us-but a trout would be in hot water

Since the demise of the salmon, the river water is lacking in marine phosphorus and calcium. As well, the mineral content of the river valley lacks limestone. These nutrients soften the water, benefiting insect abundance greatly. The lack of the nutrients has direct consequences on our fish population. Now that the #1 provider of food for fish fry and insects is gone - the salmon carcass - trees and shrubs are of prime importance. Trout are carnivorous - they eat insects, fish, fish eggs, crayfish, and mollusks. Trout nutrition goes fin to fin with tree cover. Trees drop their leaves, branches and eventually their trunks into the river, where they serve as hiding and resting places for the fish, and decompose to feed insects, which are in turn eaten by fish. Leaves and branches provide life-cycle stations for

emerging nymphal aquatic insects and resting places for airborn insects. River life is sparse without trees.

These are just a few requirements for healthy trout. A person with their own personal experience of the river, should be able to judge for themselves---Is your stretch of river a desirable trout habitat, or can something could be done to make it habitable?

Sources

: Slocan River Overview Fish Habitat Assessment and Restoration Process", by Timberland Consultants: Micheal Zimmer, Sheri Petroveic, and Kenji Kage, for Slocan Forest Products Ltd., Slocan Division B.C. 1998

: Tom Bradley "Fish in the River" website www.fishintheriver 2000

: "Freshwater Fishing Regulations Synopsis"/ Min. of Fisheries 2000

:" Benthic Algal and Insect Response to Nutrient Enrichment of an Instream Mesocosm" by Gerry G. Oliver, 1992

4.4 Passmore Repercussions For The Slocan River Fishery

Written by Susan Eyre for Fish in the River Working Group/ Spring 2000
Funded by Fisheries Renewal B.C.

The Little Slocan River Passmore Slide, two years ago, sent a great deal of silt down the river, impacting the downstream fishery. Immediately downstream a foot of clay covered the former stone and gravel beds, and sand filled in protective habitat pools. The clay layer blocked sub-surface flow, which resulted in lower water levels in the shallow wells used by the adjacent landowners. Where snorkeling once revealed healthy native trout and sculpin populations before the slide, few fish now remain. When the water was low, a person could walk quite easily across the stony gravel. Now two years after the Little Slocan River Slide, the river stone is slimy and slippery and though the larger rock is bare of clay, the lower stone and gravel is still mucked up.

The Little Slocan River Slide brought to our attention how fragile and unpredictable the riverside banks are. Why the slide occurred is still up for debate, but what was apparent was the bench and hillside had been logged, so there weren't as many tree roots binding the soil together. Also, fewer trees mean more snow cover on the ground and more melt water percolating through the soil. I997 was a high flow year. The Little Slocan River stream bed contains a lot of mobile material and a large gravel bar upstream from the slide shifted, allowing water to be deflected onto an unstable bank. Another factor was the layer of blue clay that exited the bank about half way up. Blue clay has the ability to act as a conduit for water and although it appears as a solid, water collects on top of it. The clay water flows wherever gravity takes it. Water draining from the mountain and the logged bench above the Little Slocan slide exited at the blue layer, forming a stream of turbid clay-water in the middle of the bank.

Co-operative access to the slide site through Wayne and Sue Harders' land enabled the Slocan Valley Equal Access to Public Resources Society and contractors, to secure large woody debris at the base of the slide. The effort seems to have helped and the river now runs clearer. In addition, willows planted by the volunteers are beginning to grow. However more planting still needs to be done. The South Slocan boy scouts have made an

application to host a fall "restoration workshop" open to the public, to learn how to harvest, root and plant willow for waterside bank stabilization. If accepted, the scouts will spend a day planting willow at the Little Slocan River Slide site. The interest and care by the volunteers has made a positive impact on the health and quality of the Little Slocan River

With the recently occurring Passmore Slide on Hwy 6, any fishery recovery in the immediate lower Slocan River could be negated with all the additional silt. The blue clay and silt fills in the existing pools, cements up the gravel beds that the fish spawn in and on and destroys the aquatic insect habitat. On the positive side, all the timber slid into the river could end up enhancing the fish habitat by providing cover in the form of logjams and the new pools that form behind them. We'll see how the high water has distributed the slide debris come July and August.

Sources:

: Jennifer Yeow, Passmore resident

: Wayne and Sue Harder, Passmore residents and site of slide

: Gary Theile, Vallican resident

: Bob Barclay of S.V.E.A.P.R.S., article written for the Valley Voice Newspaper, Aug/1999

4.5 Human Impacts on the Slocan River Fishery

Written by Susan Eyre for Fish in the River Working Group/ Spring 2000
Sponsored by Fisheries Renewal B.C.

Time has shown that the fortunes of civilizations have waxed and waned with the health of the watershed systems. The Slocan River though not dammed itself is not a natural intact system. It's identity is a 30 km .tributary of the Columbia River Drainage. Whatever has happened in any of the Columbia tributary watersheds, all the way down to the mouth of the Columbia at the Pacific Ocean has affected the Slocan River via migration of fish species, invertebrates, aquatic plants and insects. How do we Slocan Valley residents impact on the Slocan River fishery and can we contribute to the recovery of its fish populations ?

In just 59 years the Slocan River has gone from an abundant salmon river to a river closed to all fishing except for mountain whitefish in the spring. Although generating electricity with water is a renewable resource, the damming of the Columbia caused the extinction of the Slocan River salmon runs. Now we are not only dealing with the loss of the fish as food, as income and as recreation, but we are realizing all of the benefits that their physical bodies provided. Salmon were responsible for transporting marine material they ate in the oceans and stored in their bodies, to the headwaters of the watersheds, leaving their carcasses to feed insects, bears, plants, trees, and particularly, baby fish. The young fish fed on the carcasses and eggs and grew to a large juvenile size, capable of having enough energy to survive through the winter .Now that the abundant marine phosphorus and nitrogen nutrients are missing from the ecosystem, our river system is in nutritional decline-we still have aquatic life, but there isn't as much of it. The result is our river can't support as many fish energy- wise.

Extremely fluctuating water levels create havoc for fish. Ideally, the forested mountainsides absorb the moisture from the rain and melting snow through the tree and shrubbery roots, releasing water slowly through the earth well-secured with the network of forest-cover roots. The river water level changes are gradual and the water temperature is cool.

However with clearcutting, and forest fires in the Kootenays, snow accumulates 37% more in the openings than it does in the surrounding forests and in the spring the exposed snow melts 38% faster than in the treed areas. Groundwater runoff is higher in cleared areas than treed areas and can result in higher than normal peak flows of rainwater and snowmelt into the streams and river. With the accelerated runoff, the spawning beds can be scoured by logs and debris, or silted into hardpan so that oxygen can't reach the fish eggs, nor can young fish emerge from the gravel. The productivity of the shoreline shallows can be lost because yearling and juvenile fish loose their rearing habitat, through flooding and displacement of cover. Too much energy is used just to survive, never mind grow to a weight that will ensure fish survival through the winter. With the fast exit of water during spring runoff, by the time summer comes, the mountainside vegetation is tinder dry, the streams slowed to a warm trickle or dried up, and the river too warm for a healthy trout population. With winters onset, there aren't enough deep pools for survival habitat and the gravel beds are exposed and freeze.

Silt is very responsible for influencing fish health. Whether silt comes from logging the mountains or from your very own household project- if you see silt going into a stream- you can bet it's going to affect fish in a negative way. River gravel has many spaces between it that hold bubbles of air containing oxygen as well as water. That's the gravel where the trout spawn, where the fish eggs incubate, where the tiny transparent fish emerge (alevin), where the little yearling fish snuggle in to keep warmer in the cold winter water, and where the fish's dinner, aquatic insects, live. It is also the gravel where the silt goes. The silt cements up everything, if its blue clay, not even water can get through it. The silt fills in the pools, turning an ideal fish habitat of pool/riffle streambed into a flat barren surface and the river gets shallower, wider and warmer. Silt is bad news for trout.

When stream or riverside trees are cut down, the water is exposed to the sun and heats up. Trees are vital to keep the streams and river cool enough for trout and whitefish habitat requirements. n. When the riverside trees, particularly cedar and cottonwood, aren't allowed to fall and lie in the river, yearling to adult size fish loose valuable habitat. Trout and whitefish avoid exposed sections of the river, so the easiest method to encourage their presence, is to simply plant trees to shade the water and provide aquatic insect development and fish habitat cover. With the loss of ozone in the earth's' atmosphere, fish and aquatic life are feeling the effects of increased radiation also. Fish can get sunburnt and the aquatic bacteria cycles can be seriously affected. Tree cover helps minimize the radiation exposure.

Cold water holds more dissolved oxygen in it than warm water. Compared to the atmosphere, there is a lot less oxygen available to organisms living in the water. Fish are in competition with aquatic plants, aquatic insects, and any trees or leaves that the bacteria are rotting, for the dissolved oxygen. In summer, plant activity and water temperatures

increase, so there is even less oxygen to share. Along with warm water comes the danger of disease and parasites for trout.

To have cold water, all the little streams and big creeks need to have tree and bush cover for shading the water. If the streams get heated up running through large clearings- there's not much that's going to cool them down for the trout and whitefish. With the human population increasing in the valley, there is a greater demand for water for household use. When a resident takes water out of a stream to irrigate their garden or their hayfield - the remaining smaller volume of water left, heats up faster. This warm water joins with the river increasing the overall river temperature. Where the little fish once pooled in the small but vital, cool pools and stream mouths, now they are endangered by warm water. The question is whether they have enough energy to find another cool refuge. Fish have their territories - if their home gets wiped out by resource extraction or a landowners oversight, and if they have enough energy to get to another cool water source - there could be a school of fish already living there and no room for the refugee fish competition.

Low moist areas with cottonwood trees, impenetrable thickets and meandering streams through them, are called riparian zones. They absorb the floodwaters and release the moisture throughout the summer. They are home to more than 85% of wildlife at some point in its life cycle.

The small streams are very important rearing habitat for young trout and whitefish. Grazing cattle can tromp on the young fish and destroy the protection and water quality of the side channels. The cow dung nitrogen causes aquatic weed overgrowth, which chokes up the water channels with its mass and ensuing lack of aquatic oxygen. Destruction of riparian zones for housing or grazing lands can result in higher water temperatures in the river because of shade canopy loss and the loss of the gradual seepage of water from the spongy earth. Without the hardwood cottonwood tree trunks falling into the river, the aquatic insects are not as abundant as a food source, nor is there the habitat cover necessary for fish survival. Healthy riparian zones are an absolute requirement for salmonid survival.

Poisons - forest and farm fertilizers, herbicides and pesticides, road salt and chemicals, household cleaners and paint leftovers, destroy the water quality of the river and end up in the fish's bodies. Dead batteries, buried in the soil, leach their poisons down to the blue clay layer, and flow beneath the earth's' surface, down to the wells and the river water. Septic tanks and outhouses in the riparian zones contribute their pathogens and fecal coliform to the river water and to all who dwell within, and to whoever eats the fish. Even tires, so handy for shoring up riverbanks, leach heavy metals into the water

Gravel extraction, dredging, diverting water by pier or jetty can all have enormous impact on the survival of river life, and can change the river channel flow direction. It's very difficult to predict what course the river will take, perhaps it will flow into a blue clay layer and end up destabilizing the land above it. Driving through can have the same impact, destroying spawning beds, and leaving pollutants too.

The introduction of non-native fish and aquatic plants to our area can throw the health of the river ecosystem off balance. As well as competing for the same food sources and habitat cover, the newly- introduced fish species may prefer to eat the native species, or it

may introduce a disease or parasite that it has adapted to live with, but the native fish would be susceptible to. Aquatic plants can overwhelm the native plants, and leave the animals who feed on them hungry.

Our native rainbow and bull trout are known for their sport fish qualities of challenge and unique coloration. They are also the most adapted to the Slocan River environment. Enough adult native fish must survive each season in order to spawn a genetically strong stock. The less adults there are to spawn with each other, the weaker the gene pool becomes as a whole, loosing adaptability to disease and change. Poaching and overfishing by enthusiasts can cause this backfire effect of loosing our native fish.

Through observation, thoughtfulness, and positive direction and action we Slocan Valley residents could decide what kind of a Slocan River fishery we receive.

Sources:

:"The Streamkeepers Field Guide" by Adopt-a-Stream Foundation, 1994

: "Muddied Waters" by the Sierra Legal Defense Fund

: "Pacific Salmon" by R. J. Childerhose and Marj Trim, 1979

: "An Estimation of Historic and Current Levels of Salmon Production in the Northwest Pacific Ecosystem: Evidence of a Nutrient Deficit in the Freshwater Systems of the Pacific Northwest", by Ted Gresh, Jim Lichatowich, and Peter Schoonmaker. Jan. 2000/" Fisheries" Vol.25 #1.

4.6 The Mountain Whitefish

Written by Susan Eyre for Fish in the River Working Group/ Spring 2000
Funded by Fisheries Renewal B.C.

"A spirited and popular sportfish in swift mountain streams" is the description of the mountain whitefish in the Guide to the Freshwater Sport fishes of Canada. I've heard comments about them being too bony, or that they taste like walleye, or that when whitefish were caught in the fall, the fish were fat and not bony at all. I asked B.C. Environment- Kootenay Region why there wasn't a fall fisheries and received the answer that the public had determined the spring opening through public meetings -it wasn't a fisheries decision.

There's lots of whitefish in the Slocan River, I've been told-some getting to 3#'s. The oldest whitefish caught and tested was 29 years old. The top weight coming in at 5 #'s but that wasn't here in our river.

Whitefish are part of the salmonid family, related to salmon and trout. In the Slocan River they spawn around Christmas time at 3-4 years of age. They don't makes redds like trout or salmon, but spawn in small groups of 2-4 fish lying closely together at dusk or night in fast shallow water. The eggs hatch in early spring, the fry emerging as early as March. They hang out in protected backwaters and side channels - attracted to light and not hiding under rocks. The whitefish fry are very vulnerable to disturbance by animal feet or diverted water projects whether for farming, road building or logging purposes .In late summer the fry school-up and move into deeper faster water, usually not migrating more than a few kilometers the first year. Adult migration can travel as far as 30 kilometers.

Mountain whitefish eat aquatic insects, fish eggs and small fish. They will nudge rocks with their snouts to forage and will hang out near the river bottom to capture drifting prey.

Dams are hard on mountain whitefish lifecycles because of the loss of spawning, rearing, feeding and overwintering habitat.

For the last four weeks I've seen people fishing whitefish on the Slocan River - how's your luck been ?

Sources:

: A Guide to the Freshwater Sport Fishes of Canada by D. E. McAllister, E. J. Crossman

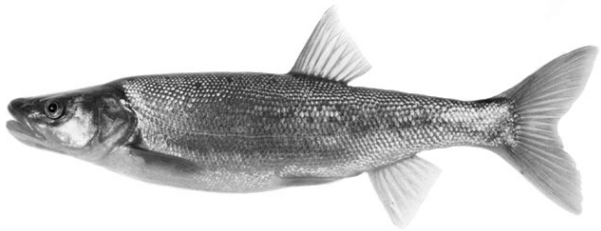
: Literature Reviews of the Life History, Habitat Requirements and Mitigation/Compensation Strategies for Selected Fish Species in the Peace, Liard, and Columbia River Drainages of British Columbia by Triton Environmental Consultants Ltd.

: John Bell, Colin Spence. and Pete Corbett /Fisheries Biologists for B.C. Environment -Kootenay Region.

4.7 Northern pike minnow a.k.a. Squafish

Written by Susan Eyre for Fish in the River Working Group/Spring 2000
Funded by Fisheries Renewal B.C.

Northern Pike Minnow is the proper politically correct name for what the locals call squafish. It should not be confused with the Northern Pike although the two share many characteristics. Because there are so many sport fish to choose from in B.C., the northern pike minnow comes at the bottom of the list for sport fishing desirability. However it does feed at the surface in the evening, will take a fly with a berry as bait, and give a short fight.



What irks man, the most effective predator, is that the Northern Pike Minnow is known as a voracious predator of trout, whitefish and other fish species. Young fry will eat aquatic and terrestrial insects and some plankton, but at 4 inches in length, they start eating other fish. During fall and winter, northern pike minnow move offshore into deeper waters where fish become the major food item.

Like other bottom feeders, the northern pike minnow are transport vehicles for many different parasites. All the parasites have a part in housecleaning stream bottom debris. Some feed fish, like mollusks and crustaceans, and others can overwhelm fish, like the encysted eye fluke, if the fish aren't healthy. Some of the parasites depend on both a fish and bird host for their survival.

Creation of reservoirs as a result of hydroelectric projects, has considerably improved the habitat of the northern pike minnow but inhibits rainbow trout populations. The northern pike minnow's habitat being warmer water, weedy lakes, slow-moving streams and edge waters of large rivers. In fall they move into deeper waters, where they are the biggest threat to the salmonid species as a predator, especially in the months from October to April. They prefer to spawn in gravely shallow areas along the shore during the months of

May to July, being sexually mature about six years of age. The females can spawn many times in a season releasing adhesive eggs fertilized by a few to many males over the gravel. The eggs hatch in about a week.. The males will eat the eggs from their own spawn. Sculpins and newts like the eggs too. The northern pike minnow lives to 15 - 20 years of age, maximum weight of 29#, and 25" long.

Not highly regarded in the Slocan Valley, it is suspected that the northern pike minnow are eating the trout fry and competing for the same aquatic insect/food supply, and that is why there is a lack of trout.

Many suggestions have been made to" get rid" of the Northern Pike Minnow by poisoning or catching them and adding them back to the river as nutrient. In some U.S. sections of the Columbia River system, a person gets paid $3-5 for catching the northern pike minnow, just to give the salmonids a chance to grow beyond juvenile size, and to balance out the fish populations. Here we have populations of northern pike minnow adults in the Brilliant Dam Reservoir, the Little Slocan Lakes and the Slocan Lake, so getting rid of them is not very feasible. If the trout and northern pike populations were brought into balance, possibly through habitat preservation and restoration of cold water sources, both trout and pikeminnow could eat each other to each others mutual benefit.

Resource info:

: Freshwater Fishes of Canada, by W.B. Scott and E.J. Crossman 1973, Fisheries Research Board of Canada

: Washington Department of Fish and Wildlife Sport Reward Hotline

: Living Landscapes of B.C., website www.livingbasin.com, Royal British Columbia Museum, Victoria, B.C.

: John Bell, Fisheries Biologist, B.C. Environment-Kootenay Region. Nelson, B.C.

: Randy Lake, Fisheries Biologist, Winlaw B.C.

4.8 Article Written For Inland Magazine

By Susan Eyre for Fish in the River Working Group /Spring 2000
For Fisheries Renewal B.C.

After tubing down the warm waters of the Slocan River last summer, I sunned on a beach and watched the kayakers, canoeists, and rafters go by..... I daydreamed of the multitudes of huge spawning chinook salmon, and of the Kokanee salmon coloring the creeks red with their ripe quivering bodies. I recalled the First Nation's name, the "Sinixt-meant "People of the Bull Trout" and wondered how many trout must have been here to be able to sustain a village. I envisioned the mussel beds stretching the width of the river," you could walk across them", stories told to me by the local old-timers. On walks I've found the piles of shells middens) covered by moss in the Vallican woods - evidence of First Nation feasts long ago

Farmers like Grandpa Avis, would hire local kids to haul salmon bodies to plow in to fertilize their fields. And Phil Kabatoff senior, when he was a kid, could catch a trout with a safety pin and a chunk of bread- no problem-there were lots of hungry trout.

Come twilight, I look for the fishermen standing on the big rock at a favorite fishing hole- and they're not there -

I know why - aside from a spring mountain whitefish opening, fishing is closed on the river. But I miss the fishers and the fish, and I'd like to help the fish live here again

My daydreams return to reality - The salmon were blocked forever from returning to their Kootenay home by the construction of the Grand Coulee Dam .The completion of the Brilliant Dam in 1942, stopped the bull trout run up the Slocan River from the Columbia via the Kootenay River. However the rainbow trout were flourishing and they continued to chase after the spawning Kokanee, hopeful for a bountiful feed of fish eggs. Fishing was still pretty good in the 1950's-70's. Then the trout and Kokanee became scarce too. Why ?

I'm a partner with a group of Slocan Valley residents called " Fish in the River". We are gathering stories, theories, and history through interviews of valley residents, presentations and coffee table discussions. We're reading through all the fisheries documents, talking to fishery technicians and biologists and compiling as much knowledge as we can on the Slocan River.

Fascinating stories of 50# chinook salmon massed in the cool deep pools at Winlaw, bucketfuls of musselshell gathered to be ground for chicken----- generations of Valley kids growing up fishing this river, the miracle of the salmon bringing the marine phosphorus nutrients from the Pacific Ocean all the way deep into the interior of B.C. to fertilize our forests by way of foraging animals on the salmons spawned-out carcasses....how fish depend on the tree and bush cover for their nutrition and survival....How culverts placed a little too high up for low water times can make the difference for survival of juvenile trout. And in winter how yearling fish like to snuggle into the gravel to keep themselves warm, so if the gravel's all filled up with silt, the little fish get too cold to survive.

All of these bits of information are like puzzle pieces coming together. It's exciting! The big picture, with all its wonders and contradictions, we are offering up to the Slocan public. By assembling all this knowledge on one table, we hope to see common (thoughts) emerging, draw some conclusions, and as a community, be able to direct ourselves to beneficial actions for the Slocan River fisheries

4.9 The Columbia Power Corporation's Brilliant Dam Expansion – Fish Ladder Or No Fish Ladder?

Written by Susan Eyre for Fish in the River/ Spring 2000
Funded by Fisheries Renewal B.C.

The Brilliant Reservoir is part of the Slocan River fisheries system, as fish migrate through the entire habitat from Slocan Lake, down river to Brilliant Dam and back again, following the feed availability cycles and species-specific spawning patterns . The Brilliant Dam Expansion, still in its early form, proposes to add a side passage around the Glade side of the Brilliant Dam to feed water to another powerhouse. The objective of the expansion is to generate more power, especially at high water time, the dollars generated, returning back to enrich the Columbia Drainage communities. There hasn't been any feed back about long term negative impacts on the downstream fisheries at this point but the expansion generally looks benign.

There is hot debate about whether a fish ladder should be incorporated into the new expansion. The proposal is designed to allow the construction of a fish ladder, but doesn't plan to build one. Though economics could be one reason for not building it, the major reason is of ecological concern. The Brilliant Dam prevents exotic fish introductions from the Columbia River from inhabiting the Kootenay and Slocan River Systems. The exotic fish in question, is the infamous "walleye". One description being, "Walleye look like a northern pikeminnow on steroids underwater – big toothy grin, spiny-rayed fins, travel in schools, totally predatory". In Ontario and the Prairie Provinces, they are one of the most important sportfish - good fishing and good eating. Walleye eat salmonid fry, as in trout and whitefish. They also eat the prolific redside shiner, which is a most serious competitor of the trout and whitefish for insect prey. In the Columbia River, rainbow trout populations have increased, despite the walleye introduction. It is suspected walleye have an impact on redside shiner, that may offset any predation by walleye on rainbow and possibly whitefish. However, the long-term impact of the walleye in the Canadian section of the Columbia River isn't known. If they are highly successful at reproducing, their impacts on the other fish species may be more substantial

If a fish ladder was incorporated into the Brilliant Dam, fish migration patterns would be enlarged. The Columbia rainbow trout could once again enter the Slocan River system, hopefully bringing back the famous fall fishery. The bull trout and the sturgeon could once again migrate back and forth, utilizing a larger feeding territory. The bull trout would have a chance to breed in a larger gene pool, producing stronger, more adaptive to change and disease, offspring. All of this could be possible, if the fish ladder worked in its function, which is a complicated affair. Supersaturation of gases from spillways can cause fish mortality, lack of current in the reservoir defies fish navigation, and adequate flow through the ladder is critical. These are just a few of the considerations. Basically, it is a very responsible decision that the Columbia Power Corporation, Fisheries Biologists, and the Public has to make, and the only way to make that decision is to be informed as possible.

Sources:

: Living Landscapes/ Royal British Columbia Museum

: Tom Bradley

: Randy Lakes/ Fisheries Biologist

:"Pacific Salmon" by R. J. Childerhose and Marj Trim

: B.C. Environment – Kootenay Region / Fisheries Biologists

5 Information Kiosks In The Slocan Valley

During the months of May and June, eight information kiosks were set up in various places of the Slocan Valley between Slocan and the junction at the Evergreen store.

The kiosks consisted of a background of pictures of the river, some fish photos, and info about our Fish in the River project. The table in front of it was filled with all the collected information in hand-out form.

Gabi was attending the kiosk, and had many discussions with interested people.

Stories ranged from young people in their twenties living by the river, and cleaning up the garbage they found in the water, car batteries, broken glass, and many other discarded items. Some people seemed to use the river as a garbage dump.

Quite a few times I heard it mentioned that there have been so many studies, and no follow-up happened. I also heard a few times from people that they have put so much energy into the fisheries in the past, and they were burnt out and have given up.

One suggestion was that it would be good to open the river for fishing to seniors and children.

Others would start a discussion that was sometimes quite heated.

The overall response was positive, people were excited that we are doing this, and more than once I heard that someone had moved here because of the river.

Many hand-outs were taken home to read and pass along to others.

6 Fish In The River Public Meetings

6.1 Facilitator's Report

Two public meetings were held in order for the community to share ideas about fish habitat and build support for possible action . The first was held on June 12 at Winlaw Hall and the second on June 14 at Passmore Hall.

The agenda for the meeting was set by the steering committee in meetings prior to the public meetings and is included with this report.

6.1.1 Winlaw Meeting Summary

Thirty-two people attended, twenty-two of which were not organizers or family of organizers. After Tom Bradley gave opening remarks, Marilyn James gave the First Nations Perspective, which included some confrontation to the Fish in the River committee regarding the importance of including the First Nations voice, as well as historical connections with the river, the importance of scientific data, and visions for creating change in the community. Shemmaho then gave a summary report of the Kitchen Table meetings.

The group then was asked to break out into smaller groups based on topics of their own initiation. Five topics were presented; First Nations Perspective (including Fish Biology, Water Legislation, and Memorandum of Understanding) , Logging, Restoration, Chemistry, and Fisheries Renewal Partnership. People were free to mingle around through the various groups with the largest concentration of people gathering in the First Nations group. Each group was asked to record information, which was then reported back to the larger group. See attached summary of the information, which got recorded.

After the reporting Leslie Mayfield spoke of a recent example of debris in the river currently causing flooding. There was interest in discussing this concrete issue but due to the fact that the meeting had already run over time the formal meeting was adjourned with people invited to keep discussing afterwards if they wished.

There was various feedback about the meeting, with some people feeling that it was good and others feeling upset by the content and attitude in Marilyn James' presentation.

6.1.2 Passmore Meeting Summary

Approximately 10 community participants attended this meeting. This meeting was strained due to the fact that Marilyn James had been told just before the meeting that based on last meetings experience she was not to be a guest speaker but was welcome to attend as a participant. This set an emotional tone that colored the rest of the meeting, with the First Nations representatives indicating outrage that the First Nations voice was being excluded.

Otherwise this meeting had the same agenda as the Winlaw meeting with Jennifer Yeow giving the opening remarks. The small groups topics initiated at this meeting were: Government Involvement, Spawning Channels, Lifestyles Affecting River Ecology, Watershed Logging, Bull Trout, and Water Legislation. Again people mingled with the

largest discussion gathering around the Government Involvement topic. Reports were made back to the larger group. Summaries of the information which got recorded are included with this report.

The large group was then engaged in discussion of what they felt the next steps should be. There seemed to be general interest in the process continuing although specific direction was not clearly stated.

6.1.3 Both Meetings

Fish in the River provided two tables of handout material .The facilitator presented a flow chart of the possible phases of the process from the forming of the core group to the implementation and evaluation of an action plan. It had been anticipated that there might be tension raised between meeting participants due to the current polarized positions regarding logging in the watersheds but this did not happen. At both meetings people were informed of a follow up meeting and a sharing of the final report to be held on June 30 at the Spicer Center. Also, a sign up sheet was passed around to gather contact information and indications of interest for further involvement.

June 21,2000

Jan Inglis

6.2 Small Group Report Summaries

6.2.1 Fish Biology

Bull Trout or Dolly Varden

Bull Trout Status in B.C. and in the Slocan

Bull Trout populations - resident (or stream), fluvial, adfluvial

Why are Bull Trout so vulnerable to environmental impacts?

List of streams known to have Bull Trout

Type of studies done in the Slocan

Bull Trout history, status, and habitat requirements

Recommendations for Slocan Valley

6.2.2 Memorandum of Understanding

In order to proceed with a valley wide strategy, a unified direction with wide spread consensus is necessary. Agreement between the Sinixt Nation and the Valley Residents must be a foundation for the strategy. This agreement must be in a politically recognized form - a written M.O.U with sign on of Sinixt and valley residents. The M.O.U. can then be a basis for levering provincial/political cooperation for the valley wide strategy.

6.2.3 Water Legislation

Water needs legal protection from the point of its source. Legal protection involves riparian zones and will result in water temperature and quality being (?). Premier Dousanjh needs to implement water protection. In the light of Walkerton and the upcoming election, the time is now. Write to your Premier and demand legislation.

6.2.4 Spawning Channels

Funding/costs (capitol/ operational)

Location

Community/government support

Science, does it work, will it work

Potential negatives / risks - introduction of fish species,

Start with eggs? start with what stock?

6.2.5 Government Involvement

Help restore fish in the river

No more studies!

More hands on studies

Open fishing as incentive for gathering information for Dept. of fisheries

6.2.6 Watershed Logging

Riparian zones - height of land on either side of the river

Food chain for fish

No logging in headwaters of watersheds

Landowners should get a tax break for growing trees, not be taxed for having marketable timber.

6.2.7 Lifestyles Affecting River Ecology

Question, what can I change about the way I live that will have a positive change on the river? Waste disposal, chemical use, water use.

Causes: Chemical Changes

Logs in lake create tannic acid, or..? Bark build-up on bottom of lake, also clogging gills.

Why are logs allowed in the lake here when they are not allowed in most of Canada or the U.S.?

Pentaclorophenol

6.2.8 River/Trout Habitat Restoration Techniques

Need community/landowner support--could have connection with Rails to Trails.

Interpretive sites. Restoration Park could be an example to follow.

Questionnaire for entire valley to determine support (either in labor or money or..) for the above.

7 Biologist Reports and Summaries of Biologist Reports

7.1 Bull Trout Assessment In The Slocan Valley

Written by Luce Paquin, Fisheries Biologist for Sinixt First Nation/Fish In The River Spring 2000

Bull Trout History

Bull trout were the most abundant and widely distributed char species in British Columbia, Alberta and western states of U.S. at the turn of the century. Since then the species has experienced dramatic declines in both numbers and distribution due to over-harvest, loss of cold water habitat and the introduction of non-native species.

In the U.S.A., around early 1900, game managers began introducing brook trout and other popular non-native fishes. Due to its predatory nature, the bull trout was not considered a desirable part of stream ecosystems ; why make the effort to stock game fish if a native fish is going to eat them all ?

As a result, in 1913 and 1914, Montana attempted to eradicate the species through :

- commercial net fishing
- poisoning campaigns continue as late as 1990

Now, states like Montana, Idaho, Washington, Oregon, Nevada, California, have recovery programs

Bull Trout Status

The bull trout (Salvelinus confluentus) is a char endemic to western North America. For many years, it has had confused taxonomic history with the Dolly Varden (Salvelinus malma).

The species is 'blue-listed' in B.C. and is under the US Endangered Species Act. Bull trout is declining in numbers throughout their range, especially at the southern edges of their distribution where a number of populations have become extinct.

In British Columbia, the major declines appear to be in the Columbia system and in the lower Fraser Valley.

Bull Trout Life-history Forms

Stream-resident populations :

- live all its life in small streams
- headwater streams, mountainous regions
- is often dwarfed and reaches sexual maturity at a small size and sometimes at an early age
- usually separated from other populations by some barrier

- suitable overwintering sites are critical to maintain a viable population

Fluvial populations :

- live as an adult in large rivers but spawn in small tributaries
- it often attains a large size, reaches sexual maturity in about its fifth year
- undergoes long migration between mainstem rivers and small tributary spawning streams

Adfluvial populations :

- live as an adult in lake but spawn in small tributaries
- it grows to a large size, reaches sexual maturity in about its fifth year
- undergoes long migrations between lakes and spawning streams

Habitat Requirements

Many biologists believe that bull trout are particularly sensitive to environmental change because they have more specific habitat requirements than other salmonids.

- water : -cold pristine water
- excellent cover:
- eggs are known to have a better survival rate at low water temperature
- spawning habitat :
  - low gradients, predominance of small gravel, low water velocity, excellent
  - riffles-pools-cascades stream pattern
  - redds often associated with ground water sources

Impacts on Bull Trout

- Environmental impacts :
  - Reservoirs
    - barriers to bull trout populations
    - gas supersaturation
    - gas bubble trauma
    - turbines
    - change natural flow and temperature regimes
    - high mercury levels
  - Logging, road construction :
    - siltation
    - freezing water
    - population fragmentation
  - Pipeline :
    - road construction
    - cover destruction
    - siltation

- Recreational fisheries :
  - overfishing
  - catch & release
- Other impacts
  - Inter-species competition: Bull trout do not do well in competition with introduced salmonids (there is evidence that introduced Lake trout have replaced bull trout in number of lakes in B.C.)
- No severe harvest regulations :
  - Slocan Lake : 1 BT /day, any size
  - Slocan Lake tributaries : catch & release
  - Upper Arrow Lake : 1 BT /day, any size
  - Upper Arrow Lake tributaries : catch & release
  - Kootenay Lake : 1 BT/day, any size

Slocan Valley Bull Trout Information

Not one study was done as a bull trout oriented in the Slocan watershed.

From a literature review, studies done on Slocan River, Lake and tributaries were either :

- Stream Inventory Forest Renewal Program (FFHIP)
- Fish Assessment projects (all species in general)
- Rainbow Trout Assessment projects :
  - rearing and spawning habitats
  - stream restoration recommendations

Bull trout presence known in Slocan watershed:

- Slocan River: Juveniles and adults are found, spawning is suspected
- Little Slocan River: Juveniles and adults are found, spawning is known
- Lemon Creek: Juveniles and adults are found, spawning is known
- Winlaw Creek: Juveniles and adults are found, spawning is known
- Wragge Creek: Juveniles and adults are found, spawning is suspected
- Silverton Creek: Juveniles and adults are found, spawning is suspected
- Bonanza Creek: Juveniles and adults are found, spawning is known
- Koch Creek: Juveniles, adults are found, spawning is suspected
- Shannon Creek: Juveniles, adults are found, spawning is suspected
- Fennell Creek: Juveniles, adults are found, spawning is suspected
- Williston Creek: Juveniles are found

Recommendations for the Slocan Valley

- More bull trout studies :
  - resident/ fluvial / adfluvial populations

- rearing and spawning habitat
- genetic studies

- More bull trout habitat restoration projects to enhance rearing and spawning habitat
- Yearly creel survey on Slocan Lake and Slocan River
- Bull trout public awareness :
  - bull trout or Dolly Varden
  - bull trout management plan

7.2 Salmon Carcasses And Nutrition In The Slocan River

Salmon decline hurts many other species/February 8, 2000
By JEFF BARNARD
Associated Press Writer
Submitted by Colin Spence/Fisheries Biologist, BC Environment-Kootenay Region

GRANTS PASS, Ore. -- A growing body of scientific evidence is showing that salmon are more than just a majestic sport fish, a tasty entree, an economic resource or a cultural icon. From Alaska to California, they serve as a huge natural recycler, responsible for transporting organic material they eat in the oceans and store in their bodies before swimming to the headwaters of watersheds, leaving their rotting carcasses to feed insects, bears, plants, trees and particularly baby salmon.

A recent study published in the journal Fisheries figures that as little as 5 percent of the historical biomass of salmon are returning to their native watersheds, creating a dramatic shortage of nutrients derived from the ocean.

The recycling role is so important that restoration of wild salmon in the Pacific Northwest "is hinging on recognition of this issue," said Jeff Cederholm, a fisheries scientist with the Washington Department of Natural Resources.

Historically, salmon management has been based on allowing the maximum catch in the ocean and rivers while allowing just enough fish to return to their native streams to spawn a new generation.

"We have essentially starved our freshwater systems," said Bob Bilby, a fisheries scientist with the National Marine Fisheries Service in Seattle.

Based on historical cannery records and published accounts, researchers estimated the annual biomass of salmon returning to rivers before the arrival of settlers in Washington, Oregon, Idaho and California.

They found that salmon runs totaling between 352 million pounds and 497 million pounds had declined to between 26 million pounds to 30 million pounds.

"This means that just 5 percent to 7 percent of the marine-derived nitrogen and marine-derived phosphorous once delivered annually to the rivers of the Pacific Northwest is currently reaching those streams," the researchers say in their study.

"This nutrient deficit may be one indication of ecosystem failure," they wrote.

Jim Lichatowich, an independent fish biologist, Ted Gresh, a graduate student in planning and public policy at University of Oregon, and Peter Schoonmaker, executive director of the Institute of the Northwest published their findings in the latest issue of Fisheries, the journal of the American Fisheries Society.

"This is sort of like the erosion of genetic diversity," Lichatowich said in an interview. "It is something you don't see, but accumulatively it probably could have a big impact."

The key to this research has been equipment that can identify individual isotopes of chemicals such as nitrogen, phosphorous and carbon, and track them to their source. Using it, scientists have analyzed leaves, plants, young fish and even grizzly bear bones. All showed high levels of nutrients coming from the ocean.

On Washington's Olympic Peninsula, Cederholm observed 22 different animals feeding on salmon carcasses.

"We have been finding marine carbon and nitrogen in leaf matter of trees growing along river corridors," Cederholm said. "The only way for it to get there is through salmon swimming up streams, spawning in rivers."

The trees in turn drop their leaves, branches, and eventually their trunks into the river, where they serve as hiding and resting places for the fish, and decompose to feed insects, which in turn are eaten by salmon.

"They are a keystone species," Cedarholm said of salmon. "All the other wildlife or plant communities have, in some way, some dependency."

Working on the Snoqualmie River in Washington, Bilby found that as much as 40 percent of the nitrogen in the bodies of young coho salmon and 60 percent of the nitrogen in young steelhead came from marine sources.

When they dumped salmon carcasses on streams running into Willapa Bay, they found higher densities of young fish around the carcasses. The young fish were feeding on the carcasses and eggs laid in the river.

The extra food meant juvenile fish grew bigger before migrating to the ocean. Bigger fish survive better, so more fish come back to the river. And so on.

It appears that salmon evolved this as a survival strategy because the streams in the Northwest were generally low in nutrients. So they brought their own lunch.

"If you don't have the subsidy provided by salmon, those systems gradually decline," Bilby said. "You'll still have aquatic life occurring in those streams, but there won't be much of it."

The Oregon Plan for restoring dwindling salmon populations recognized this research, and for the past two years volunteers have been tossing salmon carcasses from five hatcheries along coho rivers on the northern Oregon Coast. Washington has a similar program.

But there is a long way to go, the authors of the Fisheries article concluded.

Research has indicated that between 93 and 155 carcasses per kilometer are needed to provide the maximum ecological benefit on coho streams. While Oregon's goal for coastal coho streams is 26 fish per kilometer, only two to seven fish per kilometer were found in 1997.

7.3 A Proposal to Enhance Juvenile Rainbow Trout Habitat in the Slocan River

Slocan Valley Equal Access to Public Resources Society (SVEAPRS)
Nov 1998

- proposed placing boulders and LWD strategically to increase cover
- cost $7975 Bulk of work requires hiring fisheries consultant
- previous studies cite loss of juvenile habitat as contributing factor to depressed rainbow population
- large proportion of rainbow spawning activity is in upper Slocan River near outflow of Slocan Lake. This area suggested for placement of materials. 5 large structures proposed.
- MELP supports initiatives to improve habitat conditions
- want to follow up with electro-fishing to determine if new habitat is used

7.4 Slocan River Overview Habitat Assessment and Restoration Process

Michael Zimmer, Sheri Petroveic, and Kenji Kage, of Timberland Consultants Ltd.
For Slocan Forest Products Ltd. / Slocan Division, Slocan B.C. 1998

Summarized by Susan Eyre for Fish in the River Working Group

Timberland Consultants Ltd. Undertook an Overview Fish Habitat Assessment within a portion of the Slocan River watershed. The study area included the Slocan River mainstem, Little Slocan River and the first reach of 11 major tributaries. The objectives of this study were to determine habitat condition and identify potential restoration opportunities. Aerial photograph interpretation, background data review and a low intensity, ground truthing exercise, were used to determine habitat condition. Restoration priorities of high, moderate and low were assigned to all reaches of watercourses within the study area. Sixteen preliminary restoration opportunities were identified within the

study area. High priority reaches contained an obvious opportunity for restoration. Preliminary restoration recommendations target improving habitat conditions for juvenile rainbow trout. Recommended restoration measures include stream bank stabilization, landslide stabilization (remediation), instream large woody debris and boulder cluster placement and side channel enhancement. Moderate priority reaches did not have obvious restoration opportunities but have a high possibility for restoration and require detailed field assessment. Both high and moderate rated reaches are suggested for Level 1 Fish Habitat Assessments. Low priority reaches are not suggested for further investigation or restoration. Those reaches have either good quality habitat conditions or low restoration potential.

Concurrent to the Overview Fish Habitat Assessment, Timberland Consultants Ltd. Also coordinated a working group of government ministries, crown agencies, industry representatives, public interest groups and watershed citizens interested in devising a Slocan River Restoration Process. This working group includes a diverse cross-section of representative stakeholders present within the Slocan Valley. The role of this working group was to identify fish habitat restoration opportunities, encourage and delegate roles for implementation, identify funding sources and provide a high profile restoration vehicle for all other groups and citizens interested in initiating local watershed restoration projects.

Summarizers' comments: This document is a very good read for anyone who wants a thorough understanding of the status of Slocan River. Included is a Temperature zone map of the Slocan River, physical, fish and human history, limiting factors for fisheries, and comprehensive involvement direction for community groups. I close with this quote from the " Submission to HCTF on behalf of the Slocan Valley Wildlife Association", "If the present bottleneck in transitional habitat from juvenile to sub-adult stages is left unchecked, it is doubtful whether an increase in the number of older age-groups will be any better over the next five years".

7.5 Migratory, Overwintering, and Spawning Behavior of Rainbow Trout in the Slocan River

James Baxter and Robyn Roome
Dec 1998

- Rainbows are the main target of anglers in the W. Kootenays
- Low numbers attributed to : over fishing, habitat degradation, predation by other species, and reduced nutrients due to loss of salmon
- Purposes of study:
  - learn reproductive biology of the trout population
  - determine if most trout spawn in mainstem or tributaries
  - collect data that can be used for conservation and enhancement
- Other fish species found: bull trout, Rocky Mountain whitefish, northern squawfish, red-sided shiner, large-scale sucker, long-nose sucker, Kokanee, dace, sculpins.
- Before Grand coulee Dam, there were steelhead, sockeye, and chinook
- Study Methods and Findings

- studied from Nov - May
- a total of 30 rainbows (19 females and 11 males) were implanted with radio tags.
- of 28 tracked, 10 were migratory, and 18 non-migratory (moved less than 10 km)
- 3 moved into Little Slocan to spawn
- more use of mainstem than tributary habitat for both holding and spawning
- trout moved less when water temperature decreased, and moved most when temp rose above 5 degrees C.
- trout moved less as river discharge increased (and they were likely spawning then)
- over-wintering occurred until mid-March. There were 2 major over-wintering areas, both near spawning areas. One spot was near the confluence with the Little Slocan River.
- 2 populations (river-resident, and lacustrine) were observed spawning during the survey
- all radio-tagged fish were river-resident. They spawned from the last half of March until late April. The lake residents spawned in late April.
- 7 spawning areas were observed for river-resident rainbows, mostly in the upper river, from km 38 to the lake outlet
- of the 28 fish tracked, 11 spawned in the mainstem, 3 in the Little Slocan .

- Conclusion: The majority of resident trout spawn in the mainstem, so that is where habitat enhancement efforts should be directed.

7.6 Slocan River Summer Temperatures in 1997 and 1998: Implications for Rainbow Trout Distribution and Production

Steve Arndt, M.Sc.
Sept.1999

Summarized by Susan Eyre, for Fish in the River Study Group

Slocan River Temperatures

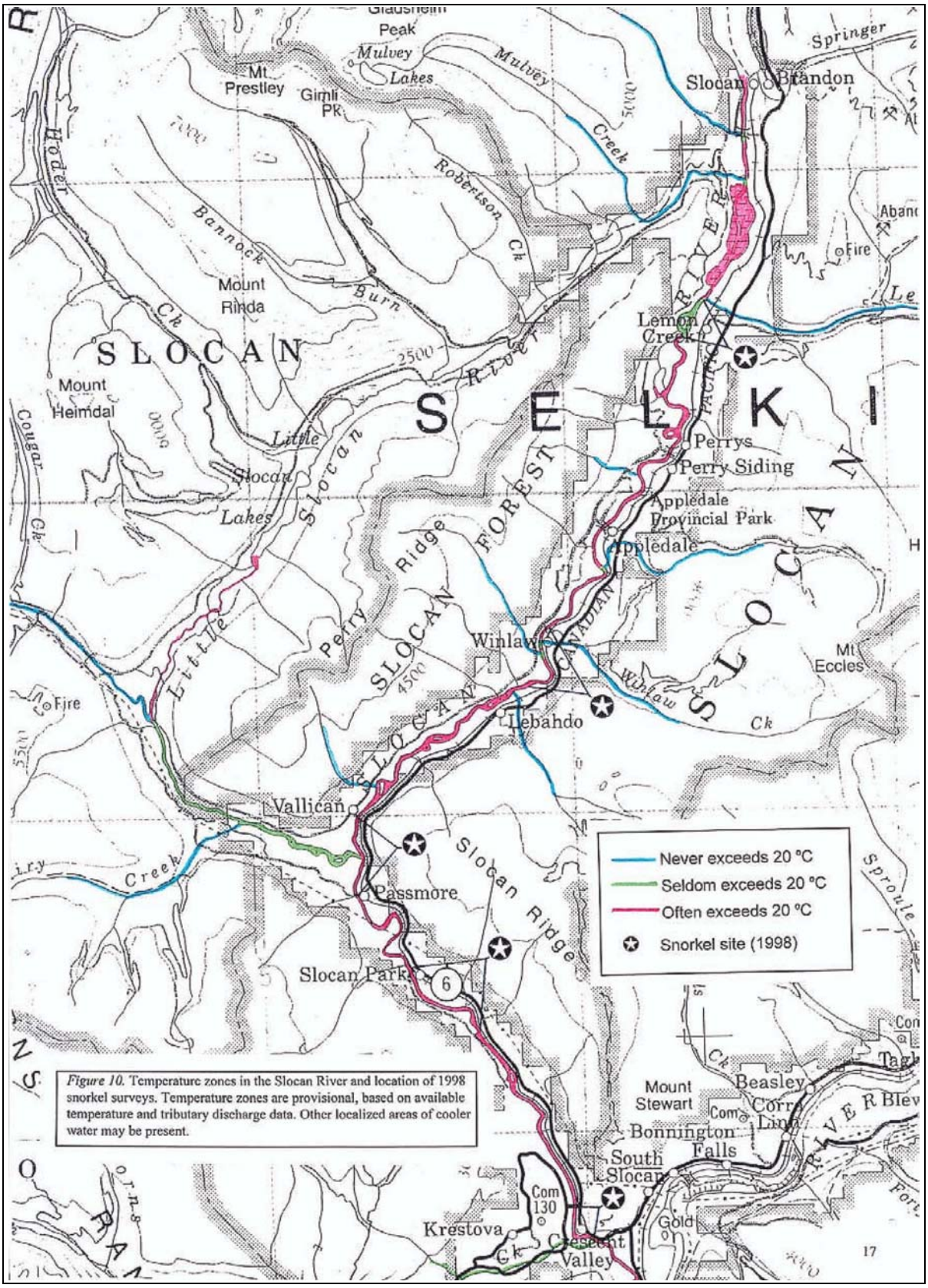
The Slocan River is warmer than most of the other rivers of the region since its source is Slocan Lake. Mainstem temperatures reached 21.5*C.in 1997 ,an unusually high water level year, and 24.4*C. in 1998 , a low water level year. In almost all the mainstem the daily maximum temperature was above 20*C. for 3-4 weeks in 1997 and about 8 weeks in 1998. Slightly cooler sections were: Lemon Creek confluence (significant influence), Winlaw and Hird Creek downstream sections (fair influence) and Goose Creek immediately downstream (slight influence).

Historically, there are indications that the river temperature was cooler in August and September than it is now, but the available measurements don't allow a reliable conclusion. Factors which could contribute to warmer temperatures now are:

1. decreased volume of mainstem flow because of agricultural and domestic uses

2. decreased volume flow because of altered run-off patterns to the tributaries from logging methods
3. rerouting of Lemon Creek causing a marshy area upstream
4. loss of shade along river because of agricultural clearing and housing development.

Peak demand for irrigation/domestic water comes at the hottest, driest part of the year when the river is already low and warmest, making the trout requirement for cool water more unlikely to be provided.


Never exceeds 20 °C
Seldom exceeds 20 °C
Often exceeds 20 °C
Snorkel site (1998)
SLOCAN
SELKIRK
Slocan
Brandon
Springer
Mulvey Lakes
Mulvey Creek
Mt Prestley
Gimli PK
Robertson Ck
Bannock Burn
Mount Rinda
Mount Heimdal
Cougar Ck
Little Slocan Lakes
Slocan River
Lemon Creek
Perrys
Perry Siding
Appledale Provincial Park
Appledale
Perry Ridge
SLOCAN FOREST
CANADIAN PACIFIC
Winlaw
Winlaw Ck
Mt Eccles
Lebahdo
Vallican
Slocan Ridge
Passmore
Slocan Park
Mount Stewart
Beasley
Bonnington Falls
South Slocan
Krestova
Crescent Valley
Gold
Fire
Figure 10. Temperature zones in the Slocan River and location of 1998 snorkel surveys. Temperature zones are provisional, based on available temperature and tributary discharge data. Other localized areas of cooler water may be present.

Water Temperature Requirements For Trout

Fish body temperature is set by the temperature of the water they inhabit. Body temperature determines the ”metabolic rate”-the fishes ‘cost of living’ . The fish’ metabolism affects its rate of growth, its swimming performance, its health, and its reproductive abilities. There is a narrow range at which fish growth and survival are maximized. . The lethal temperature for trout is from 24*to 28*C. Adults may be more able to tolerate high temperature than juveniles because of lower maintenance metabolism. I t is possible that an increase in juvenile survival in cooler reaches would result in better recruitment and higher densities of larger trout in the warmer sections.

Juvenile Rainbow Trout Requirements

Juvenile rainbow trout in hatcheries will grow well at temperatures from 7*-13*C. 15*C. is reported as the optimum for growth and food utilization. But in the wild, growth rates of juveniles may be reduced at 16*C. because the increased cost of maintenance metabolism could not be offset by a limited food supply. With juvenile rainbow trout , an increase of even 2* can cause a decrease in food consumption and growth rate, when temperatures are near the tolerance level.

Mainstem temperatures in the Slocan River are well above optimum rearing conditions for rainbow trout juveniles. Survival of juveniles is likely to be low in most reaches of the mainstem in warmer years- in years of high water discharge and cooler temperatures, there may be higher juvenile survival. The highest number of juvenile rainbow trout in the 1998 survey were found in the Lemon Creek reach, which had a great amount of large and small woody debris cover and cooler water temperatures. The interaction between water temperature, hiding cover, and nutrient conditions, providing lower energy costs related to feeding and predator avoidance, may be very important to the survival of the juvenile trout’s transition to adult size.

The unbalanced size/age structure of the trout population from 1985 surveys on, supports the view that there is a low survival rate from the juvenile to sub-adult stages. This prevents recovery of larger size trout. Stocking programs from 1989-1991 didn’t result in an appreciable change in the age structure - the stocked juveniles had either emigrated or had low survival. Most mortalities occur during the first growing season and/or the first winter. Winter survival is likely dependant on reaching a minimum size at the end of the first growing season

Historical Documentation

Fishing in the Slocan Valley, before the Brilliant Dam was built, was mostly in the Little Slocan River, its tributaries, and Lemon Creek The resident trout has a large head with a small body, less than 18 inches long-with large spots and a pronounced stripe with a deep orange color on its cheek. Construction of the Brilliant Dam in 1942 prevented the Dolly Varden from coming into the Slocan River from the Columbia River via the Kootenay River.

Local information gives evidence that the Slocan River did not support a large population of resident rainbow trout historically. Rather, the high numbers of large rainbow trout were migrants from the Kootenay River and their large size a result of increased food

abundance, well-nourished by phosphates released from the upstream Cominco fertilization plant in Kimberley.(1953-1972) This migrant trout run occurred during spring for spawning, and fall, possibly for spawned Kokanee eggs and carcasses. The migrant trout had a very different appearance from the resident trout. They were large, 5-6#s, sometimes to 10#s, and were silvery with small heads. Their small head with large body indicated a high growth rate compared to the smaller and less well-fed Slocan River resident trout. The catches of these fish dropped off dramatically coinciding with the pollution control of the fertilizer plant and the effects of the upstream dams on nutrient levels in Kootenay Lake.

Major Environmental Impacts

Major environmental impacts have greatly altered fish habitat and fish access to the Slocan River:

- 0-1935: the Slocan River supported large runs of Pacific Salmon and Dolly Varden (bull Trout)
- 1935:Construction of the Grand Coulee Dam blocked the migration of Salmon up the Columbia.
- 1942:Construction of the Brilliant Dam blocked the Dolly Varden-Bull Trout from entering the Slocan River via the Kootenay River
- 3 dams built between Nelson and South Slocan
- 1953:Cominco constructs Fertilisation plant in Kimberley, resulting in fertiliser leakage into Kootenay River downstream
- 1965:Cottonwood Fish Hatchery closed, after operating for close to 30 years.
- 1967;Duncan Dam constructed at north end of Kootenay Lake, on Duncan River reducing natural nutrient inputs to Kootenay Lake.
- 1970:Closure of Cominco's Fertiliser plant ,resulting in the end of artificial nutrient inputs
- 1972:Construction of Libby Dam on Kootenay River in East Kootenays reducing natural nutrient inputs
- During this time period the Slocan Valley was converted from forest to farmland and its tributary drainages logged

Snorkel Surveys

The trout population below Lemon Creek exceeds 400 fish/km. showing the river is capable of supporting higher numbers of trout than are present in the lower reaches. Despite the lack of nutrients provided by salmon carcasses, the productivity of the system remains fairly high. The lower river has a high count of other species-Mountain Whitefish, Northern Squawfish etc. Spawning habitat does not seem to be a limiting factor. Its unlikely that overfishing is the cause of low trout counts. Trout caught accidentally during the mountain whitefish opening are likely to survive if caught and released because of cold water temperatures. The two main possibilities that could account for low survival are 1. lack of sufficient cover for juveniles, and 2. unsuitable temperature that limit growth and

survival. Avoidance of warmer temperatures by migrating to other areas is common in trout and this may also be an important factor in the lack of trout n some sections.

Recommendations

Assessment

1. Snorkel upstream and downstream of Lemon, Gwillim, and Mulvey Creek confluences during a period of high temperature to see whether fry densities are related to spawning locations or temperature--habitat observations included.
2. Locate other areas of cool water input and map for future protection and enhancement

Enhancement

1. Enhance stream in cooler reaches-monitor fry present, movement patterns, and growth data if possible
2. Ensure there are no barriers for movement of juveniles into cooler tributaries during low water
3. Supplies of groundwater and surface flows should be protected as they provide temporary refuge areas-critical to juvenile survival in summer
4. Stabilization and tree planting of river and creek banks also creating shade and cover

7.7 Slocan River Rainbow Trout Population Assessment 1996

Gerry G. Oliver, Interior Reforestation Co. Ltd.
Prepared for: MELP

- Slocan R. mean annual discharge=89 cu. M/sec.
- Mean summer flow (July-Sept) 95 cu. M/sec
- Mean summer temp=15.4 degrees C
- Lists all resident fish species
- Snorkel survey of rainbow trout showed greatest concentration of yearlings and small fry near Winlaw Creek, and above Passmore Bridge, mostly in log jams
- Although # of yearlings was up slightly from 1993, adult population was still very small
- Argued against introducing hatchery fish
- Supported angling closure
- Recommends creation of shelter habitat (like log jams) near areas suitable for spawning so mid-size fish can find shelter from predators

7.8 Slocan River Rainbow Trout Population Assessment 1996

Ministry of Environment, Lands, and Parks
Nov 1996

- Slocan River is a fifth order stream
- mean annual discharge = 89 cu. m/sec
- mean summer flow = 95 cu m/sec., mean summer temperature = 15.4 degrees C
- relatively stable system due to lake-headed system and abundant water yield
- river is oligotrophic
- supports
  - rainbow trout (Oncorhynchus mykiss)
  - bull trout (Salvelinus confluentus)
  - mountain whitefish (Prosopium williamsoni)
  - northern squawfish (Ptychocheilus oregonesi)
  - also, catostomids, cottids, and cyprinids.
- steelhead, sockeye, and chinook can no longer access this system.
- BC Env. Fisheries program has already done population estimates, habitat assessments, special regulations, stocking, access improvement, and enhancement of spawning tributaries, but angler catch has not improved. Lack of improvement attributed to impacts on habitat and low compliance with regulations.
- population has decreased steadily since the mid '80s
- since the closure in '94, study of 3 sites on the upper river showed modest improvement, but lower river sites had no change
- increase in numbers was mostly juvenile fish
- no fish were found at Winlaw and Crescent Valley, where there had been some before
- it is not a good option to supplement wild stocks with catchable sized hatchery fish, as this could reduce wild stocks further. This happened in some Montana streams. The theory is that introduced fish disrupt the social hierarchy, and create more stress in the wild fish.
- mainstem has limited safe refuge for yearling fish. Perhaps habitat improvements to side channels could help
- immediate need to better advertise and enforce the angling closure, as anglers were observed on the river during the study

7.9 Benthic Algal and Insect Response to Nutrient Enrichment of an In-stream Mesocosm

Gerry G. Oliver 1992, for Master of Science Thesis, U.B.C.

Summarized by Susan Eyre for Fish in the River Working Group/Spring 2000

The Slocan River is a stable river system by virtue of its lake-headed nature, with an abundant water yield. It has 10 to 12 minor tributaries and one major tributary, the Little Slocan, which is also lake-headed. Water surveys conducted in the past indicate the river is lacking in plant nutrients and high in dissolved oxygen.

A nutrient bioassay was conducted in the Slocan River at Passmore bridge to evaluate trophic level responses in advance of whole-stream enrichment. (trophic - food relationships of different organisms in a food chain). A mesocosm (a controlled environment) approach was used to contrast perphyton (algae and crustaceans living attached to underwater surfaces) and insect responses to low-level nitrogen and phosphorus treatments over an 83-day period in late summer. The nutrient bioassay was used to describe how well and how many benthic (bottom-dwelling) algae and insect relationships reacted to manipulations of Nitrogen and Phosphorous concentrations and their ratios.

The purpose of this study was to evaluate benthic algal and insect responses using a range of nutrient concentrations, specifically at a 1:1 and a 4:1 ratio, to compare treatment affects on abundance, biomass, and natural relationship composition at both community levels, and identify time lag phases relative to algal and insect community dynamics

Prior to 1936 (the construction of Grand Coulee Dam) with the salmon spawning and spent carcasses directly feeding river life and contributing marine phosphorus and nitrogen, there would have been a high level of productivity at 4 levels: bacterial, algal, insect, and fish. The Slocan River presents a unique opportunity to demonstrate restoration of historic levels of productivity through nutrient augmentation of inorganic phosphorus and nitrogen to stimulate primary production and speed ecosystem recovery

Satisfactory primary and secondary responses showed the highest consistency in the 4:1 nutrient concentration. Application of the 4N: 1P ratio at the whole-river scale is recommended to meet the late summer nutrient limitations, stimulate primary productivity, and increase invertebrate biomass, without creating a nuisance algal condition in light of recreational activities and prevailing public attitudes.

Fertilizer sites should coincide with more productive trout water in the main stem channel locations noted for high juvenile rearing, downstream from suspected spawning and rearing habitat (Winlaw and the Little Slocan), although the overall river ecosystem would improve in fertility. Nutrient augmentation, in isolation of habitat improvement, cannot be expected to restore resident fish populations, as summer fish production is lost due to a lack of over-wintering habitat. While fertilization holds great promise, concurrent improvements in habitat to meet all life history needs are considered critical.

7.10 Slocan River Fishery - A Discussion of Management Alternatives

Author:
Prepared for: MELP (1989)

- recommends the Slocan as the river with best potential to become a significant trout stream in the region
- success of any habitat enhancement will be dependent on co-ordination of water and land use along the river corridor, as well as biological management
- 5000 Blackwater Quesnel stock yearlings were released summer 1989
- Habitat conservation Fund provided $ for placement of spawning gravels in Winlaw, Trozzo, and Hird creeks
- stocks are limited by-low nutrient levels in the river

- habitat degradation in the river and tributaries
- easy access to angling

- restrictions on trout catch imposed in mid 1980's
- lays out several possible management plans, with and without stocking

7.11 Fisheries Assessment of the Slocan River: Abundance and distribution of catchable-sized fish relative to production potential modeling

R. P. Griffith
Prepared for: J. C. Wightman, A/Head, Fisheries Improvement Unit, MOE, Victoria
File #: FIU-02
Date: May, 1986

- existing stocks counted by 14 snorkel surveys
- highest concentration of small rainbows was between Passmore and confluence with the Little Slocan
- other concentrations were at Winlaw and Crescent Valley, below where Winlaw and Goose Creeks empty into river
- water samples were taken at 4 sites in the mainstem, and 2 sites in the Little Slocan to apply the Habitat Quality Index
- large #s of whitefish and suckers observed in all locations, and moderate #s of squawfish in the mainstem
- sections of river with low gradient and small substrate have less fish than steeper, more confined areas
- although trout numbers appear to be well below the river's carrying capacity, there are at least 2.5x as many whitefish as trout. The river may be at its carrying capacity when all species are considered.
- in the Shuswap, when trout populations increased, they displaced whitefish to sub-dominant habitats
- best spawning conditions for trout are in the tributaries (Goose, Winlaw, Little Slocan)

7.12 1986 Fish Population and Habitat Study

Author and Title Not Known

In August 1986, juvenile fish populations were assessed in the Slocan River drainage, below Slocan Lake. This was the second and final year of a study to determine fisheries enhancement options for the system. Electrofishing was conducted at a total of 15 sites in the Slocan mainstem and 7 tributaries. With the exception of 3 juvenile whitefish in Trozzo Creek, rainbow trout was the only salmonid species captured. Trout were captured at only 10 of the 15 sites sampled, and where they occurred, numbers of juvenile rainbow were generally low. Although nutrients (TDS, nitrates, phosphorus) tend to low throughout the

system, it would appear that low numbers of juvenile trout are best explained by a lack of recruitment, consistent with the small population of larger (adult)

Fish observed in the Slocan River mainstem. Releases to the Little Slocan River, Lemon Creek, and Goose Creek could account for up to 90% of this potential. Planned mainstem stocking with yearling (or older) rainbow is supported as the most advisable enhancement option at this time.

Habitat descriptions were completed at all sampling sites, general characteristics were noted including any observed obstacles to fish passage, ambient discharge, indications of stability, etc. Water samples were collected from tributaries to the Slocan River, and were forwarded to the Environmental Laboratory for nutrient analysis, to allow for comparisons to similar data obtained for the Slocan and Little Slocan mainstems in 1985.

Notes:

- Extreme flow variation was recorded for Goose Creek, Winlaw Creek, and particularly, Pedro Creek.
- Gravel compaction with sand is evident in Lemon, Winlaw, portions of Goose Creek, the Little Slocan River and the Slocan River.
- Culverts provide obstruction on Winlaw Creek and possibly on Pedro Creek.

8 Web Site Content

Fish In The River developed and maintained a web site to distribute information and stimulate discussion during 2000. A selection of the Web content is reproduced below.

8.1 Rainbow Trout

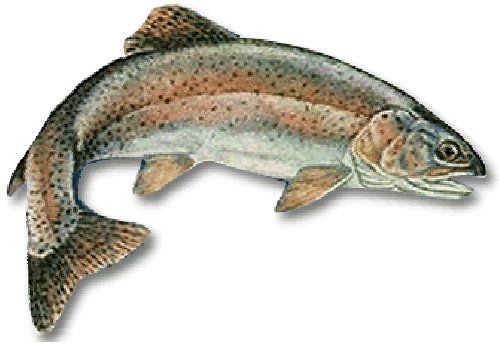
The rainbow trout (Oncorhynchus mykiss) is the most widely distributed member of the trout family, and is one of the five top sport fishes in North America.

Originally a native of the Pacific coast drainage system from Mexico to Alaska, it is now found in every Canadian province as a result of stocking. Sea-run rainbows on the Pacific coast are known as steelhead.

The rainbow has an elongated body, with an iridescent, reddish band running along each side from head to tail. Both the color and size of this fish vary with the environment. In general, large rainbows are caught in large bodies of water and small ones in streams and ponds. Stream-caught fish usually weigh under 1 lb., while fish from the rivers and lakes weigh between 1.5 and 6 lb.

Most rainbow spawn in spring. The female digs and spawns in several nests depositing 800-1000 eggs in each redd. These eggs usually hatch 4-7 weeks later. The life expectancy can be as low as 3-4 years. Rainbow often spawn in smaller tributary streams, but Slocan River mainstem fish are generally believed to spawn in the River itself.

The rainbow trout is well adapted to both streams and lakes. While it prefers cold, clear, swift-flowing water.



Rainbow trout can swim at over 20 mph (or 37 kilometers per hour). A rainbow can easily leap into the air three or four times its body length. The sensory input received by a rainbow is estimated to be 500 to 800 times more acute than the sensory input received by a human. This fish can perceive its surrounds to a degree that we can only imagine. The fish's brain is entirely devoted to bodily functions and sensory input.

A trout is somewhat near sighted but can see quite well to distances of about twenty feet. Rainbow see in color. They see color in the red to blue wavelengths about the same as a human, but much better than we do in the yellow to green wavelengths. Yellow to blue wavelengths travel better in water than in air.

Having the eyes on the side of the head also gives the rainbow trout a different perspective on the world. The fish can see to the front, sides and most of the way behind. The only

blind spots are immediately behind and directly below the fish. Upward and directly in front, the fish has depth perception or binocular vision as both eyes come into play.

The rainbow doesn't have an external ear yet it can hear sound better than almost all land animals using a three-chambered 'internal' ear. If you drop your glasses in the bottom of the boat, a trout across a large lake will easily hear that sound.

The senses of taste and smell are particularly well developed in the rainbow trout. It is believed that migratory salmonids use taste and smell to help locate the waters of their original spawning streams. A rainbow trout can smell the difference between two aquatic plants of the same species that are side by side. Rainbow trout are very sensitive to differences in pH, salinity and the differences in amino acids as found in their food sources. It is thought that the Rainbow may have taste and smell sensors on parts of its body other than in the nostrils and mouth and that these may help the trout in locating its food.

Besides the normal touch sense that most animals have, the rainbow trout has what scientists are calling the "Distant Touch" sense. Water is 800 times denser than air. In part, this is why the trout can hear, smell, taste and see color so well. As a denser medium, water carries the mechanisms for sensory input much better than air. The senses of touch and perception are no different. The Rainbow can feel and perceive distant objects or movements about 800 time's better than we can and may even have a form of echolocation.

Imagine that someone drops a ball of cheese at the other end of a football field. Other than the fact that you saw it drop, you probably wouldn't know that it had happened. At that distance, with its eyesight, a Rainbow trout wouldn't see the cheese ball drop. However, underwater it could 'feel' the concussion of the cheese ball hitting the ground, hear the sound it makes when it hits and may even be able to smell and taste the cheese shortly after the hard outer cover breaks. It is even possible that, through echolocation, the trout could tell us exactly where the cheese ball hits in the end zone.

The trout's primary receptor for this ability is the Lateral Line. It is also known that the Supra-Orbital and Sub-Orbital lines on the jaw and back on the trout's skull play a similar role. The trout may have other distant touch receptors of which we are yet unaware. The full sensory capabilities of the Rainbow are yet to be determined by the scientific community.

Content on Fish Senses form: Fish BC

8.2 Bull Trout

The bull trout (Salvelinus confluentus) is a threatened salmon species endemic to the Pacific Northwest. The fish evolved in the Columbia River Basin, and the Basin population is it's last major stronghold. Bull trout live in the Slocan River system.

Bull trout are freshwater char that spawn and rear in especially cold and clean headwater streams with low aquatic productivity. Spawning typically takes place in the fall. Spawning beds are often located in areas with substantial groundwater input, where upwelling groundwater creates cold water conditions.

Bull trout may move great distances within a river system. Studies have shown migrations of up to 350 km at this time, and wider ranging movement patterns may have been common prior to the extensive damming of the Columbia system. Like many other migratory salmon, mature bull trout return to their natal streams to breed.

Bull trout have extremely narrow habitat requirements, that is, they can only persist in a set of specific conditions. Their natural habitat is thus greatly restricted and fragmented. Bull trout populations are extremely vulnerable to watershed disturbances, including habitat alteration from dams, alterations in stream flow patterns, alteration in stream bed morphology and water dynamics, and alteration in temperatures.

Bull trout are an endangered species in much of their current range, and many sub-populations have undoubtedly been extirpated by development and land use change. The B.C. population is believe to be at risk due to the cumulative impacts of land use change and alterations to watersheds from forestry activity.

From: Bull Trout Streams of the Upper Columbia River Basin of Southeast British Columbia, James C. Bergdahl, 1996.

8.3 Riparian Cottonwood Forests

Black cottonwood (Populus trichocarpa) is a magnificent tree species which thrives in the floodplain and riparian forest ecosystems of western North America. Cottonwoods can reach 40 meters in height, and over a meter in diameter. The trees are fast growing and relatively short lived, and provide immense habitat values and food sources for wildlife of all sizes. Yet the species has been spurned as "a weed", cut, burned, and pushed aside by development. As we now start to think about the condition of our river ecosystems, and the structures and functions which maintain those ecosystems, we are taking a long second look at cottonwoods.

What is their history?

Since the end of the last ice age, stream courses have been created and recreated by the active processes of water movement. The formation and maintenance of cottonwood forests are closely related to the natural processes of flooding and disturbance. Many plants cannot cope with the saturated soils and periodic flooding that occur on river floodplains and along lakeshores. Black cottonwood is very resistant to flooding and regenerates best on disturbed lands, like the bare sand and gravel found on recently disturbed floodplains. The seedlings, once established, grow very rapidly and soon are able to withstand the frequent flooding. As other plants are killed off by floods, cottonwood and other flood-resistant plants survive to dominate these communities.

Black cottonwood grows rapidly when young and forms dense stands on newly disturbed areas. Cottonwoods get their name from the large number of seeds they produce, which are covered with white fluffy hairs. When the seeds are dropped in full summer, the air is filled with clumps of cotton-like seeds floating on the wind.

Why are they important?

Because cottonwoods grow quickly and die relatively young, cottonwood forests include many large trees and snags (standing dead trees) which are important to a variety of wildlife species. Black cottonwood trees are an important part of riparian forest ecosystems. Riparian forests moderate aquatic habitat in streams, lakes and wetlands. The shade provided by riparian trees helps keep water cool during the heat of summer, often a critical factor for fish. Overhanging trees and shrubs drop leaves and twigs into the water and this organic matter becomes an important part of the food chain, feeding microorganisms and small invertebrates, which are in turn consumed by larger creatures. As riparian trees die, they not only provide snags for wildlife but may eventually fall into the stream where they help create cover and pool habitat for fish and other aquatic creatures. Riparian forests protect streams in other ways as well – for example, tree roots and fallen trees help stabilize stream banks and prevent erosion and siltation of stream beds.

Why are cottonwood ecosystems at risk?

Black cottonwood forests are found along the banks of streams and lakes where moisture is plentiful. These are locations with rich soil, flat land, abundant water, and easy access – the exact places people wish to live and recreate. Many former black cottonwood forests have been completely cleared by human development. Settlers often cleared cottonwood forests to establish their homes and farms. Intensive livestock grazing in some of these sensitive areas has resulted in damage to soil structure, removal of understory vegetation, reduction of native plant species, and the invasion of introduced plants. Modern urban and rural development concentrates on lands within the black cottonwood ecosystem whenever possible.

What can we do?

More than ever before, land managers are realizing the ecological importance of cottonwood riparian ecosystems. Remarkably little is known about these ecosystems and much more effort is needed to fully understand them. Strategies to protect black cottonwood riparian forests include: Setting aside public lands as protected areas Private land stewardship Purchasing private land to add to protected areas Eliminating or reducing environmental degradation

Fortunately, the ecology of cottonwood ecosystems makes them excellent candidates to recover from disturbance. These ecosystems can quickly renew themselves. Realistically, the opportunities to fully protect cottonwood ecosystems in parks or ecological reserves in the southern interior are limited. The protection of these critical ecosystems must be achieved through private land stewardship. Controlling the entry of cattle into riparian forests, finding alternatives to dyking and channeling, and preventing further conversion of these forests to agricultural use are ways that landowners can help maintains the cottonwood ecosystems that remain today. Many landowners are proud of their land's contributions to wildlife habitat within a fragmented landscape.

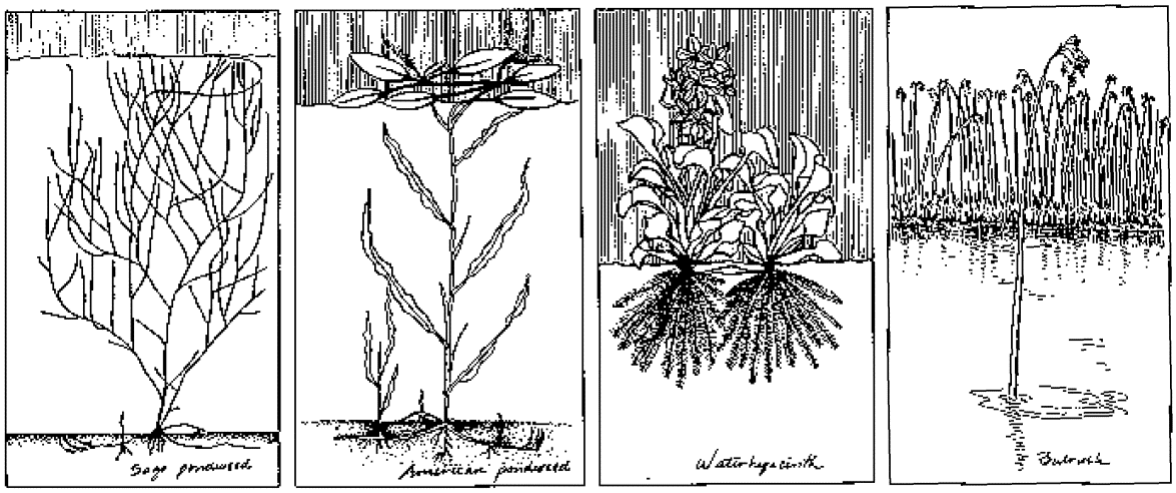
An excellent example of a recovered black cottonwood riparian forest can be viewed on the nature trails in Winlaw Regional Park, less than a kilometer north of the Winlaw Bridge on the west side of the river in Winlaw. Take a spring trip to the forest to see a wide variety of birds and plants, and get a taste of "how it was" along parts of the river in the past!

From: Cottonwood Riparian Ecosystems of the Southern Interior, MELP 1998

8.4 Water Plants

Water plants are critical components of aquatic ecosystems. Green water plants and algae provide nutrients to aquatic systems and vital habitat structures for aquatic organisms.

Water plants are commonly divided into four main groups:



Submergent Floating Leaf Floating Emergent

River and riparian ecosystems support a tremendous diversity of plant life. A vast range of microhabitats exists between the deep water habitat in the center of the river and the upland edge where the moist riparian comes to an end. Infinite variations in water depth, water flow rate, temperature, soil, and light conditions produce a complex mosaic of plant life, with an equally complex range of animal and fish habitats.

General Features of Aquatic Plants

Aquatic plants are distinguished from terrestrial plants by characteristics which enable them to survive in a water environment. The plants which show the greatest modifications live in deeper water, either wholly submerged or floating.

Water gives plants support, so they have n need of firm, strengthening tissue. Water plants tend to have flimsy, delicate stems, branches, and leaves which are pliable and resistant to breaking in turbulent water..

The buoyancy which keeps plants upright or floating in the water is often achieved by the presence of large air spaces within the plant tissue. These air spaces occur within stems, leaves and roots, and frequently link up to form a continuous passage for the circulation of oxygen to all parts of the plant. Oxygen is required for plant respiration, and is often in short supply in water, or even absent in bed strata. Aquatic plants survive by storing and circulating it within their tissues.

Terrestrial plants acquire carbon dioxide and oxygen through leaf pores which allow air into the interior of the plant. Aquatic plants have little or no access to air. They acquire the raw materials for photosynthesis and respiration from dissolved gasses in the water, through a thin outer skin.

Truly aquatic plants have poorly developed root systems, or no root systems at all. Water containing absorbed nutrients is absorbed allover the plant surface, so there is no need for a root system to absorb water, or a highly developed internal transport system to distribute water throughout the plant.

Ecological Functions of Aquatic Plants

Plants are as important to aquatic systems as they are to terrestrial systems. They are able to manufacture organic material from inorganic substances through photosynthesis. Aquatic species feed on them, either directly or indirectly through food chains.

Dead and decaying plant material is also an important food source for small scavenging animals, which in turn are eaten by larger animals, and so on up the food chain.

Plants provide mechanical support for aquatic animals, as well as protection from predators and shade. Many aquatic creatures lay their eggs on or in various parts of aquatic plants.

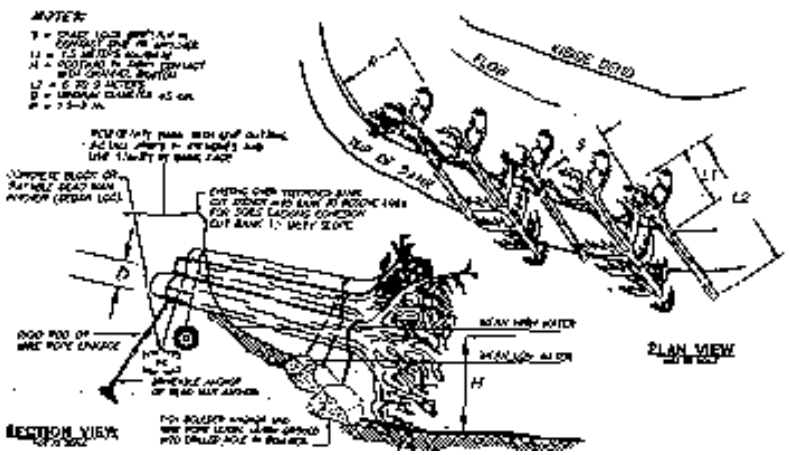
8.5 Stream Rehabilitation with Large Organic Debris

Fisheries biologists stress that a fundamental concept of fish habitat management is that fish production is limited by "bottlenecks", or specific habitat factors that limit specific phases of the life cycle. Habitat aspects that limit fish population must be identified, and habitat rehabilitation efforts should focus on those aspects. For example, improving spawning/early rearing habitat to increase the production of young fish is of little help if there is a shortage of cover or rearing habitat for medium size fish in a river system.

Exactly this situation may exist in the Slocan River. There is very limited habitat available for medium sized fish, which require shaded, hiding habitat in cool water areas. A possible way of helping the Slocan River ecosystem is by adding Large Organic Debris (LOD, more commonly called "trees") in cool water areas. Natural LOD would have been supplied by large cedar, hemlock, and cottonwood trees falling into the river from the riparian forest. The source of and rate of addition of these large structures has been greatly reduced by floodplain logging and settlement. Fish habitat managers recognize a need to provide artificially placed LOD habitat while planning for the long term recovery of riparian ecosystems, and the restoration of the natural LOD cycle.

A LOD habitat enhancement project should create a mixture of large and small habitat features that provide the preferred habitat for the target species. To accomplish this, we must identify the preferred habitat which is needed, and plan to add structures to provide this habitat.

Natural streams the size of the Slocan River generally contain full sized trees laying within and across the streams, and huge chunks of wood protruding form the bed gravel. Large wedges of spawning gravel are held back by logs, and plunge pools and log dam pools are found. These streams may have drift jams which can redirect the river flow, resulting in channel and floodplain diversity



While drift dams and floodplain diversity are critical issues in the long term, they are not a realistic starting point of habitat rehabilitation work. Projects to add specific LOD structures and small LOD concentrations are realistic, and may have very substantial ecosystem benefits. Scour pools caused by water deflection by small LOD complexes, and the hiding habitat within accumulated debris, may help to expand trout habitat bottlenecks.

Work to add LOD to stream channels is a developing science. The persistence of human installed structures has been varied. Most of past problems have been associated with structures being washed away or damaged by floods. Practitioners are learning from past efforts, and engineering and design of habitat enhancement is improving. As a natural lake head system, the Slocan River is more hydrologically stable than many western rivers. This is conducive to instream habitat restoration work.

From: Rehabilitating Steam Channels and Fish Habitat Using Large Woody Debris. Jef Cedarholm, Larry Dominguez and Tom Bumstead. In: Fish Habitat Rehabilitation Procedures. Watershed Restoration Technical Circular No. 9. Ministry of Environment Lands and Parks.

9 WHERE DO WE GO FROM HERE?

Most reports would have a conclusion at this point, what we have are possibilities. We have been fishing for clues the last few months, and laying them out as bait for the people of the Slocan Valley who love the River. Have we captured your imagination? Are you interested in helping to develop a project suggested by the information in this report?

Please leave your name, phone number, and e-mail with our contact person: Anni Holtby at Selkirk College, 359-7564; along with what and how you would like to contribute to creating a healthy fisheries in the Slocan Valley.

Written and Internet Information References

Used by Fish in the River Working Group/Spring 2000

Publications:

Literature Reviews of the Life History, Habitat Requirements and Mitigation/Compensation Strategies for Selected Fish Species in the Peace, Liard, and Columbia River Drainages, by Trident Environmental Consultants, Ltd. 1995

Freshwater Fishes of Canada by W.B. Scott, E.J. Crossman, 1973

The Audubon Society Field Guide to North American Fishes, Whales, and Dolphins, 1983

Pacific Salmon by R.J. Childerhose and Marj Trim, 1979

The Pond by Gerald Thompson, Jennifer Coldrey, and George Bernard, 1984

The Streamkeepers Fieldguide by Adopt-A-Stream Foundation, 1994

Muddied Waters by Sierra Defense Fund

Freshwater Fishing Regulations Synopsis by Fisheries B.C.

Canadian Journals of Fisheries and Aquatic Sciences

North American Journals of Fisheries Management

Trout/Winter 2000, articles by Fisheries Biologists, Dr. Robert Behnke," Winter: a Season of Death and Discontent", and Matthew Handy, "Trout in the Cold".

Internet Websites:

Living Landscapes/ Royal British Columbia Museum/ www.livingbasin.com

U.B.C. Fisheries Center, www.ire.ubc.ca/related/ubc.fish.htm

Sustainable Fisheries Foundation, www.sff.bc.ca/

Fish in the River, www.fishintheriver.org