

A DISCUSSION PAPER CONCERNING

Restoration of the Okanagan River

AND ITS RIPARIAN HABITATS



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OKANAGAN RIVER

AND IT'S RIPARIAN HABITATS

Prepared for South Okanagan Similkameen Conservation Program
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EXECUTIVE SUMMARY

The vast destruction of natural habitat along the Okanagan River has resulted in it being labeled the most endangered river in British Columbia. The South Okanagan Similkameen Conservation Program and others are keen to return some of the river and its riparian areas to a more natural state. This discussion paper is meant to provide an impetus for the restoration program by outlining the significance of the river, reviewing the habitat losses that have taken place, and suggesting possible methods for restoration.

Naturalization of Okanagan River will benefit a wide range of animals and plants, some of which are in great need of protection. For instance, the river supports one of only two remaining populations of sockeye salmon in the entire Columbia drainage. Twenty-six additional species of fish are found in the Okanagan system and together with the salmon they provide food for at least 137 other species of animals.

The importance of the river does not stop with the fish nor at the banks. Restoration of wetlands located beside the river channel is essential to bring back plant communities and the animals found within them. Most vertebrates depend upon riparian areas for at least part of their life history, and in the South Okanagan several species are "at risk". In fact, the South Okanagan supports some of the highest concentrations of "Species at Risk" in Canada.

Most of the original riverine habitat has been lost. Channelization of the Okanagan River in the 1950s shortened it by half and now only 6 kilometers of natural habitat remains. Eighty-five percent of the riparian area is no longer functional. However, both the channel and its backwaters and floodplains could be restored. Dykes could be moved further apart to provide room for the river to wander and spill out onto the floodplain during freshet. Riffles and pools could replace the concrete Vertical Drop Structures and diversify the profile of the streambed. Finally, historic plant communities could be re-established on the floodplains.

A long-term, comprehensive plan for the whole river would be valuable to guide the restoration program. However, no such plan exists and an early start is needed to take advantage of the present wave of enthusiasm and the opportunities for funding and land acquisition.

One of the first steps is to decide where to carry out restoration work. At present the river downstream from McIntyre Dam should be given the highest priority since it is the current limit of salmon migration and the area historically most important for fish. Within this area the highest priority reach for fisheries is located upstream from the Town of Oliver and immediately downstream from the natural section of river. This location provides connectivity with the natural section, was heavily used by salmon prior to channelization, and is very important for birds. Furthermore, since it is situated within the Town of Oliver, it has the high profile needed for stewardship, education, aesthetics, recreation, tourism and heritage. A further advantage is that frequent flooding reduces the suitability of this area for other uses such as land development or farming.

Before restoration work can begin, riverfront land must be secured. Although 15 privately owned parcels are located within the high priority area, only the riparian portions of these lots are needed and frequent flooding may reduce their value. A significant start can be made even if only a few, or even one, of the parcels with lengthy river frontage is purchased.

With 85% of Okanagan River destroyed so far and no guarantee that the present area will be preserved, there is a risk in waiting too long to begin purchasing habitat. Key habitats must be acquired as they come up for sale and as funding becomes available. This opportunistic approach to securing key properties will be compatible with a comprehensive long-term plan provided that the acquired lands are located in high priority areas for restoration.

Eventually costs of restoration could run into several million dollars, but a good start – a "proof of concept" could be completed for less than \$1,000,000. Many potential sources of funding have been suggested.

A limited start-up budget is needed for SOSCP and its partners to initiate the restoration program. The first step would retain a part time project leader who would work towards arranging the purchase of key properties. Until property is acquired, it is premature to design an elaborate restoration plan or an associated awareness program.

Following property purchase, a multidisciplinary team would prepare a site specific restoration plan. Approvals and funding would be obtained, and then an outreach and awareness plan would be launched. After that dykes could be relocated, the river channel could be restored by constructing riffles, pools and meanders, and plant communities could be re-established on the floodplain.

INTRODUCTION

The south Okanagan is one of Canada's most biologically diverse, species rich and endangered ecosystems (Sarell and Scott, 1995; Sarell and Haney, 2002; and Klenner & Scudder, 1999). It's major watercourse, the Okanagan River, has just been named the most endangered river in British Columbia by BC Outdoor Recreation Council. Various agencies and groups have expressed interest in returning portions of river to a more natural state (Figure 1). As a consequence, the South Okanagan Similkameen Conservation Program, which includes 31 partners, requested this paper as a discussion base to begin a program "... aimed at securing, restoring and protecting fish and aquatic habitat along the Okanagan River".

This report draws information from earlier studies to describe the importance of Okanagan River, the habitat losses that have led to the need for restoration, and the steps that are recommended to implement a restoration program.

BACKGROUND

Douglas County Public Utility District, owner of one of the dams on the Columbia River, has funded most of the recent aquatic studies on Okanagan River. Dams on the Columbia kill a significant number of salmon, and the owners of those dams must try to offset the losses. This obligation prompted Douglas County to look for ways to assist the sockeye salmon that spawn in Okanagan River. These investigations (Bull, 1999a & Bull, 1999b) identified a series of options including river restoration.

Canadian federal, provincial and First Nation fishery authorities, working together through the Okanagan Basin Technical Working Group, directed the Okanagan River studies. They insisted on an ecosystem approach that favoured natural rather than engineered options and respected not only salmon but all species of fish and wildlife. This was consistent with recommendations for the Columbia River made by the Independent Scientific Review Panel for the Columbia River (Williams, Bisson, Bottom, Calvin, Coutant, Erho Jr., Frissell, Lichatowich, Liss, McConnaha, Mundy, Stanford, and Whitney, 1999). They pointed out that hatchery production, net pen rearing and other human-controlled schemes have failed and natural environments are needed to stem the decline of salmon.

River restoration fitted the ecosystem concept well. Bull, Gaboury and Newbury (2000) were asked to design a restoration program and they suggested setting back dikes, re-establishing floodplains and replacing the concrete weirs (called vertical drop structures) with natural rock riffles. This report simplifies their findings and recommends steps that can be taken by SOSCP and it's partners to begin restoring the river.

"B.C.'s most endangered River..."

**Outdoor Recreation Council
March, 2002**

*"Our goal is...rebuilding the Okanagan River and its
salmon ecosystem..."*

**Chief Dan Wilson Chair, Okanagan Nation Alliance
April 1, 2002**

*"...sensible measures can and should be taken to restore a
natural environment to parts of the channel...it doesn't have
to be just a sterile, flood control channel..."*

**Editor, Penticton Herald
April 2, 2002**

*"... restore a greater degree of naturalness to the river than
exists today...Habitat restoration...must receive high priority"*

**Independent Scientific Group Columbia River
March, 1999**

Figure 1 – Statements on the status of Okanagan River

BIOLOGICAL SIGNIFICANCE OF OKANAGAN RIVER

Columbia River dams (Figure 2) have extirpated several of the sea run species that used to spawn in the Okanagan, but sockeye salmon continue to journey to their spawning grounds near Oliver. They have become one of only two remaining viable populations of sockeye in the entire Columbia drainage.

The nutrients that sockeye salmon bring from the sea are a great asset to the food web. In fact a recent study found that more than 137 species of fish and wildlife depend on salmon for their survival (Fraser, 2001).

In addition to sockeye, twenty-six species of fish are found in the Okanagan system (Bull, 1999a). Native species are important in their own right and, like salmon, they contribute to the ecosystem and provide food for ospreys, herons, mergansers, kingfishers, garter snakes, mink and other animals.

The importance of the river does not stop with the fish, nor at the banks. Studies have shown that most vertebrates depend upon the riparian zones at some point in their life cycle (Bureau of Land Management, 1998 and Scott & Delesalle, 1998). In the case of Okanagan River several vertebrates are "species at risk". In fact, the South Okanagan supports some of the highest concentrations of species at risk in the country (Sarell and Haney, 2002). Riparian areas along Okanagan River once contained an abundance of Black Cottonwood, Water Birch, and Red Osier Dogwood, but these are now classified among the most rare plant communities in British Columbia (Egan, Cadrin, and Cannings, 1997). Understories consist of alder, willow, rose, poison ivy and sumac. Within these woodlands and thickets live threatened, endangered and vulnerable species such as the Yellow-breasted Chat, Lewis' Woodpecker, the Western Screech Owl, Western Rattlesnake, Western Yellow-bellied racer, Night snake, Gopher Snake, Spotted Bat, Fringed Myotis, Pallid Bat, Western Red Bat, and Tiger salamander.

It should be clear from this list that a variety of botanical, fish, and wildlife species are served by Okanagan River and its riparian zones and will benefit from restoration work.

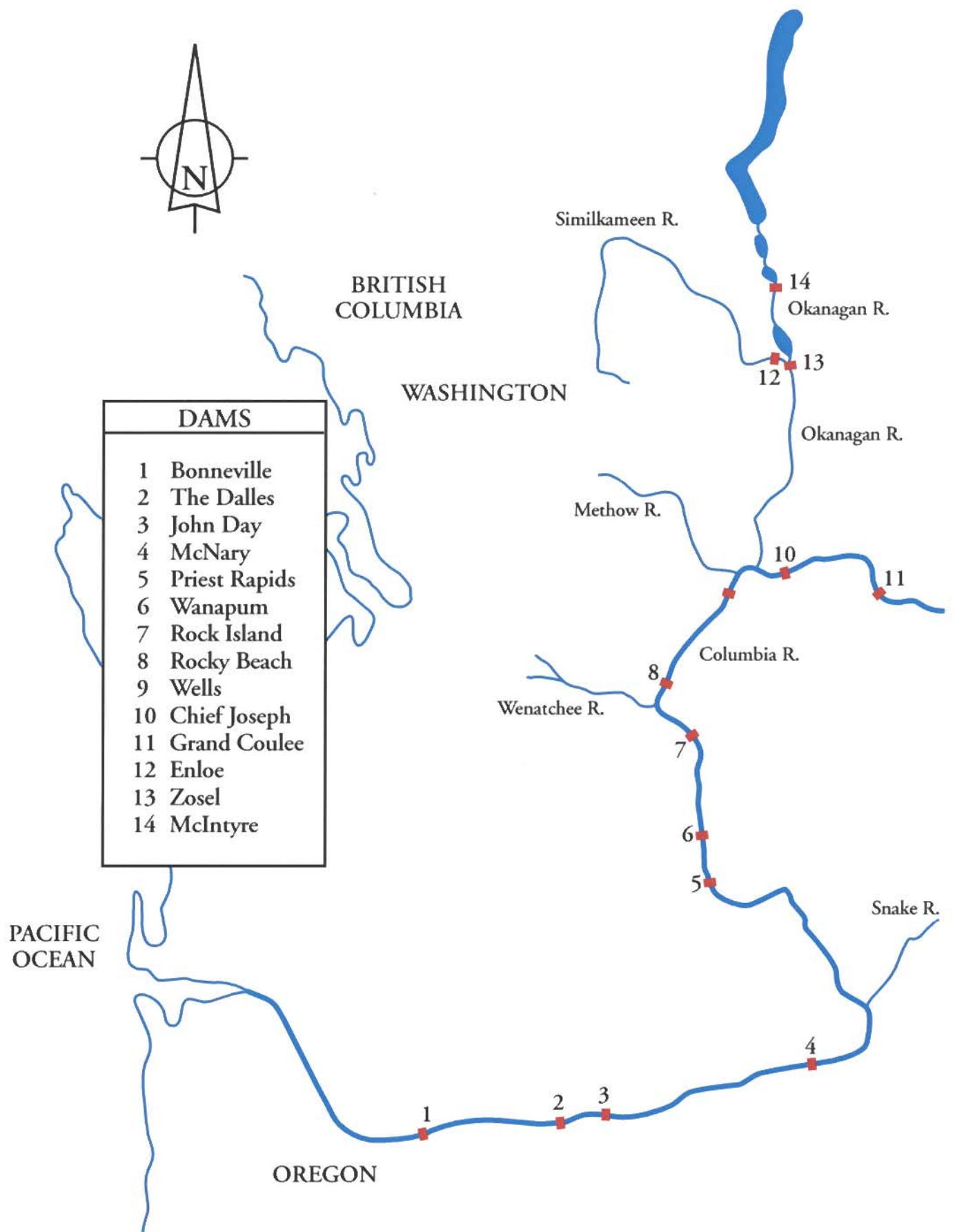


Figure 2 - Map showing sockeye salmon migration route and Columbia River Dams

HABITAT LOSSES LEADING TO THE NEED FOR RESTORATION

Major losses of aquatic habitat in and along the Okanagan River have led to the need for restoration. Significant changes to the system began about 1920, when dams were constructed on Okanagan, Skaha and Vaseux Lakes for irrigation and flood control. Despite the new storage capability, flooding problems were frequently encountered and so in the 1950s the river was straightened and dyked. Shortening the river increased the gradient and 17 weirs or "vertical drop structures" were constructed to lower the gradient between the structures. This reduced the water velocity between the drop structures so that the channel could be lined with gravel rather than pavement.

Channelization shortened the river from 70 kilometers to 37 kilometers and only 6 kilometers remain in a natural state. The channeled portion lacks diversity. Gone are the riffles and pools; undercut banks; the point bars, islands and side channels; emergent boulders and back eddies; and instream large woody debris (Figure 3).

Confining the river to a single channel without curves and simplifying the hydraulic conditions has taken a toll on aquatic life. There are no longer pool tailouts and riffle crests to provide downwelling currents for spawning salmon, trout and whitefish (Schuett-Hames and Pleus, 1996). The cover formerly supplied by boulders and woody debris is gone. In the absence of a floodplain, silt is deposited in the main channel where it can smother invertebrates and fish eggs. The biological effects of altering Okanagan River were never monitored but in other channelized systems fish populations have been reduced by 80% (Wesche 1985).

The engineered channel is bounded by barren dykes, and beyond them the riparian zones are denuded, drained and filled to allow for agricultural and urban development. Eighty-five percent (85%) of the riparian habitat and 88% of the cottonwood habitat have been lost (Sarell, 1993; and Dyer, 2002).



Figure 3 - Channelization has reduced habitat diversity

THE RESTORATION PROCESS

Studies conducted for the Okanagan Basin Technical Working Group (the fisheries authorities) over the last 3 years provide a good understanding of what is needed to restore the Okanagan River and its riparian areas. Although this program had fish as the main focus, it was ecosystem based and designed to benefit all aquatic life forms.

The most recent and most detailed report (Bull, Gaboury and Newbury, 2000) prescribes the following process:

1. The highest priority sites are chosen
2. Key wetlands are purchased within the high priority areas
3. River dikes within the purchased properties are set back to allow the river to wander and to provide space for re-establishing a floodplain.
4. Pools and riffles are constructed to naturalize the vertical profile of the channel.
5. Native plant communities are re-established on the flood plain.

These steps are illustrated in a series of pictures in Figure 4 and discussed in more detail below.

1. Prioritization of Restoration Sites

Restoring any of the channel or riparian zone between Okanagan Lake and Osoyoos Lake would be valuable. However, in many places restoration is impractical because of the amount of housing development that has taken place. Even where land remains undeveloped, sites need to be prioritized to ensure the best use of the limited funding which is available.

Eventually a long-term plan is likely to be developed for the whole river. In the meantime, SOSCP should actively pursue the purchase of critical properties in the highest priority areas as the owners decide to sell them.

This attempt to prioritize restoration sites does not consider the river upstream from McIntyre Dam. Salmon do not presently go there and salmon are a necessary component within this ecosystem-based restoration proposal. They are also of prime concern to some of the largest potential sources of funding.

Within the next year or so, authorities will decide whether to provide sockeye with access to Skaha Lake. That decision will influence restoration efforts in the area upstream from McIntyre Dam. Accordingly, SOSCP has, for the present, limited this study to the lands between McIntyre Dam and Osoyoos Lake.

The 2.8 km of river from McIntyre Dam downstream to Indian Reservation No. 1. has not been channeled. For an additional 3.1 km downstream the dikes have been set back and the river is in a natural or nearly natural condition. These two areas combine to form the 5.9 km stretch we call the natural area (Figure 5).

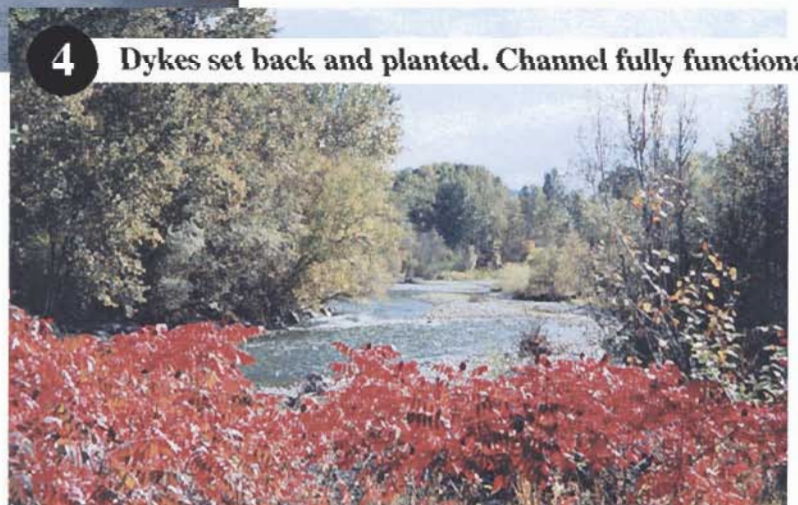
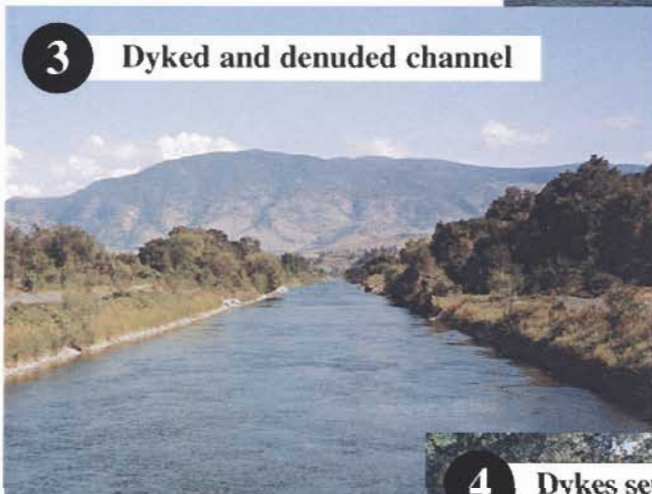
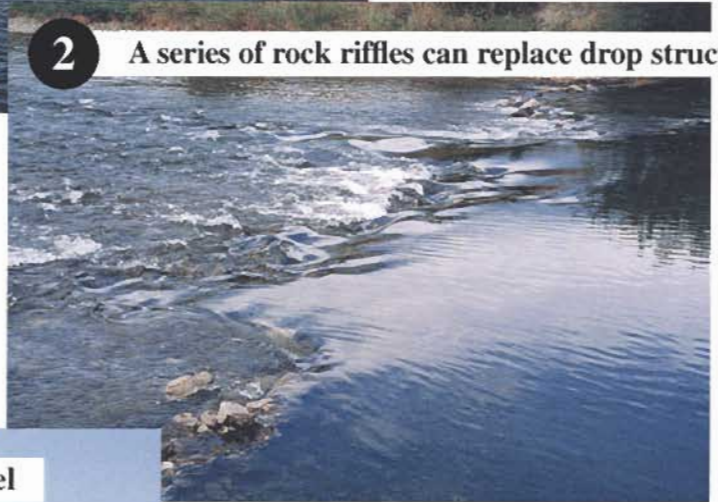
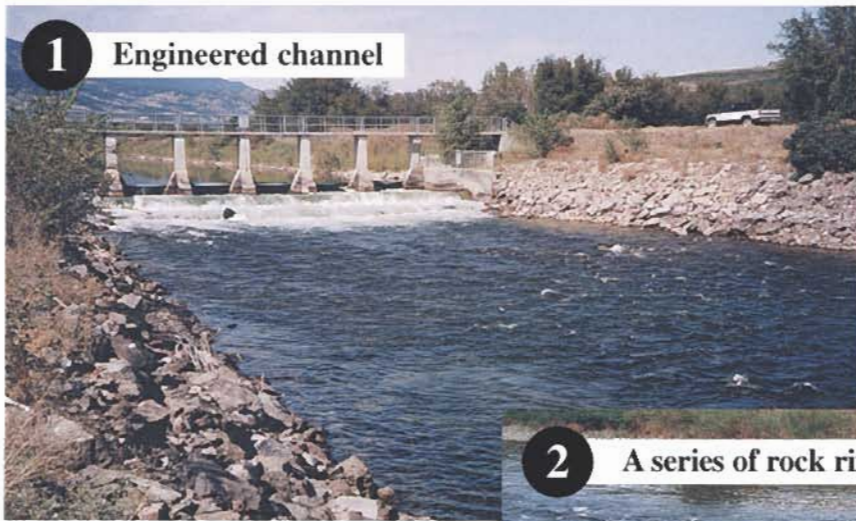


Figure 4 - A series of photos illustrating the methods of restoration

Okanagan River Restoration

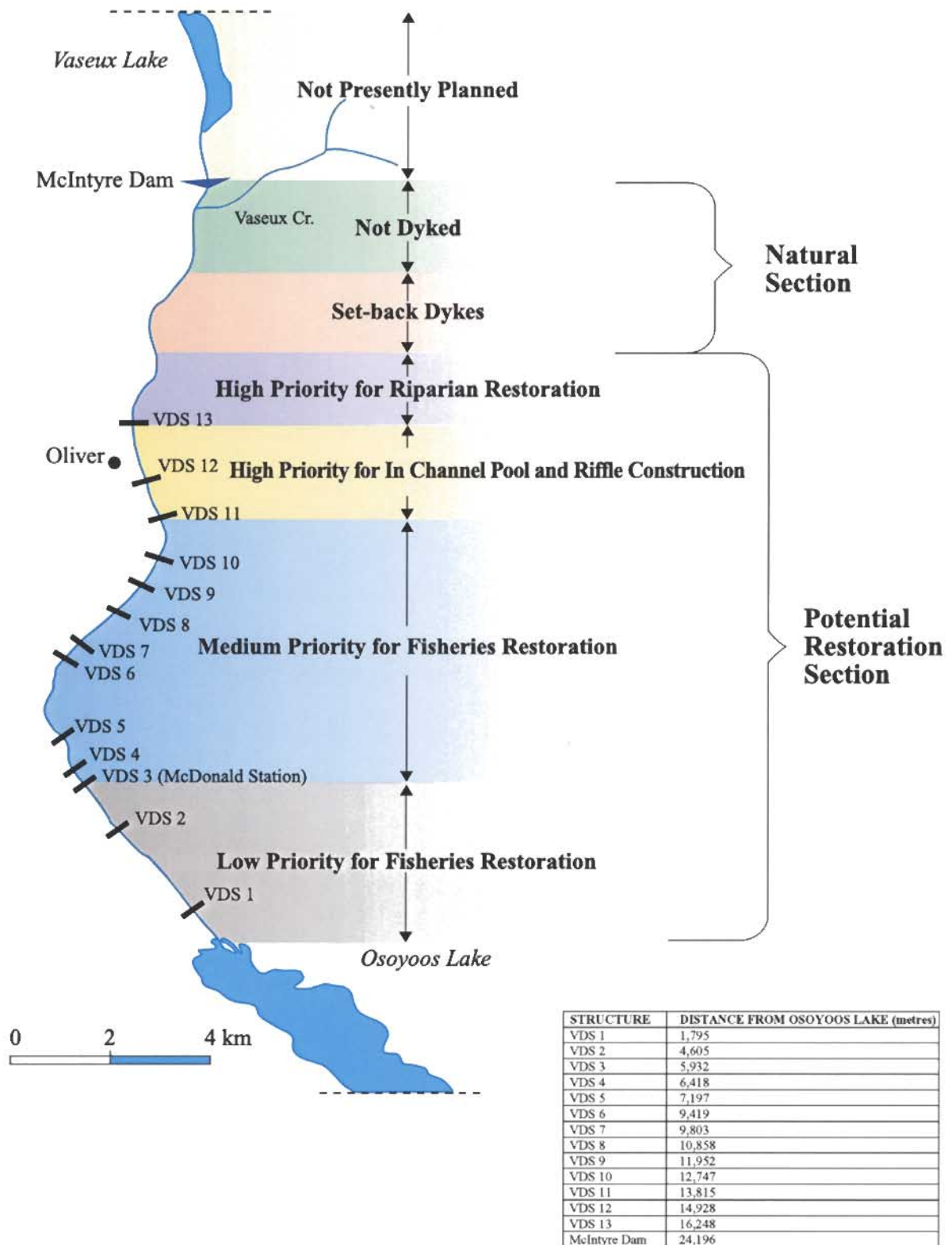


Figure 5 – Map showing recommended priorities for fisheries restoration.

Below the natural area, the river runs for 18 km to Osoyoos Lake. The upper reaches of this stretch, immediately downstream from the natural zone, are considered highest priority for restoration from a fisheries point of view. The upstream boundary of this reach starts where set back dyking comes to an end and the straight, engineered channel begins. This point in the river is 18+251 meters as measured from Osoyoos Lake by Schubert (1980).

The area between the natural section and the Town of Oliver is suggested as the highest priority because of the following benefits:

- It abuts the natural area and therefore extends the present habitat and offers connectivity for both wildlife and fish. Areas which are not immediately adjacent to present spawning grounds may be difficult or impossible to re-colonize with sockeye (Hyatt, personal communication)
- It was heavily used by spawning salmon prior to channelization (Hourston et. al., 1954)
- It recruits good volumes of gravel from Vaseux (McIntyre) Creek
- It has high value for birds (Cannings, 2002)
- It is situated within the Town of Oliver providing the high profile required for stewardship, education, aesthetics, recreation & tourism, and heritage
- It frequently floods making the riparian area suitable for cottonwoods and other endangered plants and animals and unsuitable for farming or development.

Within this section of river, riparian areas could be restored so that the channel could develop natural and diverse habitats similar to those in the portion of the natural zone where dykes have been set back. Native vegetation would then be re-established on the acquired wetlands.

Restoration of the riparian areas becomes impractical some 2 km downstream (approximately where VDS 13 is located) due to dense housing, industrial and municipal park developments within the Town of Oliver (Figure 5). Despite the fact that riparian areas are unavailable in this reach, riffles and pools could be constructed within the flood channel to diversify the aquatic habitat between VDS 13 and VDS 12 (river chainage 16+248 to 14+9228). Bull, Gaboury and Newbury (2000) gave this work a very high rating.

A lower priority area for river restoration lies between the Town of Oliver and Osoyoos Lake. Within this section of river there are many opportunities for re-meandering the river by diverting some or all of the flow through original or man-made oxbows (Figure 6). In the steeper portions, or where additional gradient could be gained by removing drop structures, water velocities could be increased and habitats could be made more complex. The relatively confined, gravel based oxbows could serve as winter rearing areas for rainbow trout according to watershed restoration expert Pat Slaney (personal communication). In addition there are areas in the lower reaches that provide good spawning for mountain whitefish and kokanee and are used occasionally by salmon.



Figure 6 - Aerial plate showing the possibility of diverting the river back into its original oxbows.

This portion of the river is rated lower than the upstream areas from a fisheries viewpoint because many of the sections are fairly flat and diverting the river would decrease the gradient even more. Water would move slowly through these sections, causing a silty substrate and heavy growths of milfoil. The results could benefit many species of wildlife (Sarell and Scott, 1995, and A. Peatt, personal communication) and warmwater fish, but might prove problematic for salmonids. The longer, slower migration pathway for sockeye, kokanee, mountain whitefish and trout might result in increased predation by birds, bass and northern pikeminnow (Hyatt, personal communication). Thus, more attention to the benefits, cost and risks of river restoration in these areas is required. Given the high benefits for other animals such investigations are definitely justifiable.

2. Land Securement

There are many ways to ensure that land can be used for conservation. This is why the term "securement" is used rather than purchase. Some examples are:

- Securement of Crown Land through a Section 16 reserve status (types of reserves which might apply include ecological, fish and wildlife, flooding, buffer zone or greenbelt)
- Protective covenants and easements
- Purchase with a leaseback
- Long term lease
- Donation, part donation or conditional donation
- Bequest or conditional bequest, and
- Reserved life estate.

Some of these methods may be useful for this project but simple purchase will be the most common means of land securement.

Bull (2000) identified 359 lots along Okanagan River south of McIntyre Dam. Of these 252 are irrelevant because they are:

- Located upstream from the high priority area (ie above the natural section) or
- Situated outside the floodplain or
- Not connected directly with the river or
- Already in Crown ownership or
- Located in areas of intense development.

Of the remaining 107 lots only 15 are privately owned and located within the high priority area between the natural section and VDS 13. Lot numbers, legal descriptions, and names and addresses of owners should remain confidential until needed but are mentioned in the restricted report by Bull (2000).

The purchase of 15 parcels seems overwhelming, but:

- Only the riparian portions of these lots are needed and these are often not of value to the owners
- A significant start on the project could be made if only a few, or even one of the parcels with lengthy river frontage was purchased
- This project can be carried out over a long time if necessary.

The land is zoned AG (agriculture) and if acquired it should be rezoned to CA (conservation area). This would require approval by the Agricultural Land Commission and the Town of Oliver. Further investigation is needed prior to arranging land purchases.

Another unknown is the availability of the land. Bull (2000) found at least some of the major owners eager to sell because of continual flooding problems. As mentioned earlier, even one of their properties would be sufficient to begin a restoration program.

Many land owners are reluctant to sell at fair market value until it suits them. For this reason key properties should be acquired at times when owners are motivated to sell.

Methods for moving ahead with securing a land base for restoration are discussed in the implementation section. However, land acquisition will be the most costly and challenging part of restoration and will require the help of the SOSCP Land Securement Team.

3. Dyke Set Backs

River ecosystems are based upon interactions between the main channel and adjacent wetlands. To function naturally, a river has to meander and during periods of high flow it must be able to spill out onto the adjacent floodplain. When a river is confined within a channelized system it's physical, hydrological and biological diversity disappears.

To restore a fully functional river system, dykes must be set back sufficiently to allow the river to meander and develop gravel bars, pools, riffles, islands and side channels (Figure 7). In fact dykes need to be set back far enough that a flood plain is re-established which will accept silt loads and surplus water during freshet flows.

The river downstream from the Osoyoos Indian Reserve to the end of the "natural" section (Figure 5) has been dyked but the dykes have been set back and follow the curves of the river. This section provides a good example of how naturally diverse habitats can function within set back dykes.

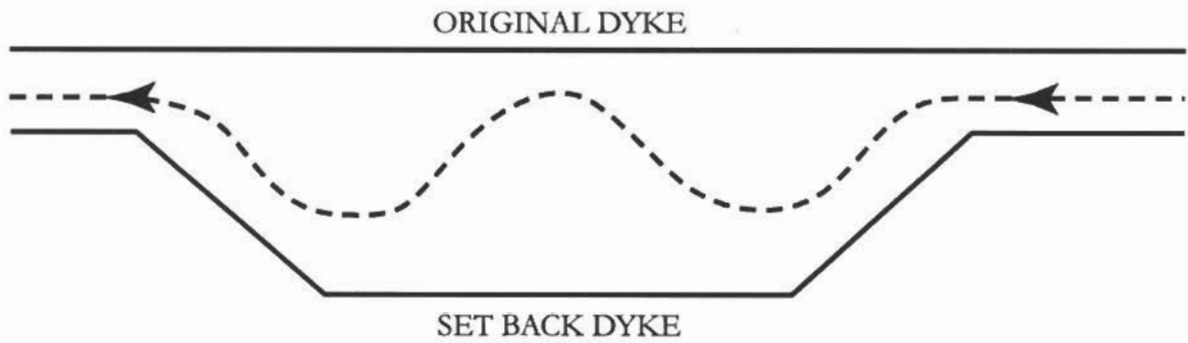


Figure 7 – Natural channel diversification through set back dyking.

4. Pool and Riffle Construction

Riffles and pools can be constructed regardless of whether set-back dyking is undertaken, so this technique is not limited to areas where riverfront properties can be secured. Furthermore, drop structures do not have to be removed but can, if desired, remain in place and be backwatered by the riffles.

Four demonstration riffles were installed downstream from Oliver in the summer of 2001 and were used by spawning salmon that fall. These will be monitored through spring floods to ensure they work at high flows. The cost of these riffles was \$100,000 (Gaboury and Mould, 2000).

Riffles and pools work even in lower gradient reaches and establish diverse micro-habitats some of which are suitable spawning habitat for sockeye salmon. These micro-habitats probably explain why, in 1947, more salmon spawned within the flatter areas between Oliver and VDS 6 than the steeper sections above Oliver (Hourston et. al., 1954).

5. Revegetation of the Riparian Areas

In addition to restoration of the river channel, plants should be re-established in the riparian zone. Black cottonwoods are ideal, especially since they have been ranked by BC Conservation Data Centre among the rarest plant communities in the province (Egan, Cadrin and Cannings, 1997). About 88% of the cottonwood habitats have disappeared from the Okanagan River and the Ministry of Water Land and Air Protection places a high priority on their restoration (Dyer, personal communication).

As well as providing a home for several species at risk, cottonwoods are ideal shade trees. Tall trees are necessary to provide shade on a system like the Okanagan which is very wide and aligned in a north / south direction. Re-establishing cottonwoods on acquired floodplains is the preferred alternative to planting them on the dykes where they pose both a maintenance problem and a safety hazard (R. Jubb, 2001).

BENEFITS, RISKS AND COSTS

1. Benefits

Clearly, returning a portion of the Okanagan River to a natural condition will benefit fauna, flora and people, and those rewards will be sustainable without further human interference. Benefits will include:

- Increased fauna and flora due to the increase in habitat quantity and quality. For example Pat Slaney, a watershed restoration expert, estimates that trout spawning and rearing habitat in Okanagan River might be tripled by re-establishing riffles and pools throughout the system.
- Easier fish migration as drop structures are replaced by riffles. Sheng (1997) suspects that emergent fry become disoriented after passing over the drop structures and are more easily caught by fish predators below the structures.
- Decreased sediment loads in the main channel since fines are deposited on the flood plains. Sedimentation has adversely affected spawning in some areas of the river (Flynn and Rosenberger, 2000; Pratt et. al., 1991; and Hansen, 1993).
- Increased stability and quality of spawning gravel by reducing the waters tractive force compared to the present channel (Newbury, personal communication).
- Increased connectivity with natural areas (travel routes for birds and mammals).
- Moderated water temperatures due to increased shading.
- Reduced maintenance costs, human hazards and liability associated with the drop structures.
- Reduced flooding of private lands due to increased channel width and lower maximum height of the river at flood stage (Symonds, personal communication).
- More attractive landscape.

These benefits do not require that other interests be sacrificed because riparian wetlands are not suitable for housing development and are often uneconomical to farm.

Although the benefits are easy to describe, they are difficult to quantify. The Independent Scientific Group for the Columbia River (Williams et al., 1999) warned that for this reason restoration could be a challenge. Hatchery fish are readily counted and it is often assumed that increasing the number of juvenile fish released will automatically lead to a greater number of returning adults. Such has not been the case, however, and Columbia River stocks continue to decline. Thus the Independent Scientific Group says...

"A major conclusion ...is the need to restore a greater degree of naturalness to the river than exists today...Habitat restoration...must receive high priority".

Despite the difficulties in quantifying the benefits of river restoration, the value of this kind of work is recognized throughout the world. Projects identical to the ones proposed here have met with success on Wandse Creek in Hamburg, Germany; the River Brede in Denmark; the Danube River in the Czech Republic and on many other waterways. One of the most ambitious projects is happening on the Kissimmee River in Florida. Some 90 km of this river are being returned from flood control channel to natural wetland. This 40-year project will cost about \$30 million (Kotler, 2002). A demonstration project to re-establish meanders and

floodplains on a section of the Kissimmee River has resulted in a ten fold increase in fish densities as well as a sizeable increase in everything from insects to wading birds.

2. Risks

Risks appear to be minimal. Discussions with water managers indicate that if dykes are set back, channel capacity will increase, the hydraulic head will be reduced and the risk of flooding to adjacent lands should decrease (Symonds, pers. comm.).

Funders interested solely in salmon may feel there is a risk that restoration work does not address the true "bottlenecks" for Okanagan River sockeye. Hyatt and Rankin (1999) point out that there is sufficient spawning and rearing habitat for sockeye in the Okanagan system. Hyatt (2002) believes that the major factors limiting the size of the sockeye population include:

- Passage at the Columbia dams,
- Ocean temperatures and mixing,
- Temperature and oxygen in the rearing areas of Osoyoos Lake
- River temperatures during adult migration
- Ecosystem constraints such as mysids and exotic fish.

However, these sources of mortality cannot be controlled and so it seems reasonable to attempt to offset them by maximizing survival wherever possible.

Another possible risk is the possibility of adversely affecting the salmon that presently spawn within the high priority area. While there is a remote possibility that altering this area could reduce its value to salmon (Phillips, 2002), this seems unlikely given that restoration would return the river to a more "normative" condition – similar to what it was like prior to channelization.

The greatest risk may be the risk involved in delaying the project. About 90% of the natural river habitat has been destroyed so far and there is no guarantee that the present area will be preserved. The longer this waterway remains unprotected the greater the risk of further deterioration. Also, as we wait to take action opportunities to purchase key habitats pass us by. Ideally long term comprehensive planning and short term opportunistic restoration will proceed simultaneously and begin as quickly as possible.

3. Costs

Ballpark costs have been worked out for some of the restoration work on the Okanagan River. Bull, Newbury and Gaboury (2000) provide estimates for a complete program between Osoyoos Lake and the natural section in the order of \$10 million, with most of the money going toward land purchase.

The highest priority area identified by Bull, Newbury and Gaboury is the same as the one identified in this report. Those authors estimate restoration costs for the river between the natural section and VDS 12 in the Town of Oliver to be in the range of \$1 million. These

latter estimates may be low for a complete restoration program in this area. However, undoubtedly a "proof of concept" or demonstration project could be completed within this area for less than one million dollars.

4. Funding

A number of funding sources might contribute to restoration of Okanagan River. None have been approached and so the list is merely conjectural. Nevertheless the following is a list of potential funders whose interests appear to be consistent with the concept.

- Aboriginal Fisheries Strategy – Canada Fisheries and Oceans
- BC Fish Living Rivers Strategy
- Columbia Hydropower Dams (BPA, Grant County PUD, Chelan County PUD)
- Ducks Unlimited
- Environment Canada – Canadian Wildlife Service
- Fisheries and Oceans Canada
- Habitat Conservation Trust Fund
- Intermountain Wetland Conservation Program
- Land Conservancy of BC
- Living Rivers Program
- Nature Trust of BC
- Okanagan Region Fish and Wildlife Heritage Fund Society
- Okanagan Basin Water Board
- Partners in Flight Great Basin Conservation. They hope to: " by 2010 restore at least 20% of the historical extent of lost or degraded riparian habitat and encourage the return of natural disturbance regimes" (Bezener 2002).
- Pacific Salmon Foundation
- Pacific Fisheries Development Program of Canada Fisheries Adjustment and Recovery Plan (CFAR)
- Public Conservation Assistance Fund
- Regional District of Okanagan Similkameen
- RENEW (Recovery of Nationally Endangered Wildlife) Program of CWS?
- SOSCP
- Trout Unlimited
- The Nature Conservancy of Canada
- Watershed-based Fish Sustainability Plan (DFO/MWLAP)
- RENEW (Recovery of Nationally Endangered Wildlife)
- South Okanagan Conservation Strategy

STEPS REQUIRED TO IMPLEMENT THE RESTORATION PROGRAM

To begin the restoration process in a logical and orderly manner and without further delay, we recommend that SOSCP follow the steps outlined below.

1) Program Initiation

- a) Provide a limited start-up budget.
- b) Request a memorandum of understanding from the major agencies (DFO, MWLAP and ONFC) to formalize the approval in principle that has been verbally stated.
- c) Appoint a project leader (in house or consultant) on a part time basis (1 day per week) who will be responsible initially for:
 - i) keeping the program moving
 - ii) communicating with fisheries, wildlife and water management authorities
 - iii) working with the SOSCP Land Securement Team to acquire key properties.

2) Property Securement

- a) Re-confirm priority areas with OBTWG, MWLAP Wildlife Section and Environment Canada.
- b) Check zoning and Agricultural Land Reserve restrictions.
- c) Collaborate with the SOSCP Land Securement Team on funding, negotiation and purchase of riparian properties in the most important restoration areas. Appoint a Fund Raiser / Land Securement Coordinator.
- d) Obtain commitments from funding partners.
- e) Decide who will own the land when it is purchased (e.g. a conservation organization such as the nature trust, a provincial government department such as B.C. Parks Branch, B. C. Fish and Wildlife Branch, Okanagan First Nation or local government)
- f) Complete the purchase of key parcels.
- g) Following the securement of property(ies) the project manager's role will be expanded to include initiating, planning, communicating, executing, and controlling the restoration program.

3) Restoration Activities

- a) Build a multidisciplinary advisory team. Representation should include at least SOSCP, ONFC, DFO, MWLAP Fisheries, MWLAP Water Management, MWLAP Wildlife, and Environment Canada. The team should promptly reach consensus on the concept and on a project management process.
- b) Establish a restoration account and capture available funds.
- c) Prepare a restoration plan including:
 - i) Survey and Design
 - ii) Cost estimation
 - iii) Risk Assessment & Environmental Assessment
 - iv) Communication with Authorities

- v) Permits and approvals
 - vi) Pre-treatment monitoring
 - vii) Outreach, awareness and stakeholder involvement
 - viii) Selection of Contractors
 - ix) Relocation of dykes
 - x) Construction of riffle / pool complexes and meanders
 - xi) Re-planting of riparian zones
 - xii) Monitoring, surveillance and adaptive management
 - xiii) Quantification of benefits
- d) Provide a catchy name which will build awareness and support for the restoration program
- e) Advise the:
- i) MLA
 - ii) MP
 - iii) Director of the Regional District
 - iv) Area Planner of the Regional District
 - v) Mayor and Council of the Town of Oliver
 - vi) Chief and Council of Osoyoos Indian Band
 - vii) BC Ministry of Transportation and Highways (who may partner on properties which are required for highway re-alignment)
 - viii) Transport Canada – Navigable Waters Division
- f) Set up a communication program (SOSCP Outreach Team)
- g) Conduct restoration work.
- h) Continue program and promotion of the program.

The implementation steps under the headings Program Initiation and Property Securement could be started as soon as funding is obtained. There is little use in planning the remainder of the program until the key parcels have been procured.

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