OKANAGAN RIVER
RESTORATION INITIATIVE (ORRI)

Vision & Partnership
ORRI Phase I and Phase II
ORRI Spawning Beds

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THE ISSUE

q̓awsitkʷ (OKANAGAN RIVER) - CANADA

- supports majority Columbia Sockeye
- 1 of BC most endangered River

HABITAT LOSS

- 84% River = channelized
- 50% River length = lost
- 90% Riparian vegetation = lost
- Instream diversity = lost
- Connection floodplain = lost
- Native species = declined
- Exotic species = allowed to colonized
Returning sections of the channelized river back to more natural, complex and diverse conditions.
ORRI PARTNERS

Direction & guidance from Steering Committee

Fishing and Oceans Canada — Pêches et Océans Canada

Contribution of several Canadian & American funding agencies
• Ecosystem based (multiple species)
• Adaptively managed
• Collaborative approach (Steering Committee)
• TEK guidance; Late Chief Albert Saddleman story
• Best management practices, measured stream geometry, natural-like features
• Improved aquatic habitat, water quality & in-stream complexity
• Improved riparian habitat, floodplain connection
• Increased flood capacity, stable stream channel
• Enhanced aesthetic and human use
ORRI – PHASE I

DUAL CHANNEL

- 1.2 km dyke set back
- 0.5 km river re-meandered
- 2 old oxbows reconnected
- split flows (50-50)
ORRI – PHASE I

**RIFFLES (2)**
- v-shaped
- spilt flows
- pool/riffle sequence

**GRAVEL BARS (5)**
- low flows
  - ↑ water depth
  - ↓ egg loss
**SPAWNING PLATFORMS (5)**

- Mainstem riffle, entrances, exits
- Froude Number $\cong 0.3$
- 25-75mm gravel size
- Boulder clusters (trout)
ORRI – PHASE I

**2000-2008**
plans, permits, designs, funds

**2009-2018**
monitoring & adaptive management

**2008-2009**
construction works

**On-going**
outreach
ORRI – PHASE II

Reconnection of small natural side channel (historic river pathway) immediately upstream Phase I
BACKWATER RIFFLE
- allowing water to enter side channel (2-5% flow of mainstem river)
- no impact at Parkrill outlet
- bank stabilization
- approach channel (spawning gravel) with gravel bar diverting debris

SIDE CHANNEL
- naturally vegetated (historic pathway)
- spawning gravel at entrance & exit
- protection cap for underground pipe
- 2 bridges on the existing dike
- 2 new small dikes (flood control)
ORRI – PHASE II

2010-2012
plans, designs, funds, outreach (OG)

2013 construction

2014-2018 monitoring, adaptive management
PHASE I & II – HIGHLIGHTS

NATURAL SEDIMENT TRANSPORT PROCESS
channel is self-sustaining with bedload movement, gravel bar creation & pool depth changes

POOL AND RIFFLE HABITATS
diversity of fish habitats & features increased overtime

SUBSTRATE COMPOSITION
spawning substrate gravel sizes changed (becoming more diverse); spawning areas naturally created

CROSS SECTION DIMENSIONS
spawning depths, velocities & Froude number remained within the range preferred
HABITAT FEATURES

• LWD increased overtime (natural transport)
• boulders are loss overtime (embedded in gravel); no trout observed

HABITAT REFUGE
Phase II side channel acted as a water quality refuge during a high turbidity event
• 2-3 times more spawners counted in Phase I (relative to run size)
• ORRI site highly attractive for spawning (site selected in priority over other available areas)
• the created spawning beds are used and have been naturally augmented
• low egg incubation survival drastically improved (rates similar to rates found in natural reach)
ORRI – HIGHLIGHTS

RAINBOW TROUT / CHINOOK

• no salmonids documented pre-treatment but trout documented post-treatment (snorkel surveys)
• no Chinook documented pre-treatment but observed using Phase I restored features
• trout observed in Phase II side channel (spring)

MACROPHYTES

• total coverage of all macrophytes reduced
• proportion of introduced invasive species reduced (Eurasian Watermilfoil)
• diversity of native macrophytes increased

INVERTEBRATES

• increased diversity & richness
**ORRI – ADAPTIVE MANAGEMENT**

**PHASE I**
- monitoring changes & manage if needed
- scoping floodplain improvements

**PHASE II**
- gravel deposited in approach channel creating blockage (high freshet years)
- scoping options to increase flow in side channel and reduce deposition in approach
- monitoring beaver activity & impact
SPAWNING BEDS in PENTICTON

1909 NATURAL RIVER & FEATURES

1950’s HABITAT LOST

2014-NOW SPAWNING BEDS
SPAWNING BEDS in PENTICTON

PENTICTON CHANNEL REACH 1

Bed No.1
Bed No.2
Bed No.3
Bed No.4
1986 Kokanee Bed
Raised Gravel Beds (3)

- Gravel placed directly over existing bed
- Entire width of the channel
- Platform immersed at all flows
- Improved hydraulic conditions (spawning)
- Gravel size for Sockeye, Kokanee, Chinook
BOULDER CLUSTERS (10)
- 3-6 larges boulders/cluster
- various configurations
- preventing foot entrapment
- hydraulics, food & cover for juvenile salmonids & Burbot
SPAWNING BEDS in PENTICTION

Construction works:

2014 Beds No.1 & No.2 (SK, CH)
2015 Bed No.3 (SK, KO)
2018-2020 Bed No.4 + KO bed

ONGOING

monitoring & adaptive management
• Beds utilized by targeted Sockeye & Kokanee, immediately after construction.

• Sockeye utilized all beds close to maximal capacity in 2014 & 2016, but not in 2015 & 2017 (very low sockeye return).

• Kokanee utilized Bed No.3 close to maximal capacity every year.

• Beds provided designed hydraulics conditions during spawning.

• Spawning habitat is still limited.

• Juvenile trout observed downstream boulder cluster.

• Eurasian Watermilfoil reduced in the restored reach.

• Beds stable overtime (high freshet flows).
Ks p’el’k’stim

“Balancing indigenous knowledge and western science to manage, protect and restore indigenous fisheries resources and aquatic habitat with the Okanagan Territory”

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