# **Mission Creek Workshop**

December 1, 2023

**Final Report** 



#### Sponsors:

Okanagan Basin Water Board Black Mountain Irrigation District Renee Merrifield, B.C. MLA Kelowna-Mission Norm Letnick, B.C. MLA Kelowna-Lake Country

#### Hosts:

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## Purpose

The purpose of this workshop was to discuss current challenges and opportunities for Mission Creek, with people and organizations that work in and around the creek. We wanted to learn from each other and identify common concerns and objectives. While to our knowledge there is not a formal 'Watershed Plan' being considered at this time for Mission Creek, there are many planning processes underway, and we hope that this dialog will improve those processes and their outcomes. The workshop will also inform future priorities for Okanagan Basin Water Board (OBWB) science, planning, grants, and recommendations to other levels of government. We sought to:

- Get updates on the creek's current condition and changes.
- Hear lived experiences about what is happening on the ground, in and around the creek.
- Learn from each other catalyzing discussion.
- Determine where knowledge or policy gaps are, and how to fill them.
- Suggest tangible next steps, contributing to, without replicating, other efforts already being considered or are underway, i.e.
  - Mission Creek Water Use Plan update
  - ONA salmon reintroduction and management plans
  - Mission Creek Restoration Initiative plans
  - City of Kelowna Water Security plan
  - OBWB hydrology studies

# **Groups** attending

Representatives from Black Mountain Irrigation District, City of Kelowna, B.C. Ministry of Water, Land and Resource Stewardship, Regional District of Central Okanagan (RDCO) planning and engineering departments, Okanagan Nation Alliance Fisheries Department, Westbank First Nation (WFN) Title and Rights, WFN Utilities and Public Works, En'owkin Centre, Mission Creek Restoration Initiative, Central Okanagan Land Trust, Okanagan Collaborative Conservation Program, Joe Rich Watershed Committee, Larratt Aquatic, Gorman Brothers Lumber, Rutland Water Works, Okanagan Fruit Tree Project, community residents, farmers, a consulting engineer, a UBC grad student, OBWB's chair, and staff from the OBWB staff and Kelowna Mission Constituency Office.



# Context

Mission Creek has a complex watershed—both in its natural characteristics, and how it is managed. As the largest and most important tributary to Okanagan Lake, it provides more than 30% of the lake's annual inflow. The creek water quality is relatively good, despite the watershed being under pressure from increasing industrial and human activities. The watershed is also a source of domestic and agricultural water for the Kelowna area, supplying water to Southeast Kelowna, Rutland Waterworks, and Black Mountain Irrigation District service areas. Kelowna's other long-term water sources are Okanagan Lake and Kelowna Creek (the latter for irrigation).

Mission Creek provides riparian and in-stream habitat for many native animals, and actively supports the newly restored runs of Columbia River sockeye and chinook salmon. These ocean-going salmon are larger-bodied fish and need more water in the creek, and at different times of the year than the resident kokanee salmon. The Okanagan Nation Alliance (ONA), and local communities through the OBWB, are working to determine the minimum and optimum flows needed to support these fish populations (a.k.a. critical flows and environmental flows) throughout the year. During periods of extreme low flow, Mission Creek water levels are supplemented by reservoir releases from upland reservoirs by Black Mountain Irrigation District, the City of

Kelowna, and the Province of B.C. The large reservoirs releasing this water are primarily licensed for agricultural irrigation. The flow requirements being met by the releases are described in a Water Use Plan developed in 2010 to maintain the naturalized flow<sup>1</sup> of water.

The Mission Creek watershed, and the activities within it, continue to change. Land use practices, wildfires, and increasing human use are changing, as is the climate. Together, these factors have led to changes in forest canopy cover that alter the timing and intensity of creek flows, increasing flood risks, and the probability of extreme flows (as seen in 2017, 2018, 2020, and 2022), especially in the creek's channelized section. These impacts are in the minds of the people, businesses, and public facilities situated close to the creek or within its floodplain, and several properties have flooded in recent years.

In the lower watershed, around the Mission Creek canyon, there are increases in landslides and erosion, steadily increasing the supply of sediment to the channel. Flood concerns continue to rise as Mission Creek experiences higher peaks than previously estimated. Lands and existing infrastructure are being impacted, and sediment accumulation is reducing the depth and flow capacity of the channelized section—built in the last century.

The estimated flow that would be present under natural conditions.

There are opportunities to restore sections of lower Mission Creek, by setting back dikes to reduce the energy of flows, increase high water conveyance capacity, and provide more habitat. As city infrastructure is renewed, it is taking higher peak flows into account. The elevation of the bridge at Casorso Road was raised to allow greater flows beneath the bridge, and the foot bridges along the upper Mission Creek greenway have been repaired. The city will be replacing the KLO bridge while accounting for riparian conditions, improving flows, and improving fish spawning opportunities. Dike safety remains a concern, as dike failure would flood Kelowna's Lower Mission neighbourhood and agricultural areas. The dikes forming the lower Mission Creek boundaries are classified as "orphan dikes" by the province, limiting provincial liability and maintenance requirements, without a clear solution for long-term management.

Expanded dike at work, May 6, 2017



# **Presentation summaries**

The following presentations were made by invited local experts and were intended to update workshop participants on the past and current conditions of Mission Creek so that discussion would be based on shared understanding.

#### Kari Alex, Fluvial Geomorphologist and Fisheries Biologist, Okanagan Nation Alliance

The Okanagan Nation intends to restore Mission Creek. They feel a cultural responsibility to bring Pacific salmon back and provide them with healthy habitats for spawning and rearing. Historically, Mission Creek moved across a broad alluvial fan, with a substantial riparian area, and normal rates of sediment movement. High instream diversity created resiliency and healthy ecosystem function, supporting salmon populations. Now, that ecosystem function has been reduced, lowering the quantity and quality of salmon habitat.

In 1938, aerial photos show that the channel was braided and unconfined as wide as 120 m—with a large sediment deposition zone. In 1951, diking narrowed the channel to 50 m wide, and between 1973 and 1986 the channel was further narrowed to 30 m. By removing meanders, Mission Creek has been shortened from 33 km to 12 km between East Kelowna bridge and Okanagan Lake. This channelization, along with development on the floodplain, has resulted in extreme, perpetuating loss and degradation of the aquatic ecosystem. Large amounts of sediment come down the creek from the upper watershed. As the creek reaches the low-gradient alluvial fan, the balance of sediment build-up and degrading (bed lowering) has been disrupted. The bank-full width (functionally, the width between the dikes) determines the distance between pools and riffles, and the radius of meander bends. With its current narrow cross-section, the creek has reduced width-to-depth ratios, lost riffle-pool habitats, lost meander bends, lost floodplain and over-bank flows, and the creek bed is less stable. The dikeconstrained channel forces water rapidly between the dikes, removing most creek-bed contours and creating a long, flat glide environment that requires much more water to maintain the depths needed for fish passage. Smallsized sediment, needed for kokanee spawning, is being washed away.

The most significant restoration actions would be to set back the dikes to reconnect the floodplain and thicken the riparian corridor. The creek is especially constrained by development near the mouth, and in several stretches along the lower creek. Setting back the dikes would directly address problems created by the narrow bank-full width, as the creek would have more room to dissipate energy and develop a more natural channel geometry (thalweg). A natural thalweg tends to have narrow incised sub-channels, which make it easier to meet the environmental flow requirements of fish. The houses near the creek are already at high risk of flooding. If the houses don't get moved in advance (i.e. managed retreat), sooner or later the creek will move them. There are good examples of managed flood retreat on the Mississippi Delta, and close to home in Grand Forks.

#### Shawn Reimer, Managing Okanagan Lake Regulation System, B.C. Ministry of Water, Land and Resource Stewardship

The province has historically been reactive, rather than proactive, with Mission Creek flooding. Even now, there is little-or-no funding associated with studies or improvements. It is a legislative reality that it is difficult to fund projects unless there is imminent risk, and this limits which projects go forward.

There are few formal records on Mission Creek dike construction, although there is general agreement that most of it was done piece-meal, and mostly used spoilage from dredging. When city boundaries were expanded in 1973, the B.C. government committed to look after the dikes along Mission Creek, although this was at variance with provincial policy. Dike maintenance has occurred sporadically since then. In 1978, the province removed sediment from a portion of the creek bed. In 1979-80, they removed the Smithson-Alphonse Dam, and upgraded the dike on the north bank downstream for 1.2 km. In 1992, City of Kelowna began to develop a plan to establish Mission Creek Greenway.

In 1997, a larger than normal snowpack prompted dike upgrades—carried out with emergency funding by the Public Safety Section of the Province's Water Management Branch. This work was followed by a report called Dikes Along Mission Creek, written to address concerns by the City of Kelowna, and the province. In 2003, B.C. passed the Flood Hazard Statutes Amendment Act which increased local government authority and responsibility for floodplain management across B.C., including flood mapping and responsibility for dikes. However, there was still some ambiguity about who was responsible for Mission Creek dikes. In 2006, the province used emergency funding to remove sediment and upgrade sections of the dikes.

Flooded home along Mission Creek during spring freshet, June 2022



In 2012 and 2013, Mission Creek had its highest recorded flows (approximately 116 and 110 cms respectively). These met the standard for 1:200-year flows (i.e. with a probability of occurring 0.5% in any given year). Since then, there have been several times when the flows were even higher. In 2014, the province commissioned a hydraulic capacity study related to these high flow events, examining the water volume that can pass through the channel. A major recommendation of the 2014 study was that the dikes should be set back to accommodate increased flow. In 2020, in response to continued high flows, they updated this study, drawing the same conclusion. Currently, the province is completing a detailed geomorphic assessment on Mission Creek sedimentation (still in draft), that further supports the previous dike setback recommendation.

The provincial perspective is that, despite the 1973 commitment, the Mission Creek dikes have always been listed as "no local authority" (orphan) dikes in the B.C. database of regulated dikes. The province provides support and regulatory guidance to communities for flood mitigation work, but since 2003 the expectation has been that local governments are responsible for the works that protect their community. Their philosophy is that decisions about building on floodplains, and local approaches to flood risk reduction, are better when informed and directed by community-level values.

Following significant floods in the Lower Mainland, Merritt, and Princeton in November 2021, the province developed a comprehensive flood strategy<sup>2</sup>, intended as a roadmap for reducing flood risks and increasing resilience to more frequent extreme flood events in the future. They recognize the need to better support First Nations and local governments in integrated flood risk planning. Dikes are just one of the tools to reduce flood risk.

The B.C. government is working with local jurisdictions to explore and implement a broad range of flood risk reduction options, including investments in dikes, where essential. The B.C. Flood Strategy Intentions Paper proposed actions to strengthen dike regulatory programs, and to review and modernize provincial legislation, regulations, and policies to address flood risks. This potentially includes developing clear regulations under the Dike Maintenance Act to promote resilient flood protection infrastructure along with other integrated approaches to reduce flood risk. Studies since the 1970s have recommended setting back the dikes, and this will provide the most protection for people. Even if the creek were dredged, if the lake is high (like in 2017) it will reduce the flow capacity of the creek, causing it to back up, resulting in flooding.

<sup>2</sup> The BC Flood Strategy was published in March 2024, and can be found at this website: https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/integrated-flood-hazard-management/bc-flood-strategy

#### Kevin Van Vliet, Manager of Utility Services, City of Kelowna

City of Kelowna has always considered Mission Creek management, restoration, and dikes to be provincial responsibilities. The city is very proactive with managing other creeks within its boundaries. The city manages and maintains stormwater outfalls to the creeks, as well as a variety of creek crossings.

The city water utility's merger with the Southeast Kelowna Irrigation District (SEKID) brought with it water storage infrastructure, and licenced water withdrawals from Hydraulic Creek—a tributary to Mission Creek. The added responsibilities for this type of water management included assuring water supply to SEKID customers, and meeting water supply obligations for Mission Creek flows during extreme conditions—like those of the Black Mountain Irrigation District (BMID) and the province. These water management responsibilities are in addition to those about the impacts of flooding and the quality of the water flowing into Okanagan Lake, the city's primary drinking water source.

Water supply infrastructure was largely designed and built in a different era, where concepts of environmental flow needs and climate change were not as pronounced as they are today. Assuring water supply into the future will require a more holistic, collaborative, and sustainable approach—which is a challenge, given the variety of jurisdictions and interests. Discussions like this workshop help us better understand what is needed, and what relationships need to be enhanced. How can we use new knowledge and address new competing demands? How will we fund additional flow capacity for environmental flow needs? Can we or should we reduce the level of service for existing users? How that will be decided?

The city is changing its water supply paradigm to a more holistic approach, encouraged by some provincial ministries. The city has formally started developing a comprehensive Water Security Plan to help guide city planning and decision making. This planning initiative addresses water values and principles across the city, and identifies internal responsibilities and gaps, to improve communications and accountability. The city recognizes that all forms and sources of water are interconnected, and healthy water systems are critical for a healthy community. Kelowna City Council adopted the Water Security Plan principles (as follows) to help guide the Plan's development. A public consultation on the draft plan will begin in 2024.

### Kelowna Water Security Plan Principles:

- Water Supply: All residents and water users in the city must have a safe, affordable, resilient, and sustainable supply of high-quality drinking water, and a reliable supply of water for agriculture.
- 2. <u>Wastewater</u>: Protect Okanagan Lake, our human health and our environment through efficient collection and effective treatment of wastewater.
- 3. <u>Stormwater</u>: Stormwater is effectively managed without negatively impacting riparian areas, infrastructure, property, or Okanagan Lake.
- Flooding: The community is resilient to climate change and resistant to lake and creek flooding.
- 5. <u>Source Water Protection</u>: Okanagan Lake and upland watersheds remain a source of high-quality water.
- 6. <u>Natural Assets & Systems</u>: Account, protect, enhance, and restore Natural Systems that make up our infrastructure inventory and increase environmental recovery.

- 7. Environmental Flow Needs: Assure that the quality and quantity of water is available to support a healthy aquatic ecosystem.
- 8. <u>Governance</u>: Indigenous knowledge, practice and permitting is effectively incorporated into water decision processes.
- Partnerships: The city works in partnership with other water providers and government agencies to ensure water security.

Examples of the city's water partnerships include work with the Mission Creek Restoration Initiative, the Mission Creek Water Use Partnership structured in the 2010 Mission Creek Water Use Plan, work with the Okanagan Nation Alliance on flood protection on Mill Creek, and work with provincial agencies on Mission Creek dike adjustments.

The city has benefitted from new Mission Creek Flood and Hazard Mapping. Through this, we have found that 200-year flood *design flows*<sup>3</sup> have increased, leading to new problems and new expectations. The creek channelization being designed around cannot handle the future flows projected by climate change, and modeling shows extensive potential for future flooding in the Mission Creek floodplain.

Mill Creek is another flood-prone tributary within city boundaries. It can

<sup>3</sup> Design flows are flow levels that must be designed for when building infrastructure or other development.

be impacted by both freshet flooding and Okanagan Lake flooding. The 2017 freshet was particularly bad for flooding property on Mill Creek, as high lake levels created a backwater into densely populated sections of downtown Kelowna. After that event, the city pursued and received a grant of up to \$22 million to improve Mill Creek flood management. A portion of these funds were used to improve the existing flood bypass from Mill Creek to Mission Creek. This project has been informed by multiple studies that use modern, risk-based hydrologic and hydraulic modeling. These reports have produced detailed flood maps and improved the decision-making process.

Studies found that Mill and Mission creek freshets peak at different times of the spring, and that Mill used to drain to Mission Creek in the past. It is practical (and invaluable) to move some of Mill Creek's high flows to Mission Creek, reducing impacts downstream during major events. The current estimate for Mill Creek's 200-year flood is almost double the rate estimated in the 1980s—reflecting more recent data, and adjustments for climate change. The long-range plan is to divert up to 15 cms to Mission Creek and manage the remaining peak within Lower Mill Creek. The city has recently added structural upgrades and improvements to debris management, operator safety, fish passage, and fish spawning opportunities downstream; all while

reducing flood peaks in both systems. Creative solutions are possible, although some tough compromises are inevitable.

#### Bob Hrasko, Administrator, Black Mountain Irrigation District

Mission Creek watershed has a total area of 910 km<sup>2</sup>. The area above BMID's intake (the water source area) is 600 km<sup>2</sup>, and the area above the City of Kelowna's intake is 138 km<sup>2</sup>. BMID has a license requirement to maintain a minimum flow rate of 0.50 cms in lower Mission Creek. The district follows the 2010 Mission Creek Water Use Plan, which requires that BMID support through reservoir releases, the naturalized flow<sup>4</sup> rate in lower Mission Creek.

BMID's water sources are reservoirs on the Graystoke Plateau. They include Belgo/Ideal Reservoir, that has 6,907 ML<sup>5</sup> of storage, of which 752 ML are for conservation flows licensed to the province. Belgo/Ideal can only store 6,815 ML, so 92 ML only exist on paper. Other BMID storage is held in Graystoke Reservoir (5,095 ML storage); Fish Hawk Reservoir (2,107 ML storage); James Lake (1,775 ML storage); and Loch Long (625 ML). The plateau includes a provincial park, and is at over 6,000 ft elevation, so it collects a sizeable snowpack and Mission Creek on average delivers 30 – 35% of the annual inflow to Okanagan Lake.

<sup>4</sup> The estimated flow that would be present under natural conditions.

<sup>5</sup> ML stands for megalitre, a metric unit of volume equal to one million litres.

In recent years, the Southern Interior of B.C. has had recurring natural disasters, including the Okanagan's floods in 2017 and 2018; the Grand Forks flood in 2018; and the floods in Merritt and Princeton in November of 2021. There was a record-breaking heat dome in 2021, and a severe drought in 2023. There have been recent significant fires in the Central Okanagan including the 2017 Philpott Fire, the 2021 Derickson Lake Fire, and the 2023 McDougall Creek Fire (also known as the Grouse Complex Fire).

The total annual flows of Mission Creek are increasing. The average annual runoff is 196,000 ML. The estimated total withdrawals are 25,000 ML, and the total average flow from the creek (net withdrawals), passing the Mission Creek hydrometric station at Ziprick Road is 221,000 ML. During a drought year, flows are less. A 1:10 year drought is estimated to have total annual flows of 130,000 ML; a 1:20 year drought would have 108,000 ML; a 1:100-year drought would have 84,000 ML; and a 1:200-year drought would have 75,000 ML (based on regional drought frequency curves, produced by provincial hydrologists). At this time, the lowest flows on record were in 1970, with an estimated 89,360 ML.

Specific challenges to Mission Creek include forest fires; pine beetle damage; risk of a high-magnitude flood like that of Merritt in 2021; risk of flood damage to properties along the creek; sand and silt deposition in the lower reaches reducing channel capacity; risk of dike failure; risk of not achieving environmental flows; the need to recognize and achieve First Nations objectives; need for higher flows to accommodate returning sockeye and chinook salmon. The total disturbed area in the upper watershed has been increased by logging, pine beetle damage, and wildfires.

BMID provides domestic drinking water to 30,000 people. It distributes irrigation water to 6,100 acres of agriculture. Of these, 5,100 acres are Grade-A land with water rights, that receives irrigation water, and whose owners pay 100% of water charges. 1,000 acres are Grade-C land with water rights, that is not currently receiving water, and whose owners pay 80% of water charges. Another 4,340 acres in the service area have no water rights and do not receive water, paying no water charges. The monies go to dam maintenance, conveyance, and renewal. BMID has a contractual obligation to preserve water for Grade-C customers, so they can call on their water rights at a future date. Any water not used by BMID customers defaults to environmental flows (stays in Mission Creek). BMID considers this to be beneficial use of their license capacity. This system has worked for 102 years.

1987 was the record highest year for water use in BMID, using 16,808 ML. In 1998, BMID used 15,558 ML to provide water to 20,000 residents and 4,200 irrigated acres. In 2007, BMID delivered 13,600 ML to 23,000 residents and 4,200 irrigated acres. In 2023 (a drought year), BMID delivered 11,800 ML to 30,000 residents and 5,100 irrigated acres. These trends demonstrate that conservation messaging is working, and that agriculture is becoming more efficient. However, the irrigated agricultural acreage is expected to increase. Over time, residential densification is expected to increase water use, but this will be offset by reduced outdoor demand.

Legislation and guidelines are changing. Water licenses still set the volume allocated; the times when withdrawals are permitted; and to what use and where the water is assigned. The Water Sustainability Act (2016) states that fish protection measures apply to all licencees, regardless of whether they have storage, and regardless of license priority rights (Section 88). BMID follows the 2010 Mission Creek Water Use Plan, specifying how they will reduce extractions during specified low flows (i.e. minimum naturalized flows<sup>6</sup> in the creek). It also has an internal drought plan, that guides BMID's water management based on remaining stored water. The district is working to better understand and respond to First Nations values for protecting fish and biodiversity.

BMID holds three types of licenses. *Waterworks licenses* allow water use year-round for domestic, residential users. For *irrigation licenses*, a licensed volume is attached to a specific land area, sometimes individual parcels, and sometimes to a jurisdictional boundary (service area). *Conservation licenses* are to support aquatic ecosystem function along rivers and creeks. Each year, BMID releases 752 ML of water from Belgo/ Ideal reservoir as conservation flows to maintain water levels in lower Mission Creek during September and October. As stated above, BMID must ensure there is 0.50 cms downstream of their point of diversion on Mission Creek during the irrigation season, under the strict rules of their water license.

In total, BMID has 13,991 ML of licensed storage in the Mission Creek watershed, in addition to the province's 752 ML of storage for conservation. Some of BMID's storage is for the 1,000 acres of Grade-C land that is not currently irrigated, but for which the Grade-C landowners pay to build and maintain the reservoirs. The City of Kelowna has 19,565 ML of storage. The city has another 7,543 ML of storage license, but the storage has not yet been constructed. BMID typically meets early season irrigation demand (for April, May, June) by drawing directly off the freshet, rather than tapping into storage. The freshet can provide more than half the total annual flow. BMID doesn't start to use stored water until the first or second week of July each year. In the past three years, BMID has voluntarily released additional water to support flows for fish.

<sup>6</sup> Naturalized flow is the estimated flow that would be present under natural conditions, and an absence of human activity.

BMID has identified more sites in its catchment area where reservoirs can be built or expanded. Expanding reservoirs is a solution for managing greater water demand and lower summer flows due to climate change. Dams can increase resilience to drought, by catching the snow melt, storing it, and using it as needed. The beneficial uses of this water can include domestic supply or agricultural irrigation, and water to meet environmental flow needs. Streams supported by storage were not on the list of critical lows flows in the drought years of 2021 and 2023. Dams can also reduce peak flows and flooding.



Without storage (i.e. their own dams), licencees drawing directly from the creek are at higher risk of being cut off under Section 88 Fish Protection Orders. This can also happen to groundwater licencees where their wells are hydraulically connected to the creek (as happened in Westwold in 2023). It is difficult for these licencees to access storage and/or storage sites, and small users may be financially challenged. In the event of sustained drought, partnerships may be necessary.

There are also negative aspects of dams. To build a dam, there is an onerous approval process, and building new dams is costly. Even if you create a large reservoir, it may not fill every year. In recent years, regulations and requirements for dam owners have increased, in part because of the dramatic Testalinden dam failure in 2010. Dam failure can cause flooding and debris flow downstream. Even failure of a low-risk dam can have a high consequence to downstream communities, and dams have high costs to maintain.

# Themes of Discussion

The following are summaries of discussion, organized into overarching themes. The statements do not represent consensus views, but have tried to capture what was said by a range of participants. There was broad agreement that we should be having facilitated holistic conversations, bridging all the themes. We need to continue to discover solutions that enhance outcomes and health for all species.

# Flooding, dikes, and other infrastructure

Since 2012, we've had much more frequent high-flow events on Mission Creek. Dike setback is key to all the topics we discussed at this workshop. Mission Creek's legacy infrastructure was built to provide irrigation and protect houses, not fish, and doesn't have capacity to handle higher flows from climate change. In the immediate short term, we need to ensure the safety and capacity of the existing (orphan) dike system to reduce flood risk to the Lower Mission. BMID has plans to fortify their dams and facilities along Mission Creek near 8-Mile Ranch. The KLO Bridge is on the list of the city's planned infrastructure projects. The B.C. Government has no budget to work on the creek or the dikes. The question is, how do we meet competing demands, and how do we fund them?

In time, we need to setback the dikes all along the lower creek. Can we move people, homes, and infrastructure out of the floodplain? Dike setbacks and reconstruction are also limited by the Agricultural Land Reserve, which protects farmland. There is little land available along the creek to put in adequate measures to stabilize the channel. If this is a community priority, changes need to happen as soon as possible. It gets ever more difficult to make changes as the creek is further constrained by encroaching development. The City of Kelowna is the jurisdiction with people, land, and infrastructure at highest risk, and it may make sense to transfer the responsibility of the orphan dikes to them.

## Funding

City of Kelowna is looking at the benefits and risks of legacy infrastructure, considering climate change. There is an urgent need for major funding to address ecosystem problems and flooding issues. There has never been consistent money assigned to the creek to maintain it. The city should move forward both with infrastructure improvements AND with property buyouts. Efforts are being made to do those purchases (property buyouts), for example, buying land for parks has the bonus of being used for flood protection if it is near the creek. However, we need provincial or federal funding to do big projects and invest in eco-assets.

Our political system isn't set up for long term decision making. The community must push politicians. There is insufficient funding for flood protection or fish restoration. We have 20 years of studies calling for dike setbacks, but land costs have escalated and are prohibitive. It would be helpful if disaster mitigation funding could pay for preventative measures such as property purchases and managed retreat, instead of funding restoration after a disaster.

#### Fish

Kari Alex said that for 10,000 years salmon were coming up the creek, and historically there was more flow in many years. Fish management and preservation are not currently viewed as high priority for settler governments and jurisdictions. Environmental flows should be better integrated into water management. The quality of kokanee and other fish habitat has declined, resulting in population declines. It is possible, in the future, that the Syilx people may seek more water releases.

Central Okanagan school children join Okanagan Nation Alliance in releasing salmon fry into Mission Creek in May 2023



### **Indigenous Perspectives**

How do you protect the upper watershed for 1,000 years? What would management by Syilx look like? Traditional Ecological Knowledge and Western science both say space for rivers is required. Why do we continue to develop the floodplain? Chad Eneas shared that the most fundamental aspect of reconciliation is between the people and the land. People have a human right to clean drinking water. The Syilx have an aboriginal right to harvest food. Fish in the creek are a form of food security. Whenever we are talking about plans or changes, we have to ask what timeframe we are considering. If you want different answers, it's important to ask different questions. Indigenous technology is science, and that should be acknowledged. We shouldn't just look at things from a Western lens.

### Land Management, Erosion, and Restoration

Many of the main issues with Mission Creek stem from the management of the creek and the lands around it. We need to study what is happening in upper Mission Creek and look at alternatives to reduce erosion. We ignore the upper watershed at our peril. There is too much industrial activity and too much logging. Logging is squeezing into the Joe Rich community and coming close to creek riparian areas. There are substantial landslides in the upper watershed, related to forestry activities. We must limit forest harvesting to safer, flatter landscapes because faster runoff, leading to higher creek flows, could take out all of BMID's infrastructure. Creek sedimentation is another major concern, coming from landslides and erosion. Channelization, creek narrowing, and floodplain development have disrupted the creek's energy and removed the creek's ability to balance its natural sediment loads.

One of the biggest dangers is wildfire occurring in the watershed. There are issues with fire danger from planting single species of trees, and burned areas have increased erosion risk. There was funding for fuel mitigation in Joe Rich, but the community wanted revisions to the plan, as they are concerned that, if not done properly, further logging will worsen fire danger. The money went elsewhere.

The south slopes of the Mission Creek canyon through the Joe Rich area are being logged in primary forest, which is another factor exacerbating erosion and reducing slope stability. A significant slide could close off Mission Creek for many days, and potentially cause catastrophic flooding downstream, should the water build up and then be rapidly released. A major rotational slide occurred on the north slope of Mission Creek in 1984, and residents are very concerned about the possibility of a similar event on the south slope. They are recommending an immediate moratorium on clear cut logging.

Whether from pine beetle kill, wildfire, or logging, reduction of forest canopy is making peak flows/low flows more extreme in the watershed. Mission Creek has been heavily impacted over time by land development activities, including channelization and diking for flood protection. This has resulted in major loss of aquatic and riparian habitat and associated fish and wildlife species. These changes are also contributing to channel instability and flood risk, particularly with the growing influence of climate change. Studies show that we need to take remediating action in the short term, or these impacts will continue to increase. However, not all the studies that have been done have been shared or integrated with each other. We need a scientific look at the watershed so we can make plans to improve different aspects of it. We should look at nature-based solutions.

## Low flows

We rely on storage from the reservoirs in the Mission Creek watershed to boost low flows in the summer and fall. More storage is needed for conservation flows. As BMID opens new irrigated land to agriculture, it comes with more funding for storage paid by the irrigators, so more water can be held back from the freshet. There isn't currently enough storage for optimum stream flows for fish each year (in every season, for every species), and BMID has expressed that their customers can't, shouldn't, and won't pay for it. If BMID releases a higher volume of flows, they risk having their reservoirs could go dry. With summer low flows also come higher air and water temperatures, which can affect the timing and success of spawning.

The worst drought on record was in 1929-31—pre-climate change. During a typical year, more water is released from Okanagan Lake at Penticton than there were inflows for those three years together. One person's view at the workshop was that "Climate change means that there are no longer going to be back-to-back droughts." However, in the last two summers, we have had no precipitation at all for four and a half months downtown. We must have a local focus on water conservation. If the creek had the proper cross section profile (thalweg), there would be more oxbows and shallow pools with tree

cover, making better use of the water that is available for environmental flows. This is one way to explain how we had enough flow in the past for fish—inset subchannels made more efficient use of the water available. This brings us back to the question of dike setbacks, to allow more natural stream geometry—although we still need to increase the amount of flow that is available for summer and early fall.

The Mission Creek Water Use Plan was developed in 2010 to specify how the water utilities would respond to different hydrological conditions, such as drought.

#### Mission Creek showing signs of drought on Aug. 4, 2021



Since that time there have been many changes in the watershed, including a transfer of responsibility for the SEKID infrastructure, and the reintroduction of ocean-going salmon, which need a different flow regime than do kokanee. This Water Use Plan should be updated.

# Sedimentation and water quality

Mission Creek has deposited up to 1.5 metres of gravel in front of McMillan Farms, which is regularly flooding. The creek needs to be assessed at a very local level along each reach. Attention is also needed on upstream channel scouring, not related to dikes, but that produces sediment. Streams are no longer running through it to the creek because they are under three feet of sand deposits. The land has become boggy. Other jurisdictions are compensating farmers, and something needs to be done now.



One participant commented, "It seems that sediment removal will be inevitable at some point. The sale of that gravel and sand should go into the Mission Creek Mitigation Bank." A counterpoint was made that if you excavate it, it will fill right up again.

# Water allocations and licensing

BMID is concerned with the withdrawals that are taking place that are not supported by storage. It appears that there is an overallocation of water licenses. These licensees will be the first to have restrictions from the B.C. government during low flows. Water users without access to storage, and those drawing from wells connected to the creek should become part of the Water Use Plan update, to come to an agreement on response to low flows. There were several other questions related to licensing:

- How is water being shared equitably?
- How can we allow green grass and hedges in this climate?
- Is unlicensed water is being taken from the creek?
- Does groundwater pumping near the creek reduce the water level?

## Watershed health

Our interpretations of creek health depend on our perspectives (water quality vs. riparian habitat vs. fish habitat). Bob Hrasko of the Black Mountain Irrigation District observed that water quality has improved since 2012 with respect to turbidity, colour, E. coli, and physical parameters. The district has collected much water quality data over time, so we aren't starting from zero, and can build on it. We need stormwater treatment/ interceptors to reduce water pollution flowing into the creek. The city is also raising awareness about water quality.

> Participants at the workshop brainstorm and share potential solutions to the many issues facing Mission Creek



# Ideas for going forward

Although there were a wide range of perspectives given at the workshop, there were a number of areas of general convergence about important next steps.

## **Needed Education**

Outreach and communications will be key to future project planning and actions related to Mission Creekto build support from government, communities, and funding sources. One opportunity would be to provide information in tax notices or utility bills to owners of creek-side properties, about hazards of earthworks, intense irrigation, cattle access to riparian areas and other activities that could increase the risk of slope failures. The **Mission Creek Restoration Initiative** is developing communications tools for reaching out to landowners to explore opportunities for securing land according to established priorities.

Education and awareness are important aspects of the city's Water Security Plan effort. It may be possible to leverage opportunities and expectations of Mission Creek as a recreation amenity for residents and visitors.



## Needed Governance

We need to elevate intra- and intergovernmental discussions at the political level that are focused on the long term, to ensure that government plans are consistent with the data and science. We need to examine what role the City of Kelowna can play with respect to Mission Creek. Taking responsibility for and having local ownership of the dikes and operations of the creek may increase our ability to drive effective, purposeful, and outcome-based decisions. If history is any indication, Mission Creek issues need local leadership that won't occur from provincial or federal governments.

There was some interest at the workshop to develop a group of interested parties to provide ongoing consultation about the creek. Property owners along the creek are impacted the most, but until this meeting, had no voice. John Wagner proposed that we have a stewardship society or council for Mission Creek, to meet regularly and work on issues. In doing so, Mission Creek could be a model for the rest of the Okanagan Basin and other creeks in B.C.

### **Needed Studies**

**Hydrology**: There was general agreement that we need a clearer hydrological picture of who is releasing and withdrawing, and when and where. Although, in mid-summer, 50% of total flows pass by the BMID intake, much less is getting to the mouth of the creek. Where is that water going? Is it being extracted, or is it moving into groundwater?

We need an accounting of what BMID, City of Kelowna, and the Mission Creek Water User groups are withdrawing from the creek's flow, as well as any other significant users. We also need to consider nearby groundwater use in this accounting and determine how pumping is impacting the creek. Rutland Water Works has nine wells along Mission Creek. The daily fluctuations in temperature, along with water conductivity readings indicate that the water in the wells is closer to creek water than ground water. There are data from nearby observation wells which can further inform this study. These hydrological studies would support the development of an updated Mission Creek Water Use Plan.

We should also be studying the affects of logging and wildfire on the hydrology of Mission Creek. Are they accelerating runoff? Are they contributing to drought and/or flooding? How can we better use land cover data to improve our hydrology models?

#### Dike Setbacks and Watershed Function:

Over the past 150 years, to free up land for development, we have altered the watershed, and the path and function of Mission Creek. In its current condition, it is not stable, and cannot provide the same ecosystem services that it naturally provided in the past. How quickly can we correct these alterations so that the creek can function again? We should have a monitoring program to assess the health of aquatic species in the creek.

We need to evaluate the benefits of dike setbacks, and other forms of engineered flood storage, for floodplain and habitats, as well as their ability to reduce flood risk to agriculture and residential areas. If the status quo is maintained, how much damage is expected for these land uses? What are the best locations for storing flood water, and how much flooding could they reduce? Is it possible to put flood gates in the dikes to dissipate peak flows and open more areas for flood storage in emergencies, for example, temporarily holding water on fields or golf courses? What would be the relative cost of buying or leasing property along the channel to retire it from development, versus repeated disaster recovery for frequently flooded properties?

Slope Stability: Where are the unstable slopes along the Mission Creek waterway? What are the impacts of logging and wildfire on slope stability? Climate change has serious implications for worsening stability on our steeper slopes adjacent to Mission Creek. Examples of this are the slides on Highway 97 near Summerland, or the 1984 slide along Mission Creek, east of Eight Mile Ranch. We need to look at slope stability, especially in areas of steep terrain for slide hazards. An updated geotechnical assessment of the south slopes of the lower Mission Creek canyon should be completed as soon as possible, and existing recent reports should be released to the public. A land slide or debris flow has the potential to be catastrophic, and there are extreme safety concerns.

## **Needed Plans**

For all areas of planning, we need to think long-term and intergenerationally.

Upland water storage: There is 100,000 ML of water flowing down Mission Creek during May-July in an average year that is not being stored. It would be valuable to have a long-term plan for greater water storage to support all midsummer withdrawals by those licensees without storage licenses. Plans should facilitate upstream storage reservoirs without increasing dam consequences if such a thing is possible.

We should also examine opportunities where Indigenous knowledge holders have recommended instead to expand wetlands in the upper watershed as an alternative way to retain water for slow release throughout the year. Large areas could be flooded to a shallow depth without as much downstream risk from dam failure. Is it possible to detain freshet water on Mission Creek watershed landscape by ponding, soak-away zones, or other off-channel storage? Should we provide incentives for farms to fill ponds with peak freshet flows for later use? Can we install stormwater treatment ponds in urban areas, and beaver dams (or analogs) in small tributaries? The plan should evaluate all possibilities.

Land securement: The Mission Creek Restoration Initiative is currently working on a Land Securement Strategy aimed at identifying property-specific restoration potential/benefits, design options and associated land requirements. This securement strategy would help determine the cost of dike setbacks.

Water Use Plan update: The Mission Creek Water Use plan was co-developed in 2010 by BMID, SEKID (now City of Kelowna), and B.C. Ministry of Environment, as an operations plan to use in case of drought, when natural flows are much lower than normal. The plan is intended to form a voluntary agreement for reducing water withdrawals during shortages, to forestall abrupt, unplanned reductions in service. Since that time, there is better measurement of creek flow and temperature in the system, along with improvements in modeling and prediction. These tools can be used to inform an updated plan, considering future withdrawals, and future risks to other users, including fish. There is also a growing recognition of the potential cumulative influence of other water withdrawals-including those accessing groundwater, from production wells near the creek. The plan should be updated, using more recent information and include more partners.

Water Security Plan: The City of Kelowna should continue with the development and approval of Kelowna's Water Security Plan and determine how some specifics, such as Mission Creek, are included. The city is also looking at creating a stormwater utility to fund stormwater management, which should hopefully improve funding reliability for work related to managing storm and surface waters, and water quality (consistent with the Water Security Plan).

<u>Water Quality</u>: The creek water quality must remain high. Non-point and pointsource pollution should be managed and prevented through effective stewardship and policy. This water ends up in Okanagan Lake, the City of Kelowna's primary water supply.



#### **Needed Actions**

It has been hard to get things accomplished on Mission Creek because of the difficulty with funding, and because there are so many different jurisdictions, including the Agricultural Land Reserve. Yet no one entity takes full responsibility. The following recommended actions are suggestions arising from the workshop, and are not necessarily consensus opinions, or the views of the organizers.

Emergency Preparedness: The region has come a long way in the development of an Emergency Operations Centre to engage resources during flooding and fire events. There is still a need for improved recovery planning beyond infrastructure replacement. We do not appear to have learned how to apply adaptations, and we are at risk of seeing a repeat of many past situations, such as bridges being damaged or destroyed (KLO Mission Creek), or bank failures (below East Kelowna Bridge) which flooded the present-day Costco area. The city is planning to install a new KLO bridge. Additional major investment dollars are required to be put into maintenance and upgrades of the creek, including gravel extraction where necessary.

Syilx Management Practices: As we speak of conservation and management of land in the Okanagan, it should be heavily informed by ideas and practices of Indigenous and specifically Syilx led management practices. It would be good to understand what Indigenous communities hope for Mission Creek. Syilx led management and solutions are prioritized for the Mission Creek waterway. It is vital to have a Syilxlens of engagement so we all can learn how to build a better relationship with the Mission Creek waterway.

#### **Become Environmental Flow Stewards:**

The community should ensure that any future restoration of the creek should accommodate the salmon and their habitat, and ensure adequate water is available during critical periods. Increase Storage: Investigate the options for additional upland storage to support existing water use and future need. Investigate where smaller reservoirs may offer environmental flow support during drought periods, allowing the main irrigation/domestic reservoirs to fulfill their customer obligations. Consider reviewing older, decommissioned works for potential renewal. Existing facilities should also be reviewed to determine if their capacity can be increased, and if operational changes can help them operate more efficiently.



Enhance Riparian Areas: How can we secure greater riparian setbacks along the creek and its tributaries? We could increase the park boundaries in lower Mission Creek. Expanding the riparian corridor will help to achieve flood management, fish and wildlife habitat protection and enhancement. There are excellent opportunities for restoring ecosystem values along the creek, and this will further contribute to increased recreational fishing in Okanagan Lake. As part of this project, we should reinforce vulnerable riparian slopes with bio-engineering: branch-packing, live-staking, pole planting, brush layering, wattle fences, willow weaving, toe boulders etc. We should also increase the shrub layer and overall width of the riparian zones. Trees such as cottonwood along creek provide good understorey habitat for fish. One approach would be to discourage hard infrastructure within 30-50 metres of the creek. Building relationships with the Agricultural Land Commission, to allow for riparian restoration on agricultural land, would recognize the importance of functional ecosystems to support agricultural activity.

Dike Setbacks: The recently released Lower Mission Creek Habitat Conservation and Restoration Plan identifies floodplain expansion through dike setback as the most important restoration strategy for achieving these outcomes and is consistent with recommendations from recent flood risk assessment and mitigation studies (e.g. Northwest Hydraulic Consultants, 2020. Mission Creek Flood Protection Works Study). Setting back dikes to accommodate the creek's changing hydrology, and expand stream capacity in the lower reaches, will reduce risk of flooding and reduce overall management risk and cost.

Floodplain Management: It may be helpful to allow seasonal flooding to properties adjacent to creek and trails, with closure at certain times of year. This will help maintain connectivity between main channel and floodplain. Floodplain expansion can be achieved through focused efforts toward securing land adjacent to Mission Creek. We there will be difficult conversations about managed retreat and land acquisition. The Mission Creek Restoration Master Plan addresses what could or should be done in lower Mission Creek, from the mouth of the canyon to the lake. We should expedite the implementation of this plan.