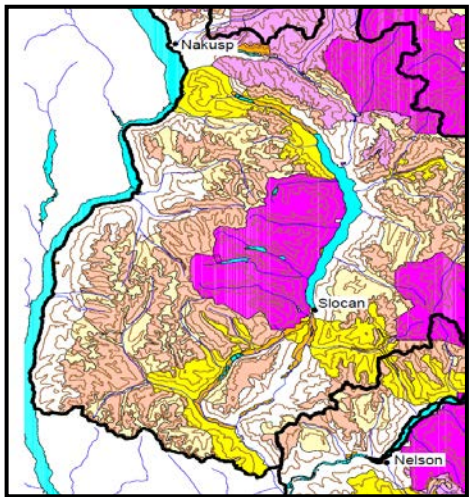
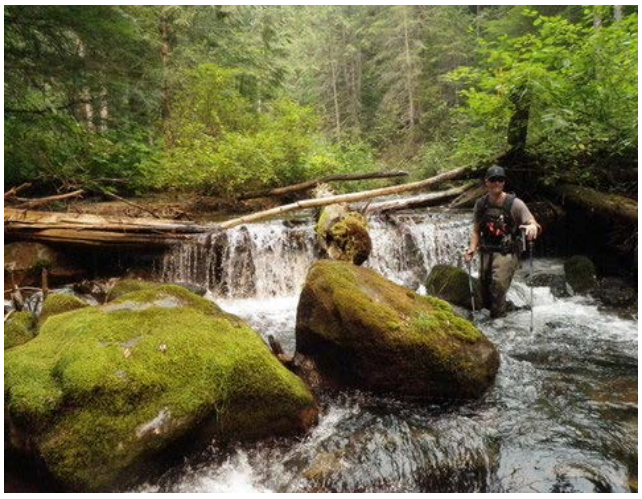
# Slocan Lake Watershed
## Priority Conservation Actions Summary Report
*Step #2 for an Ecosystem-based Conservation Action Framework for Slocan Lake*



by
Marcy Mahr, M.Sc.
March 2017

SLOCAN LAKE STEWARDSHIP SOCIETY

KCP Kootenay Conservation Program

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***Thank you!***

Village of Silverton

Village of New Denver

***LOCAL DONORS:*** Tony Kazoleas, Decker Butzner & Deborah Sword, Wendy Harlock, Ruby Truly, Evelyn Goodell & Richard Allin, Wendy King & Paul Marks

## Executive Summary

In 2015, the Slocan Lake Stewardship Society (SLSS) embarked on a process to develop an *Ecosystem-based Conservation Action Framework for Slocan Lake.* The first step towards developing this framework included a compilation of the scientific research occurring in the watershed, which was called, *Resource Analysis*: *Step #1 for an Ecosystem-based Conservation Action Framework for Slocan Lake.* As a result of this Resource Analysis, six Conservation Themes emerged, as follows:

### Conservation Themes

1. Protect Critical Habitat
2. Monitor Species at Risk
3. Enhance Connectivity
4. Prevent Invasive Species
5. Reduce Recreational Pressure
6. Advance Climate Resilience

The second step was a collaborative forum held on February 23, 2017, in Silverton, BC, and is the focus of this report. The "Slocan Lake Watershed Science & Conservation Action Forum" was co-hosted by SLSS and the Kootenay Conservation Program (KCP), a conservation partnership that supports biodiversity conservation in the Kootenay region. The Forum was built upon these components:

**Research Findings → Recommendations → Priority Actions → Action Plans & Inspired Collaborations**

The 33 participants who attended the Forum represented diverse perspectives as scientists, conservationists, local government, resource managers and planners, GIS analysts, and recreationists. Science researchers provided short presentations of their findings and recommendations that provided the starting place for discussions of conservations actions. Participants worked in small groups to review the catalogue of recommendations according to the six Conservation Themes.

The small groups narrowed down their lists of recommendations to select the top actions they thought would make the most difference in the Slocan Lake Watershed over the next 2-3 years. This process resulted in a list of the top 15 actions. Of these top actions, seven "priority actions" were selected by participants and developed into mini action plans.

## Priority Actions (not ranked)

1. Pursue Wildlife Habitat Area (WHA) designation for Bull Trout Spawning Areas
2. Identify & Conserve Remaining Old Growth Forest
3. Map Critical Habitat for Suites of Species at Risk
4. Propose Designation of the “Bonanza Biodiversity Corridor”
5. Manage & Monitor Invasive Species to Protect Sensitive Areas
6. Implement Species-specific Actions to Prevent Impacts of Invasive Species on Native Biodiversity
7. Develop an Ecosystem Climate Change Adaptation Strategy for Slocan Lake Watershed

All participants in the Slocan Lake Watershed Forum are being provided with the Forum's findings and are encouraged to pursue them as they are able. The priority actions were collectively generated and incorporated policies, objectives and activities that align with participants’ programmatic interests.

The Slocan Lake Watershed Forum has provided SLSS with strategic direction regarding priority actions. How SLSS would support and deliver on these priorities will be articulated in a Conservation Action Framework for Slocan Lake to be completed in 2017. Once ratified, SLSS will share this Framework with all of the Forum participants and more broadly with potential collaborators and local and provincial entities that have an interest in the land, water and wildlife of the Slocan Lake Watershed.

For the Kootenay Conservation Program, the Slocan Lake Watershed Forum provided a new way to be working in a local context with partners creating a “conservation neighbourhood” within which to achieve common objectives for on-the-ground conservation and stewardship activities. KCP’s Stewardship Program will remain engaged in supporting the Slocan Lake Watershed process and implementation of the priority actions. The Forum’s process and outcomes will also help guide how KCP’s Stewardship Program rolls out its new Biodiversity Conservation Action Initiative in other landscapes in the Kootenays where KCP partners want to work together to protect biodiversity.

## I. Overview[1]

Slocan Lake is a glacier-fed, undammed, relatively pristine lake in a rural area of British Columbia's Kootenay region. Much of Slocan's Lake foreshore and many of its wetlands are still intact. The Slocan Lake Stewardship Society (SLSS) is dedicated to protecting the beauty, health and wonder of the Slocan Lake ecosystem (Figure 1) for future generations. SLSS formed 11 years ago during the development of an official community plan for Area H North, when the top community values were identified as: clean air and water, scenic beauty, and peace and quiet. At the time, the communities around Slocan Lake were concerned about its continued health in light of the significant impacts by development seen on sister lakes in the area—specifically, Christina and Kootenay lakes.

SLSS's original focus was to research and cooperatively develop guidelines to ensure protection and care of Slocan Lake under the auspices of a Lake Management Plan; to support sustainable lake use; and facilitate education about the lake, its tributaries and environs. To that end, SLSS has worked together with the Villages of New Denver, Silverton and Slocan, the Regional District of Central Kootenay and the province to conduct baseline scientific studies on water quality and foreshore habitat assessment to guide its role as stewards of Slocan Lake.

SLSS anticipated having a Lake Management Plan by 2010; when that didn't happen the goal became a plan by 2012. It is now five years later, and there is still no plan in sight. Meanwhile, continual and significant pressure for industrial, residential and recreational development threaten community values of clean water, healthy aquatic and terrestrial ecosystems, and undeveloped crown land that were identified by the 2012 'Imagine Slocan Lake Study'. During this time, SLSS Directors and members have continued to meet with local governments, land managers, conservation groups and scientists about protecting the health of the Slocan Lake Watershed.

In 2015, SLSS determined it would embark on its own process to develop an *Ecosystem-based Conservation Action Framework for Slocan Lake* that would integrate SLSS strategies with current priorities and leverage existing scientific knowledge and relationships.

[1] Excerpts from Therese DesCamp's welcome address on February 23, 2017 at the Slocan Lake Watershed Science & Conservation Action Planning Forum, Silverton, BC.

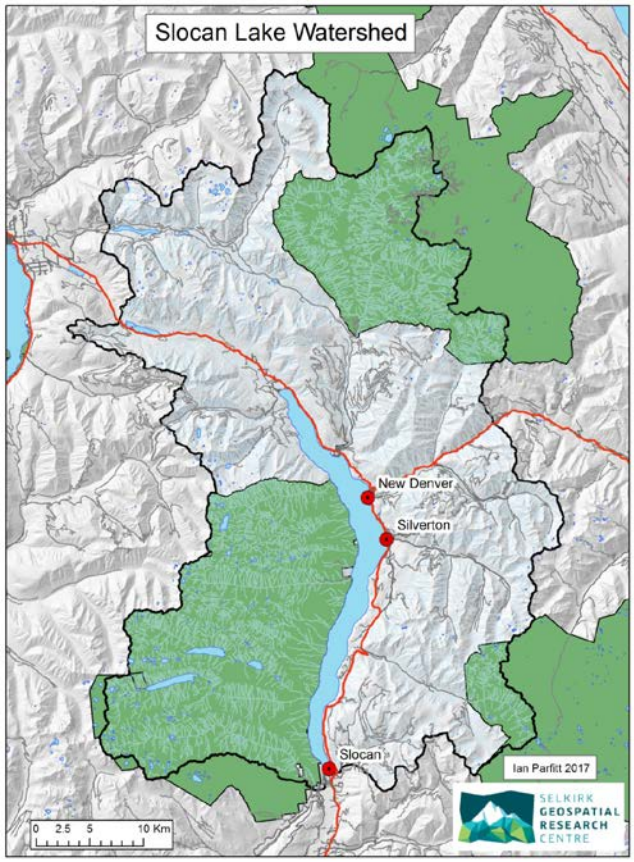


Figure 1. Map of the Slocan Lake Watershed. The black outline traces the height of land forming the hydrologic boundary of the headwaters and greater ecosystem of Slocan Lake.

## II. Priority-Setting Process

The first step towards developing a framework was taken in 2015, when SLSS sought the expert opinion of a dozen researchers working in the watershed to identify vulnerable species and critical habitat, and to point out the most pressing threats to the region's ecology. The results from these interviews were summarized in a document titled, *Resource Analysis*: *Step #1 for an Ecosystem-based Conservation Action Framework for Slocan Lake.*[2] The Resource Analysis identified six areas where strategic actions would make a significant, positive difference in keeping the Slocan Lake Watershed healthy and functioning, as follows:

[2] Mahr, M. 2015. Resource Analysis: Step #1 for an Ecosystem-based Conservation Action Framework for Slocan Lake. Prepared for the Slocan Lake Stewardship Society. 29pp.

## Conservation Themes

1. Protect Critical Habitat
2. Monitor Species at Risk
3. Enhance Connectivity
4. Prevent Invasive Species
5. Reduce Recreational Pressure
6. Advance Climate Resilience

This Resource Analysis provided the scientific foundation for a day-long workshop held on February 23, 2017, in Silverton, BC. This event, the "Slocan Lake Watershed Science & Conservation Action Planning Forum," was co-hosted by the Slocan Lake Stewardship Society and the Kootenay Conservation Program (KCP), which assisted in developing and facilitating the Forum. Given KCP's regional experience as a partnership of over 80 organizations (including SLSS) conserving native biodiversity on private lands through stewardship and securement activities, its staff brought expertise and capacity to assist SLSS in bringing together diverse interests for a strategic purpose.

> *" Today's gathering is an unusual and potentially powerful configuration of people. We are going to focus on connectivity. Our starting point is science: sharing what we know about how the ecosystems, species and habitats of this area interconnect, and exploring what we still need to learn. But we're also concerned with priorities, coordination, and collaboration—the realities of personal connectivity. Most everyone in this room works within certain mandates and organizational and political constraints. We believe that good information coupled with personal relationships can foster innovative collaborations; and that relationship is a central ingredient for any of the actions that will result from today's work together. We greatly value our collective ability to make wise choices for this ecosystem."*
>
> Therese DesCamp, SLSS Past-President
> February 23, 2017, Silverton, BC

The Slocan Lake Watershed Science & Conservation Action Planning Forum brought together researchers who had contributed to the Resource Analysis in addition to conservationists, local government, resource managers and planners, GIS analysts, and recreationists for the purpose:

***To identify priority actions that will contribute to maintaining healthy fish and wildlife populations and ecological functions in the Slocan Lake Watershed over the next 5-10 years.***

The Forum agenda was structured to address these questions:

- What is the current knowledge regarding species of concern and critical habitat in the Slocan Lake Watershed? What more do we need to know?
- Based on scientific findings, what actions will make the most difference in preventing / controlling invasive species, protecting critical habitat, enhancing connectivity, reducing recreational pressure and promoting climate change resilience?
- Where do you see opportunities in your organization's or agency's plans, policies, programs, budgets and communications for realizing these actions?
- What kind of alignment do we need to foster between scientists, non-profit organizations and local and provincial government to effectively collaborate and make a significant, positive impact while also meeting organizational mandates?

**Desired Outcomes of the Forum**

- Science-based recommendations are the foundation for setting priorities and action plans.
- Natural resource managers and representatives of local government and non-profit organizations have the information they need to broaden opportunities for collaborative approaches and actions.
- The group clearly identifies at least four conservation actions and the partnerships / teams required to achieve positive results.
- The Slocan Lake Stewardship Society and Kootenay Conservation Program have direction for how they can support priority actions in the watershed.

The Forum included scientific presentations and small group strategy sessions to identify priority actions that would likely significantly benefit fish and wildlife; protect and restore high quality habitat; and help this large lake ecosystem be more resilient to major changes such as climate change. The results, reported in the following sections, are a suite of feasible projects with mini action plans that could be completed in the next 2-3 years.

**Note: Please refer to Appendix A for Forum Participants, Appendix B for the Forum Agenda, Appendix C for a Glossary of Acronyms, and Appendix D for the Catalogue of Recommendations.*

Recommendations provided by the researchers set the foundation for selecting priority actions. Forum facilitators provided participants with a hardcopy catalogue of the researchers' recommendations from the Resource Analysis in addition to new ones offered during their presentations at the Forum. All of these recommendations were grouped under six themes to guide small group discussions.

## Themes Guiding Small Group Discussions (same as Conservation Themes)

1. Protect Critical Habitat
2. Monitor Species at Risk
3. Enhance Connectivity
4. Prevent Invasive Species
5. Reduce Recreational Pressure
6. Advance Climate Resilience

Participants worked in six small groups reviewing the catalogue of recommendations that pertained to one of the six themes (above). Each group narrowed down the list and selected the *top three actions* they thought would make the most difference over the next 2-3 years.

## III. Conservation Priorities

The results from the working groups identified 15 top conservation actions. One or two of the actions, called "priority actions", were selected to pursue further. These actions are listed in bold below and form the basis for action plans discussed in Section IV.

**Protecting critical habitat**

1. **Implement known habitat priorities for protection, maintenance and restoration, e.g., bull trout spawning**.
2. **Compile, synthesize and map species at risk and sensitive areas on one map**.
3. Improve mechanism for communication with provincial government and timber and resource industries for protecting sensitive and critical habitat.
4. Establish permanent monitoring for indicator species.

**Enhancing Landscape Connectivity**

1. **Establish the Toad-Bird-Bat-Bear wildlife corridor as "Bonanza Biodiversity Corridor." Describe and map it; gain government recognition.**
2. Identify other connectivity areas, e.g., East-West along Hwy 31A from Kaslo to Fish-Bear lakes to Slocan Lake; Goat Range Provincial Park to Beaver Lakes /Wilson Creek; mountaintop-valley bottom in Valhalla Provincial Park; between Valhalla and Goat Range Park.

**Preventing/controlling invasive species**

1. **Manage and monitor to prevent the introduction and spread of invasive species: keep up monitoring, focus on high priority species; restoration to increase native species and ecosystem resiliency; collaborate on field surveys and treatment**.
2. Improve education model so more all-encompassing, e.g., add signs to rail trails and restoration sites with Signage (remove old ones and replace with new), open houses, and impose fines to stop people from moving endangered species. Make use of the campgrounds as education hubs.
3. **Preserve and restore bat hibernacula e.g., try to prevent blasting and closing of mines; educate campers about their role as vectors for bats such as camper awnings, umbrellas, etc. that can harbour and transport bats**.

**Reducing recreational pressure**

1. Develop a recreation tenure map to understand tenures and permits for recreation. Government is moving to a permit system. Tenure map should be layered on other maps to assess whether recreation activities overlap sensitive environments.

2. Advocate for fishing regulations: need enforcement for more than bull trout, such as burbot that are often poached in the lake; involve Department of Fisheries and Oceans and other agencies responsible for fish.
3. Develop methods for assessing recreational sensitivities and "impact benchmarks" so activities that are high risk to an ecosystems can be stopped. For example, in the debate over motorized vs. non-motorized recreation there isn't a good understanding of how to assess the impact of recreation on different environments, and effective tools need to be identified – from education to closures in order to protect habitat.

**Promoting climate change resilience**

1. Increase resilience on private land by changing management. Almost all valley bottom is privately owned and lower elevations often have key habitats so there's a need for education and outreach. As the climate changes, hazards from flooding and fire will increase so need to manage risks, and to educate landowners about contributing their land to conservation through conservation planning.
2. Fire interface: Must do work to reduce fuel loads and minimize risk at forest/settlement interface fast in the next 2 to 3 years. Must educate the public. Fire control is tied to conservation planning.
3. **Initiate an Ecosystem Climate Change Adaptation Strategy for the whole area: include identifying areas for wildlife connectivity and species refugia; gap analysis and monitoring, e.g., snow and water, wetlands; compile all existing data in one place; prioritize actions; do pilot projects; develop a conservation plan with analysis of transition areas, key areas for acquisition or inclusion in protected areas; identify where restoration can provide mitigation or increase adaptation; look at trends, changes expected and how to adapt**.

## IV. Action Plans

From the 15 actions listed above that were identified during the morning session, participants were asked in the afternoon to pick which single action they could most contribute to based on opportunities that existed in their organization's or agency's plans, policies, programs, budgets and communication tools.

Five working groups developed mini action plans for seven priority actions consisting of:

1. Clear statement or recommendations
2. Activities
3. Resources
4. Partners/collaborators
5. Timeframe

The combination of small group work and networking open space—in which people could join each others' conversation and take advantage of being face-to-face—facilitated the creation of mini action plans for each of the priority actions.

**Priority Actions (not ranked)**

1. **Pursue Wildlife Habitat Area (WHA) designation for Bull Trout Spawning Areas**
2. **Identify & Conserve Remaining Old Growth Forest**
3. **Map Critical Habitat for Suites of Species at Risk**
4. **Propose Designation of the "Bonanza Biodiversity Corridor"**
5. **Manage & Monitor Invasive Species to Protect Sensitive Areas**
6. **Implement Species-specific Actions to Prevent Impacts of Invasive Species on Native Biodiversity**
7. **Develop an Ecosystem Climate Change Adaptation Strategy for Slocan Lake Watershed**

The seven actions listed above include many smaller supporting ones. Below are more detailed notes and action plans contributed from each of the working groups.

**ACTION #1: Pursue Wildlife Habitat Area designation for Bull Trout Spawning**

- Protect Bull Trout Spawning: Pursue Wildlife Habitat Area (WHA) designation for critical bull trout habitat in Silverton Creek located from fish barrier 1 km downstream of Maurier Creek mouth; and in Wilson Creek from falls downstream 1.5 km to confluence with Fitzstubbs Creek. The Slocan Lake bull trout population continues to be "At Risk" (<500 spawning adults). During recent bull trout spawning assessments over the past four years, Silverton Creek has consistently been the most utilized system ranging from 50% (2015) – 90% (2013). Wilson Creek has consistently been second in importance with a range from 10% (2013) – 42% (2015). This geographic pattern highlights the critical importance of maintaining the habitat and integrity of important systems such as Silverton and Wilson Creek to maintain Bull Trout recruitment in the watershed. Only 4 WHAs identified under Forest Practices Code; only applies to wildlife identified under Provincial Species at Risk; proponents should send information to John Krebs at FLNRO. Continue communication with Interfor about logging in Silverton Creek.

  *Potential partners/collaborators:* FLNRO, BC Timber Sales, Kalesnikoff, Interfor, FWCP, KCP, SLSS, RDCK, VWS.

**ACTION #2: Identify & Conserve Remaining Old Growth Forest**

- Update mapping for Slocan Lake Watershed; identify low-elevation habitat; protect old cedar forest = hotbeds of biodiversity.
- Obtain maps from provincial government of existing Old Growth >140 yrs in the Slocan lake Watershed. Identify specific site series; under quota for BEC systems; need evidence to propose new Old Growth Management Areas (OGMAs) to FLNRO – could perhaps establish new ones but may need to make trade-offs.

**ACTION #3: Map Critical Habitat for Suites of Species at Risk**

- Compile, synthesize and map current protected areas as well as species at risk and sensitive areas on one map to identify target areas for future habitat protection. Include red and blue listed species, ecosystems at risk, existing protected areas, designated caribou recovery areas, existing Section 16s, OGMAs, identified grizzly bear corridor, important GB foraging areas, plus others to be determined.
- Wetlands layer – Slocan Wetlands Assessment & Monitoring Project (SWAMP) (Ryan Durand), Michael Proctor.
- Site series BEC to identify certain BEC zones that are rare / under-protected – Ian Parfitt created a layer for this meeting; Deb MacKillop, FLNRO.
- New 500m ring around Summit Lake for critical toad habitat buffer area – Jakob Dulisse.
- Columbia Basin Biodiversity Atlas – science inputs.
- Identify E/W and N/S movement corridors and flyways (based on criteria) – some are listed in the Kootenay Boundary Land Use Plan.
- NCC could use this compilation to consider incorporating the Slocan Lake watershed into their South Selkirks Natural Areas Plan (currently Slocan Lake exists outside their project area).
- Consider strategic increases in protected areas to provide refugia for species as climate changes.
- Review the private land conservation layer to see if it could be useful for this area even though TNT and NCC aren't active in the north Slocan.
- Compilation of conservation information could be used by RDCK to inform their mapping of recreation lands, e.g., parks.
- Compilation could be done as a Selkirk College student project; or could train someone locally in GIS to build mapping capacity in the area.

**ACTION #4: Propose Designation of the "Bonanza Biodiversity Corridor"**

1. Develop the "Bonanza Biodiversity Corridor" Proposal for the Provincial government for formal recognition of an ecological priority area that enhances landscape connectivity and protects critical habitat from Bonanza Marsh to Summit Lake.

- Michael Proctor will make a draft map of this corridor and develop a rationale for why it is important. Define size & shape, values, threats, benefits and costs. This will be circulated for input.
- Next, generate a comprehensive map of the corridor based on multi-faceted research, monitoring and mapping. Incorporate spatially as a package SWAMP wetlands + species at risk (SAR) data + wolverine and grizzly bear movements, + Jakob Dulisse's toad data + North American Bat sampling grid.
- Develop a separate map of what's protected: old-growth forest, caribou recovery areas, parks, etc.
- Map wetland complexes with buffers; shallow wetlands are critical habitat for several species of bats.
- Use Gary Davidson's bird list. Summit Lake has the only known nesting site for Magnolia Warbler south of Trans-Canada Highway.
- Ian Parfitt offered he might be able to link mapping this corridor into the work done by a Selkirk College summer student who will be mapping trails in the area, including the rail trail from the head of Slocan Lake to Summit Lake. Selkirk has a lot of the needed layers for a map.
- Establish a Bonanza Biodiversity Corridor Committee to refer proposals.
- Assess what needs to be done to protect the corridor in terms of crown and private land ownership: Where are there conservation opportunities? Where is there urgency? What actions need government support? And what can be done outside government to partition effort?
- Collaborate with Greg Utzig and the Kootenay Resilience Project to illustrate how habitat corridors and mountain passes are key to facilitating changes in wildlife ranges with climate change.

2. Circulate "Bonanza Biodiversity Corridor" proposal to key partners for further consideration, support and opportunity for conservation management.

- Request Nature Conservancy of Canada to incorporate the Slocan Lake Watershed into their work through expanding their South Selkirks Natural Areas Planning region.
- Follow up with Ann Bunka who suggested local government representatives from the 3 villages + Rural Area H could take this corridor proposal to the provincial government for recognition.
- Bring information and proposals to RDCK staff and local government representatives because RDCK Parks staff is mapping recreation now. There is concern that RDCK acquires prime conservation lands as parks and although it has a recreational mandate it does not have a clear conservation mandate.

- Integrate FLNRO's Higher Level Plan through local government and others.
- Look at existing guidelines and make proposal to FLNRO to create Section 16 reserves (non-administered conservation lands under Land Act); need to provide FLNRO with evidence, background – may need to workshop this.
- Try to get input into Forest Stewardship Plan, e.g., if toads are referred to in Forest Stewardship Plan they will be considered.
- Mostly crown land in the Bonanza Corridor; this area has been identified in the Kootenay Boundary Land Use Plan; BC Timber Sales (BCTS) tries to be 2 years ahead with planning; they can make changes until timber goes to sale; once it is sold it's too late; BCTS lays out cutblocks but the licensee has the option to adjust them; FLNRO also needs information to incorporate into forestry plans (send Jim Guido mapped information). In discussions with BCTS and FLNRO it helps to have trade-offs in mind – if we protect this, what can be harvested?
- Send Kathy Howard mapped information because BCTS is currently road-building. Also, Contact Ken Scown, BCTS Woodlands Supervisor at BCTS and Loreen Hodgkinson, BCTS Planning Forester who are both located in Castlegar to learn more about BCTS forestry and road-building activities in the corridor. (Both Ken and Loreen were invited but were unable to attend this Slocan Lake Watershed Forum).
- Develop a field tour with BCTS, FLNRO, RDCK and local government reps, and local researchers and stewardship societies.

**ACTION #5: Manage & Monitor Invasive Species to Protect Sensitive Areas**

- Prevent the introduction and spread of invasive species: keep up monitoring, focus on high priority species; restoration to increase native species and ecosystem resiliency; collaborate on field surveys and treatment.
- Continue collaboration and coordination to strengthen partnerships among all levels of government, private landowners, NGOs, scientists, CKISS, FWCP, BC Parks, SWAMP etc.; some are already working together but need to improve collective results.
- Protect sensitive areas, e.g., Valhalla Park is relatively free of invasive species.
- Prevent spread into critical habitat: alpine, wetlands, riparian zones and places that are important for species at risk.
- Restoration and monitoring in backcountry: lodges, commercial recreation tenures, etc.; manage and enforce with BC Park's use permits and tenures to require cleaning equipment before bringing it into the backcountry (BC Parks, FLNRO, Lands Officer, Recreation Trail Societies).
- Education is crucial: of recreation guides, backcountry tenure holders, campers, anglers, hunters, mountain bikers, etc. Incorporate invasive species messaging into BC Parks' public education materials including information displays and interpretive programs where available (CKISS, BC Parks).
- Enforce regulations: RAPP line; penalties for introducing invasive species (FLNRO).

- Municipalities take more responsibility for their residents who are the illegal roadside dumpers of invasive species refuse.

*Potential partners/collaborators:* CKISS, SWAMP, BC Parks, RDCK, Villages and Municipal campgrounds, Rail Trail Society, SLSS, Slocan River Streamkeepers, Wildlife Conservation Society Canada, FLNRO, Forest Licensees, CBT.

**ACTION #6: Implement Species-specific Actions to Prevent Impacts of Invasive Species on Native Biodiversity**

**Bats**

- Preserve and restore bat hibernacula
  - Land securement to protect habitat – sites from Salmo to Nelway may be 'low-hanging fruit' but New Denver area has a lot of old mines that have yet to be investigated (Wayne McCrory to assist with this effort next fall/winter).
  - Work with Ministry of Energy & Mines to prevent blasting and closing of mines; propose use of gates that are bat-friendly and promote human safety; monitor for 2 years.
- Detect & Monitor Introduction of White Nose Syndrome
  - Monitor for "invasive bats" infected with white-nose syndrome in next few years; coming from Vancouver or Vancouver Island and natural expansion north from US or westward across Canada – expect to start seeing infected bats showing up in next few years.
  - Educate campers about their role as vectors for bats such as camper awnings, umbrellas, etc. that can harbour and transport bats; signage at BC Parks and Municipal campgrounds; add information about bats and white nose syndrome to CKISS website.

*Potential partners/collaborators:* Wildlife Conservation Society Canada, CKISS, BC Parks, Municipal campgrounds, KCP, Ministry of Energy & Mines, Rail Trail Society, SLSS.

**Pike**

- Map spawning habitat
- Develop 1-page educational resource
- Create an angler pike rewards program – speak to Matt Neufeld, Provincial fisheries biologist.

**Bull Frogs**

- CKISS to continue acoustic monitoring – check with Cori Lausen for opportunity to collaborate on monitoring with Leigh-Anne Isaac, Kootenay Community Bat Program Coordinator.

Challenges for Delivering Invasive Species Actions:

- funding, especially consistent core funding.
- private land owner participation: private land adjacent to areas managed for invasives can foil control efforts.
- access: manage forest service roads, mountain bike trails, etc. to prevent spread of invasives.
- government: sometimes difficult to get various levels of government to participate.
- limited boat inspection stations, especially for zebra and quagga mussels.
- curbing intentional actions such as illegal dumping, bucket brigading, dumping pets and aquarium plants, knotweed etc. that introduce and transport invasives.

*Potential partners/collaborators:* BC Parks through permits, signs, education; FLNRO through Recreation Sites and Trails program, Fish & Wildlife branch, and Forestry; MOE especially for zebra and quagga mussels; Ministry of Energy and Mines; Ministry of Transportation and Infrastructure; commercial vehicle scale operators and boat inspections; commercial and recreation tenure holders; Conservation Officers and other permitting and enforcement officers such as Natural Resource Officers, Land Officers; CKISS; SLSS; SWAMP; Wildlife Conservation Society Canada; consultants and researchers who are in the field and could alert others to invasives; Sufferfest; North Slocan Trail Society; Rail Trail Society; local government.

**ACTION #7: Develop an Ecosystem Climate Change Adaptation Strategy for Slocan Lake Watershed**

1. Phase I Scoping Study
    - Slocan Integral Forestry Cooperative (SIFCO) will take the lead on identifying elements of a scoping study including SWOT analysis of constraints – referred to as Ecosystem Climate Change Adaptation Strategy (ECCAS). Scoping study would encompass: existing examples; available information and studies; gaps; outcome options and conservation plan; Slocan Lake watershed specifics; constraints / barriers and opportunities; identify linkages; funding opportunities.
    - Include identifying areas for wildlife connectivity and species refugia; gap analysis and monitoring, e.g., snow and water, wetlands; compile all existing data in one place; prioritize actions; do pilot projects; develop a conservation plan with analysis of transition areas, key areas for acquisition or inclusion in protected areas; identify where restoration can provide mitigation or increase adaptation; look at trends, changes expected and how to adapt.

    Timing: 2 months. Resources: SIFCO will put $10,000 towards this scoping study (i.e., initial phase).

2. Phase II: Vulnerability Assessment
    a. Builds from Scoping Study and identifies key values to focus on; map locations; summarizes climate changes; assess exposure; assess value vulnerabilities / adaptive capacity – use kootenayresilience.org information; develop adaptive strategies; identify constraints and opportunities – what can be done to overcome these; develop a monitoring plan. Vulnerability assessment would evaluate adaptive capacity – use West Kootenay Climate Vulnerability and Resilience Project for information.

    Timing: 6–12 months. Resources: to be determined.

3. Parallel / complementary actions: at the same time as these studies are carried out:
    a. Identify common ground among various stakeholders including Villages.
    b. Work with SLSS to continue to lay groundwork for implementation of the Ecosystem-based Climate Change Adaptation Strategy.
    c. SIFCO to continue community wildfire protection plans.
    d. SIFCO to continue landowner education program.
    e. Collaborate with others at this Slocan Lake Forum to include climate change as a context within future conservation occurs; keep partners up to date on the progress of the Ecosystem-based Climate Change Adaptation Strategy.

*Potential partners/collaborators:* Local scientists, MOE, FLNRO, CBT, SIFCO, RDCK, Villages, SLSS, CKISS, KCP, SRS, Resource Industry, Sustainable Ag Community, School Districts 8 & 10.

## V. Conclusions

In the Forum, scientific results led to recommendations that provided the foundation for setting conservation priorities. Seven of these priorities were developed into action plans that inspired new approaches and partnerships. The Forum's process successfully linked components of,

**Research Findings → Recommendations → Priority Actions → Action Plans & Inspired Collaborations**

in order to propose positive solutions and activities for addressing critical habitat, species at risk, landscape connectivity, invasive species, recreational pressure and climate change in the Slocan Lake Watershed.

According to participant evaluations, 70% rated the Forum "very helpful" to "super helpful". Participants acquired new information, discovered new collaborators, and saw their role in the watershed within a bigger context. The amount of learning and relationship-building was underscored by many comments, such as:

*"It is an eye opener to listen to the short science presentations and realize the amount of data from the Slocan watershed. It is a great start!"*

*"Seeing all of the diverse work done in the valley was fabulous. It was valuable to have connections to the big picture and will be critical in local government taking the message forward."*

*"There was a good spectrum of participants with local, regional and provincial government and scientists. The significance of the Bonanza Corridor was new to me."*

*"I am impressed with how much work is being done and appreciated the range of ideas from participants."*

*"Far more is going on in the region than I realized! Good to see and hear about all of this valuable work. This simple act of bringing together so many people from varied backgrounds and interests really contributed to the exchange of ideas on how to move forward."*

*"It was new to me that some of the highest value areas like Bonanza Creek Corridor have little or no formal protection. The opportunity to network was the best part."*

*"Amazing to see so many people from so many angles and perspectives in one room together."*

*"A highlight was learning about our area in a different way. We don't usually think about how our area is all connected."*

*"All disciplines being together drove home the need to integrate across disciplines when seeking solutions."*

These comments speak to the value of the Forum for sharing the extent of research and conservation activities being done in this watershed. The opportunity for participants to work face-to-face underscored the importance of scientists and conservationists communicating with decision makers so their information can be useful and available within communication windows that will support local government and resource managers in making informed decisions.

## VI. Next Steps

All participants in the Slocan Lake Watershed Forum are being provided with the Forum's findings and are encouraged to pursue them as they are able. The priority actions were collectively generated and incorporated policies, objectives and activities that align with participants' programmatic interests.

The Slocan Lake Watershed Forum has provided SLSS with strategic direction regarding priority actions. How SLSS would support and deliver on these priorities will be articulated in a Conservation Action Framework for Slocan Lake to be completed in 2017. Once ratified, the SLSS will share this Framework with all of the Forum participants and more broadly with potential collaborators and local and provincial entities that have an interest in the land, water and wildlife of the Slocan Lake Watershed.

For the Kootenay Conservation Program, the Slocan Lake Watershed Forum provided a new way to be working in a local context with partners creating a "conservation neighbourhood" within which to achieve common objectives for on-the-ground conservation and stewardship activities. KCP's Stewardship Program will remain engaged in supporting the Slocan Lake Watershed process and implementation of the priority actions. The Forum's process and outcomes will also help guide how KCP's Stewardship Program rolls out its new Biodiversity Conservation Action Initiative in other landscapes in the Kootenays where KCP partners want to work together to protect biodiversity. Given that several of KCP's partners participated in this Slocan Lake Watershed Forum, our hope is they will help transfer this collaborative priority-setting process to other areas.

**APPENDIX A**

## Slocan Lake Watershed Forum Participants

**Research Scientists**

| | |
|---|---|
| Jeremy Baxter | Research Biologist, Mountain Water Research |
| Martin Carver | Research Ecologist, Aqua Environmental Associates |
| Gary Davidson | Independent Ornithologist |
| Jakob Dulisse | Research Biologist, Jakob Dulisse Consulting |
| Ryan Durand | Research Ecologist, Durand Ecological Ltd. |
| Doris Hausleitner | Research Biologist; Professor, Selkirk College |
| Cori Lausen | Research Biologist, Bat Specialist, Wildlife Conservation Society |
| Crystal Lawrence | Aquatic Biologist, Amec Foster Wheeler Environment & Infrastructure |
| Wayne McCrory | Research Biologist, McCrory Wildlife Services; Executive Director, Valhalla Wilderness Society |
| Darcie Quamme | Research Ecologist, Integrated Ecological Research |
| Michael Proctor | Research Biologist, Trans Border Grizzly Bear Project & Birchdale Ecological |
| Greg Utzig | Research Ecologist, Kutenai Nature Investigations Ltd. |
| Jennifer Vogel | Plant Ecologist; Executive Director, Central Kootenay Invasive Species Society |

**Resource Managers, Planners, GIS Analysts, Recreation Stakeholders**

| | |
|---|---|
| Richard Allin | Co-Chair, Rosebery-Summit Lake Rail Trail Steering Committee |
| Jim Guido | Resource Manager, Selkirk Resource District, FLNRO |
| Kathy Howard | Planning Officer, BC Timber Sales - Kootenay Business Area |
| Wendy King | Rosebery Parklands & Trails Commissioner (Galena Trail) and Rosebery Parklands Development Society Director |
| Crystal Klym | Columbia Region Manager, Fish & Wildlife Compensation Program-Columbia Basin |
| John Krebs | Director, Resource Management-Kootenay Cranbrook, FLNRO |
| Adrian Leslie | South Selkirk Project Manager of BC, Nature Conservancy of Canada |
| Stephan Martineau | Manager, Slocan Integral Forestry Cooperative |
| Ian Parfitt | Coordinator, Selkirk Geospatial Research Centre, Selkirk College |
| Chris Price | Arrow Area Supervisor, Kootenay Okanagan Region, BC Parks |

**Regional District of Central Kootenay**

| | |
|---|---|
| Meeri Durand | Planning Manager, RDCK |
| Walter Popoff | Area H Director, RDCK |

**Local Village Government**

| | |
|---|---|
| Ann Bunka | Mayor, Village of New Denver |
| Henning von Krogh | Councillor, Village of New Denver |
| Madeleine Perriere | Councillor, Village of Slocan |
| Jean Patterson | Councillor, Village of Slocan |

**SLSS Board Directors & Advisors**

| | |
|---|---|
| Therese Descamp | Past President, Slocan Lake Stewardship Society |
| Margaret Hartley | Science Advisor, Slocan Lake Stewardship Society |
| Richard Johnson | Science Advisor, Slocan Lake Stewardship Society |
| George Meier | President, Slocan Lake Stewardship Society |

**Facilitators**

| | |
|---|---|
| Juliet Craig | Manager, Kootenay Conservation Program |
| Marcy Mahr | Stewardship Coordinator, Kootenay Conservation Program;<br>Science Consultant, Slocan Lake Stewardship Society |

**APPENDIX B**

# Slocan Lake Watershed
## *Science & Conservation Action Planning Forum*

Thursday, February 23, 2017
8:30 am – 4:00 pm PT
Silverton Memorial Hall
Highway 6 in downtown Silverton

**Purpose:** to identify priority actions that will contribute to maintaining healthy fish and wildlife populations and ecological functions in the Slocan Lake Watershed over the next 5-10 years.

**Guiding questions:**

- What is the current knowledge regarding species of concern and critical habitat in the Slocan Lake Watershed? What more do we need to know?
- Based on scientific findings, what actions will make the most difference in preventing / controlling invasive species, protecting critical habitat, enhancing connectivity, reducing recreational pressure and promoting climate change resilience?
- Where do you see opportunities in your organization's or agency's plans, policies, programs, budgets and communications for realizing these actions?
- What kind of alignment do we need to foster between scientists, non-profit organizations and local and provincial government to effectively collaborate and make a significant, positive impact while also meeting organizational mandates?

**Desired outcomes:**

- Science-based recommendations are the foundation for setting priorities and action plans.
- Natural resource managers and representatives of local government and non-profit organizations have the information they need to broaden opportunities for collaborative approaches and actions.
- The group clearly identifies at least four conservation actions and the partnerships / teams required to achieve positive results.
- The Slocan Lake Stewardship Society and Kootenay Conservation Program have direction for how they can support priority actions in the watershed.

## MORNING

8:00 Display Set-up, Registration & Refreshments

8:30 Welcome - Marcy Mahr, Forum Facilitator and KCP Stewardship Coordinator; Juliet Craig, KCP Program Manager; Therese DesCamp, SLSS Past President.

8:50 Agenda Review

8:55 Round Table of Introductions: 2 minutes each

- Name, title / position, organization, and brief description of your connection to the Slocan Lake Watershed.

9:55 Highlights from the Resource Analysis of the Slocan Lake Watershed

10:00 Scientists' speed presentations – 3 minute "espresso shots" of what we found, what it means and recommendations for what we need to do.

10:45 Bio break

11:00 Action Identification – Small Groups with Table Hosts

Based on scientific findings, what actions will make the most difference in preventing / controlling invasive species, protecting critical habitat, enhancing connectivity, reducing recreational pressure and promoting climate change resilience?

12:00 Report out - Top 3 actions we could start working on in the next 2-3 years

12:30 LUNCH

1:15 Guided walk to Slocan Lake with Richard Johnson. (Optional).

## AFTERNOON

1:30 Action Opportunities – Small Groups with Table Hosts

Based on the priority actions identified, where do you see opportunities in your organization's and agency's plans, policies, programs, budgets and communications for realizing these actions?

2:20 Bio break

2:30 Action Planning & Networking – Further Advancing Actions

Networking open space with the goal of developing mini action plans for each of the priority actions.

Action planning components: Activities, Resources, Who's Involved, Timeframe

What other conversations do you need to have in order to move forward on the identified priority actions? Would you like to invite someone to your table and take advantage of being face-to-face? Do you see another action that you would like to contribute to?

3:15 What's Next? Round Table Check-in

3:45 Evaluation

3:55 Closing Remarks

4:00 Departure

**APPENDIX C**

## Definitions of Acronyms

| | |
|---|---|
| BCTS | BC Timber Sales |
| BEC | Biogeoclimatic Ecosystem Classification |
| CBT | Columbia Basin Trust |
| CKISS | Central Kootenay Invasive Species Society |
| DFO | Department of Fisheries and Oceans |
| ECCAS | Ecosystem Climate Change Adaption Strategy |
| FLNRO | Ministry of Forests, Lands and Natural Resource Operations |
| FSP | Forest Stewardship Plan |
| FWCP | Fish and Wildlife Compensation Program – Columbia Region |
| KCP | Kootenay Conservation Program |
| MOE | Ministry of Environment |
| NABat | North American Bat Monitoring Program |
| NCC | Nature Conservancy of Canada |
| OGMA | Old Growth Management Area |
| RAPP | Report All Poachers and Polluters |
| RDCK | Regional District of Central Kootenay |
| SAR | Species at Risk |
| SIFCO | Slocan Integral Forestry Cooperative |
| SLSS | Slocan Lake Stewardship Society |
| SRS | Slocan River Stream Keepers Society |
| SWAMP | Slocan Wetlands Assessment and Monitoring Project |
| SWOT | Strengths, Weaknesses, Opportunities, Threats |
| TNTBC | The Nature Trust of BC |
| VWS | Valhalla Wilderness Society |
| WHA | Wildlife Habitat Area |

**APPENDIX D**

## Catalogue of Recommendations

### Theme #1: Protect Existing Habitat

- **Maintain large areas of habitat** such as in the Wilson Creek drainage where there is caribou habitat – might still have 90 or less caribou moving through this area. Continue to defend caribou habitat for protecting watersheds and other species.
- **Advocate for wetlands protection** at the provincial level; educate landowners with waterfront and wetlands on the local level. Protect all sizes of wetlands to allow for amphibian migration and for refuge if bullfrogs get established and take over the main water bodies. Work towards recognition of the importance of the Slocan Valley wetlands at a regional, provincial and federal level. Advocate for key findings from the Fish & Wildlife Compensation Program's 'Impacts of Dams' study in order to protect wetlands.
- **Identify and permanently protect productive lowland habitat** such as foreshore, wetlands and riparian areas to reduce development nibbling away at natural habitat in the valleys, for example, protect Section 16 Reserve Lands around lakes.
- **Identify wetlands in reference condition** (least impacted) to provide a baseline for restoration using a scientifically validated technique. Document causative stresses affecting the biotic condition of Slocan Valley wetlands including wetland waters potentially affected by invasive species, mining, agriculture and development. **Track wetland restoration recovery** using quantitative indicators of wetland stress & biological health as indicators.
- **Further develop a prioritized list of wetland and riparian habitat actions** for the Slocan Valley and North Kootenay Lake based on Environment Canada CABIN methods for invertebrates & water/sediment. Continue to add to a database of wetlands prioritized with standard scientific criterion for restoration/conservation.
- **Work towards increasing knowledge and promotion of land stewardship** by private landowners on the location and importance of their wetlands in the Slocan Valley. Strengthen the wetland restoration at the Crooked Horn Farm and other potential restoration sites by extending the environmental benefits to private property.
- **Increase partnerships and coordinated leveraging** between agencies, non-profits & private landowners with regards to sensitive wetland habitats, restoration opportunities and water resources.
- **Protect old growth forest.** Obtain maps from provincial government of existing Old Growth >140 yrs in the Slocan lake Watershed. Identify specific site series.

- Conduct a more **extensive inventory of mines used by bats as hibernacula** to protect open mines for bats to access some of the best hibernacula in the Slocan Lake area. Stop mine closures, or use bat-friendly gates for closures.
- **Preserve and restore quality spawning habitat** for bull trout and other fish species in the Slocan Lake tributaries. With emphasis on Silverton Creek which currently provides 70% of the annual escapement.
- **Do not make any changes to the fish habitat** in Bonanza Creek at this time as the population of spawning Kokanee was similar to 1999.
- **Identify potential restoration projects** to restore or improve the capacity of existing Kokanee spawning habitat.
- **Compile GIS information to create a compendium of datalayers for the Slocan Lake Watershed.** For example, species at risk data from Conservation Data Centre and local and government field research; blue- and red-listed site series; old forests (140+-250+ age class); sensitive fish habitat and distribution; wetlands, etc.
- **Conduct a gap analysis of species + habitat information to assess what's going on in the matrix between large protected areas.** This requires developing a protected areas layer that includes large and small protected areas and reserves such as provincial parks, wildlife management areas, section 16 reserves. Also, create a GIS layer with management restrictions such as FPC buffers for wetlands, old-growth management areas (OBMAs), GAR UWR (mountain caribou winter range reserves), ecological reserves, RARs and others.
- From this **do a science-based biodiversity sufficiency analysis** to develop what additional protection measures and management are needed for an action plan to protect biodiversity and address the threats and impacts occurring in the watershed such as forestry practices, backcountry commercial recreation developments, invasive species, and climate change.
- Identify "at risk" habitats in Slocan Watershed and map
- Map and track reserves (e.g. small and large streams, wetlands)
- "Wildlife Habitat Features pilot project" – 22 values and spatializing them. Provides a system to catch stand-level items. Lead is Mike Knapik.
- More inventory and monitoring of ecosystems (systematic surveys) – bird inventories and monitoring.
- Identify indicator species – what are the best indicator species and what do they tell us?
- Link inventory, monitoring and habitat protection
- Work proactively before declines.

## Theme #2: Monitor and Restore Populations of Species at Risk

- **For bats:** Prepare for white-nose syndrome by establishing good bat populations before white-nose hits by enhancing summer habitat for bats to maximize their fitness. The West might have the opportunity to mitigate its devastating impacts.
- Track trends in bat species diversity (capture, genetics, acoustics) and relative abundance (acoustics, roost counts).
- Encourage and educate citizens to 'live with bats'; restore, create or maintain habitat; report and help monitor bat roosts
- **For bears:** reduce mortality. Consider a 50% cost share electric fencing program; Start to gently engage COS to apply non-lethal management to appropriate potential problem bears (non-aggressive, non-destructive, first offender females); Hands-on bear safety, electric fencing, and bear spray workshops; Need to go beyond education into proactive, interactive, helping solutions; wildlife attractant securement)
- **For fish:** Promote long-term research and monitoring of Slocan Lake's indicator fish species such as, bull trout, kokanee, rainbow trout, burbot, westslope cutthroat: What's their abundance? What's their distribution, and where do they spawn throughout the system? Fish are good indicators of the health of watersheds and water systems. Include the tributaries to Slocan River.
- Monitor the Kokanee spawning populations in Bonanza, and other tributaries to Slocan Lake such as Wilson, Carpenter and Silverton, during other years when water levels may be different than what was observed in 2015. Conducting a comprehensive assessment of Kokanee spawning in all tributaries can be used to provide an estimate of the overall Kokanee population in Slocan Lake. Enhance Kokanee, the primary food source for bull trout.
- Identify potential restoration projects to restore or improve the capacity of existing fish habitat – for example, restoring tributary streams used for spawning that have been impacted by road building, historical forest practices and channelization.
- **For birds:** Undertake structured baseline bird surveys to enable continued monitoring over time. This will be very important as the rail trail is developed and use increases.
- **For wolverines:** Establish compulsory reporting; Restrict trapping in some sub-populations; Eliminate trapping in some sub-populations. Currently no harvest limit on trapping wolverine. Given low population numbers, high frequency of females trapped and sub-population structure becoming apparent
- Determine impacts of land management practices and recreation on distribution of wolverines.

## Theme #3: Enhance Connectivity & Corridors

- **Protect Bonanza Marsh and the east and west ends of Summit** Lake because these low elevation wetlands have high ecological values, and are key places for both terrestrial and hydrologic connectivity in the Slocan Lake Watershed.
- For grizzly bears, within the Slocan Lake watershed, the only place that might use some long-term thinking about connectivity would be the identified linkage habitat **along Hwy 6 northwest of Slocan Lake in the section east of Summit Lake for about 7 km**. In this area, strategic land purchases or conservation easements in identified linkage area if relevant
- Collect more information to **identify stopover habitat for migratory bird species** using the upper Slocan Valley.
- **Determine connectivity corridors** through radio-telemetry between Valhalla Mountains and Central Selkirk Mountains and central Purcell Mountains (Central Purcell population may be a critical link to the more genetically uniform central Selkirk Mountains). Obtain movement data of large mammals around water bodies, throughout the Slocan Lake Ecosystem, and into adjacent landscapes of Kootenay and Arrow lakes.
- **Land use planning by regional district and municipalities** to minimize development in identified linkage areas (not necessarily zero development, but appropriate and minimized)
- **Protect existing connectivity corridors.**
- **Create new corridors (tunnels).**

## Theme #4: Prevent Invasive Species

- **Continue sampling programs** for high priority aquatic and terrestrial invasive species. For example, zebra and quagga mussels in Slocan Lake.
- **Continue education and outreach** to keep high priority invasive species out of Slocan Lake through education and behaviour change messaging, including PlantWise, Clean, Drain, Dry, and PlayCleanGo.
- **Manage high priority species** as per the CKISS priority lists. E.g. Control giant hogweed and other high priority invasive species that are already present from spreading. Participate in the CKISS Land Managers Annual meeting to update this list annually.
- Protect the entire Slocan system from **northern pike** and other invasive species.
- Anticipate **bullfrogs**, be ready!
- **Help protect bat hibernacula** from being infected with the fungus causing deadly white-nose syndrome. E.g. Support campaign to reduce the risk of accidentally transporting a WNS-infected bat to the Kootenays (e.g., campers).

## Theme #5: Reduce Recreational Pressure

- Advocate for **changes to fishing regulations** to reduce the allowable bull trout harvest by anglers in Slocan Lake and increase enforcement to limit poaching.
- **Control the use of motorized traffic** on the rail trail by limiting speed limits. Advocate for trail closures prohibiting motorized use of the Summit Lake section of the Rail Trail in spring for grizzly bears and especially where spotted sandpiper and killdeer nest in bare gravels adjacent to the trail. Encourage temporary trail closures for all users during August toadlet migrations.
- **Map habitat** that might be impacted by winter mechanized and non-mechanized outdoor recreation.
- For bears, consider efforts to **minimize motorized access** in heavily roaded areas around important huckleberry patches used by grizzly bears. The region has a good dose of protected areas.
- **Reduce winter recreational use** in high elevation areas with wolverine and caribou.

## Theme #6: Advance Climate Resilience through Mitigation & Adaption

- **Stop emitting greenhouse gases** (carbon) since mitigation is far more effective than adaptation.
- **Implement a regional conservation plan** that facilitate the shifts necessary for resilient ecosystems that can adapt to climate change and creates/maintains connectivity that allows for range changes by individual species. Immediately start planning for climate change for the land base, water resources and communities in the Slocan Lake region.
- **Address wildfire fuel loads** particularly near communities and to reduce the likelihood of landscape-scale fires. Decrease vulnerability to fire risk by reducing fuel loads to significantly increase the size of interface areas. Treat low elevation and mid-elevation areas on south aspects areas to reduce fire risk and promote ecosystem restoration/adaptation. At lower elevations maintain fire resistant trees species of dry forest types such as ponderosa pine, Douglas fir and western larch and reduce fuels around them so they are more likely to survive intense fire.
- **Adjust forestry practices** to accommodate extreme climate and flooding events to reduce likelihood of landsliding and waterborne erosion – i.e., avoid activities on or above unstable slopes, reduce watershed road density, limit equivalent clearcut area, etc. Oppose clearcuts because in climate change scenarios clearcuts become increasingly dense and fire-prone, and will burn hotter and more intensely than surrounding natural forests.
- **Modify private-land practices** to prepare for extreme hydrologic events - i.e., water conservation, culvert sizing, road surfacing, etc.

- **Expand water monitoring** with a focus on scale granularity, complementing regional networks and building on existing community-based monitoring within the Mid-Columbia Kootenay hydrologic region. Monitor water levels and temperature throughout sub-watersheds in the Slocan Lake system to build a robust dataset over time. Approach mitigating climate change by understanding what's going on during low flow periods when mountains no longer store enough water for downstream needs. Identify and protect water recharge sources to learn which streams are fed by recharge from sub-surface sources and which are not. How will creeks, aquifers and wetlands react when water levels change? Where are the sources of water recharge?
- **Protect wetlands and riparian areas,** including smaller and higher-elevation sites. Build long-term data sets for small wetlands. Especially concentrate on maintaining and/or enhancing water sources for wetlands and ponds.
- **Maintain cold stream temperatures** through inventory, monitoring and, if necessary, targeted treatments.
- **Identify and manage potential climate change cool refugia** – both terrestrial and aquatic.