

July 15, 2016

Cedar River HCP Oversight Committee

Kurt Beardslee
Washington Trout

Dave Beauchamp
University of Washington, College of the
Environment, Fisheries School

Richard Bigley
Washington Department of Natural Resources

Matt Everett
Highline Water District

Bob Everitt
Washington Department of Fish & Wildlife

Jerry Franklin
University of Washington, College of the
Environment, Forestry School

Jim Erckmann
Public-at-Large

Chris Konrad
US Geological Survey

Matthew Langenbaugh
NOAA Fisheries

Jason Mulvihill-Kuntz
WRIA 8

Bill Robinson
Fish Advocate

Tim Romanski
US Fish & Wildlife Service

Buck Smith
Washington Department of Ecology

Isabel Tinoco
Muckleshoot Indian Tribe

Frank Urabeck
Fish Advocate

Ray Hoffman, Director
Seattle Public Utilities
PO Box 34018
Seattle, WA 98124-4018

Dear Mr. Hoffman:

The Cedar River Habitat Conservation Plan (HCP) Oversight Committee would like to respectfully submit our completed Year-15 Comprehensive Review of the City of Seattle's HCP for your consideration.

Introduction

The Implementation Agreement for the Cedar River Watershed Habitat Conservation Plan established the HCP Oversight Committee (OC) to advise the City of Seattle during the implementation of the plan. Section 13.2 of the HCP Implementation Agreement states that "The OC will conduct periodic comprehensive reviews of activities conducted pursuant to the HCP to evaluate overall progress on implementation, and to identify and address significant issues." The last OC review was for HCP Year 8 (2008) but was completed in 2010. Because of that timing, the OC elected to skip the review scheduled for Year 11 (2011). This comprehensive review goes through Year 15 (2015), and it covers progress and new issues arising since 2008. We also review and comment on the status of City responses to the recommendations included in the Year-8 review.

Given the scope and complexity of the HCP, the OC commends the City for its accomplishments over the initial 15 years of HCP implementation. Seattle Public Utilities (SPU) has shown continuing diligence and successes in honoring its commitments in each area of the plan: watershed management, Landsburg mitigation, instream flows, and overall management. In addition, the City has shown exemplary innovation in its restoration efforts in the watershed and has been highly effective in its management of instream flows and Landsburg mitigation. Management of this very complex and challenging plan by the City has been focused, responsive, transparent, and extremely well organized.

The City has largely remained on schedule with the implementation of activities under the HCP. In the few cases where there have been delays, SPU has notified the OC and agencies and, if appropriate, amended the HCP. Some of these cases involved prudent decisions to postpone activities that would not have been effective, even if it might have been easier to simply complete the commitment. This embodies the spirit of adaptive management and demonstrates the City's commitment to stewardship for the Cedar River through its HCP, rather than simple, indiscriminate compliance with the HCP's requirements. In many cases, the City has gone above and beyond the strict requirements of the HCP to achieve a successful outcome.

Moving forward, the OC sees a number of challenges: applying lessons learned from these initial years for continued success, integrating conservation actions required under the HCP into landscape scale efforts to protect and recover ecosystems and their species of concern, and adapting to regional and global changes. None of these challenges will be easily resolved in the short term, but they will remain keys to the long-term success of the HCP.

Much has occurred since 2008. Major HCP accomplishments since then include:

- The Downstream Habitat Program continued to exceed its targets significantly, including aggressive control of invasive knotweed and other species,
- The highly innovative Upland Restoration Thinning Program was completed in 2013;
- SPU continued to comply with instream flow requirements in the face of some challenging weather conditions;
- The Walsh Lake Ditch project was completed in 2012, and
- The sockeye hatchery (no longer a requirement of the HCP) was completed in 2011, and a monitoring program and adaptive management plan for hatchery operations was completed and is now in effect.

In addition:

- Considerable progress was made on improving the discharge channel from Chester Morse Lake (CML) to Masonry Pool as part of the project to upgrade emergency pumping capability;
- Water milfoil was removed from Walsh Lake although after four years of no detection it has recently been detected
- A contracted review of watershed monitoring and research was completed in early 2016, with the stated purpose to “provide a framework to guide the research and monitoring effort of the Cedar River Municipal Watershed (CRMW) going forward”; and
- A 3rd round of comprehensive, collaborative modeling to evaluate the potential effects of climate change on future water supply was nearly completed. The effort includes the downscaling of meteorological projections to watershed streams and meteorological stations, with preliminary results suggesting conditions could be adverse for covered species. The results of this work have implications not only for water supply but also for the HCP.

- Despite Seattle’s having met its commitments to the relevant conservation measures including instream flows and the Landsburg Fish Passage facilities, the continued low abundance of steelhead, Chinook and sockeye salmon continue to be a concern.
- As with steelhead, Chinook and sockeye, the absence of Northern Spotted Owl in the Cedar River Watershed has persisted despite SPU’s having implemented the required HCP conservation measures for this species.

The primary emerging issue for the HCP continues to be climate change, which was the motivation for SPU’s modeling efforts mentioned above. Climate change was identified in the HCP as an “unforeseen circumstance” because the science at the time the HCP was developed was still unsettled. That has changed. Besides the potential to adversely affect water supply, climate change could directly affect HCP covered species and their habitats, or indirectly affect them if SPU needs to alter reservoir operations to adapt to more challenging environmental conditions. For example, earlier refill of the reservoir already seems to be occurring, and deeper and longer drawdown in summer and fall is becoming more likely if trends in temperature and snow patterns continue as projected. Drier and warmer conditions in the watershed are likely to affect forests, as well.

It should also be pointed out that HCP funding was front-loaded, so that many restoration and mitigation projects would be accomplished early in the plan’s 50-year implementation period. For example, the fish ladders and sockeye hatchery at Landsburg have been constructed and are in operation. Many of the watershed conservation measures, from road decommissioning to forest thinning, ramp down after Years 15-20. The combination of climate change and the change in activities under the HCP suggests that now is a good time to look at what conservation measures and research and monitoring activities could be revisited and modified.

Summary of Follow-up on Year 8 OC Recommendations

The OC provided 10 recommendations in our Year-8 review - four for watershed management, two for instream flows, two for Landsburg mitigation, and two of a general management nature. Generally, the recommendations from the Year-8 review are open-ended, so the OC is not looking for their immediate resolution. Instead they remain as guidance for the future. A central theme of these recommendations required maintaining or improving communication.

SPU has continued to make progress in how it communicates its activities and accomplishment under the HCP. We believe this is an important element of the success of the HCP and will become an important historical archive that could help to maintain "institutional memory" in future years.

SPU has embraced climate change as a major theme for strategic planning, and recent modeling efforts provide SPU with projections of what climate change could bring in terms of weather and water availability. While projections are uncertain and will continue to improve over time, we hope that SPU will consider placing greater emphasis on adaptation plans that address potential impacts but also afford the City flexibility for dealing with an uncertain future.

The 10 recommendations from the Year-8 OC review are listed below, in abbreviated form, along with OC comments on the status of actions in response to these recommendations.

Watershed Management

1. Consider inventories and strategies for a broad range of invasive species, terrestrial and aquatic, and forest pests that pose risks to watershed ecosystems. Consider use of herbicides to treat knotweed to provide early containment.

The City's pursuit of these issues has been excellent.

- The OC is pleased that SPU has continued a program of aggressive control of invasive terrestrial plants in the municipal watershed, including aggressive species that do not require mandatory control, such as blackberry and holly.
- SPU has also developed a comprehensive program for detection and prevention for a variety of invasive aquatic organisms that pose a threat to water supply and water quality (Aquatic Nuisance Species). The program includes training for staff and procedures to minimize and control risks from these species
- Of significant importance to water quality, SPU's efforts to control water milfoil in Walsh Lake seem to have been successful through 2015
- At SPU's urging, the City Council passed ordinances to allow use of herbicides for treatment of knotweed in 2010, 2013 and 2015 (each ordinance covering three years) in the municipal watershed, and applied Imazapyr each year since 2010. SPU has made substantial progress but the problem will require continued treatment

2. For the restoration thinning program, look at alternatives to lower per area cost and subsequently expand the program to forests that could long serve as habitat and carbon stores, and more aggressively integrate restoration planting for tree species diversity with the thinning program.

This program, completed in 2013, has been well designed, and SPU has altered the approaches over the years to produce some really innovative projects. The OC believes that may be the most effective of the forest conservation measures at both improving habitat trajectories and producing a more resilient landscape.

- SPU has done an excellent job of integrating restoration planting with thinning since 2008, planting a diversity of species that should serve to increase forest resiliency in the future.
- In the response to the Year-8 OC letter, SPU indicated that it was "evaluating treating 2000 acres more than the HCP performance target (10,480 acres)." Instead the program was terminated early at only 10,041 acres. The OC is disappointed that more acres were not treated, given that restoration thinning, when coupled with restoration planting, is the watershed conservation measure that has the greatest

potential to improve forest resilience at a larger scale. The OC urges SPU to reconsider treating more acres as a resilience strategy.

- Going forward, the OC encourages SPU to consider climate change as a major factor in the restoration planting program, for example, prioritizing the selection of tree species and genotypes that are believed to be the best adapted to expected environmental conditions. This suggestion is included in the recommendations below for Watershed Management.
3. Provide the OC a summary of adaptive management strategies to deal with climate change that can be incorporated into the restoration philosophy landscape template described in the strategic plans, and report on current and future efforts to consider increasing the adaptability of watersheds to climate change.
- The OC is aware that SPU is working on issues of watershed resilience in the face of climate change, but is aware of no report on those activities to the OC or any effort to incorporate such considerations into the watershed strategic plans. These issues are being addressed by the HCP OC Subcommittee on Climate Change described below. The OC continues to recommend these actions, and this topic is included in the recommendations below for Watershed Management.
 - In 2012, the OC formed a Climate Change Subcommittee to address impacts of climate change on the HCP, but little progress has been made on watershed issues to date. This is discussed more fully in the Watershed Management section below.
4. Ensure that the HCP and Muckleshoot Settlement Agreement (SA) are coordinated and include a report on the progress of the wildlife management efforts undertaken through the SA in the City’s annual HCP reviews.

In its letter of response, SPU made clear that the City is not involved with wildlife management, but rather its responsibility is to “manage and steward habitat,” that the watershed is being managed consistent with the HCP, and that it would keep the OC updated on cooperative efforts involving the Muckleshoot Tribe.

- The OC is pleased that the City has reported on projects where SPU staff and the Tribe have worked together on specific habitat projects, and encourages that to continue.

Instream Flows

1. Assess future performance based on recent and expected trends in climate, inflows, and diversions, especially in consideration of the instream flow requirements in the HCP, and provide the OC a summary of adaptive strategies that could be needed to meet instream flow requirements.

The City responded that it recognized the trend and water supply challenges identified by the OC, adding an additional concern that infill occurring in the channel between CML and the Masonry Pool reduces effective storage capacity. The City also cited the report from its 2nd round of water supply modeling, which includes adaptive strategies, including access to dead storage in the reservoir. The City also offered to work with the OC on these issues, which is, in part, happening now within the OC Subcommittee on Climate Change.

- The 3rd round of water supply modeling by SPU cited above in the Introduction is providing updated projections, and that modeling is based on the assumption that instream flow requirements will be met for the duration of the HCP.
- The OC commends SPU's work to improve the CML outflow channel, which is complete, and its ongoing efforts to replace the aging emergency pumps.

2. Verify the ecological benefits from a managed streamflow regime, and consider alternative approaches that might provide greater ecological benefits.

In its response, SPU cited several useful metrics on the HCP website and the possible development of other metrics with existing data. SPU made a commitment to evaluate some of these relationships and provide the results for possible inclusion on the HCP website, and cited a beginning study with United States Geological Survey (USGS), under the guidance of the Cedar River Instream Flow Commission. This study was intended to explore the effects of peak flow magnitude and duration on stream and flood plain structure and function, with the expectation of developing new metrics that display trends in stream habitat characteristics and the relationships between these characteristics and the magnitude, duration and frequency of peak stream flows and the relationship between peak flows and salmon redd scour.

- The study has provided evidence for higher scour thresholds from the winter of 2014. The habitat analysis will be completed in 2016.

Landsburg mitigation

1. Continue funding of valuable research and monitoring, if possible, and keep the OC updated on needs.

In its response, SPU mentioned the upcoming completion of the sockeye hatchery, implementation of the associated Adaptive Management Plan (AMP), several possible grants to evaluate recolonization of Chinook and coho above Landsburg, possibly continuing to collect biological samples from Chinook salmon at Landsburg Dam, and the intent to at least operate fish passage in the passive mode once the sockeye run is complete. SPU has also identified a funding shortage associated with the operation of the PIT tag detectors.

- The OC compliments SPU on the significant progress toward completion of the sockeye hatchery and broodstock collection facility, and for its implementation of the AMP.
 - The OC encourages SPU to continue efforts to collect valuable information with its fish passage facilities, as is mentioned below in our recommendations for Landsburg Mitigation.
2. Maintain reporting on fish passage at Landsburg and keep engaged in critical issues for salmonids in the entire Cedar River/Lake Washington system.

In its response, SPU indicated that it is working to improve the availability of the fish passage information on the Cedar River HCP website, including annual fish passage reports and in-season reporting on the web site.

- The OC compliments SPU on its operation of the Landsburg fish passage facility and its efforts to monitor the fish that are passing through it. Providing publically accessible information summarizing the number and type of fish that pass through the fish ladder will be important in future years.

General HCP management

1. Consider ways to provide access to Oversight Committee briefings to create a more enduring record of business, considering ways to provide increased accessibility to materials from previous Oversight Committee meetings.

In its response, SPU committed to creating a page on the HCP web site that is dedicated to the OC, posting past meeting minutes and materials, meeting schedules, and other documents related to HCP implementation decisions and modifications.

- The OC commends SPU for creating the website page for the OC and encourages SPU to keep the page up-to-date with minutes and other materials, including copies of PowerPoint presentations made at OC meetings.
2. Maintain and continue the website, continuing to develop new metrics to measure progress toward goals and increase the visibility of research and monitoring.

In its response, SPU agreed that the value of the website is dependent, in part, on how current the information is, and that it is implementing a management system to ensure that information is current and relevant and welcomes the OC's continued review and recommendations about improvements.

- The OC compliments SPU on its excellent website and efforts to keep the information up-to-date and relevant, and to continue to develop new metrics that can add value.

Progress on the HCP Since 2008

Progress on the HCP since 2008 is organized in the following categories:

- Watershed Management
- Landsburg Mitigation
- Instream Flows
- Overall HCP Management

In each of these categories, progress on both conservation measures and research and monitoring are reviewed below. Overall progress is discussed, new and emerging issues are described, and recommendations are made for each of the four categories.

Watershed Management

The review of Watershed Management includes the following HCP programs: Road Improvements, Stream & Riparian Restoration, Upland Forest Restoration, Watershed Aquatic Monitoring & Research, Watershed Terrestrial Monitoring & Research, and Cedar Permanent Dead Storage Evaluation. In addition, it encompassed the Year-15 review of monitoring and research mentioned above in the introduction, although only some of the recommendations from that report are addressed in this letter.

When the HCP was being developed in the mid-1990s, the science of climate change had produced no clear consensus on the potential effects on ecosystems in our region. Since then, there is consensus in the continually growing literature that impacts could be substantial in our region, with significant implications for many aspects of the HCP. The preliminary results of water supply modeling efforts by SPU incorporating climate change into projections of both future water supply and environmental conditions in the watershed reinforce what the general literature is saying. We can expect:

- Warmer air and water temperatures in all seasons;
- Shift in winter precipitation from snow to rain, with earlier snowmelt and the possible, eventual loss of the bimodal annual streamflow hydrograph;
- The potential for more extreme winter storms;
- Longer, drier summers, with increased stress on terrestrial vegetation and greater risk of wildfire; and
- The possibility of SPU needing to alter reservoir operations to maintain water supply and adapt to the above change in conditions.

These projected changes, some of which have already been observed, could pose challenges to species covered by the HCP and their habitats. For example, drier and warmer summer conditions, coupled with reduced snowpack and earlier snowmelt, would increase stresses on aquatic and terrestrial ecosystems. Increased stress could lead to greater risks of forest diseases, insect outbreaks, wildfires, and invasive species and pathogens in the aquatic ecosystem, as well as adverse changes to habitat for covered species. It is expected that that reservoir operations could change in several ways in adapting to impacts of climate change on water supply, including early and potentially higher refill, as snow packs become

smaller and snowmelt earlier, and longer and deeper drawdown as summer conditions begin earlier and last longer. Earlier reservoir refill in spring, already occurring, could have impacts on bull trout redds through inundation and common loon nesting through impacts to nest sites. Greater and longer drawdown could have impacts for bull trout moving upstream to spawn in the fall. Both refill and drawdown could impact the food web in CML, at the same time that warmer water temperatures and lower summer base flows could have direct impacts on bull trout in tributaries.

In short, climate change is the most significant issue that could undermine the goals of the HCP, unless SPU has evaluated potential impacts, restructured research and monitoring to reflect expected changes, and developed adaptive strategies for conservation measures that are can be more responsive to expected conditions.

Overview of Progress on Watershed Management Measures

The City is to be commended for its innovative and energetic approach to the watershed conservation measures. The programs are pretty much on schedule. The long-term approach to protecting the watershed as a reserve has so far been highly successful, and the shorter-term, active conservation measures have also been conducted with imagination and professionalism, and with the use of sound science and appropriate technology.

Using sediment delivery models and risk assessment techniques, the Road Improvement and Decommissioning Program has been highly successful in reducing road failures and sediment loading to watershed streams. The focus of the work on the “bad actors” has been highly successful. It appears that the decommissioning program under the HCP will be completed in 2021, as planned. SPU has installed new culverts and bridges or removed roads as ways of improving the passage of peak flow and sediment, and these efforts appear to have been successful. But the possibility for more extreme winter storms suggests that more attention be paid to potentially higher peak flows and greater risk to infrastructure.

The Stream & Riparian Restoration and Upland Forest Restoration programs are on schedule. SPU staff are to be commended for their creativity with the design of the projects in these programs. As a whole, they have been cutting-edge designs for forest habitat restoration that are consistent with the goals of the HCP. But the upland forest restoration program was intended to accelerate the development of old-growth conditions. The implicit assumption was that the environment over time would not be significantly different from the environment at the beginning of the HCP in year 2000. That assumption is being shown to be increasingly inappropriate as the climate changes, and projections indicate that this trend will continue. This change calls into question whether continuing with that single, over-arching goal is appropriate.

As mentioned in the introduction, the Upland Restoration Thinning Program was completed in 2013, and SPU has been effectively integrating the restoration planting program into the thinning projects. This program included restoration of more than 10,000 acres, making it a potentially very effective tool for improving habitat trajectories and increasing forest resilience.

The rate of Ecological Thinning in years 1-15 has been about 62 acres per year. However, Ecological Thinning ramps down after year 2016 to only about 29 acres per year. The capacity to improve enough habitat to substantially improve conditions for covered species at this scale of operations is questionable, especially given the challenge of climate change. It may be time to reconsider the strategy for this program, as captured in a recommendation below.

The Invasive Species Program in the municipal watershed is not part of the HCP, but SPU has done an excellent job of addressing invasive plants and aquatic organisms, as described above in the section on the Year-8 comprehensive review. This issue is becoming more significant in view of climate change, which increases stress on native species, and the possibility for the introduction of additional invasive species in the future. One area that needs more attention is the issue of forest insect pests and diseases, whether native or introduced. Climate change has already been shown to greatly increase the impacts of the mountain pine beetle on western forests, and there is the possibility for such impacts from other insect pests or forest diseases. This issue is addressed below in the recommendations for research and monitoring.

Recommendations for Watershed Management Measures

1. **Review in context of climate change:** The OC recommends that SPU evaluate all watershed management measures to make sure that, in the face of climate change, the goals of each program are still appropriate. If that is not so, then discussions with the Services may be warranted. In addition, the OC recommends that the strategic plans be reviewed and revised by SPU staff to address the potential effects of climate change. This could possibly be done as addenda to the plans, and could key off recommendations from the OC Climate Change Subcommittee, if appropriate. The OC also recommends that SPU open a dialog with the OC about potential adaptive strategies in the municipal watershed, sharing any documents developed by SPU staff, in keeping with the request we made in the Year-8 review.
2. **Forest treatment programs:** The OC suggests that SPU reconsider how the Ecological Thinning Program and other forest restoration programs are being conducted and shift the focus to projects that would both accelerate the development of old-growth conditions and increase forest resiliency in the face of climate change. For example, instead of thinning projects of several hundred acres in one location, a large number of small openings could be created in appropriate, low-diversity or stressed areas that would facilitate planting tree species expected to be better adapted to future climate conditions. These “seed populations” would provide propagules as conditions in the forest changes. This is just one possibility, and other strategies could be more appropriate.
3. **Road decommissioning and improvements:** The OC is pleased with SPU’s success in focusing on roads that have a high risk of failure or that produce more sediment loading to streams through erosional processes, and urges SPU to continue that focus for the remainder of the Road Decommissioning and Improvement Program. This is particularly

important, given the risk of more severe winter storms in the future that might place more stress on road infrastructure.

4. **Road crossings:** SPU has installed new culverts and bridges or removed roads as a way of improving the passage of fish, peak flows and sediment. It seems that these efforts have been successful, though it may be valuable to inventory past projects to evaluate their effectiveness during large storm events. The OC suggest that SPU reevaluate the peak flow criteria being used to make sure that the rate of failure will not exceed what is desired, given the potential for more extreme winter flows. This will be a challenge until reliable projections are in hand, but would be worth the effort.
5. **Large Woody Debris:** SPU has a large remaining commitment to replacing large woody debris (LWD) in watershed streams. This activity is an example where SPU can apply lessons learned from past projects to assure that new LWD is replaced efficiently for greatest ecological effect. Given the widespread use of LWD for habitat restoration in the Pacific Northwest, it may be of value to make sure projects reflect the current state of knowledge about LWD and its ecological value, and to consider whether projections of more extreme flow events in winter could alter the design of LWD projects, especially in mainstem reaches.

Overall Progress on Cedar Dead Storage

The actual permanent Cedar Dead Storage Project is not part of the HCP, and the evaluation of that project was postponed until 2020 by agreement with the Services. But some related research and monitoring studies are part of the overall Research and Monitoring Program. Those studies include the Bull Trout Passage Assistance Plan and Spawning Impedance Studies related to upstream movement in the fall, Pygmy Whitefish and Rainbow Trout Studies (completed), Delta Plant Community Monitoring (completed), and Common Loon Nesting Habitat Monitoring (in progress).

And mentioned above, SPU has been working to improve the reliability of the emergency pumps in accessing dead storage in CML. The outlet channel from the lake to the Masonry Pool is being lined to facilitate outflow, and work to replace the aging pumps and floating platforms is expected to be completed in 2017. The OC believes that these are appropriate and excellent steps to facilitate use of additional storage in extreme conditions.

Given the threat of climate change and the preliminary projections from SPU's climate change modeling, it can be expected that SPU will need to alter reservoir operations, as described above. Given that expectation, recommendations about research and monitoring for bull trout and other reservoir-related studies are described below under Watershed Research and Monitoring, along with other related studies of bull trout and common loons.

Overview of Progress on Watershed Research and Monitoring

SPU's research and monitoring efforts for both projects and habitat trends have been excellent, given the initial goals of the HCP. In the face of the emerging challenge of climate change and the fact that some conservation activities in the watershed are ramping down, however, some changes in both conservation measures and research and monitoring may be warranted.

As mentioned in the introduction, a comprehensive review of watershed research and monitoring was completed by Stephen Ralph and Derek Booth in March of 2016 (Ralph and Booth). That review was intended to provide a framework for future research and monitoring based on the appropriateness and efficacy of current research and monitoring in the context of the goals of the HCP, and the need to address the significant and emerging issue of climate change. The Ralph and Booth review includes a number of important recommendations of relevance to this OC comprehensive review.

It is important to note that the research and monitoring program is intimately related to the conservation measures being implemented, so that any change in those conservation measures would necessitate a change in monitoring. Among the issues highlighted in the Ralph and Booth report are:

- 1) the usefulness of some monitoring in the face of decreasing need for results or the potential better use of funding to address climate change issues, such as increased risks to forest resiliency and potential changes to reservoir operations for water supply reasons;
- 2) the need for bull trout studies and monitoring related to changes in reservoir operations, along with monitoring of stream and lake temperatures;
- 3) a need to shift the focus of restoration and related monitoring toward climate change resiliency;
- 4) the availability of results for review and assessment;
- 5) the need for an articulated adaptive management framework;
- 6) the need for better ongoing documentation of results; and
- 7) the need to determine what the Services need in terms of demonstrating what the HCP has accomplished.

Recommendations for Watershed Monitoring and Research

The recommendations described below are a combination of conclusions from this review and issues highlighted from the review of watershed monitoring and research by Ralph and Booth.

1. **Forest resilience and wildfire risk:** The OC urges SPU to hold workshops on forest resilience and wildfire risk and response soon, as recommended by the OC Climate Change Subcommittee. At this stage of problem definition, the focus need be less on adaptive strategies than on potential risks, appropriate forest monitoring, and identification of important thresholds. After these risks are more clearly identified, the focus can shift to potential adaptive strategies, which could lead eventually to changes in conservation measures, although some conservation measures, such as planting species or genotypes more adapted to future climatic conditions, can be safely pursued now.
2. **Forest pests:** Given the level of threat that exists, the OC believes that more emphasis should be given to the tracking of forest pests, and the OC urges SPU to develop a more

extensive program that includes not only aerial surveys but also ground surveys over time to get a clear picture of changes that might be of concern for forest health and resiliency.

3. **Bull trout, reservoir food web and common loon research:** The OC supports SPU's current effort to perform a comprehensive review and summary of bull trout research and monitoring to date and to develop a refocused program of monitoring and research that is designed to address potential issues related to climate change and potential changes in reservoir operations.
 - The review should include an assessment of whether work to date has accomplished the stated objectives. For example, did the redd inundation study produce clear results, or should it be continued until a clearer idea of effects is gained. Are there still questions about bull trout passage into tributaries in the fall during a period of drought?
 - Future monitoring and research should address two linked issues: direct effects of climate change on bull trout, or species that bull trout depend on, as a result of reduced summer streamflows and increased stream and lake temperatures; and effects of potential changes in reservoir operations.
 - Annual spawning surveys have been concluded, but should be considered as a straightforward way to assess overall health of the bull trout population - unless a better approach is developed. If restarted, spawning surveys should be done annually, as missing years would substantially reduce SPU's ability to detect trends in populations over time, a key issue as climate change continues to unfold.
 - Conduct evaluation to assess effects of new pump plants in CML on food web dynamics
 - The OC also recommends a similar evaluation of common loon nesting and feeding as it might be affected by changes in reservoir operations.
4. **Documenting accomplishments before retirements:** The OC suggests that SPU complete a similar summary, as described above, of work managed by staff who may retire in the near future to minimize loss of important information, such as work on invasive species.
5. **Annual summaries and reviews:** The OC urges SPU to produce annual summaries and reviews of the prior season's work, including research and monitoring, with results made available for analysis to staff and review by the Services and OC. These summaries should be done in the context of adaptive management, with periodic reviews of progress that can identify program changes that might be needed.
6. **New focus on watershed resiliency:** The OC urges SPU to consider shifting the focus of long-term stream and forest monitoring to include not only restoration and recovery but also tracking resiliency to climate change impacts. The OC recognizes that this shift could be challenging to design, so a cautious and careful approach is recommended, but questionable basic assumptions in the HCP about the stability of environmental conditions suggests that the effort would be worthwhile.

7. **Reprogramming HCP funds:** Some of the HCP’s current research and monitoring might be less useful in the future, and funding could be reprogrammed to greater effectiveness.
 - For example, given that the factors that control spotted owl and marbled murrelet populations are regional in nature, some of the funding for these activities could be reprogrammed to focus more on climate change and watershed resiliency issues.
 - As the level of some activities ramps down, project monitoring for the purpose of adjusting future decisions becomes less useful, especially where it takes a decade or more to achieve any meaningful results. In such cases, consideration should be given to reprogramming some of that funding to focus more on climate change and watershed resiliency issues. The OC would be pleased to help with that effort.

8. **Federal Services role:** The OC suggest that SPU begin a dialog with the Services regarding what might be required to demonstrate the effectiveness of the HCP over its term, especially in view of the challenge of climate change and other changes in conditions, to help clarify what changes to research and monitoring might be most appropriate. The OC would be pleased to help with that effort.

Landsburg Mitigation

Landsburg Mitigation Background

The Year-15 review summarizes implementation of the Landsburg Diversion Dam Mitigation portion of SPU’s HCP and the Landsburg Mitigation Agreement (LMA) commitments from 2000 through 2015. The portion of the Cedar River HCP addressing fish passage at the Landsburg Diversion Dam includes broad conservation measures that benefit all fish species, but are focused primarily on Chinook, steelhead, and coho. Because the number of sockeye salmon passed upstream of the Landsburg Diversion Dam is limited, a separate, additional mitigation component based on an artificial propagation program (the LMA) was provided for sockeye. This review reports on implementation of both agreements, and also identifies mitigation related to programs or facilities that will require additional focus during the next 5-year review period.

Both mitigation agreements, the Landsburg Mitigation portion of the HCP and the LMA are similar in that they each provide interim and long-term mitigation measures for anadromous fish. Long-term objectives for Chinook, coho, and steelhead trout in the Landsburg Mitigation portion of the HCP involve providing juvenile fish-screening facilities and upstream/downstream fish passage past the Landsburg Diversion Dam that allow these fish to recolonize their formerly occupied habitat upstream of the Dam. Because large spawning aggregations of sockeye salmon have the potential to affect water quality, these fish are largely prevented from passing upstream of the Landsburg Diversion Dam to spawn. The LMA is a separate additional mitigation agreement with primary long-term objectives of contributing “to healthy, harvestable runs of sockeye, coho, and chinook salmon and steelhead trout” by providing anadromous fish passage above Landsburg Dam, constructing a hatchery, implementing a biologically

sound artificial propagation program with the capacity to produce up to 34 million sockeye fry annually, among other actions.

In 2007 NOAA Fisheries issued an amendment to the year-2000 Incidental Take Permit removing construction and operation of the Cedar River sockeye hatchery from the incidental take permit, and removing ESA coverage for sockeye salmon. Only the sockeye monitoring and research program remains part of the HCP.

Overview of Progress for Landsburg Fish Passage Measures

Interim measures: Interim measures associated with the Landsburg fish passage component of the HCP included life history, genetic, and recolonization studies of fish populations upstream from the Landsburg Diversion Dam, some of which are ongoing and many of which have been completed and currently available at:

http://www.seattle.gov/util/EnvironmentConservation/OurWatersheds/Habitat_Conservation_Plan/FishLandsburg/LandsburgFishLadder/index.htm.

Long-term measures: Primary long-term mitigation measures that have been completed include upstream and downstream fish passage past the Landsburg Diversion Dam and over the aqueduct, a fish ladder and sorting facility at the Diversion Dam, and juvenile fish screens over the municipal water intake. These important mitigation measures were completed in 2003 and have been reported in previous comprehensive review documents. Annual operations and maintenance associated with these fish passage facilities are ongoing, and have been successfully completed annually since the facilities were constructed.

Studies monitoring the effects of Chinook, coho, and steelhead trout on water quality in the newly accessible area upstream from the Landsburg Diversion Dam have been completed. Early results indicate that the anadromous fish spawning upstream from the dam during the first fifteen-year review period have not had a detrimental effect on water quality. We understand that this report is available upon request and suggest making it available on the HCP web site.

Overview of Progress for Sockeye Salmon Measures under the Landsburg Mitigation Agreement (LMA)

Interim measures for sockeye salmon: Interim mitigation measures under the LMA included providing a temporary sockeye hatchery production and monitoring program that would be operated annually until a permanent hatchery facility could be constructed. The temporary hatchery and its monitoring programs were successfully implemented by SPU until construction of the permanent hatchery was completed in 2011. The interim hatchery significantly augmented fry production in the Cedar River annually and the associated monitoring program have provided valuable information about the ecological effects of a sockeye fry production program on the Lake Washington basin.

Long-term measures for sockeye salmon: Long-term mitigation commitments in the LMA center around construction and operation of a permanent sockeye hatchery with the capacity of producing up

to 34 million sockeye fry per year. Other long-term commitments include the development of operational protocols and an oversight committee to help guide the sockeye hatchery program, continuation of the sockeye hatchery research and monitoring program, and initiation of a program to protect and restore fish habitat in the Cedar River mainstem downstream from the Landsburg Diversion Dam.

Many of the long-term mitigation measures in the LMA have successfully been completed, or are nearing completion during this 15-year review period. Construction of a permanent sockeye hatchery was completed in 2011, and SPU has funded the operations and maintenance associated with the sockeye production program each year since then. Some aspects of the permanent hatchery are still under development, however, and will need to be finalized before the facility will be capable of achieving its full fry-production goals. One example is the need for redesign of the broodstock collection weir to safely collect greater numbers of adult sockeye during high flows without affecting migrating adult Chinook.

SPU has initiated a framework for long-term oversight and adaptive management of the sockeye fry production program during this review period. An Adaptive Management Plan (AMP) was finalized in 2006, which identifies areas of risk and uncertainty associated with fry production in the watershed, and provides operational guidelines for the hatchery program. Two groups, the Adaptive Management Work Group (AMWG) and the Technical Work Group (TWG), were formed to provide guidance on the implementation of the AMP. The AMWG is composed of agency representatives and stakeholders and provides advice to the LMA parties on the operation and evaluation of the sockeye hatchery. The TWG provides scientific advice regarding operation of the sockeye hatchery, monitoring, research, and other technical matters.

Research and monitoring activities associated with the sockeye hatchery program have successfully been implemented by SPU throughout this review period. Information from these monitoring activities has increased our understanding of the ecological effects of sockeye fry production in the Lake Washington basin, and has addressed many of the risks and uncertainties that were identified prior to initiation of the hatchery program.

Protection and restoration of fish habitat in the lower Cedar River mainstem is an ongoing process that SPU has achieved some important successes in. SPU has made significant progress on this mitigation measure, partnering with other local organizations to purchase large properties in key areas of the lower Cedar River mainstem where major restoration activities have the best chance of improving natural river function and benefiting anadromous fish species. Since this program commenced SPU has purchased and restored 54 acres of salmon habitat on the mainstem of the lower Cedar River.

Recommendations for Landsburg Mitigation Measures

1. **Reporting fish-use data:** Reestablishing upstream fish passage at the Landsburg Diversion Dam was an important long-term mitigation measure under the Landsburg Mitigation portion of the HCP. Evaluating the long-term performance of this fish passage facility by reporting the number and type of anadromous fish that pass upstream throughout the year

demonstrates the utility of this facility. It will be beneficial to provide fish passage data summary information from the Landsburg diversion dam fish camera that reports species, abundance, and run timing throughout the year. This information would be best reported on the HCP website.

2. **Passing sockeye at Landsburg:** Water quality monitoring studies have demonstrated that small numbers of anadromous salmonids spawning in the Cedar River upstream of the Landsburg diversion dam do not have a detrimental impact on water quality. Sockeye salmon are currently removed at the Landsburg sorting facility and not allowed to pass upstream, as large numbers of these fish spawning in the upper watershed may affect water quality. To support the LMA objective of contributing to healthy and harvestable runs of salmon, the OC recommends that SPU explore the idea of not operating the fish sorting facility at Landsburg and allowing all anadromous fish species (sockeye included) to pass upstream of the diversion dam. The idea of passing sockeye upstream at Landsburg would need extensive review including its effects on sockeye hatchery broodstock collection needs and approval by the Parties to the LMA.
3. **Focus of the sockeye hatchery program:** Sockeye returns to the Cedar River have steadily declined during the 15-year review period with several record low sockeye returns occurring during the past five years. The low returns are likely due to poor survival of sockeye fry during their rearing period in Lake Washington, but poor marine survival may contribute to this problem in some years. Monitoring has addressed many of the key uncertainties associated with the sockeye fry production program and provided evidence that the program does not have detrimental effects on the ecology of Lake Washington or other anadromous fish species in the watershed. To more effectively work toward the LMA objective of providing healthy and harvestable runs of sockeye salmon in the Cedar River, SPU should consider modifying the AMP to allow for supplementation techniques that help maximize fry-to-adult survival through a combination of rearing and release timing, or perhaps make other changes to the AMP. This may require extensive review.
4. **Monitoring prioritization:** Monitoring activities to evaluate the sockeye hatchery program are an important part of the LMA, and SPU has invested considerable resources into monitoring. Monitoring expenditures, both past and projected, appear to be greater than estimated in the HCP and LMA. It will be important to carefully prioritize monitoring activities moving forward, establishing a meaningful monitoring program that can be implemented throughout the life of the HCP.
5. **Monitoring at the new broodstock collection facility:** An updated broodstock collection facility for the sockeye hatchery program is currently in the design and planning phase. The new facility will allow the hatchery to reach its annual egg take goals and more fully achieve its full performance potential. Inclusion of a camera or other fish counting device into the

design of this new collection facility would allow SPU to assess the abundance of each year's adult return, providing valuable information on fry-to-adult return rates and allow the city to better evaluate the performance of its fry production program in future years.

Instream Flows

Overview of Progress on Instream Flows

Invasive species emerged as a key concern after the HCP was adopted. SPU recognized their significance and devoted considerable resources to developing effective approaches for control. These approaches have been used with success, for example, in reducing knotweed along the river. SPU will not eliminate invasive species along the river and in the watershed, but does appear to be on track for managing this problem.

SPU has commitments to downstream habitat protection under both Landsburg Mitigation and Instream Flow Protection. While downstream habitat protection efforts started slowly, the OC supported SPU's approach as appropriate, especially given limited opportunities and the benefits of working with other partners for larger-scale conservation. SPU has been incredibly successful in leveraging additional financial resources and building partnerships for long-term protection of downstream habitat.

SPU has been successful at achieving long-term instream flow goals in terms of the percent of years that minimum and supplemental flows have been provided. There have been three particularly challenging years from a water supply perspective (2001, 2005, 2015), and only in 2015, with the approval of the Instream Flow Commission, were provided stream flows below low normal flows. Between October 24th and October 30th flows were below the low normal minimum flow regime but exceeded critical flows by 30 cfs to 77 cfs on a daily flow basis.

Recommendations for Instream Flow Measures

1. **Continued vigilance to controlling invasive species.** There will be ongoing need for controlling terrestrial, riparian and aquatic invasive species in the watershed and downstream. SPU should continue to treat this activity as a high priority.
2. **Assessing impacts of changing reservoir management.** Reservoir management was not addressed in the Year-8 review. When the new emergency pumping facilities are completed (expected in 2017), SPU should be positioned to assess different scenarios for reservoir levels in view of climate change projections both within the constraints of the HCP and other options which could trigger the need for an amendment. The impacts of and potential changes in reservoir management on bull trout populations and groundwater flow into the Cedar River (moraine seepage) should be reevaluated, and mitigation of any impacts incorporated into water management. Issues regarding bull trout, which use both CML and its tributaries, were discussed above under Watershed Management, and Watershed Management Recommendation #3 addresses these issues. In addition, the coincidence of low reservoir levels at the end of a dry, hot summer could impact downstream temperatures if moraine seepage is reduced by the low reservoir levels. This potential impact should be evaluated to the extent that "dead storage" is likely to be used to maintain

- system reliability. In particular, this impact could increase the value of the fall instream flows for fish and may require reconsideration of how water is allocated seasonally for fish. The OC further acknowledges that any routine use of dead storage in Chester Morse Reservoir (below pool elevation 1532) would require extensive review and is subject to the terms of the settlement agreement between the Muckleshoot Indian Tribe and the City.
3. **Distinguishing normal and critical flow years.** As noted above, SPU has not relied on critical flow requirements in any year from 2001 to 2015 (providing flows below low normal flows only in one year), including years when such a designation could be justified. Recent climate projections should be used to consider whether critical flows are more likely to be declared during the remaining term of the HCP. It may be important to consider whether additional criteria should be used before relying on critical flows, for example, avoiding a series of critical flow years.
 4. **Revisit the Supplemental Studies.** The Supplemental Studies (also known as “Chinook Studies”) is an instream flows research and monitoring HCP activity. This activity was established under the HCP and Instream Flow Agreement to obtain “enhanced information on chinook salmon and the relationships between stream flow and fish habitat.” Shortly after its inception, the Instream Flow Commission (IFC) developed a monitoring program under the Supplemental Studies, identifying a number of monitoring activities to be conducted. Some of these activities have been conducted while others have not. Since the program was established the original monitoring recommendations have not been revisited. Since that time a great deal of new information has been obtained about the effects of climate change on stream flows and water supply. Therefore, the OC recommends that the City and the IFC conduct an evaluation of the Supplemental Studies monitoring program to determine if the studies originally recommended are still relevant and address emerging issues such as climate change, and make recommendations for modifications to the study list (e.g., examining rearing capacity for juvenile Chinook) and allocation of funds if appropriate.

Overall HCP Management

Progress of Overall HCP Management

The OC continues to be impressed with the effectiveness, responsiveness, transparency, and adaptive capacity of overall HCP management. This plan is extremely complex, the underlying agreements are complex, and management of the plan and the agreements involve many parties. Given that level of complexity, along with the challenging issues of a changing and often difficult environment, it is all the more impressive that the management of the HCP has proceeded on such an even keel. That is, no doubt, because of the professionalism and effort of City staff. The OC recognizes that, and hopes that the open communications and stellar work that have characterized the first 15 years of the HCP continue.

Recommendations for Overall HCP Management

1. **Communications:** Continue the open communications with the OC that have characterized the first 15 years of implementation of the HCP.
2. **HCP website:** Continue improving the website by including more information for OC meetings, such a PowerPoints and other information provided, and by adding new metrics for HCP performance as they are developed.
3. The OC recommends that the City issue a press release to highlight the accomplishments of the HCP.

Conclusion

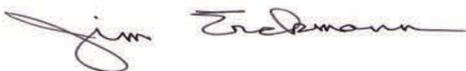
The HCP Oversight Committee appreciates the opportunity to provide the City with a comprehensive review of progress on the HCP between HCP Year 8 and Year 15, and to address significant new issues that have arisen. It is our pleasure to conclude from our review that the management and implementation of the HCP have continued to be exceptional, and we urge the City to continue this level of attention, effort, and professionalism.

If there is one recurrent issue in our review and recommendations above, it is the threat of climate change and its potential impacts on the success of the HCP. Climate change presents threats to water supply, instream flows, fish populations, watershed forests, and many covered species. These threats may require a reconsideration and modification of some of the goals of the HCP, such as trying to reestablish old-growth conditions in the municipal watershed, and it may be advisable to modify some conservation measures and associated research and monitoring.

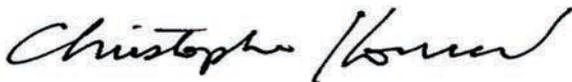
Perhaps most importantly, it seems advisable to shift to a more adaptive approach to managing the HCP, one that would allow flexibility in the face of what will likely be many surprises in the future. We believe that many of these changes can be made without a major amendment to the HCP, but that could be required at some time in the future.

We wish the City success in dealing with this emerging threat and other challenges, and we offer our assistance where that might be most useful. Keep up the good work!

Sincerely (for the HCP Oversight Committee),



Jim Erckmann, PhD, Member at Large



Chris Konrad, PhD, United States Geological Survey



Aaron Bosworth, Washington Department of Fish and Wildlife