

MAFAC CBP Task Force

Draft Scenarios

May 2020

The following is a compilation of scenarios developed by various members of the MAFAC CBP Task Force as well as a refined scenarios from the Project Team developed on behalf of the Task Force. The scenarios are presented in no particular order:

- Draft All in for Salmon Scenario, Idaho Stakeholders
- Draft Total Salmon Scenario, Idaho Stakeholders
- Draft Fish Forever Scenario, Ben Enticknap and Liz Hamilton
- Draft Stronghold-anchored and Diversified Portfolio Scenario, Rob Masonis
- Draft Climate Change Scenario, Kevin Scribner
- Draft Shared Sacrifices Scenario, Joe Lukas
- Draft Salmon First Scenario, Zach Penney
- Draft Full Recovery Plan Implementation Scenario, Steve Manlow and Washington's Columbia Basin Recovery Organizations
- Draft Level-of-Effort Scenarios, Project Team

MAFAC CBP Task Force
Draft All in for Salmon Scenario
Idaho Stakeholders
May 6, 2020

Hydro

- Immediately increase spill at dams on the lower Snake and Columbia Rivers to 125% TDG 24/7.
- Remove dams on the Columbia and Snake Rivers as follows:
 - Due to their significant impacts on salmon and steelhead, begin immediate steps to remove John Day and McNary dams and return the river to natural river conditions.
 - Beginning with Bonneville Dam and moving up to the Lower Granite Dam on the Lower Snake River, breach/remove all structures in the river and return the Lower Columbia and Snake Rivers to natural river conditions.
 - Breach all non-federal dams in the Pacific Northwest that impact salmon recovery.
 - The Columbia Treaty Dams that are key to flood risk management will remain in place, but will have adult and juvenile passage provided immediately.
 - Add passage to all blocked areas and reintroduce all historical species.

Hatchery

- Immediately change hatchery operations to local wild brood stock and follow a conservation hatchery model.
- As wild, natural population rebound, ramp down and/or decommission hatcheries.
- Even with removal of the dams on the lower Snake and Columbia Rivers, mitigation obligations will continue until mid-level goals are reached 7 out of 10 years. Present funding levels and sources will continue – including BPA ratepayer funding from the development of hydropower in the region.

Habitat

- Increase availability of storage water from Upper Columbia, Upper Snake and Clearwater Rivers to increase spill until dams are removed.
- All tributary habitat has been significantly reduced in quality and carrying capacity from historic resource extraction and settlement throughout the Columbia Basin. Massive increase funding for tributary and estuary habitat efforts (10x, 50x, 100x) to increase capacity and improve/rehabilitate habitat conditions.
- Habitat restoration must be process based with a focus on reestablishing and reconnecting flood plains and climate resiliency.
- Maximize efforts to restore Columbia River estuary habitat.

Harvest

- Immediate moratorium on all ocean harvest.
- Immediate reduction in tribal and non-tribal in-river harvest of salmon and steelhead, including hatchery-origin species, to maximum sustainable yield.
- All harvest reductions to remain in place until mid-level goals are reached 7 out of 10 years.

Predation

- Identify all in-river and ocean predators and take actions to minimize or eliminate their impacts on salmon and steelhead, including, but not limited to:
 - Remove quotas on all predator fish.

- Implement population scale removal of non-native predator fish.
- Removal of sea lions/seals up to potential biological removal (PBR) levels;
- Remove all legal barriers for removal of avian predators.
- It is anticipated that these efforts will be ramped down as the normative river is reestablished and habitats that were conducive to predators change to a more natural environment.

SCEE

- Prohibit new construction along all waterways.
- Remove or mitigate industrial actions that impact salmon recovery.
- Require that zoning along waterways consider the impact to salmon recovery.
- Eliminate all nonpoint and point source pollution to anadromous bearing surface waters.
- Immediately upgrade existing infrastructure, both road and rail, to accommodate lost barge transportation capacity.
- Evaluate Canadian/US storage operations to optimize for fish given evolving runoff patterns and amounts.

Additional Funding

- Impose “salmon tax” on all residents of Oregon, Washington, Montana and Idaho to fund habitat improvement efforts, point source and nonpoint source elimination, short-term conservation hatcheries, interim predator control measures and monitoring.
- “Salmon surcharge” on all recreational permits and licenses, including watercraft, fishing licenses, guide permits, etc.
- Lobby Congress to include federal funding for fish recovery.
- Surcharge on all existing flood control districts in the region.

MAFAC CBP Task Force
Draft Total Salmon Scenario
Idaho Stakeholders
May 6, 2020

Theme

The Columbia River Basin, including the Snake River and other tributaries, is the backbone of the Pacific Northwest. Tribal, state and local communities rely on the river system for their social, cultural and economic well-being. For example:

- Tribal communities rely on the river system for dietary, spiritual, cultural, economic and subsistence needs.
- Agriculture communities rely on the river system for water to grow crops in some of the most fertile and product farmland in the world.
- Communities rely on the river system to deliver their crops and other goods from inland ports to the ocean and, from there, to the world.
- Citizens throughout the region rely on the river system to provide inexpensive, clean and renewable hydropower.
- Recreators from around the world flock to the Pacific Northwest to take part in fishing, rafting and other recreational opportunities on the river system.

The value of the river system to the region cannot be overstated.

Unfortunately, historical management practices, including overharvest and the construction of dams along the river, and variable climate and ocean conditions, have resulted in dramatic declines to salmon and steelhead populations throughout the region. Populations declined until the 1990's, when many of the populations were listed under the Endangered Species Act (ESA). At that time, the region began working collectively to recover fish populations.

Turbines have been updated. Flow regimes have been modified. Habitat restoration is ongoing. From approximately 2000 through 2014, progresses within the four H's saw significant improvement to salmon and steelhead runs. Although populations numbers have improved, recent adverse ocean conditions due to climate change have caused fish returns to decline. More can be done to brace against the impacts of climate change. More can be done to decrease the impacts of changing ocean conditions.

Most importantly, a solution will require all citizens of the Columbia Basin working together. There should not be "winners" and "losers." Rather, all of us need to work together to create a better, brighter future for the region and its salmon and steelhead populations.

This scenario is drafted to provide an "all hands-on deck" work process where all tribes and stakeholders work together to create the future, we all desire.

- **Hydropower System (Four Dams on Lower Columbia River and Four Dams on Lower Snake River)**
 - Implement spill program, which includes adaptive management measure to improve smolt travel time and reduce powerhouse encounters.
 - Develop a “smart” smolt transportation program. Install degassing equipment to reduce TDG levels in the smolt holding raceways and within transport barges to no more than 102%. Following installation of degassing equipment, conduct a comparative Latent Mortality study between in-river fish and transport fish with real time data that includes in river and transport TDG exposure levels.
 - Implement operations to address flow and temperature effects from climate change.
 - Incorporate structural modifications, as needed, to improve salmon returns upstream.
- **Tributary Habitat**
 - In connected areas, substantially increase basin-wide habitat restoration actions.
 - Strategically target populations and habitat areas that will provide the greatest contribution to long-term recovery goals.
 - Maximize restoration efforts to conserve habitats least vulnerable to climate change or most likely to improve climate resilience.
 - Continue research, monitoring and evaluation as necessary to quantify physical and biological benefits from tributary habitat restoration and understand the most efficient methods for improving habitat.
- **Estuary Habitat**
 - Substantially increase level of effort to maximize estuary habitat restoration.
- **Blocked Areas**
 - Continue discussions to reach consensus about restored fisheries of non-listed ESA fish above Hells Canyon Complex consistent with the Hells Canyon agreement and the State of Idaho’s blocked area policy.
 - Proceed with science-based, phased approach to reintroduction of anadromous fish above Chief Joseph and Grand Coulee Dams in accordance with Northwest Power & Conservation Council’s Fish and Wildlife Program.
 - Expand the current range of non-listed fish consistent with current agreements, including the Hells Canyon agreement and the State of Idaho’s blocked area policy.
- **Predation**
 - Population scale removals of non-native/introduced species.
 - Eliminate harvest limits and regulations protecting non-native fish in waters that contain or are connected to waters containing anadromous salmon and steelhead.
 - Increase funding for federal, state, and tribal enforcement to reduce illegal or unintentional introduction of invasive/non-native species.
 - Identify and implement targeted opportunities to enhance predator control actions, including predation impacts related to climate effects (e.g., non-native fish range expansion due to dams and climate change).

- Modify or remove anthropogenic structures below Bonneville Dam that have increased predators or that make salmon and steelhead more vulnerable to predation at all life stages.
- **Hatchery**
 - Ensure that hatchery programs with a mitigation responsibility are fully and adequately funded, including routine and non-routine maintenance needs.
 - Specify hatchery goals for smolts or returning adults abundance goals.
 - Modernize hatchery infrastructure to ensure achievement of abundance goals.
 - Prioritize hatchery production to meet escapement goals.
 - Continue to improve hatchery programs using the best available science to minimize risks to natural populations.
 - Establish minimum escapement objectives to meet hatchery production goals.
 - Prepare for the likely role that hatchery programs and infrastructure will play in buffering against fluctuating environments and stochastic climate events.
 - Implement sliding scale protocol for hatchery production as natural abundance increases and proves resilient.
- **Harvest**
 - Balance fishery effort to ensure mixed stock fisheries (sport and commercial) are not artificially changing run-timing (e.g., overharvesting the earlies run Spring Chinook or upriver bright Summer Chinook).
 - Set harvest impacts at levels that do not impede recovery through use of abundance-based management frameworks or other relevant harvest management approaches.
 - Establish minimum escapement objectives to meet natural production goals.
 - Consider in-river refuges/sanctuaries that protect migrating salmon and steelhead.
- **Social, Cultural, Economic and Ecosystem Considerations and Strategies**
 - Tribal dependence on salmon and other fish species to meet dietary, spiritual, cultural, economic and basic subsistence needs is a prevailing necessity of tribal culture and society.
 - Ensure that existing mitigation commitments are met.
 - Provide subsistence and commercial fisheries for tribal and non-tribal communities. Currently, there is a lack of accountability on meeting those obligations.
 - Benchmarks should be set at intervals to ensure that salmon and steelhead adaptive management measures are effective.
 - Manage the river system in a way that recognizes, and prioritizes, the diverse cultural, economic and social values of the river system on society in the Columbia River Basin.
 - Work to restore stability for Tribes and other stakeholders, including sportsmen and outfitters on tributary systems, who rely on a strong fishery for their cultural, social and economic well-being.

MAFAC CBP Task Force
Draft Fish Forever Scenario
Ben Enticknap and Liz Hamilton
May 6, 2020

In May 2019, following two years of public process and deliberations, the Columbia Basin Partnership Task Force finalized its Phase 1 report for broad sense qualitative and quantitative goals for thriving salmon and steelhead populations throughout the Columbia River basin. The Provisional Quantitative Goals translate into a total increase of naturally produced salmon and steelhead from the current annual average of 381,000 adults (2008-2017) to as high as 3.58 million adult salmonids. This represents the need for improving salmon and steelhead runs 9.4 times above current average levels. While this would be a vast improvement in total run size, achievement of the Task Force's goal would still mean salmon and steelhead runs 40% below estimated historic run sizes.

Salmon and steelhead recovery throughout the basin would have significant social, cultural and economic benefits for people throughout the basin and beyond. The values of recovery, described in our Phase 1 report include major potential benefits for ocean and in-river treaty and non-treaty commercial, and sport fishing industries, subsistence harvest, recreation, and a healthy, abundant source of food for people. Ecological benefits are equally significant. For example, recovering Columbia Basin Chinook will have great benefits for endangered Southern Resident killer whales and more than one hundred other fish and wildlife species that benefit from abundant salmon and steelhead. The Task Force has recognized that while it will not be easy, we have common values and a shared interest in achieving our qualitative and quantitative goals.

Ultimately success in achieving our goals will require major changes throughout the basin. Current efforts are insufficient and with climate change, the challenges to success are only increasing. Given global trends in greenhouse gas emissions we are likely to see severe impacts to Columbia Basin salmon and steelhead. Climate change impacts now and in coming decades will result in increasing stress on salmon at all life stages and across all habitats including increased water temperatures, alternation of stream flows, changes in prey availability, increasing ocean acidification, and increasingly frequent and intense marine heatwaves.

The impacts of climate change demand that we take steps to increase salmon habitat and ecosystem resilience through protection, restoration and increased connectivity. By recovering and protecting wild, self-sustaining salmon populations and their habitats now, we can help salmon regain and maximize their genetic diversity and resilience, which will be critical to enabling salmon to adapt and thrive as the climate continues to change.

The "Fish Forever Scenario" described here is intended to be a comprehensive and bold approach to achieve the broad sense qualitative and quantitative recovery goals described in the Task Force's Phase 1 report. It shares and supports many but not all of the biological strategies and underlying philosophies as described in the "Salmon First" scenario. Here we provide additional specificity to some strategies plus offer new approaches. The Fish Forever Scenario recognizes the urgency for salmonid recovery needed to support both people and dependent wildlife, the increasing threats from climate change, and it aims to clearly articulate biological strategies necessary to achieve Task Force goals.

Biological Strategies

I. Columbia and Snake Hydropower System

- Begin immediate efforts to breach the four Lower Snake River dams while developing and implementing alternate forms of clean power generation, energy efficiency, irrigation and transportation for shipping and commerce;
- Increase spring spill to 125% total dissolved gas as measured at the tailrace for remaining mainstem lower Columbia River dams.
- Evaluate and implement salmonid passage and reintroduction options for areas that are currently blocked by dams.
- Implement operations to address flow and temperature effects from climate change.

II. Habitat

Similar and consistent with many of the actions described in the Salmon First Scenario for tributary habitat, estuary habitat and blocked areas, including:

- Substantially increase basin-wide habitat *protection* and restoration actions and ensure that efforts strategically target populations and habitat limiting factors that will provide the greatest contribution to long-term recovery goals;
- Maximize *protection* and restoration efforts to conserve habitats least vulnerable to climate change and most likely to improve climate resilience;
- Continue and increase efforts to alter management of water systems to provide more normative flow regimes, functional habitats, and connectivity;
- Reintroduce fish into blocked areas (Chief Joseph/Grand Coulee and Hells Canyon Complex) including advancing habitat *protection* and restoration above Hells Canyon Complex (HCC) to prepare for eventual passage at HCC.

In addition:

- Implement policies for an overall net ecological gain for salmon habitat (across tributary, estuary and blocked areas) - modernizing state land use, development, and environmental laws and regulations to result in a net gain of ecological health throughout the basin.
- Develop and prioritize a list of blocked areas/dams in tributary habitat for potential removal or fish passage improvements which would benefit salmon and steelhead recovery. Implement the list.

III. Hatchery

- Maintain science-based hatchery production to supplement natural runs and support fisheries for mitigation until broad sense regional goals for natural production are achieved.
- Ensure that hatcheries are managed in a way that is consistent with recovery of natural runs, including marking hatchery fish to readily distinguish them from natural fish.
- Use conservation hatchery strategies as needed to proactively address future threats, including climate change.

IV. Harvest

- Ensure that conservation and management measures are appropriately allocated such that management measures are equitable, just, and consistent with federal law;
- Continue to set harvest at levels that do not impede recovery through use of mark-selective fisheries, abundance-based management frameworks and other relevant harvest management approaches (e.g. fisheries are focused to selectively target hatchery-reared salmon and more abundant wild stocks while protecting weaker, less abundant stocks);
- Establish or continue to use existing sliding scale harvest schedules that increases the rate of harvest as runs increase (recognizing that these scales are designed for the low-end goals in Figure 2 of the Phase 1 Report of the Columbia Basin Partnership Task Force of the Marine Fisheries Advisory Committee).
- As natural returns of salmon and steelhead approach high-range goals, work towards adding retention of wild salmon and steelhead.
- Where biological benefits can be achieved, eliminate non-consumptive fishery impacts on salmon and steelhead where threatened fish populations are actively spawning.

DRAFT

MAFAC CBP Task Force
Draft Stronghold-anchored and Diversified Portfolio Scenario
Rob Masonis
May 6, 2020

Scenario Description

The Columbia Basin can still provide abundant, healthy populations of naturally produced salmon and steelhead long into the future if we are good stewards. But that is not true everywhere in the basin. The ability to produce abundant, fishable populations of naturally produced salmon and steelhead varies based on habitat quality, quantity and connectivity. Some areas of the basin are highly degraded due to extensive habitat alteration that has severely limited their fish production potential. Others have plenty of high quality, connected habitat with substantial natural production potential. In between are areas where significant – and important for purposes of achieving long-term viability -- natural production can occur with habitat improvements and good fishery management. The Columbia Basin Partnership’s quantitative natural production goals reflect this reality.

This scenario calls for accepting this reality and managing habitat and fish in the context of the specific watersheds in which they live. Sub-basins with highest natural production potential will be managed as strongholds to maximize that potential. Sub-basins with low natural production potential will be managed for hatchery production that serves harvest fisheries in a way that does not jeopardize wild stocks. Other rivers will have mixed management, with both natural production and hatchery operations.

Infrastructure throughout the Columbia Basin is upgraded to meet the needs and values of the region in the 21st Century. Much of our current infrastructure (e.g., dams, hatcheries, irrigation systems) was built in the mid -20th Century based on the scientific understanding and technological capability at that time. Today, we have a much better understanding of what salmon and steelhead need to thrive and technological advances have made it possible to meet the region’s power, transportation and water supply needs in new ways.

This scenario emphasizes adapting the engineered systems that serve our human needs in order to provide the functional natural ecosystems that salmon and steelhead will always need. Some dams are removed. Other dams are optimized for power generation. Grid improvements, battery storage, energy efficiency investments and other innovations enable us to meet energy needs while reducing the burden placed on our rivers. The infrastructure investments create employment opportunities and costs are equitably distributed and controlled with a more complete recognition of the social, cultural and economic values provided by a functional ecosystem.

Our outdated river governance structure is improved. Today’s siloed management of habitat, fisheries (harvest and hatcheries) is integrated to ensure that management actions and policies align to achieve well-defined quantitative and qualitative goals at the stock and population scales. Opportunities to “stack” and sequence actions across “the Hs” are identified and pursued to take advantage of synergistic effects. Transparency and accountability are hallmarks of the new governance system, and consequently public confidence in river management is high and people feel that their tax and ratepayer dollars are being wisely spent.

Fishing, too, is updated for the times in which we now live. Selective gear is used in commercial fisheries to minimize take of non-target stocks. Sportfishing is managed to keep impacts controlled and to promote fishing opportunity and equitable distribution of opportunity throughout the basin. Gear restrictions, area closures, and innovative management techniques such as periodic, temporary “fallowing” of rivers, etc. are management tools used to maintain quality fisheries that can be sustained year-in and year-out. Enforcement of fishing regulations is robust and there is a strong self-enforcement ethic among fishers because fishing opportunity is dependent on good stewardship. Longer, consistent seasons allow fishing dependent businesses to sustain themselves and is better than the status quo.

Hatcheries are deployed in an ecological context using the best available scientific information and monitoring practices (see below), in a manner consistent with achieving stock and population-specific natural production goals. In stronghold natural production watersheds, hatcheries are not used unless there is a compelling conservation need. Hatcheries designed to provide harvest opportunity are sited in areas with low natural production potential where the risk of straying is low, and the fisheries targeting hatchery fish are managed to minimize impacts on non-target stocks. Less intensive hatchery operations are located on “intermediate” rivers where significant natural production can occur but not at the stronghold level.

Large-scale experiments and robust monitoring programs are established to answer important unanswered questions. The portfolio management approach enables use of treatment and control rivers to get more clarity on issues including, but not limited to: the ecological and genetic impacts of hatchery fish on naturally produced fish; the benefits of different types of fishing, harvest and predation control management; the effect of large increases in escapement to the spawning grounds on productivity and spatial distribution; and the resiliency of salmon and steelhead to thermal and hydrologic changes caused by a warming climate.

Habitat protection and restoration is prioritized in sub-basins where there is substantial natural production potential that can be realized with such investments. Emphasis is on restoring ecological processes. As habitat is opened and restored, river-specific escapement goals are updated to ensure enough fish return to use the habitat and take advantage of the additional production potential. Habitat protection and restoration continues throughout the basin to maintain and improve ecological function commensurate with natural production goals for stocks and populations.

Guiding Principles and Assumptions

1. The needs of salmon and steelhead have been and always will be the same, regardless of human desires.
2. Locally adapted, spatially distributed populations with genetic and life history diversity are the most productive, fit and resilient salmon and steelhead.
3. Potential for natural production of salmon and steelhead varies by sub-basin.
4. Portfolio river/stock management is more cost effective and provides better biological outcomes than the status quo.
5. By sequencing and stacking actions across the Hs, large and potentially rapid gains in natural production can be made.
6. Treaty obligations to Columbia Basin Tribes must be honored.

7. The human actions that have been primarily responsible for the decline of wild salmon and steelhead in the past may not be the actions that can provide the biggest natural production boost in the near term.
8. Hatcheries can be used to provide harvest opportunity if properly located, sized and operated to be consistent with natural production objectives at the stock and population scale.
9. Large-scale experiments and better monitoring are needed to answer critical uncertainties. ; we lack sufficient data to accurately predict the impact of key management practices.
10. Humans can adapt much more easily than fish.
11. Transparency and accountability are essential to establish and maintain public confidence in salmon recovery efforts.
12. We should manage with future generations in mind, not maximize short-term objectives at their expense (transgenerational equity).
13. Economic losses necessitated by short-term “surge” recovery actions and transitions should be mitigated.
14. Major infrastructure investments are needed to operate the Columbia-Snake system to achieve CBP goals.
15. Costs and benefits of salmon recovery should be equitably distributed, recognizing the need to remedy past inequities in the distribution of costs and benefits.

MAFAC CBP Task Force
Draft Climate Change Scenario
Kevin Scribner
May 6, 2020

Task Force Colleagues-

NOTE: this document is 47 pages, which includes an Appendix. Portrayal of methodology and scenario description are in the first 13 pages.

It is fitting that I write this introductory note on the 50th Anniversary of Earth Day, which I experienced in the Spring of my senior year in high school, for while drafting these sample climate scenarios I tried to keep the future time horizon of 25, 50 and even 100 years in mind. This being the temporal landscape in which our Provisional Recovery Goals were purportedly conceived.

These **Columbia Basin Climate Scenarios** are framed by a spectrum of plausible, prevalent Basin-wide attitudes toward climate-influenced change in Basin hydrology, with the rate of change ranging from “slow and steady,” to “dramatic and mercurial,” and attitudes varying from “resistance to change,” to “embracing change.” Another set of scenarios could use a similar framework to discern how the Basin salmon runs could/would also respond to climate-influenced change in Basin hydrology, and may focus on salmon’s evolutionary response, which, as I understand it, is their primary method of responding to change.

Let me emphasize that these are **sample scenarios**. I am their sole author, as slipping-away time and then the Pandemic swept away my intention to facilitate group-developed scenarios. These scenarios were informed by the scenario planning methodology that I have referenced a number of times at Task Force meetings, the one championed by Dutch/Shell Oil and the Global Business Network (see **Plotting Your Scenarios**), and used recently by the Pacific Fishery Management Council.

I believe that moving from **sample scenarios** to robust Partnership Scenarios will require a full Partnership workshop that invites all the Members to contribute their experience and wisdom. I have included sample **key questions** that could inform such a workshop.

I have also kept in mind Barry’s comment upon the value of the SERA Workshop at our September 25-26, 2019 meeting:

Barry highlighted that this (SERA Workshop) exercise was an attempt to recognize that salmon and steelhead recovery is not just biological – other factors are driving fish abundance and fish abundance also affects those other factors. **He explained that the SCE&E discussion will help the group better determine which scenarios have barriers to implementation.** (emphasis added)

I have also kept in mind the following from the **2018 Fourth National Climate Assessment**:

Barriers to Adaptation

Despite emerging recognition of the necessity of climate change adaptation, many barriers still impede efforts to build local, regional, and national-level resilience. Barriers are obstacles that can delay, divert, or temporarily block the adaptation process, and include difficulties in using climate change projections for decision-making; lack of resources to begin and sustain adaptation efforts; lack of coordination and collaboration within and across political and natural system boundaries as well as within organizations; institutional constraints; lack of leadership; and divergent risk perceptions/cultures and values. Barriers are distinguished from physical or ecological limits to adaptation, such as physiological tolerance of species to changing climatic conditions that cannot be overcome (except with technology or some other physical intervention).

As well, I cannot not pay attention to what our region, nation, all nations and planet is experiencing in this Pandemic. We—everybody—now have and will continue to have direct experience with “dramatic and mercurial” systemic change. Last fall, a Pandemic would have been considered a *plausible future*, now it’s our reality. I have been collecting commentaries which speaks to the *if and how* the Pandemic can help us prepare for climate change. Some say the Pandemic is a warm-up act for climate change. Another writes that with climate change we don’t know exactly when, where and how the changes will occur and that there is no vaccine for this kind of change once it’s upon us. Others say that it is already upon us, and the analog to a virus vaccine is *mitigation*, which is more akin to maintaining comprehensive health, fitness and well-being (no underlying health issues = resilient, regenerative SCE&E functions), while everyone on the planet works to minimize or eliminate spreading the virus (virus = green house gases).

The Covid-19’s mortal effect on humans with underlying health issues may counsel us to look at our salmon runs with a similar lens: which runs have underlying health issues, which are on life support, which are currently sufficiently fit and resilient to withstand various rates of change in Basin hydrology? How can we foster fitness in all 24 stocks, and to accomplish this in time to respond to plausible slow, steady or dramatic, mercurial change? And, equally important, how fit, healthy, resilient and regenerative do our Basin SCE functions need to, in turn, be the stewards of the Basin’s hydrology so its fosters fit, healthy, resilient and regenerative salmon runs? And which driving forces influencing SCE functions are within control of the Basin, and which driving forces buffet the Basin from outside our control.

The Pandemic will also show us how willing, able and prepared we are to *adapt* to dramatic, mercurial change. The **National Climate Assessment** has identified *mitigation* and *adaptation* as two key responses to climate change.

But, one may ask, what climate-influenced changes are we envisioning, anticipating, expecting? Where? When? How? The *plausible futures* scenario planning approach does not purport to foretell the future, rather, it poses an array of futures that give us stories in which to explore how we could achieve our goals in each of them. It is in this spirit that I have drafted these **sample scenarios**.

If and when we have a Climate Scenario workshop, we can share our personal experiences with hydrological change. Some of us who live in the Blue Mountains region experienced a 100 year flood in February, with our previous 100 year flood occurring just 20 years prior, and some climate models indicating more of the same, and potentially more frequent. Joel can tell you about fishing offshore in the *blob seasons* and experiencing an array of new marine species. No doubt, we all have a story.

In closing this introductory note, I must say something about our younger generations, as I have also been collecting commentary both from and about them. I've read op-ed's from millennials who list the negative driving forces that have buffeted their upbringing: 911, 2008 Great Recession, Pandemic—and they then ask the adults in the room (if there are any): **WTF?**

How to authentically bring them to the Partnership Table will be a challenge, and I very much appreciate and honor the efforts by Zach and Katherine to do so. And here is a comment from a high school senior, a member of what I've read will likely now be referred to as Generation C (Covid-19):

Jerome Foster II just finished Week 57 of climate-striking, every Friday, in front of the White House. The high-school senior has become a force—just last month, the Audubon Naturalist Society gave him its Youth Environmental Champion award (and, since youth are now driving the environmental movement, this is no niche prize). This interview has been edited and condensed for clarity.

What 's the essential message that young people would like to get across to older people about climate change—what do you think older generations are not understanding correctly?

Two things. In order for substantive progress to take place to stymie the climate crisis, humanity needs to operate from a standpoint of intergovernmental solidarity, empathy, equity, and moral clarity. These should be the pillars on which we forge the pathway to a sustainable future. Also, what older generations are not understanding is the meaning of the Native American proverb, "We do not inherit the earth from our ancestors; we borrow it from our children."

Lastly, here is an excerpt from a blog entry I wrote about Bristol Bay and its salmon, after spending 2019 summer there, and in the context of the existential threat of the Pebble Mine:

Our Children's Children's Children's Children's Children's Children's Children's Children*

Seven Generations—My Native American colleagues have taught me to think of the future in this way. It's certainly a challenge to get a good grasp of the future, much less plan for it. And it gets downright brain boggling if we try to wrap our minds around the concept of *forever*. So, instead, let's think in terms of seven generations, or roughly 200 years, calculating 30 years per generation.

It is with ease that I can envision the Bristol Bay salmon running abundantly for the next 200 years—and effortlessly I can envision this going on for time immemorial—if we only let them do so. On the other hand, I can't, for the life of me, envision the toxic residue from a Pebble Mine being safely contained in a reservoir for forever, much less 200 years. The arrogance of anyone calmly proclaiming that the toxic aftermath of Pebble Mine will be confined and taken care of forever... can this ever pass the laugh test? Isn't this a proclamation more suited for the theater of the absurd?

...\$1.5 billion is generated every year by the Bristol Bay salmon fishery. Multiply this by 4,000 years (remember the EPA Bristol Bay Watershed Assessment's declaration of 4,000 years of salmon fishing) and the expected economic value of Bristol Bay is 6

trillion dollars. And guess what, to realize this value we don't have to generate and then manage (forever) any toxins, or restore any land or water. No, we will simply continue the sustainable management that has guided this fishery into being the salmon rock star of the planet. The value of Pebble Mine (400-600 billion dollars) pales in comparison—and the mine's development requires so much expensive and damaging effort, including constructing of miles of roads, a power plant, and otherwise unnecessary ports of call.

Can we conceive of a *plausible future* for the Columbia River Basin that we can generate and which gives us the realistic opportunity to recover our salmon so they can join Bristol Bay's in the planetary salmon jam band? Let's go beyond "hope so," and give it our all to make it so, barriers (clearly identified—all!) be damned.

* This title shows how many generations of children are in 7 Generations.

Thank you—Kevin Scribner

Five Sample *Columbia Basin Climate Scenarios (CBCS)*

- 1. Tick-Tock—Banking On Slow Change**
- 2. Readiness Is All—Time Is On Our Side**
- 3. Time Is Nigh—Surfing Waves of Change Together**
- 4. Torrents Of Change—Time For Triage**
- 5. *Wild Card: DeGrowth***

NOTE: these scenario summaries describe *plausible futures* of human behavior *adjustments* to the Basin's Social, Cultural, and Economic functions and practices in response to a range of climate-influenced changes in the Basin's hydrology. These sample summaries could be fleshed out, added to, and/or replaced at a workshop using the CBP SCE&E Condensed Table as the guiding framework. Accompanying scenario summaries, with accompanying detail, could/should also be developed to describe a range of *plausible futures* for salmon to *adapt* to the same or similar range of climate influenced changes in Basin hydrology. These salmon scenarios could/would use the Biology Table as the framework for drafting details of each scenario.

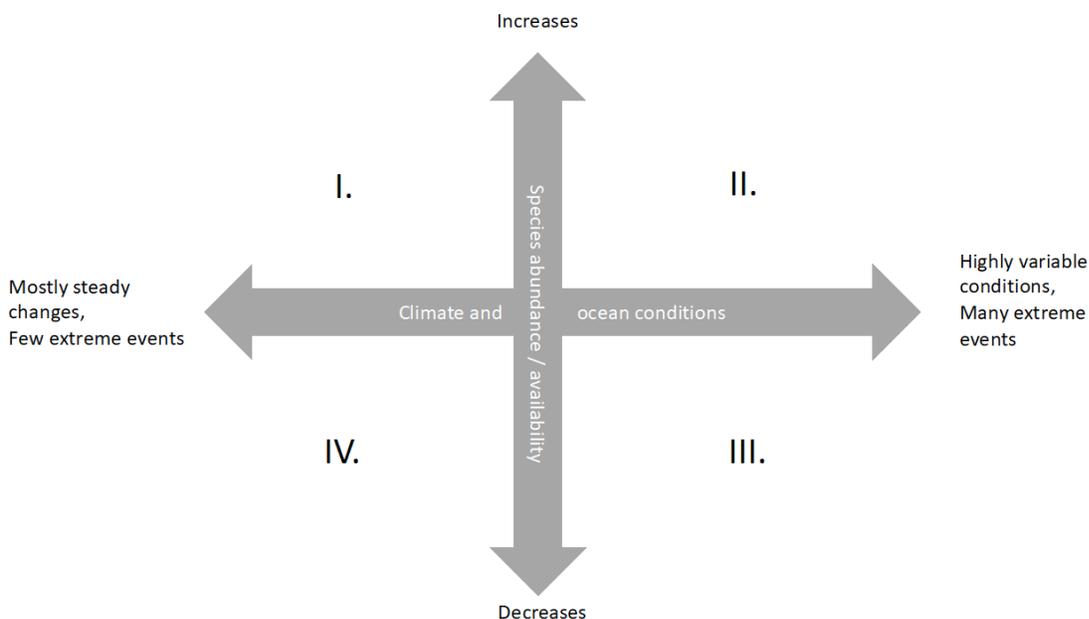
Advice From: Pacific Fishery Management Council's Developing Future Scenarios for Climate Change in the California Current System: Workshop Report

This scenario creation workshop brought together more than 80 participants from different aspects of the fishing community and fisheries management, including scientists, fishery participants, marketers, conservation professionals, and others.

PFMC Workshop facilitators reminded participants of the following: Good scenario planners never assume that the future will be like the past - or even like the "expected future." Instead, they constantly ask, " 'what if?' and imagine a range of different, surprising, but plausible, situations that they might have to operate in.

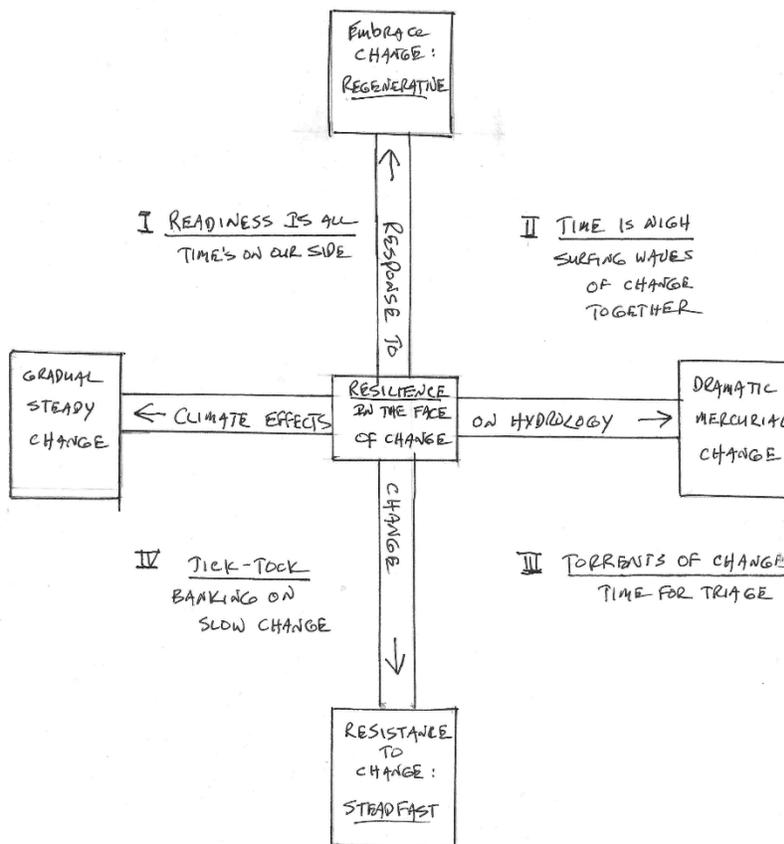
Although scenarios are stories about the future, they are not predictions, nor are they descriptions of desired future states. They are created and designed to describe the range of plausible conditions that an organization or a community could face. By thinking about these ahead of time - essentially rehearsing the future - organizations can be far better prepared for the future uncertainty. Over the past decade, many organizations have begun to use scenario planning as a means to prepare for the uncertainties and surprises associated with climate change...

PFMC Matrix: This creates four quadrants, each of which describes a different set of conditions to be faced and managed. Given that working scenarios are not predictions or projections, but rather plausible future conditions, the next task for participants was to discuss whether these scenario quadrants were plausible, relevant, challenging and divergent.”



The **Columbia Basin Climate Scenarios (CBCS)** use the following matrix framework:

- **Horizontal Axis:** Gradation of *Climate Effects on Basin Hydrology*, from *Gradual, Steady Change* on the left, to *Dramatic, Mercurial Change* on the right.
- **Vertical Axis:** Gradation of *Response to Climate Effects on Basin Hydrology*, from *Resistance to Change* on the bottom, to *Embracing Change: Becoming Regenerative* at the top, with *Experiencing Change with Resilience* at the midpoint.



Suggested Key Questions to Consider for each Scenario:

Over the course of 25/50/100 years:

- What are the projected changes to climate and environmental conditions that will affect the Basin's hydrology?
 - Annual Precipitation Levels and Patterns—more rain, less snow?
 - Timing?
 - Change in seasonal flows
 - Less time-release (snow-pack) cold water?
 - Erratic? Eccentric? Episodic? Gradual?
 - More floods—number and size?
 - More floods and droughts?
 - Uniform across the Basin?
 - Cold Water
 - Flow
 - Refugia
 - Floodplain Connectivity
 - Reservoirs
 - Surface
 - Snow

- Impoundments
 - Soil
 - Sub-surface
 - Aquifers
 - Shallow
 - Deep
 - Seasonal Heat Units
 - Longer, warmer Summers?
 - Daytime temperatures
 - Nighttime temperatures
 - Shorter, warmer Winters?
 - Water Temperatures
 - Warmer rivers and streams?
 - Diminished cold-water refugia?
 - Aridity
 - Forests
 - Fires increase—number and size?
 - How will plant community ecosystems change?
 - Agriculture
 - Change in crops and irrigation practices?
 - California-like temperature ranges?
 - Change in pests and disease?
 - Ocean—changes in:
 - Acidity
 - Temperature
 - Currents
 - Trophic systems—*carrying capacities*
 - Ecosystems
 - Sea-level Rise
- What are the projected changes to human population levels that will affect the Basin’s hydrology/water?
 - How will the change in population affect Basin hydrology?
 - How many Basin residents in:
 - 25 years
 - 50 years
 - 100 years
 - How and where will the Basin population be distributed?
 - How will the Basin population be differentiated?
 - Age/Generation/Gender
 - Income
 - Job Sector
 - Racial/Ethnic
 - Culture
 - Education Level
 - Born in the Basin

- Immigrant: National; International
 - Quality of Life?
 - *Climate Refugees?*
 - Dynamic Economy?
 - What will be the aggregate affect of these numbers, and their distribution and differentiation?
 - Will newcomers value salmon?
- How will changes in markets affect Basin SCE and hydrology?
 - How will extreme events, such as a Pandemic, affect Basin SCE and hydrology?
- How will changes in Basin hydrology over time affect salmon ecology?
 - How will the changes in Basin hydrology over time have ripple effects throughout all interconnected Basin ecosystems?
 - How will changes in Basin hydrology over time affect SCE functions, including the interconnectivity and interdependence between these functions?
 - How will the changes in Basin hydrology over time affect the interconnected and interdependent relationships between the SCE functions?
 - How will the pace of change in Basin hydrology affect salmon ecology and SCE functions?
 - What is the capacity of salmon to evolutionarily *adapt* to new conditions within a 100 year time span? What influences the capacity to adapt?
 - What is the capacity of SCE functions to *adjust* to new conditions within a 100 year time span?
 - What are the characteristics of human and community capacities to make adjustments, including responding to the pace of change?
 - What are the characteristics of communities and SCE functions that contribute to resistance or the hesitation to embrace change?
 - What are the characteristics of communities and SCE functions that contribute to the willingness to embrace change?
 - What are the characteristics of SCE functions that will support/guarantee that salmon abundance remains a priority for the Basin while undergoing adjustments in response to slow and gradual change?

- What are the characteristics that will support/guarantee that salmon abundance remains a priority for the Basin while undergoing adjustments in response to swift and dramatic change?
- What SCE functions can slow the pace of climate changes—both drawdown/sequester legacy carbon and mitigate for current and future GHG emissions, i.e. healthy soils, forests, rangelands, sea grass/kelp, oysters shells?

SCENARIO SUMMARIES

Tick-Tock—Banking On Slow Change

The prevailing Basin perspective recognizes there are changes in climate and that these changes and their effects will proceed at a gradual and steady pace, gently rippling through the Basin's hydrology, ecology and SCE&E functions. This supports the attitude that *we have and will continue to have time to respond to these changes*. A notable percentage of residents and leaders question—with some disbelief or distrust—the science and modeling providing the signals of change. Some of these indicators seem remote (changes in the Pacific Ocean—*out there*) and many residents are buffered from direct experience with the effects. There is a failure of the Basin to realize the potential rapid increase of change—even with the exponential growth lessons available from the 2020 Pandemic—and how interconnected and interdependent the Basin's SCE&E functions are. The variety of attitudes and experiences support a posture that is resistant to a collective response to change. Place- and demographic specific-based ecological and SCE&E challenges are often seen by many as *their problems, not ours*.

The *Partnership* is able to maintain an influential voice for collaborative strategies and actions for salmon recovery, but is often drowned out by the cacophony of polarization. The lack of consensus or a substantial majority to commit to a singular strategy to salmon recovery burdens the sense of taking a balanced approach with glacial, divisive-dominated decision-making, binding salmon recovery to no more than a *steady as she goes* status in the face of change. Funding to support salmon recovery is hindered by a perception and reality that the mechanisms to generate revenue are not equitably shared by everyone throughout the Basin, and that current levels of funding are more than adequate.

The Basin's population increases, both from new births and from immigration, including migrants from other regions within the US as many search for increased quality of life, with more favorable climatic conditions desired. Salmon culture and its advocates gradually slide into a minority position. Many from the younger generations publicly cry for the older decision-makers *to wake up and smell the change*, but are marginalized. People tend to identify themselves by boundaries and differences, be they regional, political, economic, racial, cultural, generational. Social and cultural equity is acknowledged but does not widely influence policy and *false equivalencies* are allowed to influence decision-making.

Sample Projected Recovery Approaches and Actions:

Current Salmon Recovery Plans are considered sufficient, though constantly searching for increased funding and risk falling behind the curve due to inability to keep pace with changes in hydrology and SCE demands.

Salmon Recovery suffers from a fragmented approach, not integrated Basin-wide and Ocean-inclusive.

Salmon stocks on ESA *life support* relapse more and more, questioning the Basin's will to provide this support.

Yakima River Plan is championed as a model for watershed-level salmon recovery, but replication throughout the Basin is minimal and spotty

There is more leadership resistance than support for innovative experimentation, especially projects that are considered expensive, may require infrastructure modifications, and require multiple years for proof of concept.

Major infrastructure changes are relegated to more study.

Block areas introduction is relegated to more study.

Readiness Is All—Time Is On Our Side

The prevailing Basin perspective recognizes there are changes in climate and Basin hydrology, and that these changes and their effects will proceed throughout the Basin at a gradual and steady pace. This supports the attitude that *time is on our side, and Basin-wide, we need to be collectively preparing to be ready to embrace change*. A minimal and fading percentage of residents and leaders question—with some distrust and disbelief—the science and modeling providing the signals of change. Indicators of change, though they may seem remote (changes in the Pacific Ocean) and many residents are buffered from direct experience, are persuasive and serve to generate widespread agreement to be prepared, to be ahead of curve, to be pro-active instead of reactive. The *Partnership* is able to maintain an influential, prominent, if not dominant, voice for collaborative strategies and actions. The Basin has learned lessons from the 2020 Pandemic, including that change can rapidly increase and expand with ripple effects throughout the Basin's interconnected and interdependent hydrological, ecological and SCE&E functions.

The Basin's population gradually increases, both from new births and from immigration, including from other regions within the US, as many search for increased quality of life, including climate related conditions. The Partnership is a successful champion of the Basin incorporating Salmon Culture education into both formal and informal learning processes, ensuring newcomers of all ages learn about salmon. Caring for salmon is embedded into the Basin culture, and Tribal *Traditional Ecological Knowledge* is embraced. The Partnership has welcomed the younger generations into its functions and messaging, encouraging them to help demonstrate how to enthusiastically and creatively embrace change. Revenue to adequately support salmon recovery uses a variety of mechanisms that insure that opportunities to contribute are available and actualized by all Basin residents.

Maintaining social, cultural and environmental relationships are hard-wired into all strategies and actions. Balance means *we are all in this together*, traveling together into the future. People tend to identify themselves by their relationships, to others, to the landscape, to the planet. Commitment to the health and well-being of the Basin's salmon and SCEE is embedded in a robust regional identity, not requiring Federal rules and regulations, i.e. Endangered Species Act.

Sample Projected Recovery Approaches and Actions:

The Partnership successfully champions robust Basin-wide Recovery Plans, embracing and building upon all Recovery Plans-to-date. Recovery Plans will rely upon a certain amount of *luck* (Nature helping), but acknowledge, too, that adage that to a certain extent: *we make our luck*

The Partnership hosts Task Forces that meet regularly, developing effective, collaborative methods Basin decision-making to address Mitigation & Adaptation to climate change

- Biological
- SCEE
- Integration
- Design
- Adaptive Management

Salmon Recovery Plans include SCE&E Resilience Plans. SCE&E Resilience Plans rely upon *Life Cycle Assessment* methodology to evaluate *footprints* of practices, leading the Basin toward practices that support mitigation measures and support adaptation.

Sufficient, dedicated funding sources are identified and implemented.

Innovative Experimentation is a key strategy, embraced as the source of “vaccines” for future hydrological changes. The Basin *Brain* calmly and creatively approaches what are characteristically considered intractable issues. There are minor-to-major infrastructure changes and refinements.

The Yakima River Plan model is steadily adopted, with variations, throughout the Basin.

Elevated belief in equity endorses design and implementation for re-entry of salmon into blocked areas.

Time Is Nigh—Surfing Waves of Change Together

Effects from the changing climate are rampant throughout the Basin, showing in dramatic and mercurial ways. Rapid response is necessary. The Partnership has been instrumental in generating a Basin that is ready and prepared for this *future-become-present* of big waves of change. Small pockets of residents and leaders still question—with some distrust and disbelief—the science and modeling providing the signals of change, but have little-to-no influence regional decisions. Indicators of change are present everywhere, with all residents directly experiencing a/some/many effect/s of change. The Basin is incorporating pro-active strategies prepared from lessons learned from the 2020 Pandemic, including that change can increase rapidly, erratically, and have ripple effects throughout the Basin’s interconnected and interdependent SCE&E functions. The *Partnership* is viewed by the Basin as the prominent voice for collaborative strategies and actions.

The Basin’s population is increasing by leaps and bounds, both from new births and waves *climate refugees*. The Partnership has successfully championed integration of Salmon Culture and the caring for salmon into most, if not all, aspects of life. The younger generations are respected partners, providing insights, commitment and energy in helping the Basin surf these waves of change. Though challenged by more frequent, significant changes in hydrology, there is a deep, strong and pervasive commitment to the health and well-being to everybody and each of the Basin ecosystem’s—*we are unwavering in our*

dedication to the interrelationships and interdependency between people and natural ecosystems in the Basin that identify who we are. Salmon recovery funding is an essential priority and has a revenue stream that is basic to all households, similar to utilities like water and electricity. The recovery of salmon runs and sustaining of Basin SCE&E is considered to be a good *return on investment*.

Balance becomes gymnastic, with the Basin doing its best to not fall off *the balance beam* within pervasive dramatic, mercurial change, keeping upright together while surfing big waves.

Sample Projected Recovery Approaches and Actions:

Partnership convenes Integrated Task Forces to manage mobilization—*all hands on deck—declares, with Basin support, that Salmon are essential.*

VALUE OF CLEAN, COLD WATER—*priority appropriation supercedes prior appropriation; water-for-flow markets accelerate—when water is precious, we will use it with precision*

Strategies for Salmon Recovery and SCE&E Resilience strive to maintain characteristics of Living Rivers, and focus on actions to mitigate and adapt—*quickly!*

Strategies for a Normative River alternative are developed: interconnected and integrated basin plumbing system (many small impoundments and many spigots) + monitoring; dedicate quality water to where and when needed most for priority smolts and adults

YAKIMA RIVER PLAN is the compelling model, being replicated across the Basin—*readying each watershed for Congressional infrastructure stimulus funding targeted on shovel-ready projects*

Introduction of salmon in blocked areas is recognized as a top priority for expanding the essential habitat and fostering stock diversity.

The Basin prepares for inevitable grief from unavoidable losses.

Loss of California salmon stocks due to hydrological changes emphasizes the vulnerability of some/many Basin stocks

Torrents Of Change—Time For Triage

Effects from a changing climate are rampant throughout the Basin, showing in dramatic and mercurial ways. Rapid response is necessary. The Partnership has been relegated to a minority voice of preparation for big waves of mercurial change. Polarization has frozen the Basin's capacity to prepare for what is occurring, leaving the response to be reactive, not proactive—the Basin is constantly *behind the curve*. The failure of the Basin to realize the potential exponential growth of change—even with the lessons available from the 2020 Pandemic—and to realize the extent of interaction and interdependency between the Basin's SCE&E functions, also contribute to being *behind the curve*. Indicators of change are present everywhere, with all residents directly experiencing a/some/many effects of change.

The Basin's population is increasing by leaps and bounds, both from new births and an onslaught of *climate refugees*. Unable to successfully champion integration of Salmon Culture into Basin lives, there is clear and present danger that salmon will be considered non-essential as human survival-oriented responses to the mercurial waves of change dominate. The younger generations are extremely exasperated and would check out if they could. They express a significant distrust of Basin leadership. The Basin population becomes stratified and fragmented. Creating and/or maintaining a broad social and cultural safety net is judged to either be non- or less-essential than *taking care of one's own*.

Maintaining balance is wishful thinking. The global shock from the 2020 Pandemic is now viewed as a penetrating jab, now that the effect from changes in climate are felt *as a haymaker*.

Triage decisions dominate policy, with stark determinations of what is essential and what is expendable. In a policy framework dominated by human survival, salmon recovery is felt to be non- or less-essential until SCE&E functions regain resilient capacities—if they can. Funding for salmon recovery is woefully inadequate to support Basin-wide recovery and difficult decisions must be made on which number and location of stocks to support, and which stocks to be left on their own. This paucity of funding is exacerbated by the disruption in global and national economies and the evaporation of wealth from slumping stock markets.

Sample Projected Recovery Approaches and Actions:

The Partnership is in-effective.

Basin leadership is fractured, the population fragmented. The Basin *Brain* is harried, stressed, rationality is a luxury.

Survival of the fittest becomes a societal expectation.

Warm water species expand into more and more of the Basin.

Viable natural salmon ecosystems south of British Columbia look to be a fantasy.

Artificial "salmon ecosystems" are possible, but only where the Basin can be significantly re-plumbed—salmon are completely dependent upon human design and engineering. The Columbia Basin is re-designed as a Salmon Aquarium.

California salmon are history.

Wild Card Scenario: DeGrowth

NOTE: this summary was submitted by Megan Seibert, megan@rndg.org, <https://www.realgnd.org>

The **REAL Green New Deal Project (RGND)** provides an *eyes wide open*, systems and evidence-based viability analysis of Basin functions.

RGND's core starting premises:

- Climate change is but one symptom of our overarching overshoot crisis.
- The commonly accepted narrative about renewable energy and sustainability is impossible to deliver. Its key flaws that motivate our work:
 - The notion that the system can remain the same and all we have to do is switch out one variable – replace fossil fuels with renewables – and voila, we'll have a sustainable world. As if changing the energetic basis of all of civilization is as simple as changing a battery. Quite the opposite – an energetic shift will transform everything, forcing us to re-think life as we know it.
 - There are massive limitations and impediments to the renewable energy technologies commonly put forth as solutions (e.g. solar PV, large-scale wind, batteries, hydrogen, etc.) which make them not very sustainable and likely not viable from a basic implementation perspective.
- No matter the technology considered, *renewable energy simply cannot supply the same quantity or quality of energy as fossil fuels, meaning that we face massive scale-back and restructuring.*

RGND hopes to re-direct the paradigm about renewable energy and sustainability away from magical, myopic thinking towards the type of sober, holistic thinking that might actually have a chance of veering us in the right direction.

Keeping in mind that energy underpins everything, from biological food webs to the human civilizations embedded within them, the mission of RGND is to:

- Concretely understand which renewable technologies are viable, how much energy they can supply, and what those supplies will mean for the type of world that's possible.
- Conduct all of the above within the context of restoring a thriving, biodiverse habitat for Earth's non-human creatures and fair, egalitarian social structures for its people.

RGND asserts that the key question for the Basin, and the planet, is “which renewable energy technologies are sustainable and viable in which contexts and how that can inform what the changes in our demand and behavior must be, keeping in mind that the two reduction levers to pull on are the number of people and the amount of energy we’re each consuming.”

RGND is unprecedented not just in scale and breadth, but in facing head-on subject matter that is typically considered taboo, uncomfortable, or outside the scope of energy and sustainability. A commitment to systems thinking and a genuine concern for the Earth and all its inhabitants requires nothing less than a full, honest look at the truth.

REFERENCE MATERIALS

- ***Plotting Your Scenarios***
- **Pacific Fishery Management Council’s Developing Future Scenarios for Climate Change in the California Current System: *Workshop Report***
- **CBP BIO Table**
- **CBP Condensed SCEE Table**
- **SERA Workshop Report**
- **SERA Icons**
- **Real Green New Deal description (in Appendix), website: <https://www.realgnd.org>**

MAFAC CBP Task Force
Draft Shared Sacrifices Scenario
Joe Lukas
May 6, 2020

Problem Statement: ESA Litigation and endless debate on individual risk factors for Columbia River Basin salmon and steelhead declines is dividing the region. Many groups spend significant money and attention monitoring the issue hoping to avoid being drug into court or having their interests attacked in the name of salmon recovery demands. Some sectors of the economy are under direct attack and there are growing demands to dismantle portions of the Federal Columbia River Power System in the name of salmon recovery while climate policies calling for carbon-free power generation place ever greater pressure on clean electricity infrastructure. The region needs to come together to craft lasting, durable solutions that form a “Community Response” if we are to have any hope of meeting the quantitative goals envisioned in the Columbia Basin Partnership process. This requires many different entities and interests to modify their approach to salmon recovery and set aside traditional thinking to enable a focused effort at measures across the salmon and steelhead lifecycle that can provide conditions where the adaptability and productivity of these incredible creatures can flourish. All must contribute something meaningful to this effort. Goring one group’s Ox while others seek to avoid contributions will doom salmon and steelhead to museum-piece status. Our systems, structures and funding sources must also be critically examined. Simply relying upon minor modifications to systems that have proven to be either ineffective or mis-guided is a failed strategy. A new approach is necessary that relies upon “Shared Sacrifice” from all citizens of the Pacific Northwest. The path towards healthy, self-sustaining and harvestable salmon and steelhead populations requires contributions of some type from all corners of the Pacific Northwest. We must collectively recognize that past efforts (while well-intentioned) are failing and a new approach is needed.

Scope of the Solution: A comprehensive multi-lateral agreement that consists of needed reforms in the areas of: Governance for Salmon Recovery Systems and Funding, hydrosystem operation and configuration, habitat measures, ocean conditions considerations, harvest and weak stock management reform and hatchery mitigation changes can create an environment where salmon recovery efforts could coordinate under shared interests. The current environment encourages excessive focus on certain impacts to the salmon life-cycle without companion efforts at an appropriate scope and scale. This agreement would be implemented through Federal Legislation that would provide stability and certainty for citizens of the Pacific Northwest and create an environment where salmon and steelhead recovery is a clear objective with clear contributions from all residents that call this area home.

Governance and Funding Strategies

Most of our laws and regulations addressing salmon and steelhead call for efforts to reverse declines or avoid jeopardy of individual actions. We have no clear statutory requirements to recover salmon and steelhead to the level of abundance envisioned through the Columbia Basin Partnership quantitative goals. The best biological strategies possible will fail without the political will to fund and implement them in a timely manner. The crazy-quilt approach to governance of salmon and steelhead recovery is failing and must be replaced.

ESA: The Endangered Species Act is a remarkably powerful tool of modern conservation but its mechanisms were intended to protect discreet populations of organisms at risk of extreme impact from human activity. This tool fails miserably in its attempt to protect and recover animals that range from the inland Mountains of the Pacific Northwest into international waters and is subjected to harvest in fresh and salt water up and down the Pacific Coast and beyond. Salmon and Steelhead should be exempted from the requirements of

the Endangered Species Act and their recovery and management in the United States would be governed by replacement legislation: The Northwest Salmon Act.

Northwest Power Act: On December 5, 1980 Congress passed the Pacific Northwest Electric Power Planning and Conservation Act which was signed into law by President Carter. The focus of this law was on power allocation and planning to avoid a future power crisis like the Washington Public Power Supply System bond default. The Northwest Power Act also required the Council to prepare a plan to protect, mitigate and enhance fish and wildlife of the Columbia River Basin that were affected by the construction and operation of hydroelectric dams while also assuring the Pacific Northwest an adequate, efficient, economical and reliable electric power supply. It can be argued that the fish and wildlife provisions were an afterthought to hold back ESA actions for declining runs. Recovery of salmon and steelhead is an important enough and large enough scale undertaking that it requires its own unique legislation identified above which would be separate and distinct from the power focus of the Northwest Power Act.

Funding: Each utility receiving preference power from the Bonneville Power Administration or its successor would collect \$0.0045 for each kwh sold to residential, commercial, agricultural, industrial or other customers for salmon and steelhead recovery. Assuming application to 7,000 aMW of priority firm power this portion of the "Salmon Tax" would generate \$275,940,000 per year for salmon recovery. The same level of Salmon Tax would also be imposed on the non-firm sales of BPA or its successor which average 1,500 aMW per year which would generate an additional \$59,130,000 per year. Investor-owned utilities in the region contribute to salmon and steelhead recovery primarily through requirements in their FERC Licenses. This in effect creates a different standard from the intense focus placed on the FCRPS and BPA Ratepayers. To address this inequity, 50% of the residential exchange settlement and any future program would be re-directed to salmon and steelhead recovery efforts. For FY 2022-23 this would be \$129,500,000 and would increase to \$143,050,000 by FY 2026. This funding would replace BPA's Direct Fish and Wildlife Program and would increase funding from this source from the current \$250,000,000 per year to \$464,570,000 which represents an increase of 86%!

Other sources of funding should also be developed. For instance, the state of Washington had 607,816 fishing license holders in 2019 generating total revenues of \$29,598,111 Oregon sold 650,435 fishing licenses generating \$28,438,654 with 520,492 fishing licenses sold in Idaho generating \$12,635,326. This total of \$70,672,091 includes all fisherman targeting all species in these 3 states. If a "NW Salmon Stamp" or expansion of the Columbia River Basin Endorsement at \$10/fisherman was applied under the assumption that 50% of all license holders targeted salmon and steelhead it would raise another \$8,893,715 from northwest anglers in these three states. This amount also places the magnitude of hydropower mitigation funding into some context.

Biological Strategies

Hydropower: Calls for dam breaching are divisive and economically damaging and should be considered a measure of last resort if innovative measures to increase salmon survival fail. The regional response to Climate Change and carbon reduction goals must recognize the critical role that hydropower plays as a renewable resource that integrates wind and solar power. We must find certainty amidst these demands for reduction of hydropower generation in the region in the name of salmon and steelhead recovery. Fish spill up to 125% Total Dissolved Gas levels represents a very risky operational regime that may be damaging the very resource it is intended to protect. This is not a binary issue, other Columbia River Basin Hydropower Operators have developed innovative solutions that reduce tainter gate spill and TDG impacts

on juvenile and adult salmon. These approaches can be adapted to the Lower Snake River Projects where so much uncertainty exists with respect to the future configuration for salmon and steelhead recovery.

Lower Snake River Dams

The spillways at the Lower Snake River Dams could be modified to pass a high-volume of total river flow without generating high levels of TDG. This has been accomplished at other projects through use of a full water-column slot that in effect creates a synthetic water fall without a plunge pool that causes physical damage to fish and high TDG levels. A high-flow synthetic waterfall of this type should be designed for each lower Snake project at a scale sufficient to pass a maximum volume of water without increasing TDG levels above 120% TDG. An example of such a design has been successfully used for fish passage at Wanapum Dam on the Columbia River.

Failsafe

If the spillway reconfiguration described above does not significantly increase juvenile outmigration survival above currently measured survival from Lower Granite Dam to Bonneville Dam over a 10-year test period following construction, implement more aggressive actions.

Blocked Areas: The enhanced funding available under this proposal should be used to fully fund reintroduction efforts above Grand Coulee/Chief Joseph Dams and the Hells Canyon Complex. Removal of ESA concerns as called for under this scenario should eliminate complications associated with the ESA-nexus to reintroduction efforts. In exchange for fully funding the above efforts and in recognition of the importance of the Northwest Hydrosystem in addressing climate change, these efforts must not negatively impact hydropower generation at Grand Coulee, Chief Joseph or the Hells Canyon Complex dams.

Habitat: Current habitat measures are implemented in a “peanut-butter” fashion where funds are spread around under political rather biological considerations. Future efforts should be based on biological merit giving priority under 2 primary criteria: 1) what measures will benefit the greatest number of fish at risk? And 2) without undertaking expensive and uncertain monitoring and evaluation programs what programs best address a limiting habitat factor for stocks with the greatest opportunity to benefit. An example of the application of these criteria would be immediate prioritization of high-quality estuary projects as improvements here benefit every stock in the Columbia Basin.

Harvest and Weak Stock Management: The harvest impact approach allowing for “incidental take” of at-risk stocks in mixed stocks fisheries is failing to protect the weakest stocks in the basin. The following harvest reform measures must be implemented:

- 1) Harvest of the weakest stocks in the basin should be curtailed entirely and limited to ceremonial fisheries only. This should be considered a temporary measure to get more fish on the spawning grounds and will provide an immediate boost to recovery efforts.
- 2) Mixed stock fisheries targeting healthy fisheries should be encouraged but reformed to reduce incidental harvest of weak stocks to the maximum extent practical. Live capture methods should be emphasized over other gear types. The enhanced funding identified above should be used to convert the fishing fleet into gear more suitable to minimizing mixed-stock fishery impacts. Funding should also be used to assist businesses, families and livelihoods impacted by temporary closures.
- 3) Future restored fisheries should limit reliance on mixed-stock fisheries in freshwater and focus more on carefully managed terminal fisheries.

Hatchery Reform: The vast number of juvenile hatchery fish released each year within the Columbia Basin provide a relatively small return in terms of adults available for fisheries, broodstock, conservation, and

recovery efforts. The specific purpose and underlying mitigation agreements for each hatchery in the Columbia Basin should be re-evaluated in terms of their contribution to achieving the quantitative goals of the Columbia Basin Partnership. Utilities, tribes, states and federal fish and wildlife agencies operating hatcheries under historic mitigation or other agreements would be released from those obligations in order to critically examine the role and operation of each facility in light of their contribution to or impact on the recovery goals. The enhanced funding identified in this scenario would be used to modify, improve or re-program facilities that could contribute to meeting the recovery goals.

Predation: Salmon and steelhead form an important food source in the Pacific Northwest for not just humans but also for birds, pinnipeds, mammals and other fish. Some of this predation is a desirable component of a healthy ecosystem, other elements are unintended consequences of various actions such as creation of new habitats through placement of dredged sediments, congregation of returning adults at fishway entrances, concentrated releases of hatchery smolts, introduction of non-native sport fish and many other anthropogenic effects. Current efforts tend to focus on one specific predator with a dedicated program of some type for each. None of these programs have any clear requirements or links back to salmon and steelhead recovery goals. Each program should have specific objectives and be tailored and prioritized based on their contributions to meeting the Quantitative Goals of the Columbia Basin Partnership.

Ocean Conditions: It has become abundantly clear that Ocean Conditions play an extremely important role in salmon and steelhead survival, growth and ultimately returns to freshwater. Chinook population declines are not unique to the Columbia River Basin and have declined sharply across their geographic range up and down the Pacific. Concurrently with this decline, pink salmon returns have increased dramatically with 500-600 million now produced which is way above historic averages. Much of this pink salmon production occurs in hatcheries and the correlation with weak chinook runs cannot be ignored. This relationship should be investigated immediately and if pink salmon competition is believed to be an issue then efforts should be made to reform those hatchery programs. Additionally, an effort should be initiated to coordinate the size and timing of Columbia River basin hatchery releases with ocean productivity information.

Social, Cultural, Economic and Ecosystem Considerations

Tribal: The collapse of salmon and steelhead populations in the Pacific Northwest has had negative and severe impacts throughout the region and nowhere is this more severe than for tribes where salmon and steelhead meet dietary, spiritual, cultural, economic and subsistence needs. Efforts that seek to minimize continued short-term impacts also negatively affects the timeframe to recovery and delays the benefits of recovery in meeting these needs.

Economic: This scenario would create economic impacts to interests across the region. However, the business certainty and positive effects of salmon and steelhead recovery are worth the sacrifice.

Public Support: Any scenario that leans on any individual sector of the Pacific Northwest is doomed to failure. Any one group or constituency has the political power to stalemate or block the reforms and change needed for salmon and steelhead recovery. We have already experienced this and we can spend endless amounts of time and money on litigation and efforts to re-package past efforts that have failed or we can ask each citizen to contribute something towards salmon and steelhead recovery and make this a community effort.

MAFAC CBP Task Force
Draft Salmon First Scenario
Zach Penney
May 6, 2020

Theme

For Columbia River tribal nations, the goals for salmon and steelhead remain the same as they were in the 1800s. Before the states of Oregon, Washington, Idaho, Montana, and Nevada existed, salmon and steelhead populations were healthy, self-sustaining, and the water they depended on, unallocated, unsullied, and unblocked. For tribes that signed treaties facilitating non-tribal settlement, the right to fish at usual and accustomed places was retained. This right also includes a habitat component that others should not engage in habitat-damaging activities that would diminish the abundance of salmon and prevent tribes from earning a moderate living through fishing. Regrettably, this has not been the case for salmon or tribes. Now is the time for the region to treat the needs of the salmon as a paramount objective to achieve and to restore them once again to healthy, self-sustaining, and harvestable levels.

In line with the “Tribal Perspective” of Phase 1, one of the intentions of the “Salmon First” scenario is to avoid normalizing the status quo or perpetuating the “false equivalencies” among sovereigns and stakeholders on “remaining whole.” This scenario aims to achieve the fastest possible response to declining populations of salmon and steelhead with emphasis on the following philosophies:

- The baseline for tribal salmon restoration and harvest is 1855 – there is a large gap between current conditions and the baseline.
- Broad tribal alignment exists for an immediate call to action by the region to reverse the decline of salmon and steelhead;
- Implementation of biological strategies needs to be immediate. At the co-management level, tribes have been involved in trying to reverse declines since the late 1970s and are not willing to wait another 25 years for “new aspirational” scenario planning implementation to meet tribal cultural, subsistence, and economic needs;
- Regional talking points need to change from, “how do we get enough salmon to meet everyone’s needs” to “what can we do to meet the needs of salmon”;
- Over a century of anthropogenic modifications to the river system, such as redirection or impoundment of water and introduction of non-native species, has created an ecosystem that is unnatural and growing increasingly inhospitable to salmon and steelhead. In order for salmon and steelhead to thrive at healthy and harvestable levels, the region needs to return the river to a more normative state, and to conditions suitable for salmon, especially as climate change exacerbates the already inhospitable conditions in the Columbia River;
- The long-game of the “Salmon First” Scenario is to have salmon and steelhead in all places that they historically inhabited, but with an understanding that certain geopolitical relationships, agreements, and continuing dialogue may allow certain goals to be attained sooner than others;
- The “Salmon First” Scenario requires the Pacific Northwest to integrate salmon recovery into everyday decision making at the local, state, and federal levels;
- An expectation that all scenarios devise a slider model baseline that does not treat hatchery production as a negative impact on recovery, but as a necessary tool to support recovery;

- An expectation that Columbia Basin hatchery mitigation funding and supplementation will be necessary while the factors/structures that caused the need for mitigation in the first place remain the primary issues negatively impacting recovery. This also includes the use of hatcheries to reintroduce extirpated stocks below and above blocked areas; and
- The “Salmon First” Scenario aims to achieve tribal goals in a manner that benefits all with an emphasis on getting more fish back in the river (i.e., doing what must be done to making salmon and its habitat “whole”).

Additional Scenario Description

The “Salmon First” Scenario maximizes effort in the near term on all fronts toward achieving goals as soon as possible, consistent with fair allocation of the conservation burden and Treaty/Trust obligations the Federal government has to Indian tribes. The scenario recognizes challenges and threats of climate to the modified river system and makes strategic choices in light of related risks, but with the goal of restoring all fish in all places; including blocked areas that were historically accessible to anadromous fish.

Regional Considerations

The scenario recognizes regional/sub basin differences in stock composition, population status, management efforts and jurisdictional boundaries. Specific strategies affect different stocks, groupings of stocks, or regions differently. The scenario allows for adjusted strategies that are specific to a region with coordinated efforts in the mainstem migration corridor.

Biological Strategies

- *Hydro*
 - With dams still in place, continue to implement aggressive spill program under existing configuration, as well as other efforts devoted toward reducing delayed mortality impacts derived from dam and reservoir passage, both downstream and upstream;
 - Begin immediate regional efforts to breach one or more dams and consider alternate forms of fish-friendly power generation and commerce;
 - Evaluate future passage/reintroduction options in blocked regions within the Columbia Basin;
 - Implement operations to address flow and temperature effects from climate change;
 - Conduct outreach and education to the hydro customers on the historic and current impacts to tribal communities, benefits of salmon runs in the PNW, costs and benefits of maintaining the hydrosystem relative to other alternative forms of energy.
- *Tributary Habitat*
 - At the outset, substantially increase basin-wide habitat restoration actions and ensure that efforts strategically target populations and habitat limiting factors that will provide the greatest contribution to long-term recovery goals;
 - Maximize restoration efforts to conserve habitats least vulnerable to climate change or most likely to improve climate resilience;
 - Conduct research, monitoring and evaluation as necessary to quantify physical and biological benefits from tributary habitat restoration and determine whether habitat improvements can yield biological responses sufficient to meet recovery targets;

- Conduct outreach and education to local and state land and water management boards and committees to integrate salmon recovery into local decision (rule) making;
- Continue and increase efforts to alter management of water systems to provide more normative flow regimes.
- *Estuary Habitat*
 - Substantially increase level of effort to maximize estuary habitat restoration.
- *Blocked areas*
 - Proceed incrementally as laid out in existing plans;
 - Explore and begin to implement experimental reintroduction with interim hatchery supplementation concurrent with evaluation of passage potential;
 - Maximize/expedite studies to reintroduce fish into blocked areas (Chief Joe/ Grand Coulee and Hells Canyon Complex) including habitat restoration above Hells Canyon Complex (HCC) to prepare for eventual passage at HCC. Ramp up efforts to expand distribution in tributary habitat (e.g., Cowlitz, Lewis, Willamette Basin, Deschutes, Yakima, etc.) and address any other significant blockages in tributaries¹;
- *Predation*
 - Identify and implement targeted opportunities to enhance predator control actions;
 - Population scale removals of non-native/introduced species;
 - Increase funding for control efforts related to past or present federal and state introductions of non-native fish species;
 - Eliminate harvest limits and regulations protecting non-native fish in waters that contain or are connected to waters containing anadromous salmon and steelhead;
 - Increase funding for federal, state, and tribal enforcement to reduce illegal or unintentional introduction of invasive/non-native species;
 - Identify and implement targeted opportunities to enhance predator control actions, including predation impacts related to climate effects (e.g., non-native fish range expansion due to dams and climate change);
 - Modify or remove anthropogenic structures that have increased predators or that make salmon and steelhead more vulnerable to predation at all life stages.
- *Hatchery*
 - Ensure that hatchery programs with a mitigation responsibility are fully and adequately funded;
 - Adequately fund routine and non-routine maintenance and support modernization of hatchery infrastructure to ensure achievement of mitigation goals;
 - Prioritize hatchery production in areas where restoration and mitigation goals have not been met;
 - Identify areas suitable for reintroduction and implement reintroduction programs;
 - Continue to improve hatchery programs using the best available science to minimize risks to natural populations;
 - Prepare for the likely role that hatchery programs and infrastructure will play in buffering against fluctuating environments and stochastic climate events;

¹ It is recognized some sovereigns are constrained in consideration of this issue.

- Implement sliding scale protocol for hatchery production as natural abundance increases and proves resilient;
- Reevaluate mitigation hatchery production when dams have been removed and the historic impacts of those dams have been fully mitigated.
- *Harvest*
 - Ensure that conservation burden is appropriately allocated such that treaty harvest is not bearing a disproportionate amount of the responsibility, consistent with federal law;
 - Continue to set harvest impacts at levels that do not impede recovery through use of abundance-based management frameworks or other relevant harvest management approaches (e.g., tribal fisheries in the mainstem Columbia and in tributaries are implemented currently to target more abundant stocks while protecting weaker, less abundant stocks);
 - Run-timing of salmon and steelhead is highly heritable; therefore, fishery effort needs to be balanced to ensure mixed stock fisheries (sport and commercial) are not artificially changing run-timing (e.g., overharvesting the earliest run Spring Chinook or upriver bright Summer Chinook);
 - Establish or continue to use existing sliding scale tribal harvest schedules that increases the rate of harvest as runs increase (recognizing that these scales are designed for the low-end goals in Figure 2 of Phase 1 Report of the Columbia Basin Partnership Task Force of the Marine Fisheries Advisory Committee).
 - Consider in-river refuges/sanctuaries that protect migrating salmon and steelhead;
 - Reduce non-treaty “sport fishery footprint” or impact limits as may be necessary to address conservation and recovery across the abundance range (e.g., limiting or eliminating catch-and-release fishing during warm water periods);
 - As natural returns of salmon and steelhead approach high-range goals, work towards ending the need for mark-selective fisheries;
 - Eliminate non-consumptive fishery impacts on salmon and steelhead when fish are actively spawning.

Social, Cultural, Economic and Ecosystem Considerations and Strategies

- Tribal dependence on salmon and other fish species to meet dietary, spiritual, cultural, economic and basic subsistence needs is still a prevailing necessity of tribal culture and society. Prioritize tribal ceremonial, subsistence and commercial needs and fishing-based economy;
- Historic benefits should be weighed in comparison to future impacts. The economic sectors that may be impacted have benefitted the most;
- Stepwise implementation of dam removal will be less disruptive. Allows evaluation and adaptive management;
- Ensures that existing mitigation commitments are met. Currently there is a lack of accountability on meeting those obligations;
- Most likely scenario to address Treaty obligations by federal government;
- Benchmarks should be set at 2 generations of salmon (10 years). Goal should be to see improvements immediately.

MAFAC CBP Task Force
Draft Full Recovery Plan Implementation Scenario
Steve Manlow and Washington's Columbia Basin Recovery Organizations
May 6, 2020

Theme

Washington State's collective and local response to federal Endangered Species Act (ESA) listings in the late 1990's was unprecedented. Unlike the traditional process that has the federal government writing a recovery plan, the State created a locally-based infrastructure of regional salmon recovery organizations ("Regions") to coordinate the efforts of thousands of local professionals and volunteers working in concert with federal, tribal, and state agency scientists and policy makers to create our own regional salmon recovery plans. In the Columbia Basin, these Regions include the Upper Columbia Salmon Recovery Board, Yakama Basin Fish and Wildlife Recovery Board, Snake River Salmon Recovery Board, and Lower Columbia Fish Recovery Board. These Regions facilitated development of NOAA-adopted recovery plans that share the common goal of returning ESA-listed salmon, steelhead and bull trout to healthy, self-sustaining and harvestable levels. This bottom-up approach and the scale of their efforts was unprecedented in the United States and has been dubbed "The Washington Way" by those involved in salmon recovery. With the plans completed, the Regions turned their focus to facilitating implementation.

Today, nearly 20 years later, salmon recovery efforts have been instrumental in helping some species turn the corner toward recovery and have slowed the decline or prevented extinction of several other species. Progress has indeed been made within the level of commitment and resources applied to recovery efforts to date. For example, progress to date through Washington's Salmon Recovery Funding Board (SRFB) alone on a statewide basis includes opening access to 2,000 miles of existing habitat and restoring 519 acres of wetlands, 6,016 acres of estuaries, 19,590 acres of riparian habitat, 23,304 acres of uplands, and 499 miles of stream habitat (RCO, 2019). While some species such Snake River fall Chinook, Mid-Columbia Steelhead, and Lower Columbia steelhead are trending toward delisting abundance targets, other species, such as Lower Columbia fall Chinook and Upper Columbia River spring Chinook, are not making progress or are falling further behind. Too many ESA-listed species remain precariously close to the brink of extinction. Progress in some sectors, such as hatchery and harvest reform, is occurring too slowly in some areas or is being offset with challenges in other sectors, such as general habitat loss (especially in urbanizing areas), predation, and invasive species. In addition, warming oceans, changing stream environments, shifting food webs, and other issues associated with climate change are playing an increasing role in limiting recovery progress.

At the time recovery plans were developed, the expectation was that existing management programs that we rely upon to maintain the baseline would be updated to better reflect salmon and steelhead recovery needs, and that restoration programs aimed at improving the baseline would be fully funded. Unfortunately, we have not collectively and fully integrated salmon recovery needs into our various local, state and federal land use programs. In addition, for the 2010-2019 time period, we have funded less than one-fourth of the estimated \$2.49 billion in capital and \$436 million in capacity costs associated with actions in the NOAA-adopted recovery plans for the Columbia Basin. These costs are conservative, and are primarily related to habitat actions. They do not include actions and costs

associated with any changes in infrastructure or operation of the hydropower system, hatchery and harvest reform, or emerging predator and invasive species control needs.

The Regions believe that the lack of recovery progress to date is not related directly to inadequacies in existing recovery plans. While impacts vary across each Region, an interconnecting theme is that we are not investing socially, politically or economically in salmon recovery at a scale necessary to fully recover fish to delisting or healthy and harvestable levels. Much stronger policy level support across various management sectors (all-H integration) is needed to meaningfully increase recovery progress across the Columbia Basin. Regions are uniquely suited and well-positioned to facilitate needed conversations to achieve a Full Recovery Plan Implementation Scenario, with the active engagement of NOAA Fisheries and state and tribal fishery co-managers. ***Achieving the broad-based goals established by the Columbia Basin Partnership requires concerted effort along a continuum. The challenges that currently limit progress toward achieving population specific delisting targets must be first overcome if we wish to ever achieve the broad-based targets that we have established.***

Regional Considerations

This Full Recovery Plan Implementation Scenario recognizes biological, social, political and cultural differences in recovery approaches across the Regions. It also recognizes the differences in recovery focus within each adopted plan. For example, some Regions developed comprehensive plans that address impacts across all of the “Hs” (e.g., habitat, hydro, harvest, hatcheries, ecological interactions, and predation), whereas others focus largely on habitat protection and restoration. Regions are working diligently to update the knowledge base and technical foundation to better support decision-making across the Hs. This scenario recognizes these differences and that the various strategies, measures and actions described below do not apply equally to all stocks or Regions across the basin. It also acknowledges and fully respects tribal treaty rights and the critically important role of fishery co-managers in supporting recovery programs. Lastly, it strongly supports the concept of identifying what we can do to more fully address and elevate the needs of salmon.

Needs for Full Recovery Plan Implementation

Below is a summary of general needs that exist in the Columbia Basin Regions for full Recovery Plan Implementation. These are written generally as the scope, approach, and priorities for addressing these needs vary across the Regions.

- Ensure Regions have the capacity to build the strong partnerships and leverage the diverse resources needed to effectively and strategically implement recovery actions identified in NOAA-adopted recovery plans. This includes increasing policy and financial support to:
 - Provide for the sharing of information on recovery initiatives, programs, science, and progress;
 - Support the development of collaborative partnerships that support salmon recovery efforts in the management of forests, water, habitat, harvest, hatcheries and hydro facilities;
 - Further coordination among federal, state, local and tribal programs affecting salmon recovery;
 - Support expanded coordination, as needed among recovery partners, to better develop and implement complex, large scale projects and programs; and,
 - Provide Regions, as needed or requested, the capacity and resources to complete or update science based, community supported plans for recovery of listed and enhancement of non-

listed salmon, steelhead and bull trout, to ensure effective recovery actions and strategic allocation of resources. In some Regions, this includes updating existing recovery plans to address climate change, new science, and changing conditions.

- Provide Regions and partners with the capacity and tools to adequately track, monitor and report on the progress of salmon recovery across the H's (habitat, hatcheries, harvest, hydro and predation) within each Region and across the entire Columbia Basin:
 - Ensure fish (VSP) monitoring is sufficient to support NOAA status and delisting reviews, as well as broader recovery progress;
 - Expand the ability to monitor and assess habitat status and trends, and project and action effectiveness, in a coordinated manner across the Columbia Basin; and,
 - Focus monitoring and research on improving our understanding of life-cycle bottlenecks, spatially and temporally.
- Expand existing habitat funding programs, including Pacific Coast Salmon Recovery Fund (PCSRF) and National Estuary Program (NEP), to fully address habitat restoration and protection needs identified in NOAA-adopted and tribal recovery plans. Restoration efforts should be maximized in a manner that conserves and restores habitats that are most resilient to climate change, including cold water refugia.
- Develop new and broader-based habitat restoration funding sources to provide long-term funding stability.
- Expand funding for incentive-based programs to offset impacts to those property owners who support habitat protection and restoration work on their lands.
- Ensure hatchery and harvest reform and policy updates and programs are compatible with and support recovery of at-risk locally adapted fish stocks.
- As local, state and federal land management programs are updated, fully incorporate and consider salmon, steelhead, and bull trout recovery needs. This includes strengthening policies and existing statutory requirements to ensure recovery needs are fully and explicitly integrated into decision-making processes. Key programs are identified in respective recovery plans, incorporate various "Hs", and vary across Regions.
- Identify and implement targeted opportunities to enhance predator and invasive control actions, including:
 - Population scale removal of non-native/introduced species;
 - Increase funding for control efforts related to pinniped and avian control efforts in the mainstem and estuary;
 - Eliminate harvest limits and regulations protecting non-native fish in waters that contain or are connected to waters containing anadromous salmon and steelhead; and
 - Increase funding for federal, state, and tribal enforcement to reduce illegal or unintentional introduction of invasive/non-native species.

- Ensure that future governance structures and approaches honor, build upon, and coordinate with existing recovery efforts and partner commitments made to date.
- Substantially increase funding to address mainstem-wide fish survival and passage issues across the entire fish life cycle, including key issues such as tributary overshoot.
- Finalize development of the “All-H Slider Tool”, enhance it to address population-scale impacts, and make the tool and the underlying life cycle model and supporting documentation (with assumptions and data sources) available for use by Regions and other partners to support adaptive management of the NOAA-adopted Recovery Plans.

In addition to the above basin-wide needs, the following high priority regional needs must be addressed to support Full Recovery Plan Implementation in a manner that achieves established recovery goals. These needs apply only to the identified Region, and should be not viewed as endorsed by other Regions.

Upper Columbia Salmon Recovery Region

- Implementation of recommendations made by the [Independent Scientific Advisory Board Review of Spring Chinook in the Upper Columbia](#).
- Integration among all-H management sectors (habitat, harvest, hatchery and hydropower) to maximize alignment with recovery goals.
- Reduce avian and pinniped predation.
- Increased aquatic habitat restoration on Okanogan Wenatchee National Forest managed-lands.
- Prevent Northern Pike from getting below Chief Joseph Dam.
- Clean Water Act 401/404 permit streamlining for salmon restoration projects.

Mid-Columbia and Snake River

- Continue extensive efforts to restore spawning and rearing in Mid-Columbia and Snake River tributaries. Sustaining this progress requires ongoing support from BPA, NOAA’s Pacific Coast Salmon Recovery Fund, Washington State’s salmon recovery programs, the Yakima Basin Integrated Plan, the Bureau of Reclamation, and other programs that focus on high priority actions that support recovery of the Yakima, Walla Walla, and Lower Snake MPG’s.
- Improve smolt survival from spawning and rearing areas downstream through the mainstem Yakima, Columbia River and Snake Rivers. This will require:
 - Reducing high predation rates by pikeminnow, bass, walleye and other predatory fish;
 - Reducing entrainment rates and associated mortality rates at major diversion structures in the Yakima Basin;
 - Fully implementing bird predation reduction programs in the Middle and Lower Columbia; and,
 - Continuing efforts to improve smolt survival through the Columbia River Power system.

- Ensure that returning adult steelhead and Chinook are able to successfully migrate from the ocean to tributary habitat. This will require improving reproductive success by means of downstream passage of adults that overshoot at mainstem dams, and taking other actions that improve the overall conversion rate of adults between Bonneville Dam and Mid-Columbia and Lower Snake River Tributaries.
- Seek to align Washington State's recreational and commercial harvest policy with conservation and recovery goals, and managing to meet escapement goals for ESA-listed populations.
- Maintain and expand existing population viability monitoring efforts to ensure that we can effectively track steelhead and Chinook populations relative to the goals set out in the YSRP and Snake River Salmon Recovery Plan for SE Washington, and identify life stage specific population bottlenecks that need to be addressed.
- Ensure that adequate long-term habitat status and trends and project effectiveness monitoring is in place to guide our ongoing investments and indicate when and where we need to address developing threats such as climate change.

Lower Columbia

- Improve fish-in fish-out monitoring for Primary and Contributing populations to support annual abundance and productivity estimates, and identification of population and species-scale life history bottlenecks.
- Fully fund and implement the Lower Columbia Habitat Status and Trends Monitoring (HSTM) Program (LCFRB, 2016).
- Establish and conduct an effectiveness evaluation for all key implementation programs (e.g., land use, hatchery, harvest, hydro, ecological interactions) identified in the Recovery Plan, to inform threat reduction progress and adaptive management.
- Ensure full integration and prioritization of salmon recovery needs and recovery plan goals in implementation of key local, state and federal recovery partner programs (e.g., land use, regulatory, natural resource management, etc) identified in the Recovery Plan.
- Update local and state Growth Management Act (GMA) programs to ensure that protection of watershed functions and processes is fully considered on par with other land use goals and objectives, and establish criteria and guidance for implementing partners.
- Accelerate salmon and steelhead reintroduction efforts in the Cowlitz and Lewis River watersheds, and manage hatchery and harvest operations in manner that ensures success.
- Substantively increase investments in fall Chinook and chum salmon habitat restoration and protection, with a focus on Primary populations.

- Ensure that recovery burden is appropriately shared and equitably allocated in a manner that ensures level of effort is proportionate to relative contribution to impacts, and that no party bears a disproportionate amount of responsibility for recovery.

DRAFT

MAFAC CBP Task Force
Draft Level-of-Effort Scenarios
Project Team
May 6, 2020

Theme

In the process of considering scenarios (or alternative pathways to achieving the goals), the Task Force explored potential outcomes and strategies under scenarios that involved continuing existing levels of effort, moderately increasing levels of effort, and maximizing levels of effort to address all threats. As part of this effort, the Task Force also explored an “a la carte” menu of strategies in these various categories, with the notion that it could prove useful to construct stock- or region-specific scenarios that employed a mix of strategies from different the different level-of-effort categories, depending on what was most appropriate to specific stocks or regions. In addition, the Task Force held a series of meetings with local technical experts in the Upper Columbia, Snake Basin, Mid-Columbia, and Willamette/Lower Columbia subbasins to explore what the three levels-of-effort scenarios might look like in a particular region. The process of exploring these scenarios was useful in the following ways:

- Provided a basis to begin consideration of the strategies and levels of effort that might be required to achieve the goals
- Provided a basis from which to evaluate qualitatively the likelihood of achieving the goals or the length of time it might take to achieve the goals
- Provided a basis for regional discussion to explore outcomes for specific stocks and areas
- Provided a springboard for Task Force members to consider additional scenario themes or approaches

Ultimately, the Task Force reached a consensus that continuing existing levels of effort was highly unlikely to achieve the high-range goals and chose to consider it a baseline rather than a viable scenario.

Below we have expanded upon the “a la carte menu,” the discussions that took place at the regional meetings, and Task Force discussions to flesh out potential scenarios under the moderately increased and maximum levels of effort. In some cases, the primary variable between these two scenarios is level of investment (e.g., in habitat actions); in others there is a more clear distinction between strategies in the two categories. The strategies in both scenarios reflect efforts to frontload efforts for the next 25 years. Both scenarios also incorporate a concept that a set of benchmarks would be developed that could be used to evaluate progress and that if those benchmarks were not met, additional actions would be triggered, although the details of these benchmarks and additional actions have not been developed. Both also incorporate the concept of identifying critical uncertainties, innovative approaches, and strategic choices that might drive implementation, although those aspects of the scenarios require additional development. In addition, the strategies identified are broad and general and would need further refinement to be implemented.

Biological Strategies

- **Hydro**
 - **Moderate Increase in Effort**
 - With federal Columbia and lower Snake River mainstem dams still in place:
 - Continue to implement aggressive spill program under existing configuration, as well as other operational and configurational efforts devoted toward reducing passage and reservoir mortality.
 - Explore further expansion of spill measures (e.g., to 125% dissolved gas levels at all dams at all times). Invest further in significant dam modifications to help reduce gas impacts and speed river channels through the reservoirs and through the spill gates.
 - Explore additional ways to enhance adult overshoot issues of some stocks.
 - Continue and if possible expand actions to manage temperature, including flow management and in-season actions in warm years for vulnerable stocks and identification and protection of cold-water refugia.
 - Ensure that a credible system is in place to evaluate the effects of the aggressive spill program.
 - [Consider adding additional detail from regional meetings]
 - FERC-licensed projects:
 - Look beyond FERC license agreements and corresponding biological opinions or, in the case of the mid-Columbia PUD dams, the Habitat Conservation Plan, to find additional operational measures that could be implemented to improve survival (e.g., year-round bypass operations, alternative spill regimes, adult passage technologies) or additional mitigation actions that could be implemented.
 - [Consider adding additional detail from regional meetings]
 - Explore potential to improve operations to address flow and temperature effects from climate change and implement if feasible measures are identified
 - **Maximum Increase in Effort**
 - Begin immediate efforts to breach one or more federal mainstem Columbia and/or lower Snake River dams. During the planning phase:
 - Continue to implement aggressive spill program under existing configuration, as well as other operational and configurational efforts devoted toward reducing passage and reservoir mortality.
 - In addition to considering breach one or more lower Snake River dams, consider breaching John Day and/or McNary Dam (mortality sources for salmon in nearly the entire river, not just the Snake, plus they likely inundated important historical spawning and rearing habitat. As alternative to breaching, consider structural and operational changes at

the lower Snake/lower Columbia (especially John Day) dams that were short of breaching (e.g., spillway crest operations) [Submitted after regional meetings]

- Consider ways to relax flood risk constraints on both flows and habitats (e.g., relax flood control operations, invest in coordinated effort to remove flood control structures and reopen floodplain habitat in major tributaries and estuary, invest in additional flood control structures to protect existing urban areas, de-invest in storage and find other ways to manage flood risks) [Submitted after regional meetings]
- With a protected areas program of some sort, protect rivers from new structural changes, from land use changes that further degrade habitat and water quality, and from new water withdrawals and in-water developments.
- Explore additional ways to enhance adult overshoot issues of some stocks.
- Continue and if possible expand actions to manage temperature, including flow management and in-season actions in warm years for vulnerable stocks and identification and protection of cold-water refugia.
- Manage dams primarily for fish, with power generation and navigation secondary
- Establish flow augmentation targets
- [Consider adding additional detail from regional meetings]
- FERC-licensed projects:
 - Identify and implement additional actions such as year-round fish passage, additional turbine restrictions, fish-friendly turbines at all dams or additional mitigation actions that could be implemented.
 - Ensure that efforts to restore habitat in the middle Snake River (above the Hells Canyon Complex dams) are implemented aggressively as outlined in the [settlement agreement?].
 - Identify and implement additional opportunities to remove additional FERC-licensed dams in the basin.
 - [Consider adding additional detail from regional meetings]
- **Critical uncertainties**
 - Effects of increased spill
 - Extent of latent mortality

- Survival studies are done primarily with hatchery fish. Impacts may not be the same to natural-origin fish. Fish used in PUD hydro survival studies are predominately hatchery-origin juveniles, which are often larger and could display different characteristics than natural-origin fish.
- **Innovative approaches**
 - [Would need to develop additional content]
- **Tributary Habitat**
 - **Moderate increase in effort**
 - Moderately increase funding for habitat actions in the basin. [Better define what this means?]
 - Optimum opportunities for improvements will be more complex and costly.
 - Significant improvements will require expansion of implementation infrastructure and supporting assessment information.
 - Develop frameworks to ensure that habitat restoration efforts strategically target populations and habitat limiting factors that will provide the greatest contribution to long-term recovery goals.
 - Ensure that efforts focus primarily on large-scale, process based restoration and protection of habitat function sufficient to demonstrably improve abundance and productivity of key populations.
 - Ensure that such frameworks incorporate considerations related to habitats least vulnerable to climate change or most likely to improve climate resilience.
 - Develop frameworks to ensure that areas with the greatest tributary habitat restoration potential are harmonized in the long term with hatchery programs in a manner that enhances progress toward long-term goals.
 - Conduct research, monitoring and evaluation as necessary to quantify physical and biological benefits from tributary habitat restoration and determine whether habitat improvements can yield biological responses sufficient to meet recovery targets.
 - Develop approaches to working with local governments and other land and water managers to enhance land use planning and regulatory programs to better protect salmon and steelhead habitat.
 - Develop outreach programs that target specific issues (e.g., irrigation efficiency).
 - Develop outreach programs to private landowners.
 - [Consider adding additional detail from regional meetings]

- **Maximum increase in effort**
 - In addition to all the above actions:
 - Increase funding by an even greater amount [Better define what this means?]
 - Address major constraints such as existing development in floodplains.
 - Enhance investments in efforts to prevent additional degradation.
 - [Consider adding additional detail from regional meetings]
- **Critical uncertainties**
 - Need better understanding of capacity to improve tributary habitat productivity and constraints to improving. There is uncertainty about the carrying capacity of freshwater habitats. There is also habitat in relatively good condition that is not as productive as would be expected – why? (e.g., why is the Middle Fork Salmon River not more productive and why is the Lemhi River more productive than more pristine habitats?)
 - Need to better understand whether and how tributary habitat restoration actions lead to increases in population-level spawner abundance and productivity. Need better understanding of habitat status and fish survival at population scale, how fish respond to habitat actions, and how habitat actions contribute to recovery.
 - Need better understanding of the effects of toxic pollutants throughout the Columbia River Basin on salmon and steelhead.
- **Innovative approaches**
 - Look at innovative practices for cooling tributary water (e.g., wastewater dischargers required to cool water before discharging; geothermal, hyporheic cooling).
 - Explore and implement innovative approaches to preserving/restoring floodplain function (e.g., pay landowners to allow property to flood).
 - Explore and implement innovative approaches for preventing land-use conversions (e.g., to residential or industrial development)
 - Explore approaches to temperature control such as that developed in Fifteen-Mile Creek. This volunteer program, started in 2011, uses a stream temp and flow forecasting model, and when lethal temps for fish are projected, an alert system goes out to irrigators. Water rights holders are compensated for releasing water instream. During the 2015 drought conditions, enough water was released to avoid lethal temps.
 - Elevate the power of life-cycle models as a tool to be used in evaluating restoration opportunities.
- **Estuary Habitat**
 - **Moderate increase in effort**
 - Increase funding to support a substantial increase in the level of effort to restore estuary habitat.
 - Increase flexibility in existing project approval and funding processes.

- Investigate potential for purchasing private land for habitat restoration actions and purchase land from motivated sellers.
- Focus restoration projects to benefit ecosystem function for a variety of species and increase habitat to a high level of fish function in selected priority areas.
- Use Lower Columbia Estuary Partnership habitat analyses to ensure that habitat restoration efforts strategically target populations and habitat limiting factors that will provide the greatest contribution to long-term population goals.
- Implement projects with increased complexity and cost that requires some impact to existing infrastructure (e.g., dike removal).
- Increase efforts to work with local governments and other land and water managers to enhance land use planning and regulatory programs to better protect salmon and steelhead habitat.
 - Integrate and prioritize salmon and steelhead recovery needs into land use planning processes.
- Give highest priority to shoreline protection and restoration activities that focus on removing non-marine impacts from shoreline habitat.
- Give high priority to increasing and improving floodplain habitat and protecting floodplain habitat from future industry expansion.
- **Maximum increase in effort**
 - Significantly increase funding to support a substantial increase in level of effort that is necessary to maximize habitat restoration in the estuary.
 - Significantly increase flexibility in existing project approval and funding processes.
 - Purchase privately owned land to use for habitat restoration actions wherever possible.
 - Focus restoration projects to increase habitat to a high level of fish function throughout the estuary to ensure there is rearing habitat well connected through the entire migratory corridor, especially in the Portland-to-Longview reach.
 - Focus maximum restoration effort on securing habitats that are least vulnerable to climate change or are most likely to improve climate resilience for healthy and stronghold populations.
 - Shift to largescale process-based restoration of habitat condition and function, which will require significant increase in impacts to major infrastructure (e.g. railroads, highways, waterfronts).
 - Maximize efforts to work with local governments and other land and water managers to enhance land use planning and regulatory programs to better protect salmon and steelhead habitat.
 - Integrate and prioritize salmon and steelhead recovery needs into land use planning processes.
 - Give highest priority to shoreline protection and restoration activities that focus on removing non-marine impacts from shoreline habitat.
 - Give high priority to increasing and improving floodplain habitat and protecting floodplain habitat from future industry expansion.

- **Blocked areas**
 - **Moderate increase in effort**
 - Expand efforts to find opportunities and improve passage into tributary and mainstem blocked areas in conjunction with dedicated programs for hatchery supplementation.
 - In the Upper Columbia, develop dedicated hatchery production to support reintroduction efforts. Restore habitat (20% in 25 years).
 - In the Upper Snake, restore naturally reproducing unlisted populations of salmon and steelhead within select tributaries upstream of the HCC to meet harvest cultural, and ecological needs.
 - Pave the way for restoring a fall Chinook salmon population above the Hells Canyon Complex by ensuring that efforts to restore habitat in the middle Snake River (above the Hells Canyon Complex dams) are implemented aggressively as outlined in the [settlement agreement?]
 - Expand tributary reintroduction efforts (including Wallowa Lake, North Fork Clearwater, and [provide examples outside of Snake Basin?])
 - Improve passage structures and operations at FERC-licensed dams to improve efficiencies.
 - [Consider adding additional detail from regional meetings]
 - **Maximum increase in effort**
 - Restore effective adult and juvenile passage consistent with high levels of self-sustaining natural abundance and production in historical ranges.
 - Breach the main blockages and reestablish anadromous fish above Grand Coulee/Chief Joseph and the Hells Canyon Complex.
 - Short of breaching these dams, invest significant funds (hundreds of millions) in reintroducing anadromous fish to these areas and in juvenile and adult passage facilities.
 - Similar to the above, but invest heavily in weirs and other facilities to combine significant reintroduction with large-scale trap and haul transport for both juveniles and adults, rather than passage investments at the dams.

- As a possible added element of reintroduction, invest in hatchery production in the blocked areas to supplement salmon and steelhead abundance in these areas
 - (This bullet and subbullets submitted after regional meetings)
 - Explore and implement additional decommissioning and removal of dams after current licenses expire, along with systematic restoration of habitats in currently blocked areas.
 - In the Upper Columbia, achieve functioning juvenile and adult fish passage and have dedicated hatchery production for reintroduction. Achieve colonization of habitat in blocked areas.
 - In the Upper Snake, work toward a longer term vision in which the Hells Canyon Complex dams have been removed.
 - [Add additional detail from regional meetings, including more on Willamette and other lower Columbia tributary dams?]
- **Critical uncertainties**
 - Engineering for passage systems.
- **Predation**
 - **Moderate increase in effort**
 - Identify and implement targeted opportunities to increase predator control actions for the purpose of reducing abundance of predatory species in specific geographic areas where predation rates are high.
 - Implement actions to reduce available habitat for predatory species in these areas.
 - Implement actions to exclude predatory species from these areas.
 - Implement management strategies that maximize harvest of non-native predaceous fish species in waters that contain or connect to waters that contain anadromous salmon and steelhead.
 - Utilize various strategies (e.g. capture and transport, modify habitat function) to redistribute predators to locations where salmon and steelhead are less susceptible to predation.
 - Utilize lethal actions to eliminate predators.
 - Increase funding to support implementation of predator control actions.
 - **Maximum increase in effort**
 - Implement large scale predator control programs that function at the population scale to significantly reduce abundance of predatory species and associated predation impacts.
 - Implement actions that impact habitat for the purpose of reducing amount of habitat that supports predatory species.
 - Reduce geographic range of predatory species by limiting access to portions of the basin.
 - Utilize lethal actions to eliminate portions of populations.

- Significantly increase funding to support implementation of predator control actions.
 - **Critical uncertainties**
 - Need better understanding of impacts of non-native species, particularly non-native fish predators.
- **Hatchery**
 - **Moderate increase in effort**
 - Implement hatchery reform actions by modifying size or type of hatchery program to limit impacts/risks to key natural origin populations.
 - Reduce program size or eliminate program entirely where program results in higher impacts/risks to natural populations.
 - Modify broodstock source by incorporating natural-origin adults or developing local hatchery brood stock.
 - Modify release locations to maximize harvest or removal (e.g. trapping) of hatchery adults.
 - Increase pace of hatchery reform actions in basins where significant habitat restoration is occurring.
 - Strategically implement mitigation programs to control impacts/risks to natural populations and provide intended fishery benefits.
 - Strategically implement hatchery production in areas where restoration and mitigation goals have not been met.
 - Use conservation hatchery strategies to proactively address future threats, including climate change.
 - Eliminate hatchery releases in selected areas where natural populations are healthy to establish strongholds or gene banks for natural populations
 - Utilize hatchery programs to support reintroduction, supplementation, and harvest opportunities and benefit natural populations.
 - Plant hatchery adults or juveniles into geographic areas that currently do not support a self-sustaining population for reintroduction purposes or to reduce demographic risks.
 - Focus hatchery programs in areas that support high harvest rates for hatchery fish and limit impacts/risks to natural populations.
 - Operate supplementation and conservation hatchery programs using natural origin brood stock to assist in seeding underutilized habitat.
 - [Consider whether additions/modifications needed here to align with full suite of qualitative goals]

- **Maximum increase in effort**
 - Reconfigure hatchery programs to significantly reduce impacts/risks to stronghold populations by eliminating hatchery releases in priority basins.
 - Identify stronghold populations throughout the basin where releases of hatchery juveniles or adults will not occur.
 - Reconfigure harvest/mitigation programs to significantly reduce impacts/risks to natural populations.
 - Focus on natural populations for brood stock and reduce dependence on hatchery brood stocks.
 - Maintain hatchery programs in basins where no natural production occurs.
 - Reevaluate mitigation programs to determine if fishery benefits are being realized and ensure the conservation of natural populations impacted by these programs.
 - Limit use of hatchery programs to support conservation, supplementation or reintroduction of natural populations.
 - Maintain hatchery programs of limited duration for the purpose of supplementing depressed populations and ensure these programs include monitoring and adaptive management elements to manage program to benefit natural populations.
 - Implement hatchery programs necessary to reintroduce salmon and steelhead into basins that can support natural populations and currently have not production.
 - [Consider whether additions/modifications needed here to align with full suite of qualitative goals]
- **Harvest**
 - **Moderate increase in effort**
 - Refine abundance-based management strategy to ensure that harvest rates are adequate to conserve depressed or listed populations.
 - Implement management strategies that maximize ratio of hatchery:natural fish handled in non-tribal fisheries where possible.
 - Ensure that conservation burden is appropriately allocated such that treaty harvest is not bearing a disproportionate amount of the responsibility, consistent with federal law.
 - Curtail or eliminate fishing selected geographic areas to create refuges/sanctuaries for migrating adults.
 - Curtail or eliminate fisheries directed on natural populations where populations are not exhibiting a healthy self-sustaining abundance levels.
 - Limit incidental impacts in fisheries to levels that allow for rebuilding of depressed populations.
 - Close or severely limit harvest of at risk populations.

- [Consider whether additions/modifications needed here to align with full suite of qualitative goals]
 - **Maximum increases in effort**
 - Close or severely limit all harvest to maximize natural spawning escapement.
 - Adjust harvest as needed to ensure that natural production goals for stronghold populations are achieved.
 - Reevaluate fishery management strategies to ensure that fisheries are focus on harvest of hatchery mitigation stocks and maximize ratio of hatchery/natural adults in harvest in non-tribal fisheries.
 - Allow retention of natural adults for stock abundance approaches high goal.
 - [Consider whether additions/modifications needed here to align with full suite of qualitative goals]
- Climate
 - [Consider developing climate strategies to include in all threat categories]
 - **Critical uncertainties**
 - Future changes in temperature and precipitation could have regional effects on the timing and distribution of water, water quality, ocean conditions, and the susceptibility of areas to expansion and introduction by non-native species.

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