Staff summary of Issues & Recommendations
Scientific Foundation / Principles

*preliminary draft, please refer to full recommendations for complete review

10/29/2013 10:05 AM

2009 Fish and Wildlife Program Section

Section II. B Title: Scientific Foundation and Principles (pg 9-11);

Overview

Several entities recommended adopting the ISAB recommendations for revising the Scientific Principles. Some entities suggest that text should be added to the principles to convey that the Columbia River ecosystem includes upland, tributary, mainstem, estuary, plume, and near-shore ocean environment and that salmon and steelhead evolved over time to respond to the variation in their environment.

Also one entity suggests adding 2 new principles to reflect (1) salmonid fecundity (productivity) rates evolved over thousands of years in equilibrium with mortality rates that since have been substantially increased by human development and (2) interim measures are needed to boost rates of population productivity until ecosystem integrity and sustainable mortality schedules are restored.

I. Summary

- The CSKT (16), NPT (25), NOAA-F (30), Native Fish Society (60), and Trout Unlimited (67) recommend that the Council replace the 2009 FW Program Scientific principles with the 6 new principles recommended by the ISAB.
- Native Fish Society (60) recommends, per ISAB, that the vision and biological objectives be examined for consistency with the scientific principles.
- The CTGR (18), Cowlitz I.T. (22) and NOAA-F (30) suggest that additional language be added to the scientific principles to clarify that (1) the Columbia River ecosystem includes upland, tributary, mainstem, estuary, plume, and near shore ocean environments; and, (2) and that Salmon and steelhead accommodate ocean mortality and environmental variability by having life histories that have sufficient level of productivity and a wide range of biological diversity (i.e., resiliency).
- The CTUIR (19) and YN (17) suggest adding 2 new principles to the 2009 Program principles, specifically: Principles 9, salmonid fecundity (productivity) rates evolved over thousands of years in equilibrium with mortality rates that since have been substantially increased by human development of the Columbia Basin. In the near term, fecundity rates that evolved in pristine natural conditions cannot be expected to offset the unnaturally high mortality rates that have been imposed by human disturbance of salmonid ecosystems, and, Principle 10, to the extent that these heavily disturbed ecosystems will take centuries to recover, interim measures are needed to boost rates of population productivity until ecosystem integrity and sustainable mortality schedules are restored.

II. Framework Recommendations

State F&W Agencies/other state agencies/state supported agencies

None

Tribes/ Tribal Organizations

1. Confederated Salish Kootenai Tribes, CSKT (16) (submitted by Lynn DuCharme)

- 3. Species Focused Recommendations – Species recovered in the context of the ecosystem: The ISAB provides six new principles that are intended to replace the original eight principles on page 9-10 of the current Program, while retaining most of the original content. They are structured to express the theme that sustainability can be enhanced in two ways: first, by building resilience to reduce the probability that an ecosystem will cross a "tipping point" and shift into a new regime; and second, by building adaptability to improve outcomes when such regime shifts do occur. The latter concern is especially relevant in the Columbia River Basin in the face of Climate change, human population growth, proliferation of chemicals, hydrosystem development, and the emergence of hybrid food webs due to the spread of non-native and artificially propagated species (ISAB 2013-1)
- The recommended inclusion of ISAB's recommendations for scientific principles consist of:
- **Principles to enhance resilience**
- Principle 1: The abundance, productivity, diversity, and spatial distribution of organisms are sustained by complex and adaptive ecosystems.

  Physical and biological components of ecosystems act synergistically to produce the abundance, productivity, and diversity of plant and animal communities. Ecosystems are usefully described as complex hierarchies of nested components distinguished by scales of space and time. Higher-level ecological patterns and processes constrain, and in turn reflect, localized patterns and processes. Ecosystems are also adaptive systems in that they develop over time in response to dynamic internal and external factors. The system we see today is the product of its geological, biological, and human legacy. Natural disturbance and change are normal ecological processes which create, alter, and maintain ecosystems. Management actions to maintain ecosystem services are most effective when undertaken with an understanding and appreciation of the natural limits and underlying structure and function of the ecosystem, and the dominant forces being imposed on the ecosystem.
- Principle 2: Biological diversity allows ecosystems to persist in the face of environmental variability.

  The diversity of species, populations, genes, and life history traits within biological communities contributes to ecological stability in the face of disturbance and environmental variability by providing a greater range of options to absorb, or respond to change. Populations are the basic units of abundance, productivity, and diversity. Each population has a distinct role that contributes to the structure, productivity, and sustainability of the ecosystem over time. A population that is genetically adapted to its local conditions is more productive in that habitat than would be other populations of the species not adapted to those conditions.

Populations with different adaptations are also likely to have distinct responses to changing environmental conditions, such that productivity increases for some and decreases for others. This diversity of responses generally reduces temporal variability in productivity summed across all populations in the landscape (the "portfolio effect"). Loss of locally adapted populations through extirpation or introgression with non-adapted sources lessens phenotypic and life history diversity, overall productivity, and ecological resilience. Introduction of non-native species can increase diversity but disrupt stabilizing ecological interactions that have co-evolved among native species. Management actions are most meaningful when they contribute to long-term maintenance of the diversity of locally-adapted populations of native species and of all the habitats needed to support their full life cycles.

- Principle 3: Human health and well-being are tied to ecosystem conditions.

  As humans, we often view ourselves as separate and distinct from the natural world. However, we are integral parts of ecosystems. Our actions have a pervasive impact on the structure, function, and resilience of ecosystems, while at the same time, our health and well-being are tied to ecosystem conditions. In the face of such widespread human impacts, a landscape perspective is needed to protect ecosystem processes and guide the restoration of fish and wildlife. A landscape perspective enhances resilience because it protects redundancy and diversity to maintain options, it avoids management that limits ecological variability, and it embraces adaptive management to foster innovation through learning and experimentation. Maintaining redundancy and diversity in landscapes comes at a cost, but that cost must be balanced against the benefits of resilience to unexpected perturbations from human actions.

- **Principles to enhance adaptability**
- (These principles are based in part on text from Walker and Salt (2006), Harris (2007), and Gunderson et al. (2010).)
- Principle 4: Biological and cultural diversity provide the raw material for reorganization and adaptability during unexpected transitions to new ecosystem regimes.

  Regime shifts have now been observed in hundreds of different ecosystems, including marine, freshwater, and terrestrial ones. Adaptability is the capacity of actors in a system (fish, wildlife, people) to avoid crossing into an undesirable regime or to succeed in crossing into a desirable one. For people, this capacity requires weighing options, keeping options open, and creating new options when old ones close. Once an ecosystem's resilience has been overwhelmed, what matters is the system's transformative capacity to reorganize in ways that will minimize loss and restore beneficial conditions and services. Basic elements critical to adaptability include the biological diversity of fish and wildlife species represented by genes, populations, and species, and the cultural diversity of people and communities represented by learned behaviors, ideas, values, and institutions.
- Principle 5: Ecosystem management is adaptive and experimental.

  The complexity of ecosystems routinely disables attempts to command and control them. We must seek to be more flexible and adaptable in our management responses to a world in which change occurs continuously and unpredictably. Because our knowledge is limited, the only practical response is one of discussion, modeling, experimentation, and learning. Structured decision making (SDM) combined with

adaptive management — the intentional use of experiments to investigate ecological problems and to iteratively test and revise management programs — improves problem solving by clearly articulating current understanding, acknowledging uncertainty and risk, and by promoting continuous learning and adaptation. Experimental management does not simply mean passive learning by doing but rather deliberate intervening directed at understanding key ecosystem dynamics and creating new knowledge through scientific experimentation and inquiry.

- Principle 6: Socioeconomic understanding and engagement is required to make management actions more sustainable.

  Effective management actions follow from the cultural values and incentives of people who live in the landscape, who use its land, water, or living resources, or who are concerned about sustaining its habitats and fish and wildlife populations. Societal knowledge is filtered by values to create intentions that may become actions. People respond better to positive incentives than disincentives. Collaboration and partnerships can increase the effectiveness and efficiency of actions. Aligning policies with the appropriate level of governance can also improve effectiveness, recognizing that local actions can affect socioeconomic outcomes at regional, national, or international scales. Developing mechanisms and networks for the communication, sharing, and review of new knowledge can enhance the diffusion and adoption of innovative actions.

2. Confederated Tribes and Bands of the Yakama Nation. YN (17) (submitted by Steve Parker)

- Current Program II.B.2, Scientific Principles, p.9, a. Recommendation: add Add principles 9 and 10 explaining that 1) salmonid fecundity (productivity) rates evolved over thousands of years in equilibrium with mortality rates that since have been substantially increased by human development of the Columbia Basin. In the near term, fecundity rates that evolved in pristine natural conditions cannot be expected to offset the unnaturally high mortality rates that have been imposed by human disturbance of salmonid ecosystems, and 2) to the extent that these heavily disturbed ecosystems will take centuries to recover, interim measures are needed to boost rates of population productivity until ecosystem integrity and sustainable mortality schedules are restored.

3. Confederated Tribes of Grande Ronde, CTGR (18) (submitted by Lawrence Schwabe)

- C.2 Amendments to Scientific Foundation and Principles
- Recommendation 5 – add language to scientific principles on page 9 and 10: the Columbia River ecosystem includes upland, tributary, mainstem, estuary, plume , and near shore ocean environments.
- Recommendation 6 – add language to scientific principles on page 9 and 10: Salmon and steelhead accommodate ocean mortality and environmental variability by having life histories that have sufficient level of productivity and a wide range of biological diversity (i.e., resiliency).

4. Confederated Tribes of the Umatilla India Reservation, CTUIR (19) (submitted by Kat Brigham)

- Current Program II.B.2. Scientific Principles. p. 9 a. Recommendation: Add principles 9 and 10 explaining that 1) salmonid fecundity (productivity) rates evolved over thousands of years in equilibrium with mortality rates that since have been substantially increased by human development of the Columbia Basin. In the near term, fecundity rates that evolved in pristine natural conditions cannot be expected to offset the unnaturally high mortality rates that have been imposed by human disturbance of salmonid ecosystems, and 2) to the extent that these heavily disturbed ecosystems will take centuries to recover, interim measures are needed to boost rates of population productivity until ecosystem integrity and sustainable mortality schedules are restored.

5. Cowlitz Indian Tribe, Cowlitz I.T. (22) (submitted by William Iyall)

- ***Fully Incorporate Estuary, Plume and Nearshore Ocean in Program***
- Current Program: various sections Recommendation 1: Add language to the *Scientific Principles*, pages 9 and 10: *The Columbia River ecosystem includes the estuary, plume, and near shore ocean environments. Salmon, steelhead, lamprey, sturgeon and eulachon accommodate ocean mortality and environmental variability by having life histories that have a sufficient level of productivity and a wide range of biological diversity (i.e., resiliency).*

6. Nez Perce Tribe, NPT (25) (submitted by David Johnson)

- Modify the text to indicate that the ISAB has identified six new principles that are intended to replace the original eight principles on page 9-10 of the current Program, while retaining most of the original content. They are structured to express the theme that sustainability can be enhanced in two ways: first, by building resilience to reduce the probability that an ecosystem will cross a "tipping point" and shift into a new regime; and second, by building adaptability to improve outcomes when such regime shifts do occur. The latter concern is especially relevant in the Columbia River Basin in the face of Climate change, human population growth, proliferation of chemicals, hydrosystem development, and the emergence of hybrid food webs due to the spread of non-native and artificially propagated species (ISAB 2013-1)
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of the natural limits and underlying structure and function of the ecosystem, and the dominant forces being imposed on the ecosystem.

- Principle 2: Biological diversity allows ecosystems to persist in the face of environmental variability.

  The diversity of species, populations, genes, and life history traits within biological communities contributes to ecological stability in the face of disturbance and environmental variability by providing a greater range of options to absorb, or respond to change. Populations are the basic units of abundance, productivity, and diversity. Each population has a distinct role that contributes to the structure, productivity, and sustainability of the ecosystem over time. A population that is genetically adapted to its local conditions is more productive in that habitat than would be other populations of the species not adapted to those conditions. Populations with different adaptations are also likely to have distinct responses to changing environmental conditions, such that productivity increases for some and decreases for others. This diversity of responses generally reduces temporal variability in productivity summed across all populations in the landscape (the "portfolio effect"). Loss of locally adapted populations through extirpation or introgression with non-adapted sources lessens phenotypic and life history diversity, overall productivity, and ecological resilience. Introduction of non-native species can increase diversity but disrupt stabilizing ecological interactions that have co-evolved among native species. Management actions are most meaningful when they contribute to long-term maintenance of the diversity of locally-adapted populations of native species and of all the habitats needed to support their full life cycles.

- Principle 3: Human health and well-being are tied to ecosystem conditions.

  As humans, we often view ourselves as separate and distinct from the natural world. However, we are integral parts of ecosystems. Our actions have a pervasive impact on the structure, function, and resilience of ecosystems, while at the same time, our health and well-being are tied to ecosystem conditions. In the face of such widespread human impacts, a landscape perspective is needed to protect ecosystem processes and guide the restoration of fish and wildlife. A landscape perspective enhances resilience because it protects redundancy and diversity to maintain options, it avoids management that limits ecological variability, and it embraces adaptive management to foster innovation through learning and experimentation. Maintaining redundancy and diversity in landscapes comes at a cost, but that cost must be balanced against the benefits of resilience to unexpected perturbations from human actions.

- **Principles to enhance adaptability**
- (These principles are based in part on text from Walker and Salt (2006), Harris (2007), and Gunderson et al. (2010).)
- Principle 4: Biological and cultural diversity provide the raw material for reorganization and adaptability during unexpected transitions to new ecosystem regimes.

  Regime shifts have now been observed in hundreds of different ecosystems, including marine, freshwater, and terrestrial ones. Adaptability is the capacity of actors in a system (fish, wildlife, people) to avoid crossing into an undesirable regime or to succeed in crossing into a desirable one. For people, this capacity requires weighing options, keeping options open, and creating new options when old ones close. Once

an ecosystem's resilience has been overwhelmed, what matters is the system's transformative capacity to reorganize in ways that will minimize loss and restore beneficial conditions and services. Basic elements critical to adaptability include the biological diversity of fish and wildlife species represented by genes, populations, and species, and the cultural diversity of people and communities represented by learned behaviors, ideas, values, and institutions.

- Principle 5: Ecosystem management is adaptive and experimental.
  The complexity of ecosystems routinely disables attempts to command and control them. We must seek to be more flexible and adaptable in our management responses to a world in which change occurs continuously and unpredictably. Because our knowledge is limited, the only practical response is one of discussion, modeling, experimentation, and learning. Structured decision making (SDM) combined with adaptive management — the intentional use of experiments to investigate ecological problems and to iteratively test and revise management programs — improves problem solving by clearly articulating current understanding, acknowledging uncertainty and risk, and by promoting continuous learning and adaptation. Experimental management does not simply mean passive learning by doing but rather deliberate intervening directed at understanding key ecosystem dynamics and creating new knowledge through scientific experimentation and inquiry.
- Principle 6: Socioeconomic understanding and engagement is required to make management actions more sustainable.
  Effective management actions follow from the cultural values and incentives of people who live in the landscape, who use its land, water, or living resources, or who are concerned about sustaining its habitats and fish and wildlife populations. Societal knowledge is filtered by values to create intentions that may become actions. People respond better to positive incentives than disincentives. Collaboration and partnerships can increase the effectiveness and efficiency of actions. Aligning policies with the appropriate level of governance can also improve effectiveness, recognizing that local actions can affect socioeconomic outcomes at regional, national, or international scales. Developing mechanisms and networks for the communication, sharing, and review of new knowledge can enhance the diffusion and adoption of innovative actions.

Federal F&W Agencies/Other Federal agencies

7. National Oceanic and Atmospheric Administration- Fisheries, NOAA-F (30) (submitted by Elizabeth Gaar)

- Scientific Principles: We support the ISAB program Review recommendations to update the scientific principles. We recommend that program emphasize suitability, adaptability, and resilience which correspond closely to NOAA's VSP concept.
- **II. Basinwide Provisions Scientific Foundation and Principles**, page 9, Recommendation: Adopt the ISAB's recommendations for updates to the Scientific Principles. Their principles are intended to express the theme that sustainability can be enhanced in two ways: first, by building resilience and second by building adaptability to improve outcomes when regime shifts occur. These principles are particularly relevant in

the face of emerging threats such as climate change and human population growth. The recommended inclusion of ISAB's recommendations for scientific principles consist of:

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communication, sharing, and review of new knowledge can enhance the diffusion and adoption of innovative actions.

- Recommendation: Add the following to the Scientific Principles [Insert] *The Columbia River ecosystem includes the estuary, plume, and near shore ocean environments.*[End Insert] ; Insert] *Salmon, steelhead, lamprey, sturgeon and eulachon accommodate ocean mortality and environmental variability by having life histories that have a sufficient level of productivity and a wide range of biological diversity (i.e., resiliency).*[End Insert]

Bonneville Customers/other utilities and user groups

None

Environmental /NGOs

8. Native Fish Society (60) (submitted by Bill Bakke)

- submitting the ISAB recommendations to the Council for adoption by reference see Reference Document Section at the end of this document for program objective details from the ISAB 2013-1 Review of 2009 Program, page 4+, 4. Updating the Scientific Principles for Sustainability, in which the ISAB recommended using 6 new scientific principles. The recommended inclusion of ISAB's recommendations for scientific principles consist of:
  - **Principles to enhance resilience**
  - Principle 1: The abundance, productivity, diversity, and spatial distribution of organisms are sustained by complex and adaptive ecosystems.
    Physical and biological components of ecosystems act synergistically to produce the abundance, productivity, and diversity of plant and animal communities. Ecosystems are usefully described as complex hierarchies of nested components distinguished by scales of space and time. Higher-level ecological patterns and processes constrain, and in turn reflect, localized patterns and processes. Ecosystems are also adaptive systems in that they develop over time in response to dynamic internal and external factors. The system we see today is the product of its geological, biological, and human legacy. Natural disturbance and change are normal ecological processes which create, alter, and maintain ecosystems. Management actions to maintain ecosystem services are most effective when undertaken with an understanding and appreciation of the natural limits and underlying structure and function of the ecosystem, and the dominant forces being imposed on the ecosystem.
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- Also, the ISAB recommends that the vision and biological objectives be examined for consistency with the scientific principles < see **http://www.nwcouncil.org/fw/isab/isab2013-1/>**

9. Trout Unlimited (67) (submitted by Kate Miller)

- **Promote Scientific Principles, Objectives and Strategies ,** TU believes that fish and wildlife management should be based on the best available science. Accordingly, we place much stock in the work the of the Council's Independent Scientific Advisory Board (ISAB). Our recommendation is that the Council should adopt the ISAB's recommendations set forth in the ISAB's *Review of 2009 Fish and Wildlife Program*, a report issued in March <see **http://www.nwcouncil.org/fw/isab/isab2013-1/>.** The recommended inclusion of ISAB's recommendations for scientific principles consist of:
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system (fish, wildlife, people) to avoid crossing into an undesirable regime or to succeed in crossing into a desirable one. For people, this capacity requires weighing options, keeping options open, and creating new options when old ones close. Once an ecosystem's resilience has been overwhelmed, what matters is the system's transformative capacity to reorganize in ways that will minimize loss and restore beneficial conditions and services. Basic elements critical to adaptability include the biological diversity of fish and wildlife species represented by genes, populations, and species, and the cultural diversity of people and communities represented by learned behaviors, ideas, values, and institutions.

- Principle 5: Ecosystem management is adaptive and experimental.
  The complexity of ecosystems routinely disables attempts to command and control them. We must seek to be more flexible and adaptable in our management responses to a world in which change occurs continuously and unpredictably. Because our knowledge is limited, the only practical response is one of discussion, modeling, experimentation, and learning. Structured decision making (SDM) combined with adaptive management — the intentional use of experiments to investigate ecological problems and to iteratively test and revise management programs — improves problem solving by clearly articulating current understanding, acknowledging uncertainty and risk, and by promoting continuous learning and adaptation. Experimental management does not simply mean passive learning by doing but rather deliberate intervening directed at understanding key ecosystem dynamics and creating new knowledge through scientific experimentation and inquiry.
- Principle 6: Socioeconomic understanding and engagement is required to make management actions more sustainable.
  Effective management actions follow from the cultural values and incentives of people who live in the landscape, who use its land, water, or living resources, or who are concerned about sustaining its habitats and fish and wildlife populations. Societal knowledge is filtered by values to create intentions that may become actions. People respond better to positive incentives than disincentives. Collaboration and partnerships can increase the effectiveness and efficiency of actions. Aligning policies with the appropriate level of governance can also improve effectiveness, recognizing that local actions can affect socioeconomic outcomes at regional, national, or international scales. Developing mechanisms and networks for the communication, sharing, and review of new knowledge can enhance the diffusion and adoption of innovative actions.

- Also, the ISAB recommends that the vision and biological objectives be examined for consistency with the scientific principles < see **http://www.nwcouncil.org/fw/isab/isab2013-1/**>

Individuals

None