August 2, 2016

MEMORANDUM

TO: **Fish and Wildlife Committee members**

FROM: **Lynn Palensky**

SUBJECT: **Update from the Corps of Engineers on water temperature modeling**

BACKGROUND:

Presenter: Lynn Palensky and Julie Ammann, Corps of Engineers, Chief of Reservoir Control Center

Summary: The climate change sub-strategy in the Council's 2014 Fish and Wildlife Program calls on the federal action agencies, in coordination and collaboration with others, to "assess whether climate change effects are altering or are likely to alter critical river flows, water temperatures or other habitat attributes in a way that could significantly affect fish and wildlife important to the program." The program also states "the Council supports ongoing studies and development of assessment methods by the federal action agencies and others. Further, the Council requests other entities to collaborate with the federal action agencies on this work." In order to take into account the potential effects of climate change, the region needs to evaluate future hydrologic and temperature alterations associated with climate change.

A key aspect of such an assessment is for the federal and non-federal hydropower project operators to work collaboratively to complete the water temperature modeling capabilities in the mid-Columbia reach of the mainstem Columbia River from Grand Coulee Dam through the Hanford Reach. In December 2015, the Council sent a letter (attached) to the

851 S.W. Sixth Avenue, Suite 1100
Portland, Oregon 97204-1348
www.nwcouncil.org

Steve Crow
Executive Director

503-222-5161
800-452-5161
Fax: 503-820-2370

Corps of Engineers (COE) and the mid-Columbia PUDs that would: a) acknowledge and compliment their ongoing water temperature modeling efforts; b) urge completion of those modeling efforts in individual river reaches; and c) encourage development of a Columbia Basin systemwide water temperature model for the mainstem Columbia and Snake Rivers. The COE send a response to the Council's letter in March 2016 (attached).

Julie Ammann will provide an update on the progress of their modeling efforts in the mainstem.

Relevance: One of the Council's emerging high priorities addresses "preserving program effectiveness by … taking into account the effects of climate change." (See p. 116 of the Council's 2014 Fish and Wildlife Program.)

Workplan: This presentation addresses one of the Council's emerging priorities to implement adaptive management, and take into account the effects of climate change. This work is tracked in the division's work plan under adaptive management.

Background: Climate records indicate the Pacific Northwest has warmed about 1º C (or 1.8º F) since 1900, or about 50 percent more than the global average warming over the same period. The warming rate for the Pacific Northwest over the next half century is projected to be in the range of +0.2-0.9° C (or +0.4-1.6° F) per decade. Projected annual precipitation changes for the region over the next few decades are relatively modest and likely to be indistinguishable from natural variability. The projected future changes in temperature and precipitation will alter the snow pack, stream flow, and water quality in the Columbia Basin with the following anticipated impacts:

- Warmer temperatures will result in more precipitation falling as rain rather than snow;
- A potential for more winter flooding, affecting salmon eggs and overwintering juvenile fish;
- Snowpack will diminish, particularly in lower-elevation watersheds, with altered runoff timing;
- Peak river flows will likely shift to earlier in the spring;
- Water temperatures will continue to rise, affecting adult and juvenile salmon migration and disrupting growth; and
- Summer flows are likely to be lower, affecting adult and juvenile salmon migration.

These temperature and hydrologic changes are expected to have a variety of interrelated impacts on aquatic and terrestrial ecosystems in the Columbia River Basin. The Council's Fish and Wildlife Program recognizes the need to assess and, where necessary, respond to the

impacts of climate change, which could threaten the program's past and ongoing investments in habitat improvements in the Columbia River Basin.

To conduct a temperature assessment of the mainstem Columbia River, a collaborative effort by federal and non-federal project operators in developing water temperature models for the mid-Columbia reach of the river is needed to complete the temperature modeling capability for both the mainstem Snake and Columbia rivers. This temperature modeling work will enable the region to better assess the potential effects of climate change and hydropower project operations on summer water temperatures in both rivers.

More Info: The current status of the water temperature modeling effort in the mid-Columbia reach is that model development is largely completed for the Grand Coulee, Chief Joseph, Wells and Rocky Reach reservoirs. Temperature model development is currently underway by Grant County PUD in the Wanapum and Priest Rapids reservoirs and is expected to be completed in early 2016. Thus additional temperature model development is needed in Rock Island reservoir and for the Hanford Reach.

Additional work will also be needed to link the individual water temperature models together into a Columbia-Snake river system application.[1] Developing a system application temperature model will require calibration, sensitivity analysis, and related activities once all the reservoir models are completed. Climate change and current condition (or baseline) scenarios will also need to be prepared, providing all the pertinent streamflow and relevant ambient conditions and inputs for the system application and subsequent temperature modeling analysis.

[1] This is no small task. Development of a system planning temperature model application tool has not yet begun; such a system modeling tool will be needed for climate change modeling analyses in the mainstem Columbia and Snake rivers.