actions, if warranted, to maintain or improve adult conversion rates in accordance with 2008 BiOp expectations.

Recent court ordered operations - based on the available Smolt-to-Adult information - will likely result in reduced returns of SR steelhead, and to a lesser extent SR spring-summer Chinook salmon than those estimated in the 2008 BiOp. However, the ISAB (2008a and 2010), after reviewing information prepared by NOAA, USFWS, ODFW, and FPC and considering affects to other ESA-listed and unlisted species, recommended spread-the-risk operations to collect information necessary for better long-term decision-making. The Action Agencies, after receiving input from the RIOG favoring this operation – has agreed to operate in this manner, and will recommend future operations on a year by year basis.

Recent spill-transport operations at the Snake River collector projects should substantially reduce straying of SR steelhead into Deschutes and John Day river populations of MCR steelhead; reducing any resultant genetic impacts to these populations (compared to impacts resulting from straying under the Base or Current periods evaluated in the 2008 BiOp).

Evaluations of physiological effects of transport and potential mechanisms of delayed and latent mortality are generally consistent with inseason SAR patterns of PIT tagged fish assumed in the 2008 BiOp. New information on tagging effects indicates that juvenile reach survival estimates and SAR estimates for tagged fish (used in the BiOp analysis) are likely biased low due to tag loss and differential mortalities of PIT tagged verses untagged juveniles. Thus, the untagged majority of fish in the ESUs are likely experiencing higher survival rates and adult return rates than was estimated using the COMPASS model.

The studies reviewed above support NOAA's assumptions in the 2008 BiOp that the RPA, as amended, will address factors that have limited the functioning and conservation value of mainstem migration corridor habitat that Interior basin salmon and steelhead use to migrate to and from the ocean.

2.2.3 Tributary Habitat Improvement

NOAA Fisheries reviewed the new scientific information on the best methods for achieving the benefits needed from tributary habitat restoration (RPA Actions 34 and 35 including Table 5, in the 2008 BiOp). These studies support the Action Agencies' approach for selecting goals for habitat improvement projects based on addressing limiting factors, including Reclamation's ongoing Tributary and Reach Assessment effort to assess the natural potential of selected river/habitat systems in their current form to help direct project implementation. Thus, as explained in the following sections, the new scientific information supports NOAA's conclusions that the RPA, as amended, addresses factors that have limited the functioning and conservation value of spawning and rearing habitat and will increase the survival of the affected populations.

2.2.3.1 New Information Relevant to the 2008 FCRPS BiOp and AMIP

Recent peer reviewed papers have discussed elements tied to determining the appropriate scale, context, analytical approach, and decision-making process needed to successfully restore or rehabilitate tributary habitats used by Columbia River salmon and steelhead. Olden and Naiman (2010) emphasizes the importance of understanding natural processes—in this case focusing on the role of thermal regimes in habitat restoration. Similarly, Palmer (2009) identified several ways in which ecological knowledge should influence restoration. As an example, he cites the interest in removing sediments in order to restore channel function in mid-Atlantic streams where there are large, agriculturally-derived sediment deposits on the floodplains. In this case, the use of an ideal (pre-development) reference condition to guide restoration projects led to failure primarily because massive regional changes in land-use and water infrastructure were acting as an on-going “disturbance” event, keeping channel morphology in a perpetual state of disequilibrium.

Roni et al. (2008) reviewed 345 studies on the effectiveness of stream rehabilitation, but found it difficult to draw conclusions about many specific techniques. Limited information was provided on physical habitat, water quality, and biota and most of the published evaluations were of short duration and limited in scope. Nonetheless, the authors stated that the failure of rehabilitation projects to achieve objectives could often be attributed to an inadequate assessment of the historical conditions and the factors limiting biotic production, a poor understanding of watershed-scale processes that influenced local projects, and monitoring at inappropriate spatial and temporal scales. The authors suggested that as an interim approach, high-quality habitats should be protected and connectivity restored before implementing instream habitat improvement projects.

The latter recommendation is supported by the work of Isaak et al. (2007), who modeled linkages between habitat quality, size, and connectivity and the occurrence of Chinook redds in Idaho streams. Connectivity was the strongest predictor of redd occurrence, but interacted with habitat size, which became more important when populations were reduced. The authors concluded that size and connectivity should be maintained wherever possible and should be used to strategically prioritize areas for habitat improvement.

Beechie et al. (2008b) in a review of the methods of planning and prioritizing restoration actions, suggested that restoration groups often confuse watershed assessment, project identification, and project prioritization. Their paper states that a clear sequencing of identifying restoration goals, conducting watershed assessments, identifying restoration opportunities, and then prioritizing actions is needed to assure effective programs. They also review six general ways of prioritizing restoration actions (project type, refugia, decision support systems, single-species analysis, multispecies analysis, and cost effectiveness) and concluded that decision support processes that incorporated stakeholder values were probably the most flexible and transparent. Alternately, where priorities were based on cost-effectiveness, more assessment information was required up front, but funding agencies had more confidence that scarce funds would be used effectively to achieve restoration goals. In a more recent review, Beechie et al. (2010) outlined four principles that would ensure river restoration was guided toward sustainable actions: 1) address the root causes of degradation, 2) be consistent with the physical and biological potential of the site, 3) scale actions to be commensurate with the environmental problems, and 4) clearly articulate the expected outcomes.

Several authors offer tools for evaluating the potential benefits of combinations of specific actions. The modeling framework developed by Jorgensen et al. (2009) converted suites of restoration actions into changes in habitat condition and then linked these to Chinook population status. Honea et al. (2009) used a model to predict that actions reducing fine sediment in the streambed would have a large influence on the size of the Wenatchee population of UCR spring Chinook through improved egg survival. Opening access to habitat in good condition would also have a positive but smaller effect on spawner numbers. Pollock et al. (2007) and Beechie et al. (2008c) identified a key recovery mechanism for incised channels—sediment retention by beaver dams, assuming time frames similar to those for riparian forest restoration (decades to low centuries).

Potential effects of climate change on conditions in tributary habitat used for spawning and rearing are described in Section 2.2.1.3.2.2 through 2.2.1.3.2.3.

2.2.3.2 Relevance to 2008 FCRPS BiOp Analysis and AMIP

The studies reviewed above emphasize the need to incorporate proper planning, sequencing, and prioritization into decision frameworks to best achieve habitat program objectives. Additionally, the papers recommend that planners assess the natural potential of the system and use this information to direct project location, design and selection. This corresponds with the approach taken in the RPA, as amended, to improving tributary habitat. The RPA focuses on priority populations and draws upon the menu of tributary habitat actions and the key limiting factors identified in ESA recovery plans. Across the Interior Columbia basin, project selection incorporates the recommendations of Expert Panels, made up of local biologists with professional knowledge of the habitat conditions within their geographic area. The Expert Panels have met several times over the past year to develop a common understanding of the array of physical attributes that can be used to describe the restoration capacity of aquatic and riparian habitats. They have incorporated information from recovery planning documents on current landscape condition, intrinsic potential (capacity to provide spawning and rearing habitat), and limiting factors and threats into their decision framework for project selection and design.

In the 2006 -2007 and 2008 Annual Progress Report for the FCRPS, the Action Agencies reported that they had improved 3,264 acres of fish habitat; increased tributary stream flows by a cumulative 1,082 cubic feet per second; opened up access to 582 miles of spawning and rearing habitat; improved 92 miles of streams; and protected over 700 miles of riparian habitat through land purchase or lease. Reclamation's Tributary and Reach Assessment effort is designed to evaluate the physical processes acting on a watershed and to identify limiting factors at a finer scale than is available from subbasin assessments and recovery plans. These assessments analyze biological conditions (including fish and riparian communities), geologic setting, subbasin hydrology, hydraulic and sediment transport processes, and anthropogenic constraints. The recent studies described above emphasize the need to assess the natural potential of the river/habitat system in its current form and use this information to help direct project implementation, indicating that this information will be critical to the ultimate success of the tributary habitat program. Reclamation completed the Middle Fork and Upper John Day assessments in 2008 and is currently working in the Yankee Fork of the Salmon River in Idaho, the Grand Ronde River/Catherine Creek in eastern Oregon, and the middle reach of the Methow River in Washington. These assessments are scheduled to be completed by the end of 2011 and additional assessments will be planned for the following years. Additional assessments are scheduled for the Entiat, Wenatchee, and Methow rivers. The Yakima Tribe is working on reach assessments in Icicle Creek and the Twisp and Chewuch rivers.

The RPA, as amended, includes the 2008 Columbia Basin Fish Accords (Appendix G). The Accords support and enhance the tributary habitat program by securing a number of Columbia Basin tribes and the State of Idaho as implementing partners. The Accords' habitat improvement objectives are beyond those required by Table 5 of RPA Action 35, which adds to NOAA Fisheries' confidence that habitat improvements over the term of the BiOp will meet or exceed those expectations for the affected populations.[24]

In summary, the studies reviewed above support NOAA Fisheries' assumptions in the 2008 BiOp that the RPA, as amended, will address factors that limit the functioning and conservation value of habitat that Interior basin salmon and steelhead use for spawning and rearing. The PCEs expected to be improved are water quality, water quantity, cover/shelter, food, riparian vegetation, space, and safe passage/access, as described in the 2008 analysis.

2.2.4 Estuary and Plume

NOAA Fisheries reviewed the new scientific information relevant to the rationale for RPA Actions 36 and 37. As explained in the following sections, the studies on estuarine ecological services and habitat diversity support NOAA's assumption that estuary habitat projects will improve the survival of juvenile salmon and steelhead. Thus, the new scientific information supports NOAA's conclusions that the RPA, as amended, will address factors that have limited the functioning and conservation value of habitat that basin salmon and steelhead use for

[24] The following populations are expected to benefit from Accord tributary habitat actions. Based on calculations of benefits by the Accord Tribal partners (using the same method as the Collaboration Habitat Workgroup), the survival benefits of these actions will exceed those called for in RPA Action 35, Table 5.
Mid-Columbia River Steelhead DPS: All populations in this DPS with the exception of Touchet River steelhead.
Snake River Steelhead DPS: The Upper Grande Ronde River steelhead population.
Snake River Spring/Summer Chinook Salmon ESU: The Upper Grande Ronde and Lemhi River spring Chinook salmon populations.
Upper Columbia River Spring Chinook Salmon ESU: The Wenatchee spring Chinook salmon population.
Upper Columbia River Steelhead DPS: The Entiat, Wenatchee and Okanogan River steelhead populations.