**Steelhead Section: Audrey and Ryan**

In the FEMA vs NWF case described above, The NWF argued that *the National Flood Insurance Program (NFIP), as currently implemented by FEMA, could result in increased development in flood-prone areas with consequent impairment of floodplain functions of salmon bearing waters* (NWF vs FEMA)*.* A Biological Opinion filed by the National Marine Fisheries Service (NMFS) following the NWF vs FEMA case further supports this argument. The NMFS concluded that the implementation of NFIP is likely to jeopardize the continued existence of the following salmon: PS Chinook salmon, Hood Canal summer-chum salmon, and PS steelhead (National Marine Fisheries Service p.142, 2008). Similar issues have appeared in the Lapawai Creek watershed presenting the same set problems for the steelhead *(Oncorhynchus mykiss)* populations that reside there.

*Oncorhynchus mykiss* is an historic steelhead trout population that has important cultural significance to the Nez Perce Tribe. The species is federally listed as part of the Snake River Basin Steelhead distinct population segment (DPS) with Lapwai Creek designated as critical habitat (Richardson and Rasumussen p.iii, p.17, 2007). The management and protection of *O. mykiss* in the Lapwai basin cannot be based solely on the identification and fulfillment of the specific hydrological and biological requirements of the fish as there is a complex legal, jurisdictional, and social background that also affects decision-making within the watershed. The legal and jurisdictional complexities within the Lapwai Creek Watershed have direct impacts on the habitat provided within the stream network thus affecting the viability of the local *O. mykiss* population. As mentioned above, the overlapping jurisdiction between Nez Perce Tribe and Nez Perce County requires integrated management of the watershed and the fishery through adaptive governance (Cosens and Williams p.6, 2011). To further complicate management, as an anadromous fish, the National Marine Fisheries Service is the agency that oversees the steelhead fishery rather than the US Fish and Wildlife Service. These human-based complexities need to be overcome in order to properly protect the steelhead population in Lapwai Creek.

The human based complexities are just one page in a book of complex issues named Lapawi creek watershed. The watershed drains an area of 174,600 acres and is comprised of the Lapwai Creek, which flows down upland areas dominated by dry land agriculture, while grazing and logging activities are prevalent throughout the headwaters and canyons (Richardson &Rasmussen p.25, 2007). The Lapawai Creek main-stem is feed by the tributaries of Mission, Sweetwater, Webb, and Tom Beall Creeks (Richardson &Rasmussen p.23, 2007).

Alterations to the landscape have created problems with water quality, quantity affecting the native and migratory steelhead populations. For example paved, gravel and dirt roads constrict many miles of stream throughout the drainages, and create numerous fish passage barriers at those locations where stream channels are crossed (Richardson & Rasmussen, 2007). Irrigation diversion structures such as the Lewiston Orchards Irrigation District’s (LOID) canal removes water from the Sweetwater and Webb creeks. Water reduction can have significant impacts on many abiotic factors (temperature, oxygen, sediment load), in turn altering the structure and function of stream biotic communities (Hartsen, 2010). The alterations to the landscape, and various land uses provides a unique set of circumstances, which, contributes to highly degrade aquatic conditions throughout the watershed (Richardson & Rasmussen, 2007).

Another alteration to the landscape that specifically effects steel head habitat is the development of floodplains. Floodplains are important for steelhead populations because they function as refuge areas with lower velocities during high flood and the provide nutrient and sediment exchanges that are essential to the species (National Marine Fisheries Service, 2008). It could be deduced that if there is no connection to the floodplain, the fish species that rely on these areas can lose access to these types of refuge and may not survive the large flood event (Williams, p.115, 2011).

The NIFP implemented by FEMA has disrupted flood plain connectivity in many ways but we will just touch on two here. First, communities that participate in the NFIP must comply with the NFIP’s minimum floodplain management criteria, which permit development in the floodplain as long as structures are placed on fill or stem walls at or above the base flood elevation, or BFE (National Marine Fisheries Service, 2008). This is the water surface elevation associated the 100 year flood. By filling or building stem walls one foot above the BFE will destroy any existing flood plain connectivity and encroaches on the existing stream channel. The encroachment will increase stream velocities and volumes. In turn the refuge that was once present is destroyed or fragmented.

Second if levees are constructed to mitigate flood damage, FEMA will not include these areas in the mapping process, or require the purchase of flood insurance. The theory being that the levees will protect any development in these areas from floods. Levees diminish floodplain storage of water during floods, and confine the river within a walled in channel, pushing the flooding farther downstream, and adding pressure to extend the levee flood (NMFS 2008). This increases stream flow velocities in the channel, sediment loads and erosions rates.

In 2007, a significant effort was made toward inter-agency collaboration through the joint writing of the Lapwai Creek Watershed Ecological Restoration Study (LCWERS) by the Nez Perce Tribe Department of Fisheries Resources Management, Watershed Division and the Nez Perce Soil and Water Conservation District. This is an important step towards adaptive governance that could lead to better protection of *O. mykiss*. Five primary factors that affect the ability to maintain a viable population of *O. mykiss* in the Lapwai watershed were identified in this document: “high summer instream temperatures, excessive sedimentation, loss or disturbance of riparian habitats, changes in vegetative structure, and alteration of environmental processes” (Richardson and Rasumussen p.6, 2007). These factors are intertwined and linked to habitat alteration through land use changes and other human-induced modifications that affect streams. Through reversing the social and management actions that have caused those habitat alterations, there is the potential for restoration within the watershed with respect to each of the factors outlined above. The LCWERS recommends that restoration activities primarily focus on (i) watersheds of high fish density and (ii) the reconnection of presently disconnected high quality fish habitat to habitat where fish are currently present (p. 45).

Reducing the amount of withdrawals from the stream will increase flow and have a positive effect on temperature regime, depth of the stream, and creation of areas of refuge such as pools and riffles because the added water will create a wider, more diverse stream profile (Prof. Brian Kennedy, lecture Oct. 13, 2011). Decreasing the sediment load in the stream will create better habitat for *O. mykiss* through reducing turbidity, increasing dissolved oxygen levels, and enhancing macroinvertebrate production (Bjornn and Reisner p. 85, 1991; Richardson and Rasumussen p.21, 2007). Decreased sediment load can be achieved through implementing best management practices in agricultural fields as well as through restoring vegetation to the riparian zones to reduce erosion. Vegetated riparian zones will also aid in lowering water temperatures and in providing a source of large woody debris to the stream which will add to habitat diversity. All of these restoration options will also provide better spawning habitat.