Watershed Condition

Healthy, functioning watersheds are essential for sustaining fish populations as well as fundamental ecosystem services (Potyondy 2011; National Fish Habitat Board 2010). Watersheds in better ecological condition will be more resilient to invasion by non-native species and the effects of climate change (Potyondy 2011; The Wildlife Management Institute and The Theodore Roosevelt Conservation Partnership 2009). An understanding of the current condition of watersheds is important to informing aquatic conservation and restoration planning decisions by identifying where high quality fish habitat exists and where it may be restored with minimal effort. Additionally, an understanding of watershed condition can identify areas of poor habitat quality where long-term investment needs to take place, perhaps because the presence of a unique or endemic fish species.

Watershed condition assessments, as well as the data that inform them, that cover the entire geography of the North Pacific region are limited. In order to include the most comprehensive data in the tool, as well as to facilitate cross-region priority setting, we used only datasets that spanned the entire North Pacific region. These datasets came from two sources: the Wild Salmon Center and the NASA Socioeconomic Data and Applications Center (SEDAC).[1] We selected data from within these data sources to include as measures of watershed condition in the NPLCC tool; all were summarized to the watershed level.

WSC Pacific Salmon Conservation Assessment

The Wild Salmon Center created the Pacific Salmon Conservation Assessment (PSCA) geographic database (2008a) as part of its North Pacific strategy. This database provides spatially-explicit biological and physical data throughout the range of wild Pacific Salmon, including information on species abundance and distribution, dams, hatcheries, and landcover. We relied on three components of the PSCA, described below.

Land Use

The PSCA assesses several measures of land use in the iLandcover table. We chose to include the percentage of agricultural and urban extents within each watershed in this tool as measures of human impact on the landscape.

Dam impacts

The PSCA uses several different methods to summarize the locations and impacts of dams across the region, organized in the iDams table. We used the PSCA measurement of cumulative impedance (PSCA approach 3), which reflects the impacts of dams by comparing, within each watershed, the total length of streams above any dams in the stream network, weighted by the cumulative impedance of those dams, to the total stream length of connected streams within the watershed. In the original PSCA analysis, passable dams were given an impedance value of .1, and impedance accumulates with each additional upstream dam. Impassable dams were given an impedance value of 1.

[1] For more information on all input datasets, please see the bibliography below, or the data dictionary available at http://nplcc.apps.ecotrust.org/news/about/.

Hatchery Density

The PSCA includes a point dataset identifying the location of a variety of hatchery-type operations, including release sites, seapens, and spawning channels along with general hatcheries (Wild Salmon Center 2008b). We calculated the density of these hatchery locations within the area of each watershed to represent the distribution of their effects on the landscape.

SEDAC

The Socioeconomic Data and Applications Center is a part of NASA's Earth Observing System Data and Information Systems (EOSDIS), and provides a variety of global spatial datasets as part of its mission to "to serve as an "information Gateway" between the Earth and social sciences." We used two important datasets to reflect watershed condition from the SEDAC repository that spanned the entirety of the North Pacific region, described below. Each was summarized to the watershed level.

Human population density

To calculate human population density, we used 2.5 arc-minute resolution data of 2010 human population estimates based on a sub-national and national growth rates, adjusted to match United Nationals national level population estimates. (CIESIN/Columbia University, United Nations FAO, and CIAT 2005). For each watershed, we calculated the number of people per watershed, and then divided that number by that watershed's area.

Human Influence Index

The Global Human Influence Index dataset provides a global index of anthropogenic impacts via a global raster datasets with a 1-kilometer resolution. The index is derived from nine data layers describing global human influence, including population density, developed areas, nighttime light exposure, land use and landcover, and human access near coastlines, roads, railways, and navigable rivers (Wildlife Conservation Society (WCS) and Center for International Earth Science Information Network (CIESIN)/Columbia University 2005). Index values range from 0 to 64 in the North Pacific region; we assigned to each watershed its average index value.

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