**Title:** CCC\_Steelhead\_IP\_SWFSC

vector digital data

**Abstract:** Information on estimating the quality and extent of historical habitat is needed for ongoing efforts to conserve and eventually recover protected populations of Pacific salmonids. Because georeferenced spatial data on habitat and fish distribution at the regional scale are lacking, we adapted methods of the Coastal Landscape Analysis and Modeling Study (CLAMS) to implement a GIS approach in modeling the intrinsic potential (IP) of stream reaches to support juvenile steelhead, coho, and chinook salmon. The IP model uses geomorphic and hydrological attributes (expressed as the weighted geometric mean of indices for mean annual discharge, channel gradient, and channel constraint) to estimate the latent potential of stream reaches to provide favorable habitat characteristics for spawning and rearing. Indices for the model are derived from a 10 m DEM and PRISM precipitation data. Thus, the model predicts patterns of relative productive potential expected in the absence of human disturbances, as related through the input data. To apply the model appropriately in California, we investigated the species-specific weighting functions (proposed by CLAMS) for coho and steelhead using values available in the literature. Also, because patterns in precipitation and runoff vary across latitudes, we appplied a linear regression model to gage station data to better estimate mean annual discharge from drainage area and precipitation.

See Agrawal, A., R. Schick, E. P. Bjorkstedt, S. R.G., M. Goslin, B. C. Spence, T. Williams, and K. M. Burnett (2005). Predicting the potential for historical coho, Chinook and steelhead habitat in Northern California. NOAA Technical Memorandum NMFS-SWFSC-379.

Spence, B. C., E. P. Bjorkstedt, J. C. Garza, J. J. Smith, D. G. Hankin, D. Fuller, W. E. Jones, R. Macedo, T. H. Williams, E. Mora (2008). A Framework for assessing the viability of threatened and endangered salmon and steelhead in the North-central California Coast Recovery Domain. NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-423

**Purpose:** This data set provides an estimate to the spatial distribution of potential habitat for Central California Coast Steelhead

**Supplemental:** Intrinsic potential measures the potential for development of favorable habitat characteristics as a function of the underlying geomorphic and hydrological attributes, as determined through a Digital Elevation Model (DEM) and mean annual precipitation grid. The model does not predict the actual distribution of "good'' habitat, but rather the potential for that habitat to occur, nor does the model predict abundance or productivity. Additionally, the model does not predict current conditions, but rather those patterns expected under pristine conditions as related through the input data. Thus, IP provides a tool for examining the historical distribution of habitat among and within watersheds, a proxy for population size and structure, and a useful template for examining the consequences of recent anthropogenic activity at landscape scales. -------------------------------------------- E. Mora &amp; M. Jones 1/2008

Natural Barriers and Dams Attributes Added to Coverages. To incorporate both natural barriers and anthropogenic barriers (dams), attributes have been added to the coverages affected by these barriers. If a natural barrier(s) and/or dam(s) is present in the watershed, a NAT\_BARR\_RE and/or ANTHRO\_BARR\_RE attribute exists in the arc attribute table. All arcs downstream of the barrier are given a value of zero and all arcs upstream of the barrier are given the value of the FNODE of the first arc downstream of the barrier (essentially the node where the barrier is located).

In July of 2012, NOAA Fisheries made revisions to their intrinsic potential model for steelhead in the Central California Coast and Northern California distinct population segments. These revisions involved modification of curves relating estimated mean annual flow and suitability. Details of these revisions and their influence on population delineation and viability criteria can be found in Spence, B.C., E.P. Bjorkstedt, S. Paddock, and L. Nanus. 2012. Updates to biological viability criteria for threatened steelhead populations in the North-Central California Coast Recovery Domain. (Revised 2 July 2012). NMFS Southwest Fisheries Sciece Center, Fisheries Ecology Division, Santa Cruz, CA. Versions of the steelhead IP model that pre-date these revisions are incorrect and should be discarded.

In September 2014, NOAA Fisheries Southwest Fisheries Science Center collaborated with NOAA Fisheries West Region to create a species-specific data files of intrinsic potential for four ESUs and DPSs within the North-Central California Coast Recovery Domain: California Coastal Chinook salmon, Central California Coast coho salmon, Northern California Steelhead, and Central California Coast steelhead. These data files differ from their predecessors in two important respects. First, stream reaches with IP values of zero that occur upstream of the upper extent of the predicted distribution have been removed to reduce file size and increase portability. Second, areas upstream of long-standing natural barriers to fish passage have been removed from these files as well. This eliminates the need to query based on barrier attributes in order to obtain the extent of intrinsic.

ST\_IP\_CURVE12\_RE: use for mapping - shows the quality of the IP (from 0.0 to 1.0).

STIPINT\_RE = Integrated IP: use if comparing to other watersheds. The area over which IP was calculated is taken into account (values are > 1).

To get total IP miles for a population, sum all the STIPINT\_RE records in that population

**Status:** Complete

No Updates planned

**Contact:** NOAA Fisheries West Coast Region, Santa Rosa, CA

Charleen Gavette

777 Sonoma Ave

Santa Rosa

CA

95404

[charleen.gavette@noaa.gov](mailto:charleen.gavette@noaa.gov)

Data originally created by the NOAA Fisheries Southwest Fisheries Science Center, Santa Cruz, CA. Compiled into one data set by NOAA Fisheries West Coast Region, Santa Rosa, CA

**Projection:** NAD 1927 UTM Zone 10N

**Horizontal Datum:** D North American 1927

**Ellipsoid:** Clarke 1866

**Attribute:** OBJECTID

Definition: Internal feature number.

Esri

Sequential unique whole numbers that are automatically generated

**Attribute:** Shape

Definition: Feature geometry.

Coordinates defining the features

**Attribute:** FNODE\_

Definition: Internal node number for the beginning of an arc (from-node).

**Attribute:** TNODE\_

Definition: Internal node number for the end of an arc (to-node).

**Attribute:** LPOLY\_

Definition: Internal node number for the left polygon.

**Attribute:** RPOLY\_

Definition: Internal node number for the right polygon.

**Attribute:** LENGTH

Definition: Length of feature in internal units (meters).

**Attribute:** ID

**Attribute:** AREA\_\_KM2\_

Definition: Drainage area in square kilometers to the downstream end of the reach

**Attribute:** LLID

Definition: Each channel is assigned a unique identifier, based on the latitude and longitude at the mouth. At channel junctions, the identifier is assigned to the channel with the largest drainage area and the smaller channel is assigned a new LLID. LLIDs are calculated using pixel corners to differentiate cases where two tributaries enter the mainstem at a single DEM node.

**Attribute:** FROM\_DIST

Definition: The distance from the channel mouth to the downstream end of the reach (in meters).

**Attribute:** TO\_DIST

Definition: The distance from the channel mouth to the upstream end of the reach (in meters).

**Attribute:** AZIMTH\_DEG

Definition: Average flow direction for the reach in degrees azimuth.

**Attribute:** ORDER\_

Definition: Strahler stream order. Note that stream order is a function of where the channel head is defined.

**Attribute:** MEAN\_GRAD

Definition: Mean gradient through the reach (vertical change/horizontal length).

**Attribute:** MAX\_GRAD\_D

Definition: Maximum gradient encountered downstream through the network.

**Attribute:** MIN\_GRAD

Definition: Minimum gradient within the reach (at the scale of DEM pixels).

**Attribute:** MAX\_GRAD

Definition: Maximum gradient within the reach.

**Attribute:** AVEDEVGRAD

Definition: Average deviation of gradient through the reach.

**Attribute:** VALWIDTH\_L

Definition: Valley width in meters on the left side of the channel (facing downstream).

**Attribute:** VALWIDTH\_R

Definition: Valley width in meters on the right side of the channel.

**Attribute:** WIDTH\_MIN

Definition: Minimum valley width within the reach.

**Attribute:** WIDTH\_MAX

Definition: Maximum valley width within the reach.

**Attribute:** WDTHAVEDEV

Definition: Average deviation of valley width through the reach.

**Attribute:** MNANPRC\_MM

Definition: Mean annual precipitation depth in millimeters, averaged over the drainage area to the downstream end of the reach.

**Attribute:** MEANANNCFS

Definition: Mean annual discharge for the downstream end of the reach based on a regression equation for western Oregon.

**Attribute:** TEMPERATUR

Definition: Mean August air temperature (in 1/10 degree Celsius) acquired from a PRISM temperature grid

**Attribute:** VALLEY\_W

Definition: VALWIDTH\_L + VALWIDTH\_R

**Attribute:** SACW

Definition: Active channel width: 2.19108 + 1.32366 \* MEANANNCFS \*\* .5

**Attribute:** SVWI

Definition: Valley-width-index: VALLEY\_W / SACW

**Attribute:** MEANANNCMS

Definition: MEANANNCFS converted to cubic meters/second.

**Attribute:** MEAN\_GRADPCT

Definition: MEAN\_GRAD \* 100

**Attribute:** MX\_GRAD\_DPCT

Definition: MAX\_GRAD\_D \* 100

**Attribute:** CALMEAN\_GRAD

Definition: MEAN\_GRADPCT \*\* .756656 \* 1.259

**Attribute:** CALMAX\_GRAD\_D

Definition: MX\_GRAD\_DPCT \*\* .756656 \* 1.259

**Attribute:** CG\_ST\_CURVE12

  Definition: Steelhead suitability index for gradient using a 12% gradient threshold

**Attribute:** SVC\_STCURVE12

  Definition: Steelhead suitability index for valley width using a 12% valley constraint threshold

**Attribute:** SC\_ST\_CURVE12\_RE

  Definition: Steelhead suitability index for discharge using a 12% gradient threshold

**Attribute:** ST\_IP\_CURVE12\_RE

  Definition: IP score for steelhead using a 12% gradient threshold

**Attribute:** STIPINT\_RE

  Definition: Total distance weighted (in meters) IP for steelhead (12% gradient threshold)

**Attribute:** ANTHRO\_BARR\_RE

  Definition: Anthropogenic Barrier; 0 = below barrier, 1= above barrier

**Attribute:** Name

  Definition: Population Name

**Attribute:** Shape\_Length

  Definition: Length of feature in internal units.