

**Muckleshoot Indian Tribe
WRIA 8 Chinook Recovery Plan
Geospatial Data Base and Analysis
Final Report**

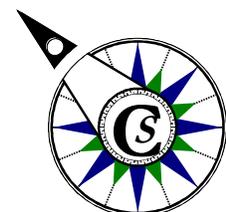
Data and analysis were assembled and conducted according to terms laid out in the November 3, 1999 contract signed between CommEn Space and the Muckleshoot Tribe. The contract called for the assembly of a base, geospatial data set containing data for the Cedar River Watershed, WRIA 8, as well as a series of custom analyses to evaluate road density and road/stream crossings, land cover and SSHIAP features by basins draining to stream points identified by the Muckleshoot representatives. Approximately 206 analysis units were identified for basin delineation and consideration. These areas include stream reaches open and accessible to anadromous fish as well as some which accompanying SSHIAP data indicate are blocked. Analysis of shoreline type and dock area along shoreline segments defined also defined by Muckleshoot representatives are included.

The following report summarizes the data components and processing steps underlying each of these products. It does not constitute a formal accuracy assessment of the results, but rather a basic evaluation in non-technical terms of the results of this project. No ground truthing or field verification has been done with these results. They have not been systematically corroborated with any other data to evaluate their accuracy. Please direct specific questions regarding methodologies and processing steps directly to CommEn Space. Data and tabular results are provided within directories included on the Pentium computer provided by the Muckleshoot Tribe for execution of this contract.

1. **Base Data Layer Set:** Base data includes SSHIAP points and a hydro layer provided by the Northwest Fisheries Commission. From the hydro layer, we extracted “pour points”, or the lowest elevation point on a stream channel selected for analysis. From this point, a basin can be delineated using a topographic model to identify that portion of the landscape that drains a particular stream segment. These drainages serve as analysis units where we quantify those factors that are being considered in the analyses detailed below.

An edgematched 10 meter DEM grid covering the area from Tacoma to Everett and Puget Sound to the Cascade Crest and obtained from USGS provides topography for analysis. We have also provided a an image file of this grid with topography rendered in a colored hillshade to support future mapping of these data. Roads are provided for the WRIA only and come from WGT, a commercial vendor.

Land Cover has been derived from a seven band 1998 TM image via spectral mixing approach. Extent is the same as the topographic grid and the two grid data sets have been registered to one another so that grid cells overlay. As discussed in January during one of the progress reviews stipulated in the contract, bathymetry proved unavailable for the two lakes and was excluded from the base data set.



2. **Data set-Up and Preparation:** The preparation phase ensures that the contractor has the opportunity to review the data for compatibility, to bring individual sets together and to conduct preliminary analysis. Critical to preparing data the base data sets to execute the promised analyses was the delivery of accurately routed and snapped SSHIAP data and accompanying hydro files that were under processing by King County and the Northwest Indian Fisheries Commission. These data sets arrived late accounting for the extra time required to execute the contract. Routing and indexing was also not complete or accurate. Consequently, contractor could not automatically identify the downstream pour points of stream segments selected for analysis. Similarly, analysis units were not always part of a contiguous stream system leading to a singular pour point as we were lead to believe they would be. For these reasons, manual processes were used to identify and verify pour points for analysis (see meta data and accompanying documentation).

Other preparation included registering grid data sets, image processing and analysis and topographic correction to prepare the DEM to work with accompanying hydro data in the drainage delineation process.

3. **Road Analysis:** Analysis includes a calculation of road density using two measures. The first evaluates the number of incidents where roads intersect with streams within the delineated drainage of a selected segment. The second measure estimates road density per basin. Measurements are obtained by multiplying total road length per basin by a constant (60 feet) to produce an estimate of gross area of roads. This figure is divided by total area of the basin to provide an estimate that can be compared from one basin to another.
4. **Impervious/Semi-Pervious Assessment:** This is a custom data set developed specifically for this project. Land cover classifications are intended to provide approximations of different vegetated and non-vegetated conditions. The analysis approach involves sub-pixel evaluation of spectral signatures which we believe provides the user with a more complex and nuanced understanding of the pattern of land use within each drainage basin (See accompanying Land Cover Analysis Write-Up for a full description of the methods behind this approach).
5. **Shoreline Habitat Analysis:** Per the contract, this phase involves a calculation of total dock area along the shorelines of the Chinook migration route from the ship canal mouth on Puget Sound through Lakes Union, Washington and Sammamish. An automated process was developed to make a preliminary delineation of docks and other built structures along the shorelines from 1996 aerial photographs provided by USGS. Photo resolution is 1 square meter. Results of the automated process were then visually checked against photographs and edits were made to eliminate debris in the water and other effects imposed by the nature of the photograph.

The decision was made not to edit out boats and other transitory structures picked up and defined as docks by the automation process. These structures represent obstacles affecting the migratory passage of fish and were thus left to contribute to the estimate of the total area of affected shoreline. The results of this particular analytical approach thus represent a “snap shot” of typical structures along the shorelines in WRIA 8. Tabular results include total area of docks and structures per designated shoreline segment and a ratio of that area to the length of a given segment as a normalizing statistic.

6. **Shoreline Vegetation Analysis:** As discussed, the resolution of air photos limited the range of classifications we were able to make of shoreline type. In the end, CommEn Space and Muckleshoot representatives agreed upon three types: built, forested or otherwise vegetated, and open grass or sand. Total extent of each of these three types per segment is an estimate based on

coarse scale evaluation of photographs. In Lake Union and Lake Washington, check points were established along the shoreline at an interval of 150 meters. Aerial photographs were used to classify shoreline types at each point. These “attributes” were then transferred from the point data to the geospatial data representing shoreline. Relative approximations of the percent of each type per segment are the result of a calculation of the number of points representing each shore type over the total number of points per each segment. The same process was used on Lake Sammamish however the point interval was 100 meters.

Results should be considered a coarse approximation of shoreline vegetation conditions for the full extent of the analysis area. They have not been further ground truthed or checked and are expected to be surpassed by field work currently underway.