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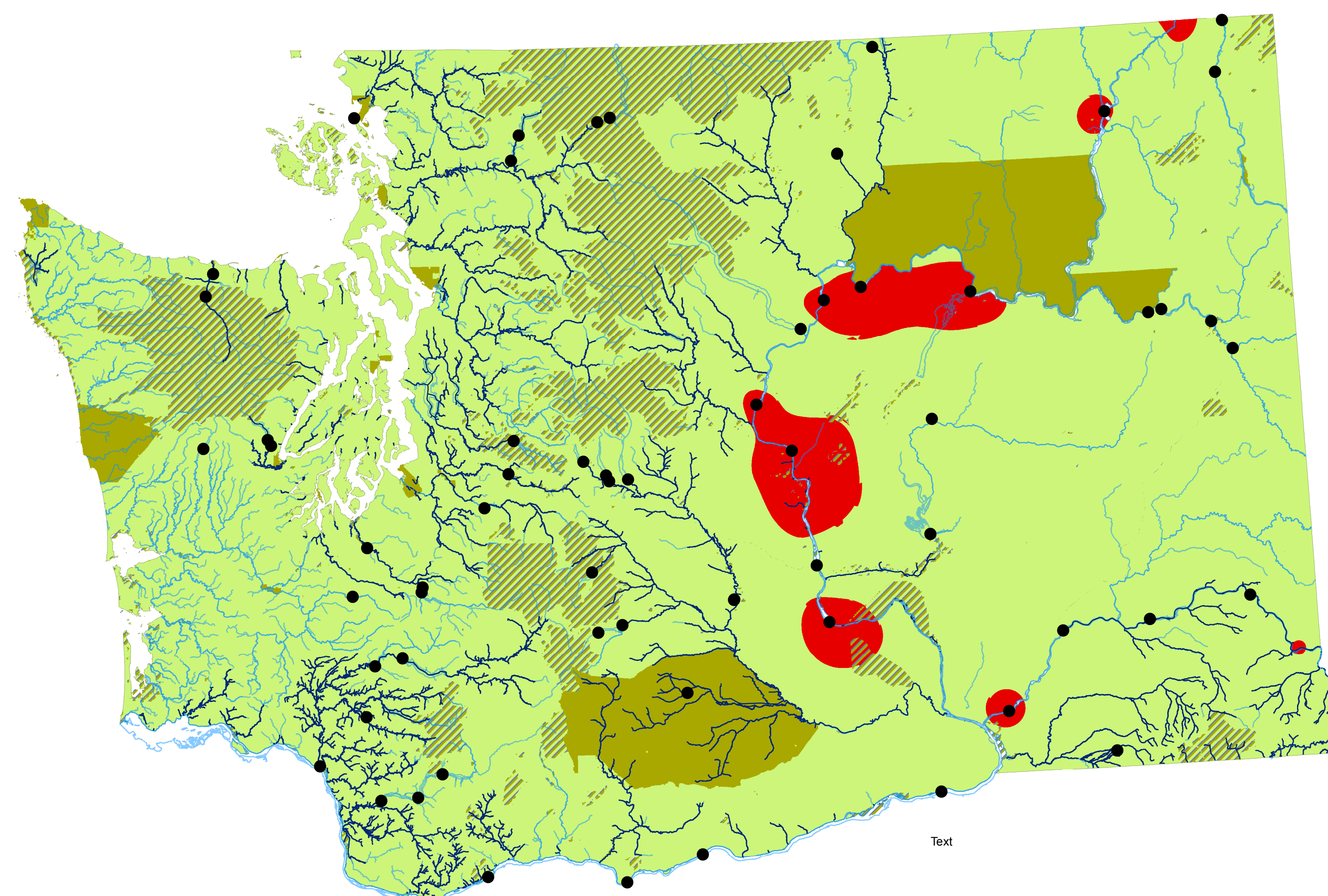


Hydroelectricity in Washington State: Finding New Locations for Hydroelectric Dams

Victoria Karout, University of Washington-Tacoma, 2010-2011 GIS Certificate Program

Society's longstanding dependence on non-renewable energy sources such as oil and coal has proven to be incredibly harmful to the environment. Hydroelectricity has presented the future with an opportunity to utilize an alternative type of energy source, a renewable one. Hydroelectric power is best produced through the implementation of dams that contain turbines. The turbines turn as water passes through, which in turn rotates a metal shaft in an electric generator that outputs electricity. Power lines distribute electricity across space from the power source to areas of demand. An ideal placement for a dam is in a section of a river that has a large drop in elevation, creating a higher stream flow. This allows the water to move more rapidly through the turbines and in turn allows the generator to produce power at a higher rate (USGS, 2011). Since hydropower is a renewable source, the dam requires only a single building so it does not continuously deplete resources while producing electricity. The dam also does not emit pollution in the air, land, or water, which is contrary to the side effects of most typical electric power plants. Current consumption of hydropower in the United States lies at 28 million households, which is the equivalent of 500 million barrels of oil (US Department of Energy, 2011). Washington State boasts itself as the leading hydroelectric power producer in the nation, as it produces nearly 75% of the state's electricity via hydropower. The Grand Coulee hydroelectric power plant located on the Columbia River is the highest capacity electric plant in the nation. The remainder of the state consumes non-sustainable energy sources such as coal, natural gas, petroleum, and even nuclear power to fuel consumer demands (US Energy Information Administration, 2011). The purpose of this project is to propose the best sights for the building of hydroelectric dams in Washington State. The hypothesis is that one or more possible dam sites will be found, where the state will be able to supply the remaining 25% of non-hydroelectric consumers with hydroelectricity. Washington State has already proven itself as a leader in hydroelectric power. By further excelling in this endeavor for a more sustainable electric supply, Washington State can serve as an exemplary role model on both a domestic and global level.

Possible Locations For Hydroelectric Dams To Be Placed



These maps were produced in using the ArcGIS 9.3.1 Software. The Washington State base map was obtained from WAGDA. River and stream locations were obtained from the North West Habitat Institute. Dam coordinate locations were found at Lat-Long.com, put into a table in Microsoft Excel, then exported as a table into ArcMap. The table was then transformed into a point shapefile using the 'Add X Data' tool. Protected lands were obtained from the Protected Areas Database of the United States and classified based on type of protected land. In this case, areas of critical environmental concern and tribal lands were used and classified on the maps. Areas on rivers that contained salmon and steelhead populations were obtained from the US Fish and Wildlife Service and projected. Stream flow information was found for 52 various sample locations throughout Washington State rivers, and then interpolated using the IDW method to approximate stream flows of rivers in between these points. The raster files were then classified based on four standard deviation classes, and the class with the highest stream flow is projected onto the center map in red as the ideal location for dams to be placed. The layout was also produced using ArcMap. The data collection and presentation found that most locations with the highest stream flow and not restricted due to the selected factors already had hydroelectric dams placed on them. There are a few locations shown in red in the center map that could have dams placed on them.

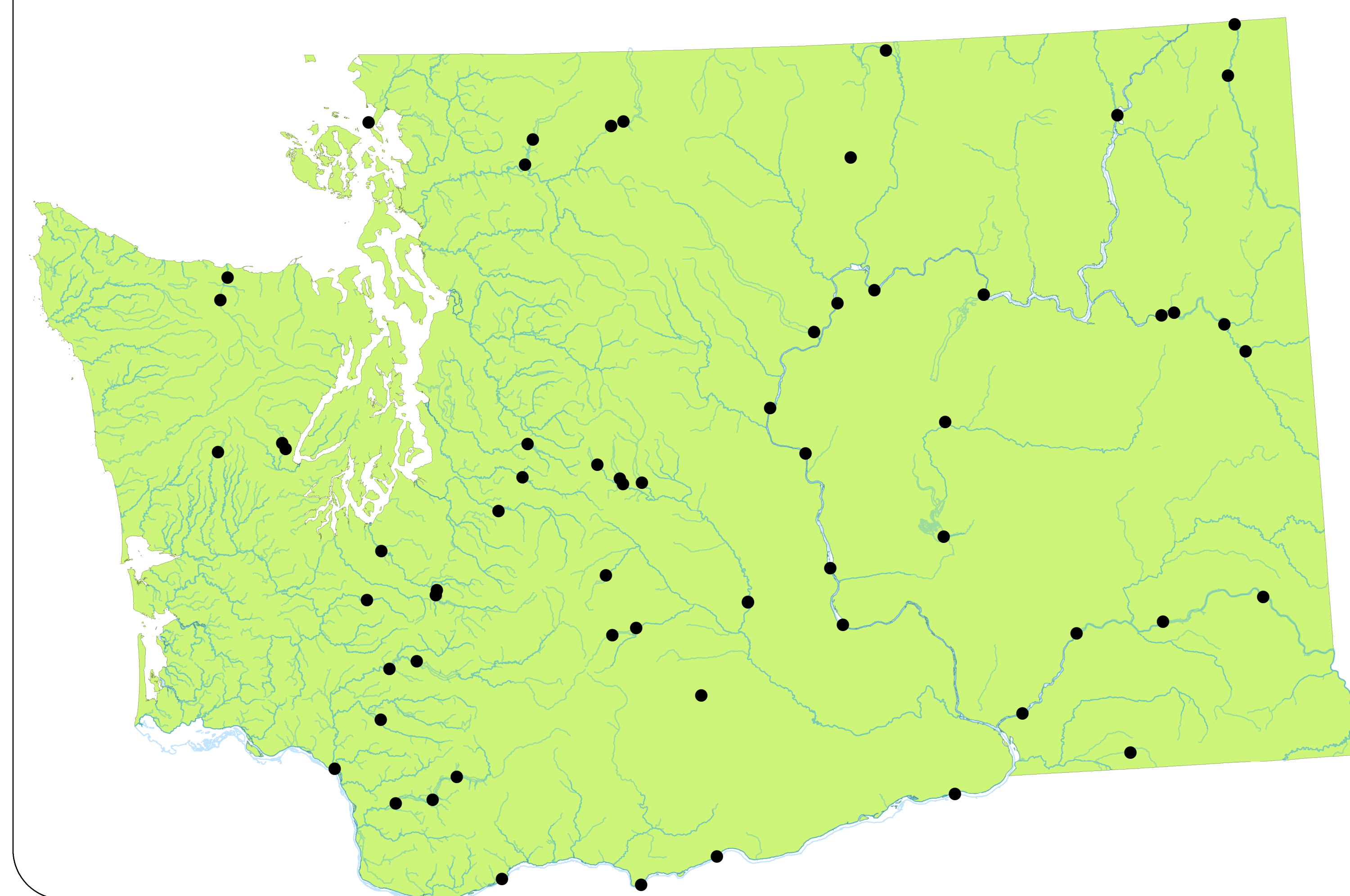
References:

- USGS. May 22, 2011. Hydroelectricity. <http://www.epa.gov/cleanenergy/energy-and-you/affect/hydro.html>
- US Department of Energy. May 22, 2011. Hydropower. <http://www.energy.gov/energysources/hydropower.htm>
- US Energy Information Administration. May 23, 2011. Washington. <http://www.eia.gov/state/state-energy-profile.cfm?sid=WA>

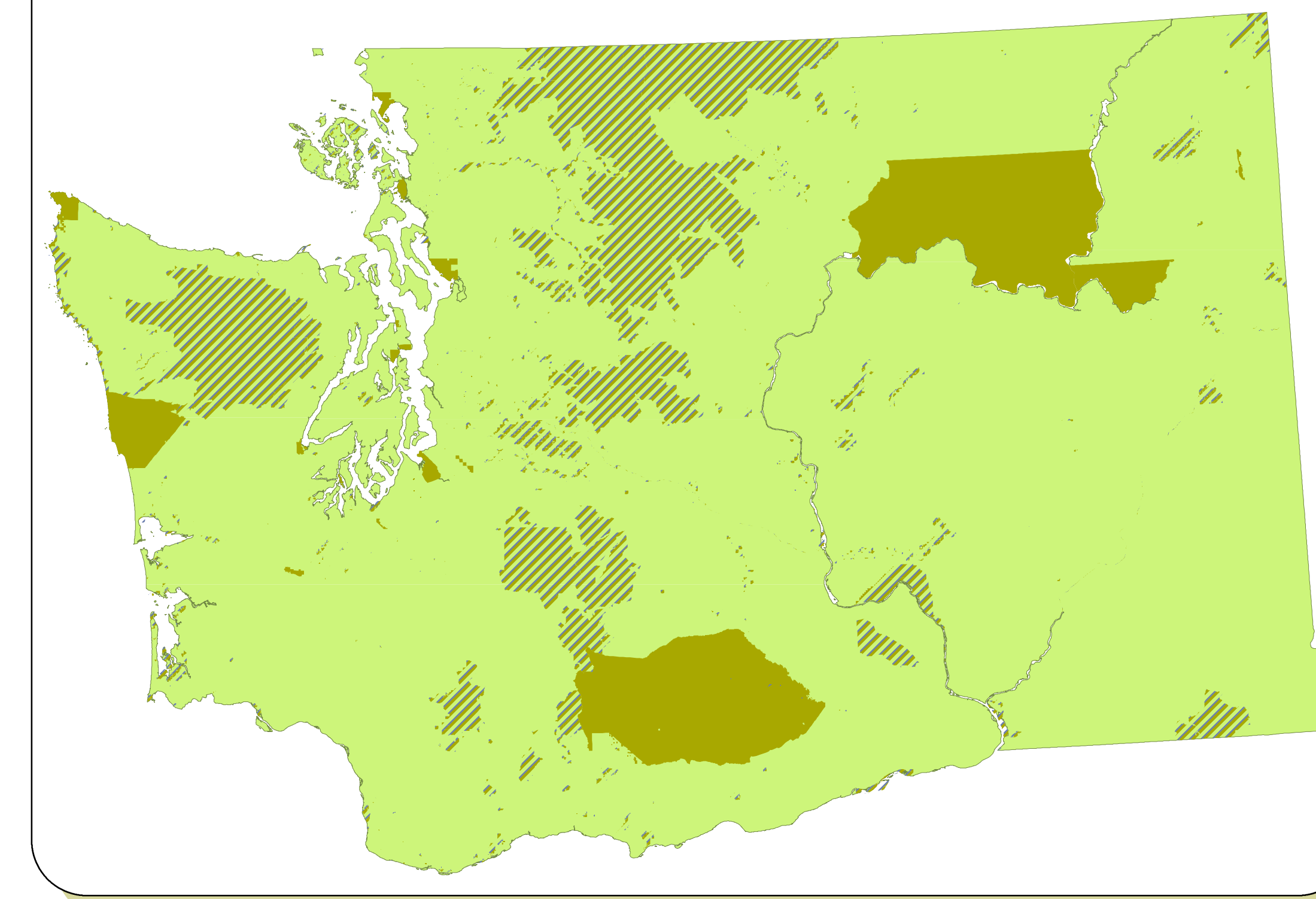
Restricted Rivers Due To Salmon and Steelhead Fish Populations



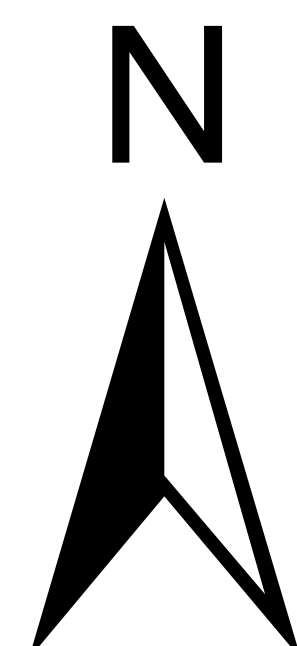
Washington Current River and Dam Locations



Restricted Land Due to Critical Environmental Concern and Tribal Areas



- Rivers
- Restricted Rivers
- Dams
- Tribal Lands
- ▨ Environmentally Protected



Projection: NAD_1983_UTM_Zone_10N
 Data Sources: <http://www.nwhi.org/index/gisdata>,
<http://www.lat-long.com> <http://seamless.usgs.gov/ned19.php>,
<http://www.protectedlands.net/padus/>, <http://wagda.lib.washington.edu/>
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