

**Final Technical Report
Research Project Agreement No. T4118, Task 54**

**Development of a Resource Planning Index for Washington's Scenic and Recreational
Highways**

By
Kevin Ramsey, Ph.D.
University of Washington Department of Geography

Washington State Transportation Center (TRAC)
University of Washington, Box 354802
University District Building
1107 NE 45th Street, Suite 535
Seattle, Washington 98105-4631

Technical Monitor
Paula Reeves
Washington State Department of Transportation

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1. INTRODUCTION

Washington State Department of Transportation Local Programs Division requested the creation of a Resource Planning Index for use in benchmarking and tracking the stewardship performance of investments associated with Washington’s Scenic and Recreational Highways. For the purpose of this study, *stewardship* is defined as “protecting, preserving, and enhancing resources associated with the state Scenic and Recreational Highways.”¹ These resources may be scenic (e.g., view shed), environmental (e.g. ecosystems, water quality, or wildlife habitats), or historic (e.g. historic locations). The Resource Planning Index (or “Index”) provides a rough measure of the potential for locations along Scenic and Recreational Highways to benefit from stewardship-oriented projects.

WSDOT recognizes that projects intended to serve the goal of increasing tourism or economic development may or may not also serve the goal of stewardship. WSDOT also recognizes that there is an opportunity to increase emphasis on accomplishing both tourism/economic development and stewardship. This analysis focuses exclusively on the goal of stewardship. More detailed and local-scale analysis conducted as part of corridor plan or other plans will be required to evaluate whether individual investments can address the goals of both stewardship and tourism/economic development. The findings from this statewide analysis of stewardship potential are preliminary. These findings should be used as a ‘first cut’ guide to highlight areas in the Scenic and Recreational Highway System that have a high potential for protecting, preserving, and enhancing resources associated with the state Scenic and Recreational Highways.

¹ Steering Committee Meeting, State Scenic and Recreational Highway Plan, September 24, 2009; p. 3.

2. IDENTIFICATION OF OPPORTUNITIES

The first step in this analysis was to identify different kinds of opportunities for protecting, preserving, or enhancing resources associated with the state Scenic and Recreational Highways. These opportunities take into consideration the kinds of impacts that highways can have on scenic, environmental, and historic resources as well as ways in which those impacts can be mitigated. Opportunities considered in this analysis are listed as follows:

- ***Enhancing the viability of existing habitats and ecosystems***
Scenic and recreational highways have inevitable impacts on the existing habitats and ecosystems in their proximity including storm water run-off, watershed function, noise and air pollution, habitat fragmentation, and facilitating the development of unprotected lands. Areas with existing habitats and ecosystems provide opportunities to mitigate potential impacts through stewardship projects including overlay zones, the purchase of land or conservation easements, or roadway design improvements that mitigate sound, air, or water pollution resulting from roadway traffic.
- ***Enhancing the viability of known habitat corridors***
Several “species of concern” in Washington State require the ability to travel between habitat areas to maintain genetic diversity. Biologists have identified corridors throughout the state that are crucial to maintaining necessary habitat connectivity. Scenic and recreational highways, and the development of land to which they provide access, may impact habitat connectivity. Investments such as roadside habitat preservation or (in the case of major highways) bridges for wildlife passage can mitigate these impacts and enhance the viability of habitat corridors.
- ***Reducing impacts to species at particular risk of road kills***
Some priority habitat areas within Washington contain species that are at particular risk to collisions with vehicles on sections of scenic and recreational highways. For instance, several reptile species move slowly and are attracted to the heat emanated by road surfaces at night.² Areas rich with these species provide opportunities for roadway design improvements that can help to reduce road kills.
- ***Enhancing the viability aquatic and riparian habitat***
Scenic and recreational highways, as well as the development of land to which they provide access, may have implications for the viability of aquatic and riparian habitat. A majority of fish and wildlife species in Washington depend on aquatic and riparian ecosystems for all or part of their life cycle.³ This includes a number of federally listed endangered and threatened species, such as salmon. Opportunities to mitigate impacts on these ecosystems may include improved culvert design for fish passage, improved

² According to Kelly McAllister, Habitat Connectivity Biologist at WSDOT.

³ Washington Department of Fish and Wildlife, 2003. “Design of Road Culverts for Fish Passage”, <http://wdfw.wa.gov/hab/engineer/cm/>

management and treatment of roadway runoff, riparian habitat restoration along scenic and recreational highways, and protection of aquatic or riparian habitats near scenic and recreational highways.

- ***Reducing impacts to places of scenic, cultural, and historic significance***
Places of scenic, cultural, and historic significance in Washington State can be detrimentally impacted by highway traffic and development pressures. Specific impacts include noise and air pollution as well as nearby development that can alter the character of these places. Such impacts can be reduced or mitigated by historic preservation, the purchase of land or conservation easements to preserve view sheds, or improved roadway design.

This analysis assumes locations with multiple opportunities for protecting, preserving, and enhancing resources associated with the state Scenic and Recreational Highways have a higher potential for benefits than other locations. In other words: the more opportunities that exist in a location, the higher the potential for benefit. Locations with high potential will be assigned a correspondingly higher Index value and corresponding color on the map (see Figure 1).

3. DATA COLLECTION AND QUALITY ASSURANCE

Existing spatial data resources relevant to determining areas with high potential for protecting, preserving, and enhancing resources associated with the state Scenic and Recreational Highways were collected and assessed for quality. Table 1 includes a listing of all data used in the development of the Resource Planning Index. These data are grouped as *features of interest* that are associated with specific opportunities identified in Section 2.

Table 1: Data included in the Resource Planning Index analysis

Feature of Interest	Relevant Opportunity	Data Title	Data Source	Data Description	
Protected areas	<i>Enhancing the viability of existing habitats and ecosystems</i>	Natural Area Preserves (NAP)	Dept. of Natural Resources	Polygon data describing the location of NAPs in Washington. NAPs “protect the best remaining examples of many ecological communities including rare plant and animal habitat.” ⁴ These areas are not intended for recreational purposes.	
	<i>Enhancing the viability aquatic and riparian habitat</i>	Natural Resource Conservation Areas (NCRA)	Dept. of Natural Resources	Polygon data describing the location of NCRAs in Washington. “Conservation areas protect outstanding examples of native ecosystems, habitat for endangered, threatened and sensitive plants and animals, and scenic landscapes. Environmental education and low impact public use are appropriate on conservation areas where they do not impair the resource values of the area protected.” ⁵	
	<i>Reducing impacts to places of scenic, cultural, and historic significance</i>	Wildlife areas and refuges		Dept. of Fish and Wildlife	Polygon data describing protected areas designated for wildlife conservation.
		National Parks		National Park Service	Polygon data describing the location of National Parks in Washington. National Parks are tourism and recreational destinations that preserve natural and cultural resources.
		WA State Parks		State Parks	Polygon data describing the location of State Parks in Washington. State parks are tourism and recreational destinations that preserve natural and cultural resources.
		USFS Wilderness Areas		USFS	Polygon data describing the location of federally designated Wilderness Areas in Washington State. These public lands are protected from all development and allow only for low impact recreation.
		TNC nature preserves		TNC	Polygon data describing the location of all preserves owned and managed by The Nature Conservancy. These preserves are open to the public for low impact recreational activities.
		National Recreation		WSDOT	Polygon data describing the location of all National Recreation Areas in Washington.

⁴ http://www.dnr.wa.gov/ResearchScience/Topics/NaturalAreas/Pages/amp_na.aspx

⁵ http://www.dnr.wa.gov/ResearchScience/Topics/NaturalAreas/Pages/amp_na.aspx

		Areas		
Priority Habitat Areas	<i>Enhancing the viability of existing habitats and ecosystems</i>	Tallus slope	Dept. of Fish and Wildlife	Polygon data describing tallus slope habitats in Washington State. According to Kelly McAllister, Habitat Connectivity Biologist, "this habitat type captures some of the more reptile rich areas in Washington which is significant for highways since reptiles are subject to elevated road kill risk due to their slow moving nature and attraction to heat being emanated, at night, from road surfaces."
		Shrub steppe	Dept. of Fish and Wildlife	Polygon data describing shrub steppe habitats in Washington State. Habitat recommended for consideration by Kelly McAllister, Habitat Connectivity Biologist due to road kill impacts on species of concern.
		Prairie	Dept. of Fish and Wildlife	Polygon data describing prairie habitats in Washington State. Habitat recommended for consideration by Kelly McAllister, Habitat Connectivity Biologist due to road kill impacts on species of concern.
Natural Heritage Areas	<i>Enhancing the viability of existing habitats and ecosystems</i>	Natural Heritage Areas	Dept. of Natural Resources	Polygon data describing areas with rare plants and ecological communities that have been prioritized for conservation efforts by Washington Natural Heritage Program (WNHP) within the Department of Natural Resources. ⁶ These areas are likely to be unsuitable for recreation-oriented investments (due to impacts of people-traffic on wildlife).
Wildlife corridors	<i>Enhancing the viability of known habitat corridors</i>	Lynx corridors	UW	Raster data regarding landscape permeability for lynx in Washington State. Cells are valued based on a habitat connectivity analysis conducted by biologist Peter Singleton. Location that are most viable as habitat corridors are given the highest value.
		Wolf corridors	UW	Raster data regarding landscape permeability for wolves in Washington State. Cells are valued based on a habitat connectivity analysis conducted by biologist Peter Singleton. Location that are most viable as habitat corridors are given the highest value.
		Wolverine corridors	UW	Raster data regarding landscape permeability for wolverines in Washington State. Cells are valued based on a habitat connectivity analysis conducted by biologist Peter Singleton. Location that are most viable as habitat corridors are given the highest value.
		Grizzly bear corridors	UW	Raster data regarding landscape permeability for grizzly bears in Washington State. Cells are valued based on a habitat connectivity analysis conducted by biologist Peter Singleton. Location that are most viable as habitat corridors are given the highest value.

⁶ http://www.dnr.wa.gov/ResearchScience/Topics/NaturalHeritage/Pages/amp_nh.aspx

Lakes, wetlands, rivers and streams	<i>Enhancing the viability aquatic and riparian habitat</i>	Streams and rivers	Dept. of Ecology	Arc data regarding streams and rivers listed in the Washington Shoreline Management act. ⁷ A 1000 foot buffer around these areas was created for the purpose of analysis.
		Lakes and wetlands	Dept. of Ecology	Polygon data regarding lakes and wetlands listed in the Washington Shoreline Management act. ⁸ A 1000 foot buffer around these areas was created for the purpose of analysis.
Impacted waterways	<i>Enhancing the viability aquatic and riparian habitat</i>	Class 2 impacted waterways	Dept. of Ecology	Polygon data describing “waters of concern”. These waterways have evidence of water quality degradation. A 1000 foot buffer around these areas was created for the purpose of analysis.
		Class 4 (A, B, & C) impacted waterways	Dept. of Ecology	Polygon data describing polluted waters that do not require a TMDL (Total Maximum Daily Load). A 1000 foot buffer around these areas was created for the purpose of analysis.
		Class 5 impacted waterways	Dept. of Ecology	Polygon data describing polluted waters that require a TMDL (Total Maximum Daily Load). A 1000 foot buffer around these areas was created for the purpose of analysis.
Fish barriers	<i>Enhancing the viability aquatic and riparian habitat</i>	Fish Barriers	WSDOT	Point data of locations where fish passage across WA roadways is impeded
Historic locations	<i>Reducing impacts to places of scenic, cultural, and historic significance</i>	Nationally registered historic locations	Dept. of Archeology and Historic Preservation	Point data describing nationally registered historic places in Washington State. These locations are being preserved for their historic significance. A 1000 foot buffer around these areas was created for the purpose of analysis.
Current and	<i>Enhancing the viability of</i>			

⁷ ftp://www.ecy.wa.gov/gis_a/shore/sma-arcs.zip

⁸ ftp://www.ecy.wa.gov/gis_a/shore/sma-arcs.zip

future land use	<i>existing habitats and ecosystems</i>	Benton County	Benton Co.	Visual inspection of online comprehensive plan map ⁹ indicates no conflict with areas of high stewardship potential.
	<i>Enhancing the viability aquatic and riparian habitat</i>	Chelan County	UW	Polygon data regarding parcels zoned or planned for commercial, industrial, or business park development.
		Clallam County	UW	Polygon data regarding parcels zoned or planned for commercial, industrial, or business park development.
	<i>Reducing impacts to culturally and historically significant places</i>	Clark County	Clark Co.	Polygon data regarding parcels zoned or planned for commercial, industrial, or business park development.
		Franklin County	Franklin Co.	Polygon data regarding parcels zoned or planned for commercial, industrial, or business park development.
		Grant County	Grant Co.	Polygon data regarding parcels zoned or planned for commercial, industrial, or business park development.
		Grays Harbor County	Grant Co.	Polygon data regarding parcels zoned or planned for commercial, industrial, or business park development.
		Jefferson County	Jefferson Co.	Polygon data regarding parcels zoned or planned for commercial, industrial, or business park development.
		King County	King Co.	Polygon data regarding parcels zoned or planned for commercial, industrial, or business park development.
		Kitsap County	UW	Polygon data regarding parcels zoned or planned for commercial, industrial, or business park development.
		Klickitat County	UW	Polygon data regarding parcels zoned or planned for commercial, industrial, or business park development.
	Mason County	UW	Polygon data regarding parcels zoned or planned for commercial, industrial, or business park development.	
	Okanogan County	UW	Polygon data regarding parcels zoned or planned for commercial, industrial, or business park development.	
	Pacific County	Pacific Co.	Polygon data regarding parcels zoned or planned for commercial, industrial, or business park development.	
	Pierce County	Pierce Co.	Polygon data regarding parcels zoned or planned for commercial, industrial, or business park development.	
	San Juan County	<i>San Juan Co.</i>	<i>Zoning data received from county. Metadata not yet available for review.</i>	

⁹ http://www.co.benton.wa.us//UltimateEditorInclude/UserFiles/Common/Document/Benton_County_COM_PLAN_12-03-2009_120238.pdf

		Skagit County	Skagit Co.	Polygon data regarding parcels zoned or planned for commercial, industrial, or business park development.
		Snohomish County	Snohomish Co.	Polygon data regarding parcels zoned or planned for commercial, industrial, or business park development.
		Spokane County	Spokane Co.	Polygon data regarding parcels zoned or planned for commercial, industrial, or business park development.
		Stevens County	UW	Zoning data received from UW. No metadata is available to assess its relevance to stewardship priorities. Therefore it is not included in this analysis.
		Thurston County	UW	Polygon data regarding parcels zoned or planned for commercial, industrial, or business park development.
		Watcom County	Watcom Co.	Polygon data regarding parcels zoned or planned for commercial, industrial, or business park development.
		Yakima County	UW	Polygon data regarding parcels zoned or planned for commercial, industrial, or business park development.

4. INDEX CALCULATION METHODOLOGY

The data sets listed in Table 1 of this report were analyzed to create a unique data set called a Resource Planning Index for the purpose of this report. This Index assigns values to locations along Scenic and Recreational Highways based on the potential to protect, preserve, or enhance resources associated with the state Scenic and Recreational Highways. The Index data is organized in the form of a raster grid with cells that correspond to 1000 feet on the ground.

The Index value for each cell is calculated based on the presence (or in some cases, proximity) of a feature of interest that is relevant to an opportunity to protect, preserve, or enhance resources associated with the state Scenic and Recreational Highways (see Section 2 and Table 1 above). If a cell intersects multiple features of interest, its Index value will be higher. All features of interest are weighed equally in this analysis, with the exception of wildlife corridors. The weight assigned for these corridors is graduated based on each cell's viability as a wildlife corridor (see data description in Table 1 above). Highest viability cells are given the same weight as every other feature of interest. Less viable cells are given proportionally less value. The calculation of Index values is described here:

- +10 if a cell is within a protected area
 - +10 if a cell is within a Priority Habitat Area of concern
 - +10 if a cell is within a Natural Heritage Area
 - Up to + 10 if cell is within a grizzly wildlife corridor
 - Up to + 10 if cell is within a lynx wildlife corridor
 - Up to + 10 if cell is within a wolf wildlife corridor
 - Up to + 10 if cell is within a wolverine wildlife corridor
 - +10 if a cell is within 1000 feet of a SMA-listed lake, wetland, river, or stream
 - +10 if cell is within 1000 feet of an 'impacted' waterway
 - +10 if cell contains a fish barrier
 - +10 if cell is within 1000 feet of a registered historic location
- Exclude all cells within parcels zoned for commercial, industrial, business park, or airport development.

5. IDENTIFICATION OF LOCATIONS OF HIGHEST POTENTIAL

Figure 1 represents Resource Planning Index values for each 1000 foot segment of the state Scenic and Recreational Highways.¹⁰ The range of Index values along these roadways is 0 to 45. This data was then analyzed to isolate the segments that have the highest potential for preserving, and enhancing resources associated of Scenic and Recreational Highways. Roadway segments with clusters of cells in the top 33% of the Index range (30 or higher) were identified. These areas are represented in Figure 2. For ease of readability Figure 2 *does not* symbolize isolated cells with values of 30 or higher. For raw Index values throughout the Scenic and Recreational Highway System, including an accounting of all cells with values over a particular threshold, it is necessary to consult the original raster layer created for this analysis.

¹⁰ For map readability, the 1000 foot cells were expanded by one cell in each direction. To recover precise measurements for points along Scenic and Recreational Highways is will be necessary to return to the original GIS data.

Index Value



Washington Scenic and Recreational Highway Resource Planning Index

December 2009



Data and analysis methodology described in the 2009 report "Development of a Resource Planning Index for Washington's Scenic and Recreational Highways"

Map Design by Kevin Ramsey, 2009.

Figure 1: Resource Planning Index Values for Scenic and Recreational Highways

Locations of highest potential

1. US route 101 along the west coast of the Olympic Peninsula
2. U.S. route 101 near Willapa National Wildlife Refuge
3. Highway 14 east of Washougal
4. SR 142 near Klickitat
5. SR 410 in Mt. Rainier National Park and east to SR 12 junction
6. SR 821 along Yakima River
7. I 90 east of Kachess Lake
8. SR 97 near Liberty
9. SR 2 east of Stevens Pass
10. SR 20 from North Cascades National Park to Rainy Pass
11. SR 17 near Lenore Lake
12. SR 25 south of the Canadian border
13. SR 31 south of the Canadian border

Data and analysis methodology described in the 2009 report "Development of a Resource Planning Index for Washington's Scenic and Recreational Highways" prepared for WSDOT by Kevin Ramsey.

Map design: Kevin Ramsey, 2009.

Locations of Highest Potential for Protecting, Preserving, and Enhancing Resources Associated with Washington Scenic and Recreational Highways

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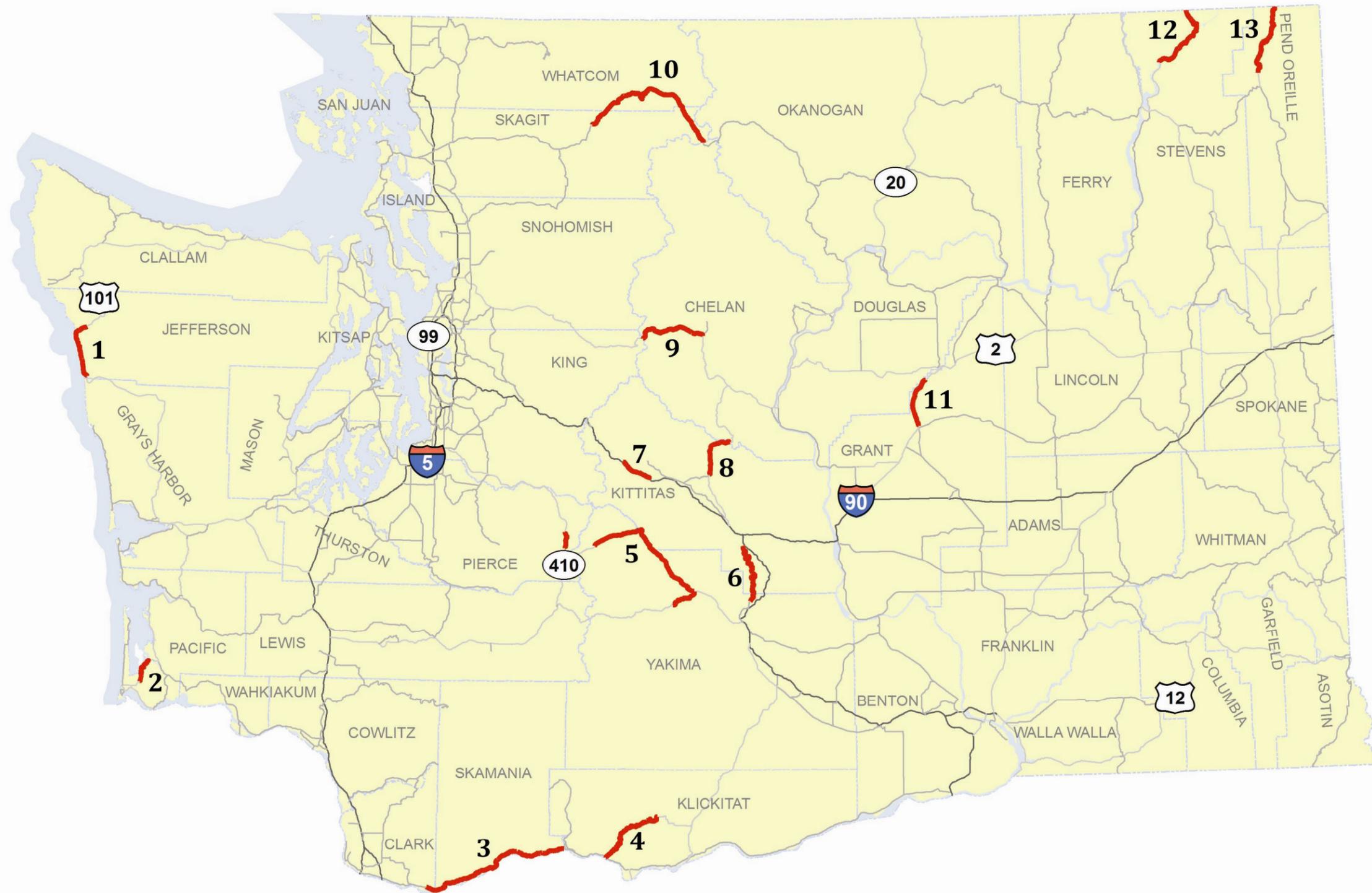


Figure 2: Locations of Highest Potential for Protecting, Preserving, and Enhancing Resources Associated with Washington Scenic and Recreational Highways

6. LIMITATIONS OF THE RESOURCE PLANNING INDEX

As with any statewide GIS analysis, this Index has a number of limitations that must be considered whenever it is used. First, the data available provide only an imperfect assessment of a location's opportunities for protecting, preserving, or enhancing resources associated with the state Scenic and Recreational Highways. For instance not all protected areas have equal viability as functioning ecosystems or habitats. Nor do all rivers, lakes, and wetlands have equal viability as riparian habitats. Yet this analysis treats all such places equally and with equal weight and assumes that these areas can equally benefit. Again, this may not necessarily be the case. However, it does provide a new data set and a method for benchmarking and tracking progress that can serve to support the visual assessments of scenic qualities conducted in the past.

There are also issues around the completeness of statewide data. For instance, wildlife habitat corridor data is only available for four carnivorous species of concern in Washington State. There are many other species of concern for which habitat connectivity and corridor data is not currently available. Likewise data regarding Priority Habitat Areas is shaped by the interests, priorities, and abilities of field biologists who conduct field surveys to collect data about such areas. Finally land use data that is collected at the county level may vary in accuracy, currency, and definitions. Fortunately, county-level zoning data is only used to *eliminate* areas from consideration rather than boost Stewardship Index values. Therefore this particular limitation has only minor significance to overall Stewardship Index values

There are also limitations to the Index as a measure of a location's potential for benefit. What the Index measures is simply the proximity or absence of particular features of interest. These features of interest are associated with various opportunities for protecting, preserving, or enhancing resources associated with the state Scenic and Recreational Highways. Therefore locations with higher Index values roughly measure the number of different opportunities that may be collocated in a particular cell or area. However, it is important to be clear that the Index does not necessarily measure or describe the priority of a location.

7. RECOMMENDED USE OF THE RESOURCE PLANNING INDEX

There may be a number of ways in which the Index could be used. One appropriate use is as follows:

- ***Identification of appropriate locations for focus***

The Index is a first-pass assessment of locations where there may be a confluence of opportunities for protecting, preserving, or enhancing resources associated with the state Scenic and Recreational Highways. Therefore, if the goal of an investment is to address multiple opportunities at once, the Index can be used to roughly determine whether or not a location may be appropriate for this goal. As always, a local scale

analysis of the location should assess exactly what opportunities exist there and whether a proposed project would actually provide the desired benefit or impact to the location.