

Integrated Ecosystem Assessment (IEA)

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What does a healthy ecosystem look like? How can we measure progress?	Identify ecosystem goals, indicators, and targets
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Developing an ecosystem assessment for PSP work

- To conduct an IEA, we need an ecosystem model.
- The ecosystem model is under development, but it will take approximately 2 years before it is complete.
- In the meantime, the scientific community can provide qualitative or semi-quantitative results from existing and new assessments.

Ecosystem components in Puget Sound

- Species and food webs
- Habitats and processes
- Water quality
- Water quantity
- Human health and well being





Atmospheric Exchange

e.g. Pollutant deposition, carbon dioxide absorption, warming temperatures



Human Uses, Impacts (health impacts, well being)

A B

e.g. Harvest, aquaculture, consuming seafood, recreation, etc.

e.g., Harmful algal blooms, changing ocean properties



Marine/ Estuarine Species and Food Webs

C

e.g., Salmon, bald eagles



Aquatic/ Terrestrial Food Webs

C

e.g. Nutrient inputs, toxic impacts on food webs

e.g. Vegetative cover in riparian zone, aquatic insect abundance and diversity

Ocean Exchange

e.g. Eelgrass shelter for Dungeness crab, herring spawn on kelp fronds



Water Quality

F

e.g. Suspended sediments reduce light for eelgrass, kelp beds filter particulates



Freshwater Flows/Quality

E F

e.g. Contaminant loadings, freshwater impacts on marine circulation

e.g. Beach nourishment from stream sediments, stream flows balance salinity and sustain marsh plants

e.g. Salmon spawning capacity, amphibian abundance



Habitat Quality and Quantity, Processes

D

Process of science for PSP

- Steering committees--
group of diverse
scientists to oversee
initial content
- Broad reviews from
scientific community
- Oversight by Science
Panel?



Risk analysis technical steering committee

- Helen Berry (WA DNR)
- Wayne Palsson (WDFW)
- Jim West (WDFW)
- Molly Ingraham/Jacques White (TNC)
- Mary Mahaffey (USFWS)
- Tim Essington (UW)
- Joe Joy (WA DOE)
- EPA

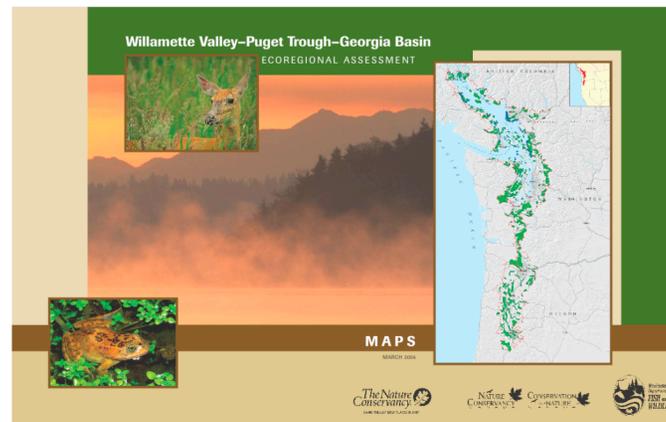
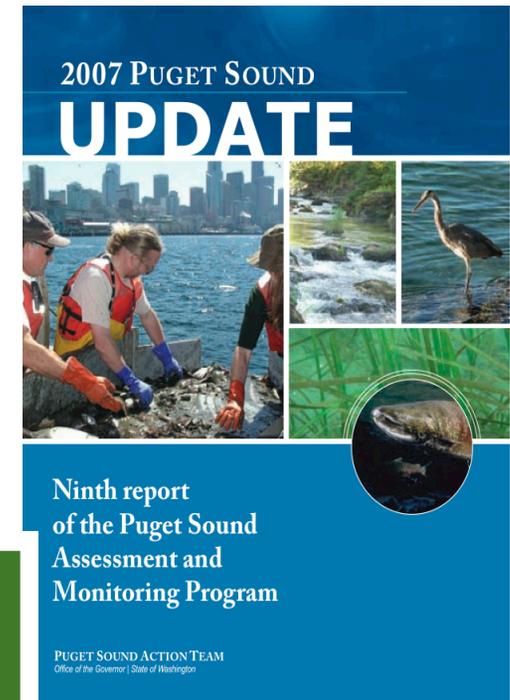
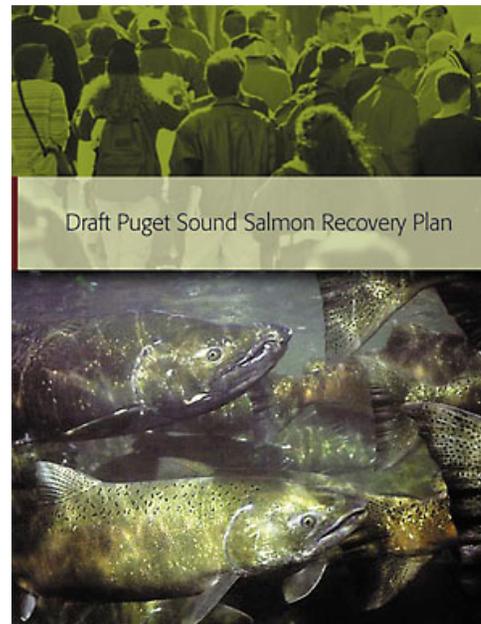
Risk analyses for the Puget Sound ecosystem

Qualitative --> quantitative approaches

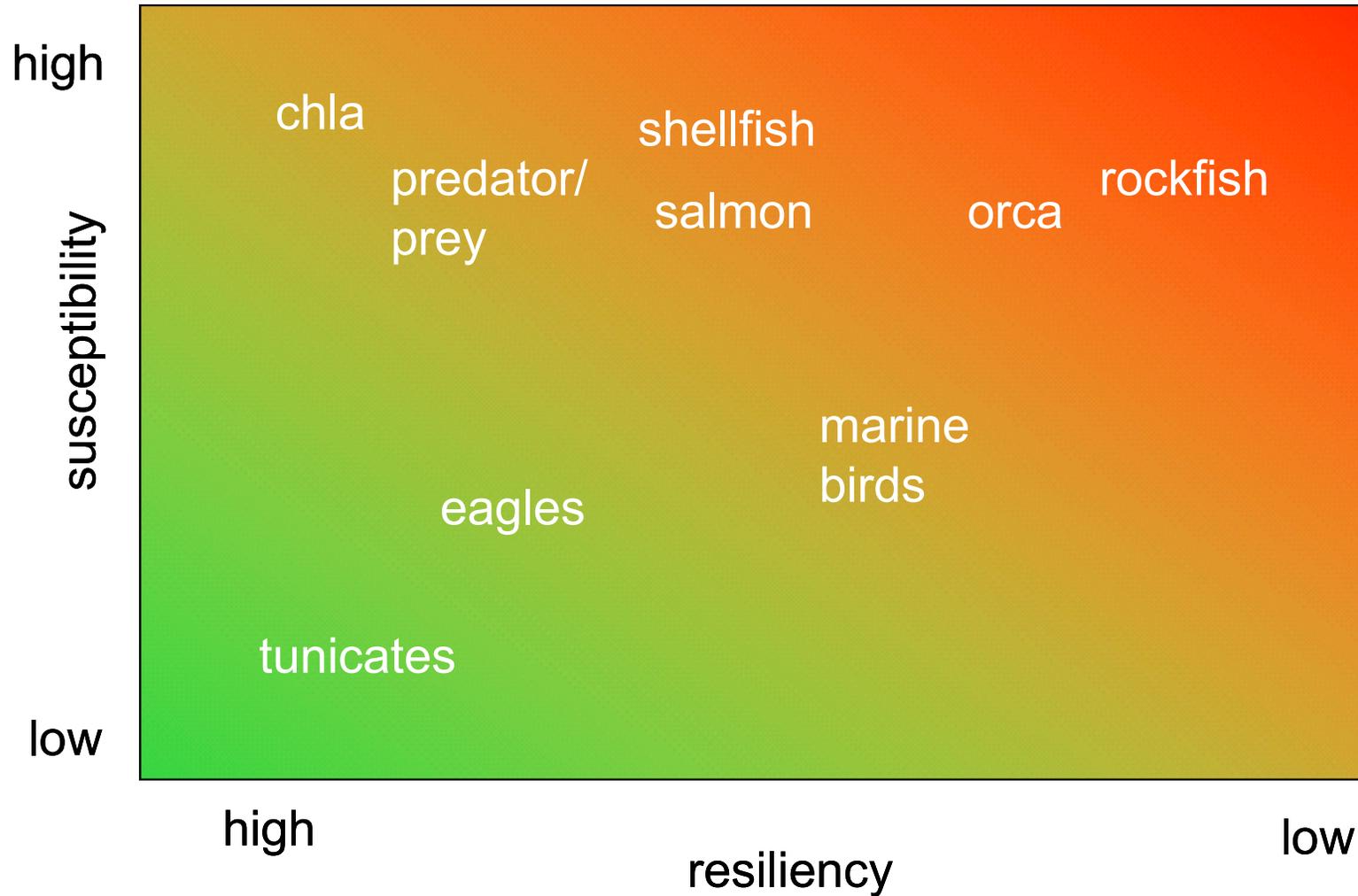
(1) estimating the current status of each of the ecosystem components, and (2) conducting a vulnerability assessment to ascertain the degree of threats facing each component and the resiliency of the components

Sources for qualitative risk analysis

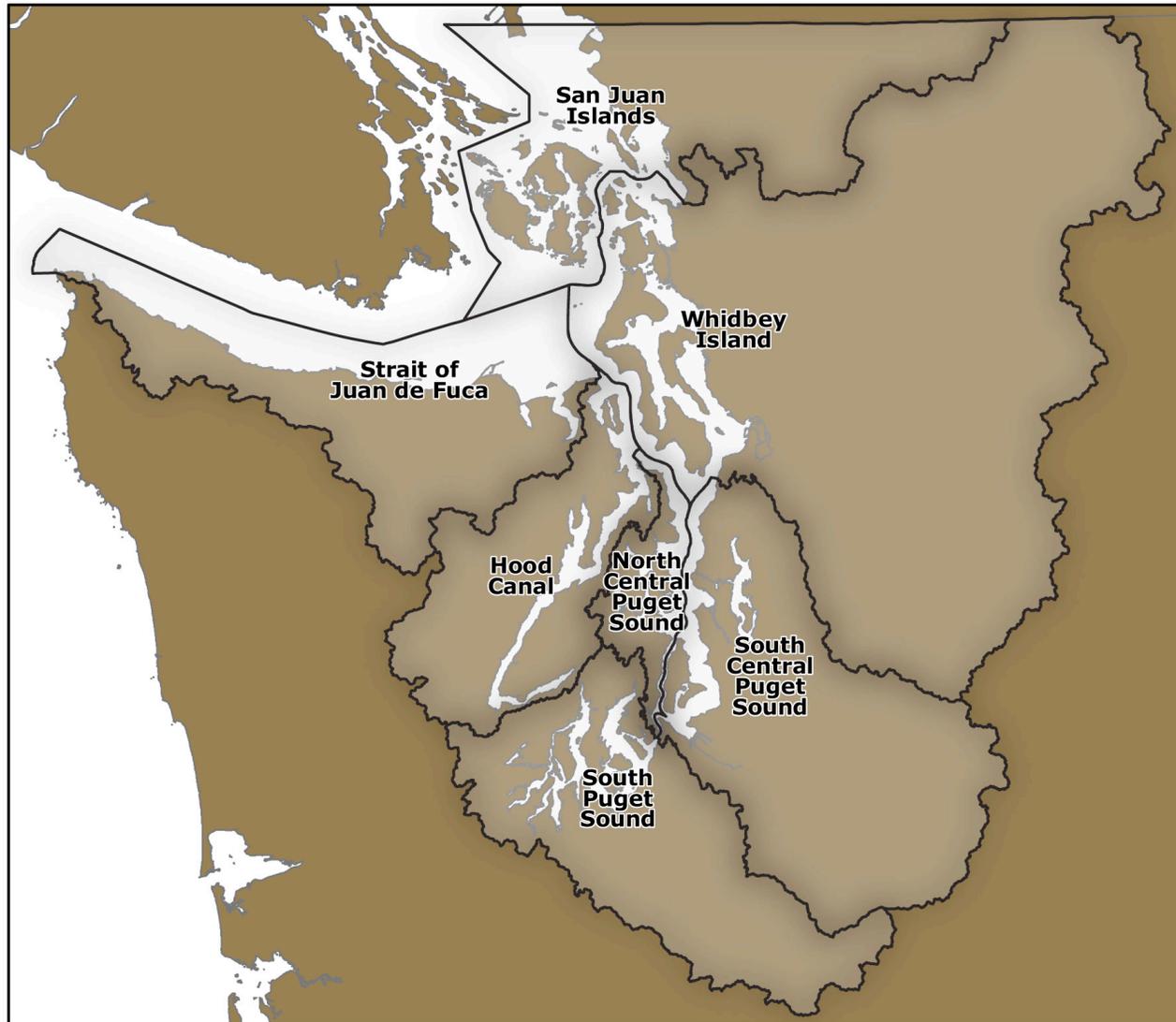
- Existing assessments
- Simple spatial analyses



Result from risk analysis: categories of vulnerability



PSP Action Areas



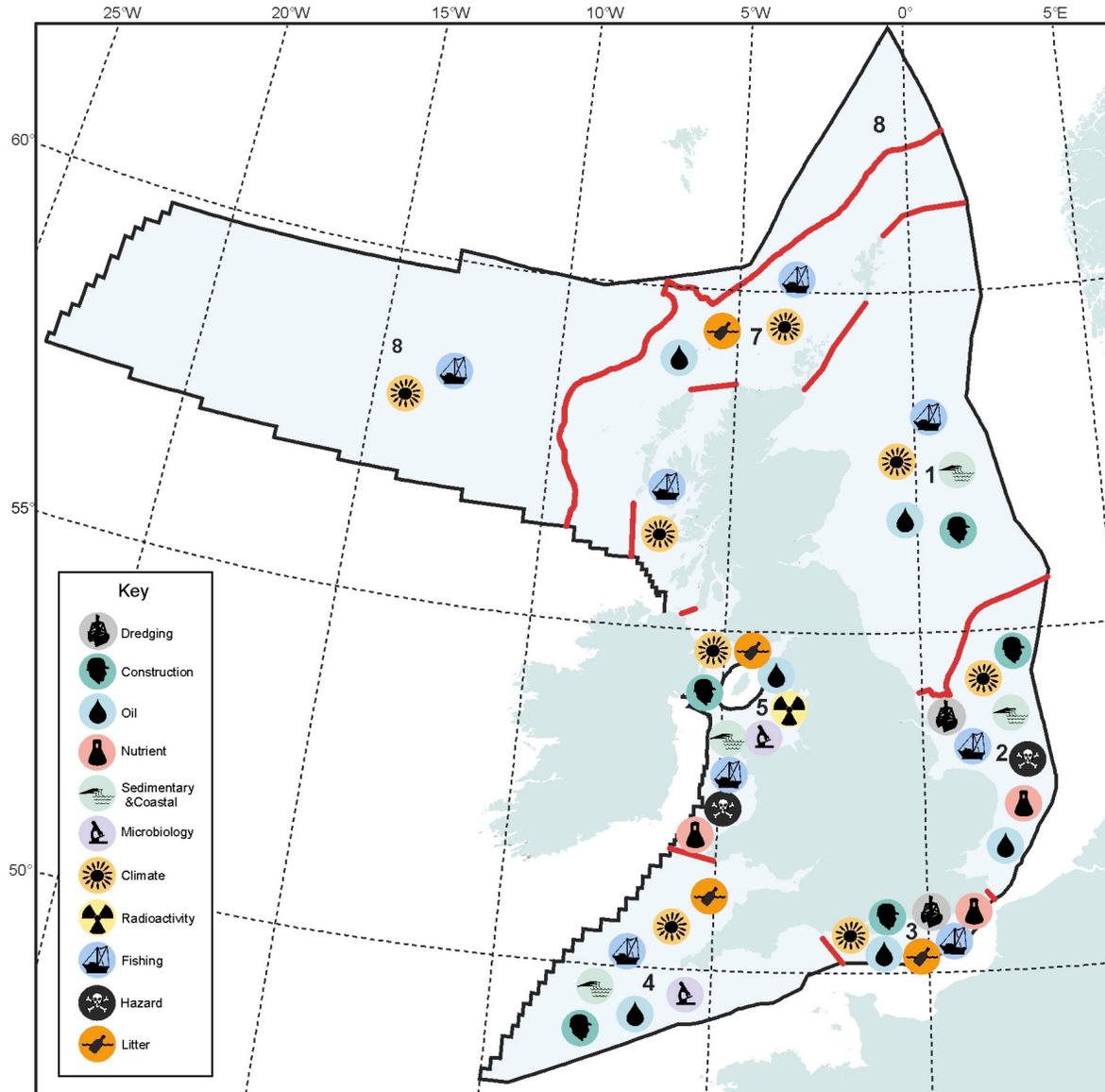
Key threats by sub-region of ecosystem--example from UK

Region	1. North Sea	2. Southern North Sea	3. Eastern English Channel	4. Channel and Approaches	5. Irish Sea	6. Western Scotland	7. Scottish Continental	8. Scottish Offshore
Climate Impacts								
Fisheries								
Nutrients		Coastal						
Microbiological Contaminants								
Hazardous Substances								
All oil Industry								
Radioactivity								
Construction								
Dredging								
Sedimentary and Coastal Erosion								
Litter								

Orange shading indicates the impacts from activities (rows) are considered to be important in the corresponding regions (columns)

<http://www.defra.gov.uk/environment/water/marine/uk/stateofsea/chartprogress.pdf>

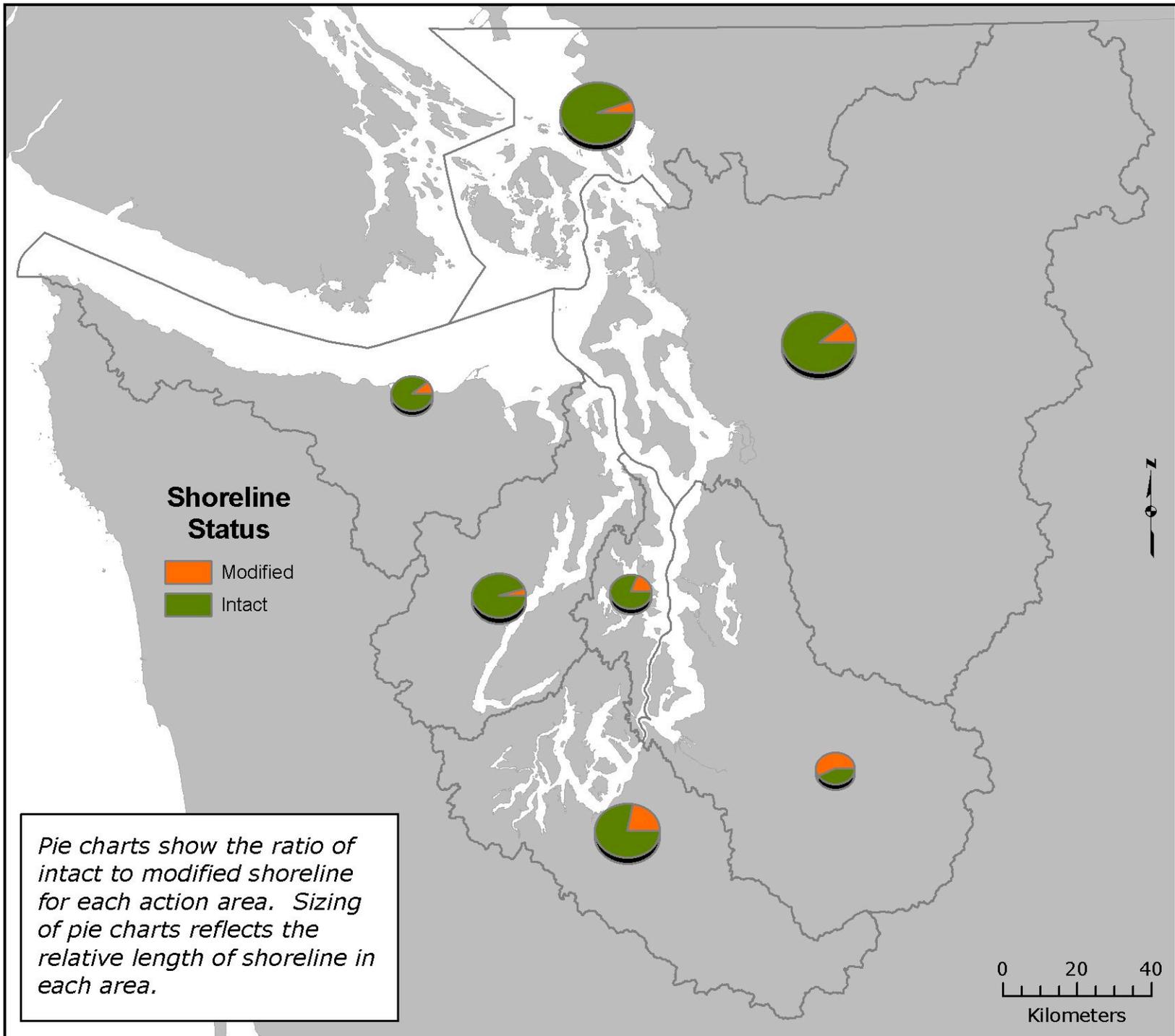
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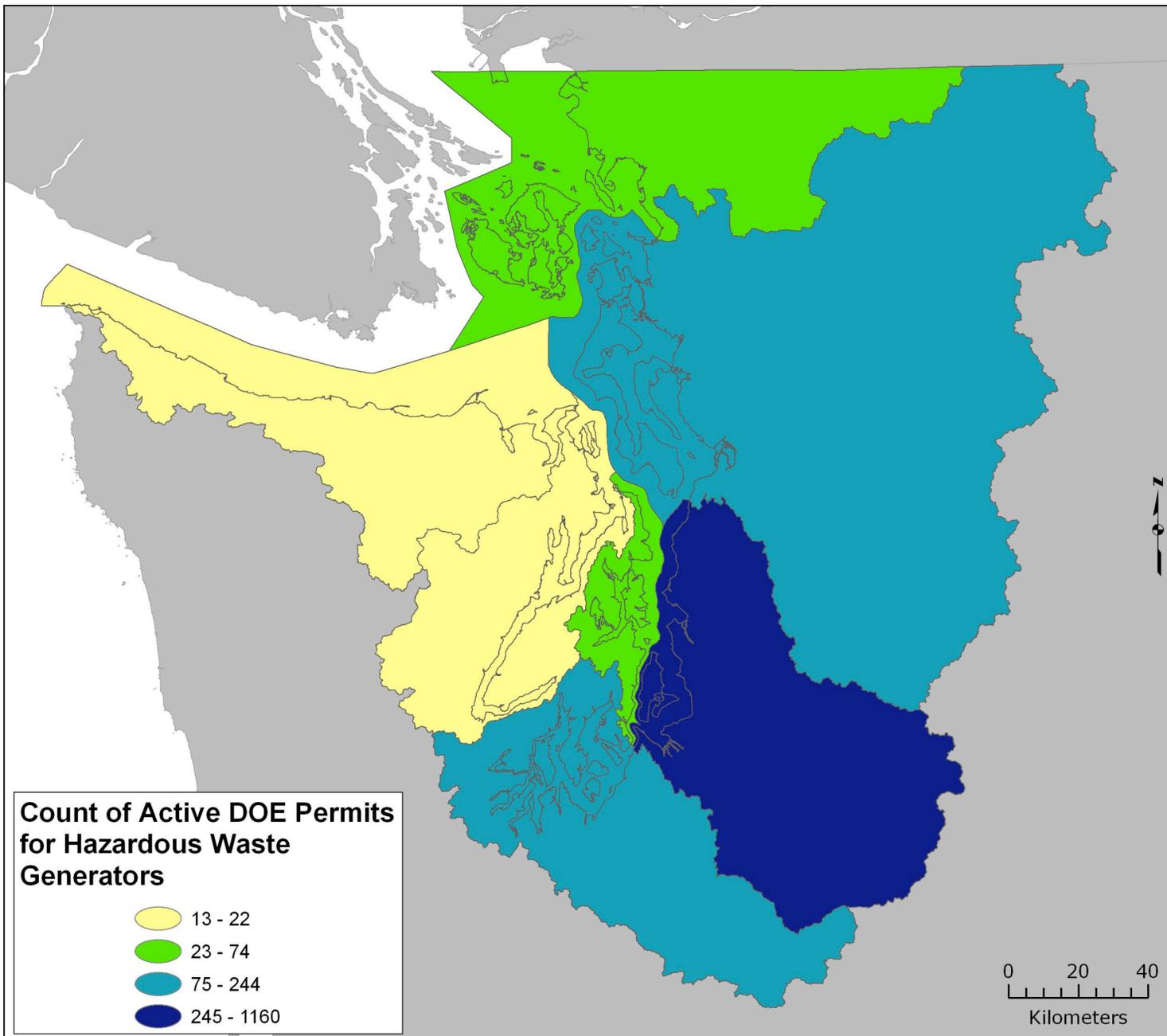


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Simplified Puget Sound Sub-basin Threats Tables

Threat group	Threat activity	Sub-Basin						
		1	2	3	4	5	6	7
Habitat alterations	Existence or operation of offshore, shoreline, and benthic structures							
Habitat alterations	Construction or repair of offshore, shoreline, and benthic structures							
Habitat alterations	Operation of vehicles / vessels (i.e., sound pollution, wakes, collisions)							
Habitat alterations	Log booming, log grounding, floating log storage, and log rafts							
Habitat alterations	Dredging, capping, and disposal of dredged sediments							
Habitat alterations	Mining							
Habitat alterations	Littering (i.e., terrestrial trash, marine debris, derelict fishing gear)							
Habitat alterations	Land conversion due to forest practices, agriculture, or urbanization							
Habitat alterations	Activities contributing to air pollution							
Habitat alterations	Activities contributing to climate change							
Habitat alterations	Recreation and ecotourism							
Surface / ground wa	Floodplain drainage and disconnection							
Surface / ground wa	Alteration of stream flows due to channeling, damming, withdrawing, or diverting water							
Surface / ground wa	Depletion of aquifers / groundwater							
Surface / ground wa	Contamination of aquifers / groundwater							
Pollution	Stormwater spills/discharges							
Pollution	Wastewater spills/discharges							
Pollution	Toxics or oil spills/discharges							
Pollution	Sewage, greywater, bilge, and ballast discharges from boats							
Pollution	Mis-use of on-site sewage treatment							
Pollution	Agricultural runoff							
Aquaculture	Benthic aquaculture							
Aquaculture	Pelagic aquaculture / hatcheries							
Harvest	By-catch, accidental death							
Harvest	Demersal fishing (i.e., bottom trawling, longline, set net, spearfishing, pot fishing)							
Harvest	Pelagic fishing (i.e., gillnet, purse seine, angling)							
Harvest	Hunting							
Species Invasion	Exotic species introduction and subsequent invasion							





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