

Indicators for the Habitat Ecosystem Component

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Habitat indicator selection

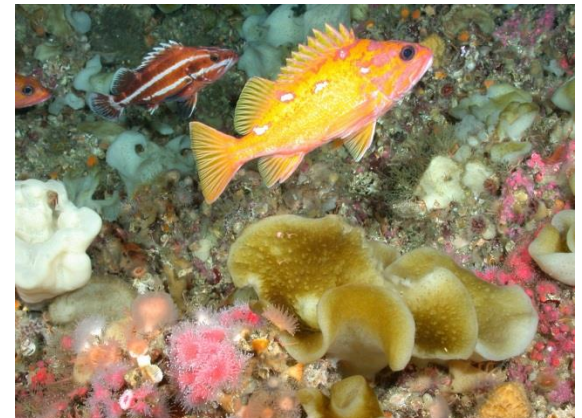
SELECTING AND EVALUATING INDICATORS FOR HABITATS WITHIN THE CALIFORNIA CURRENT LARGE MARINE ECOSYSTEM

CCIEA PHASE III REPORT 2013: HABITAT

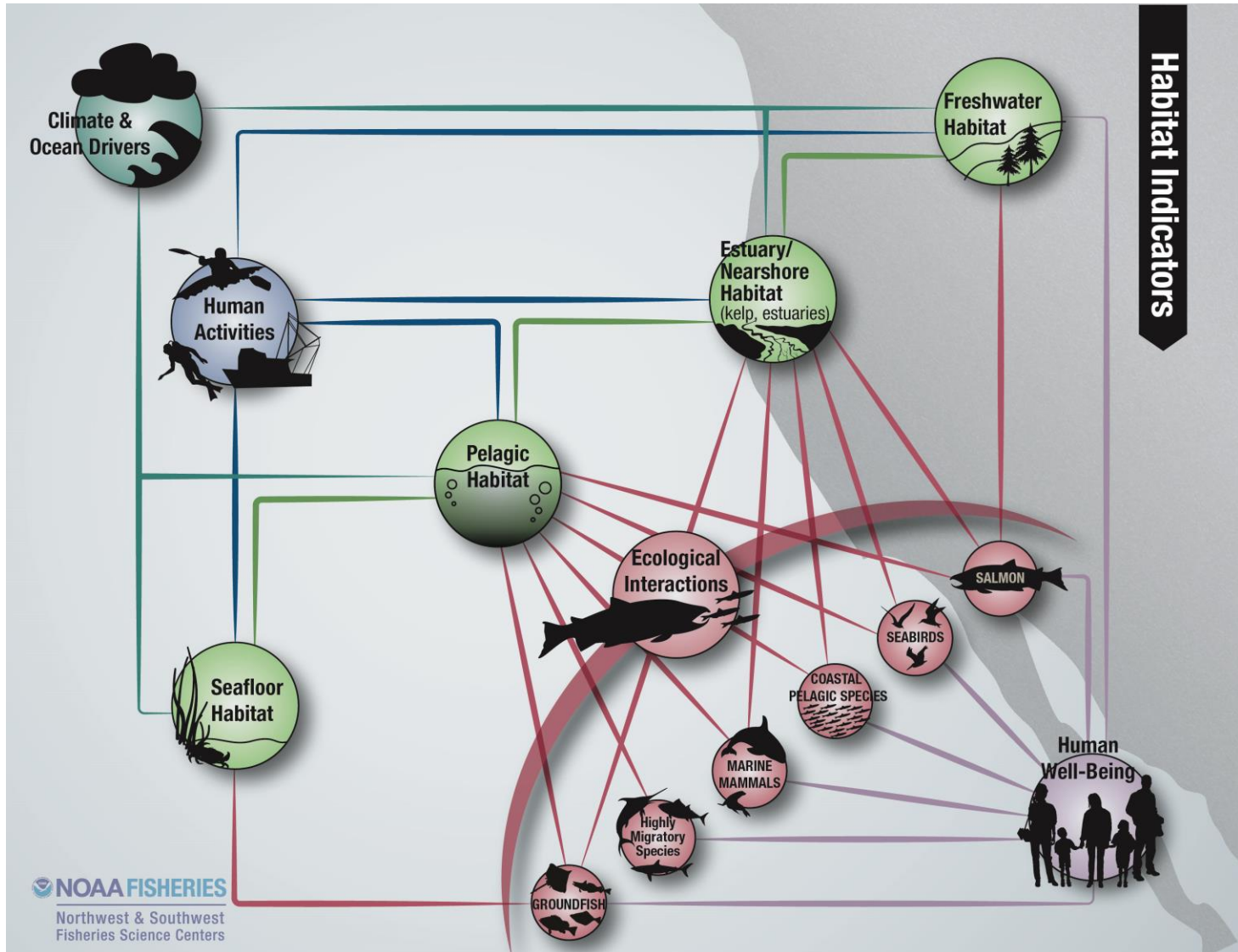
Correigh Greene¹, Kelly Andrews¹, Tim Beechie¹, Dan Bottom², Richard Brodeur², Lisa Crozier¹, Aimee Fullerton¹, Lyndal Johnson¹, Elliott Hazen³, Nate Mantua³, Charles Menza⁴, Mindi Sheer¹, Waldo Wakefield², Curt Whitmire², Mary Yoklavich³, and Juan Zwolinski⁵

www.noaa.gov/iea/Assets/iea/california/Report/pdf/9.Habitat_2013.pdf

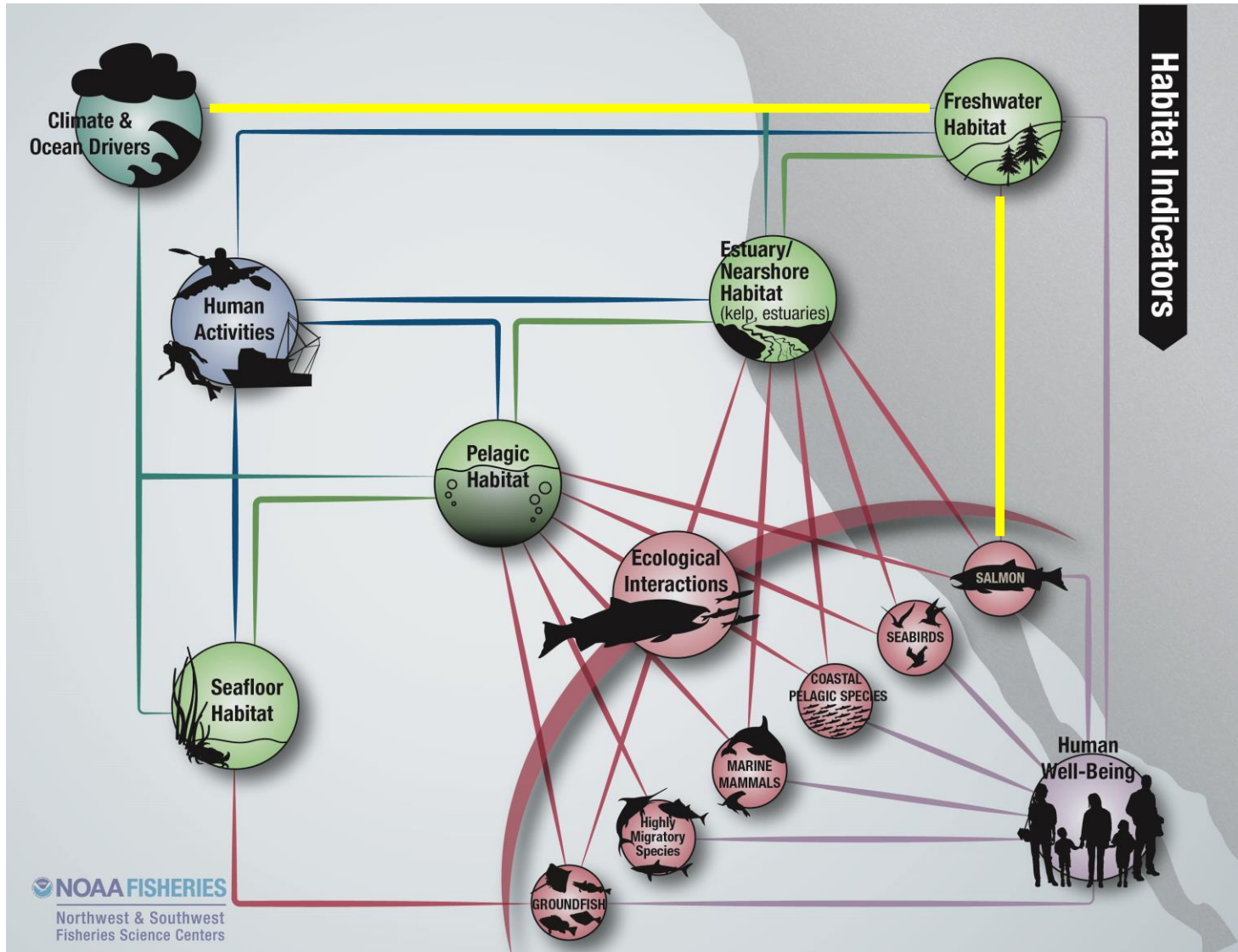
(Or just Google “CCIEA Habitat Indicators”)



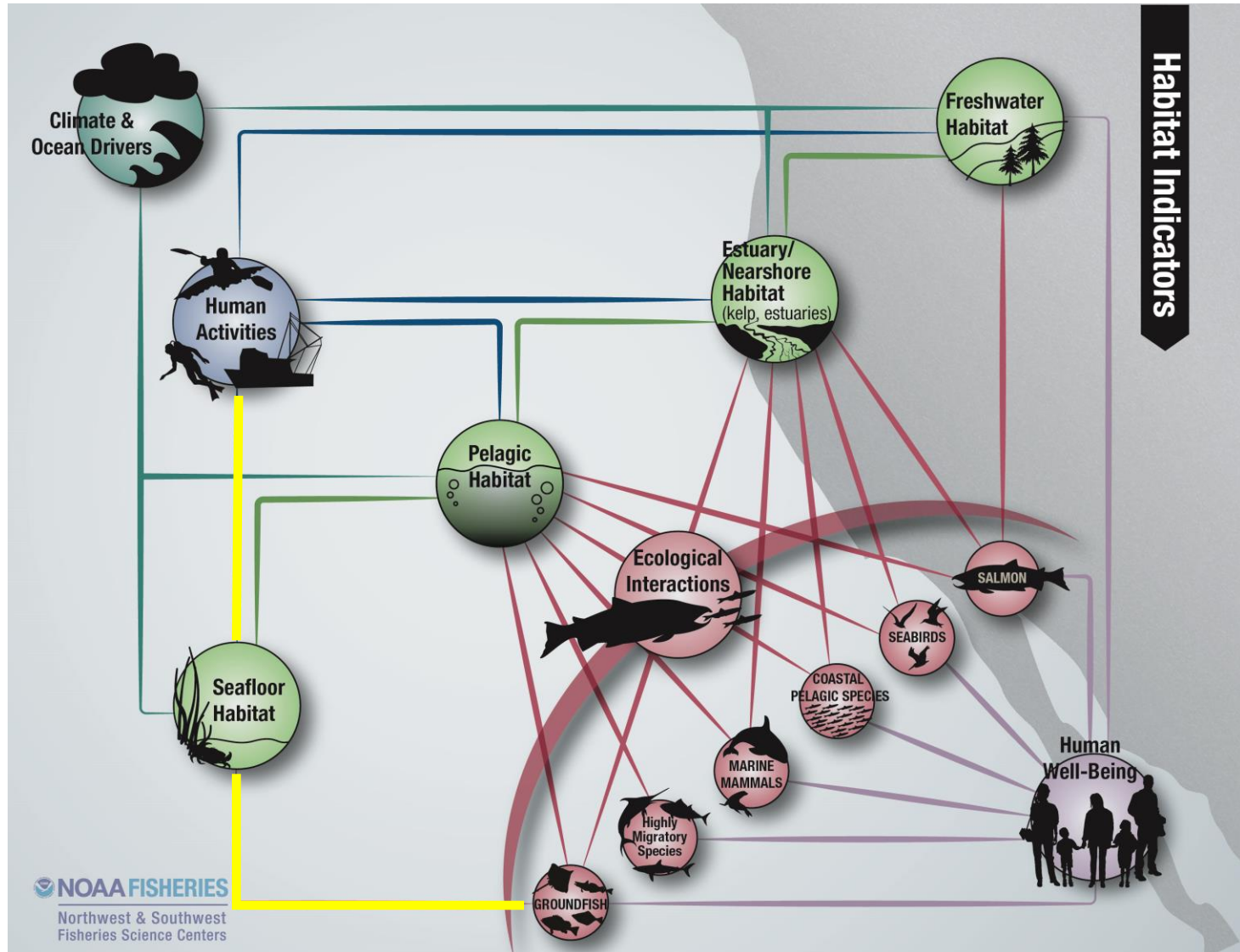
Conceptual model for habitat



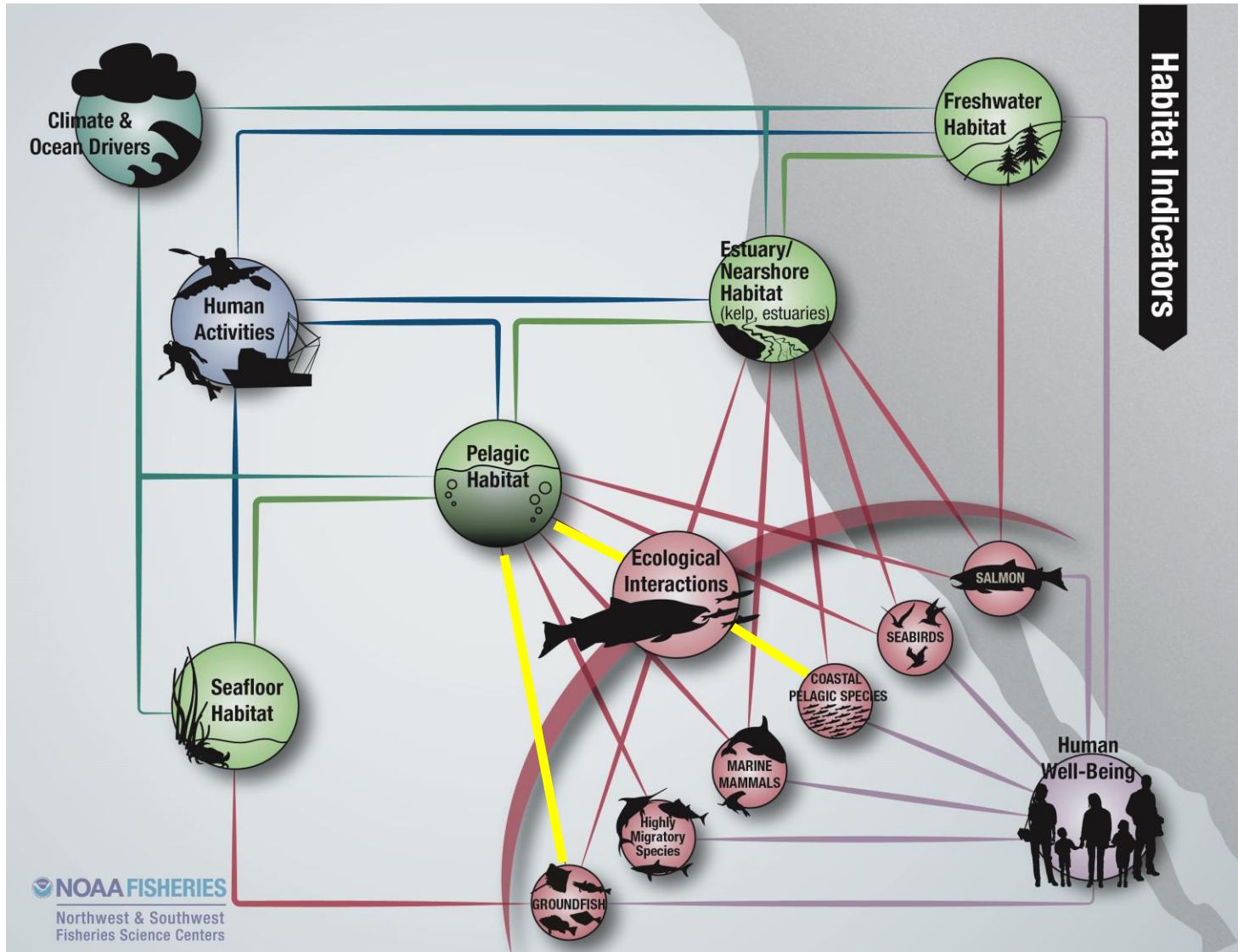
Habitats mediate climate effects



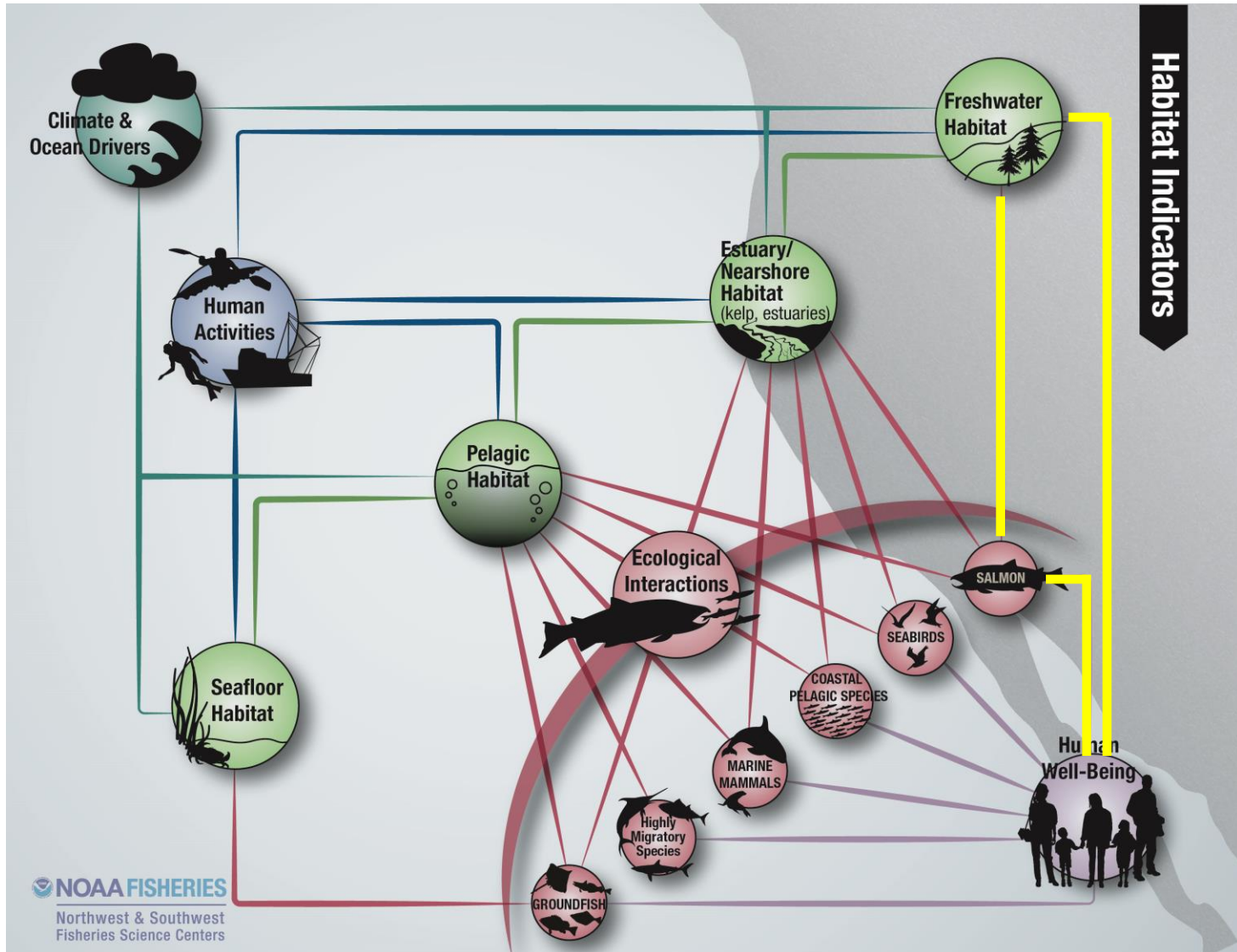
Habitats mediate effects of human activities



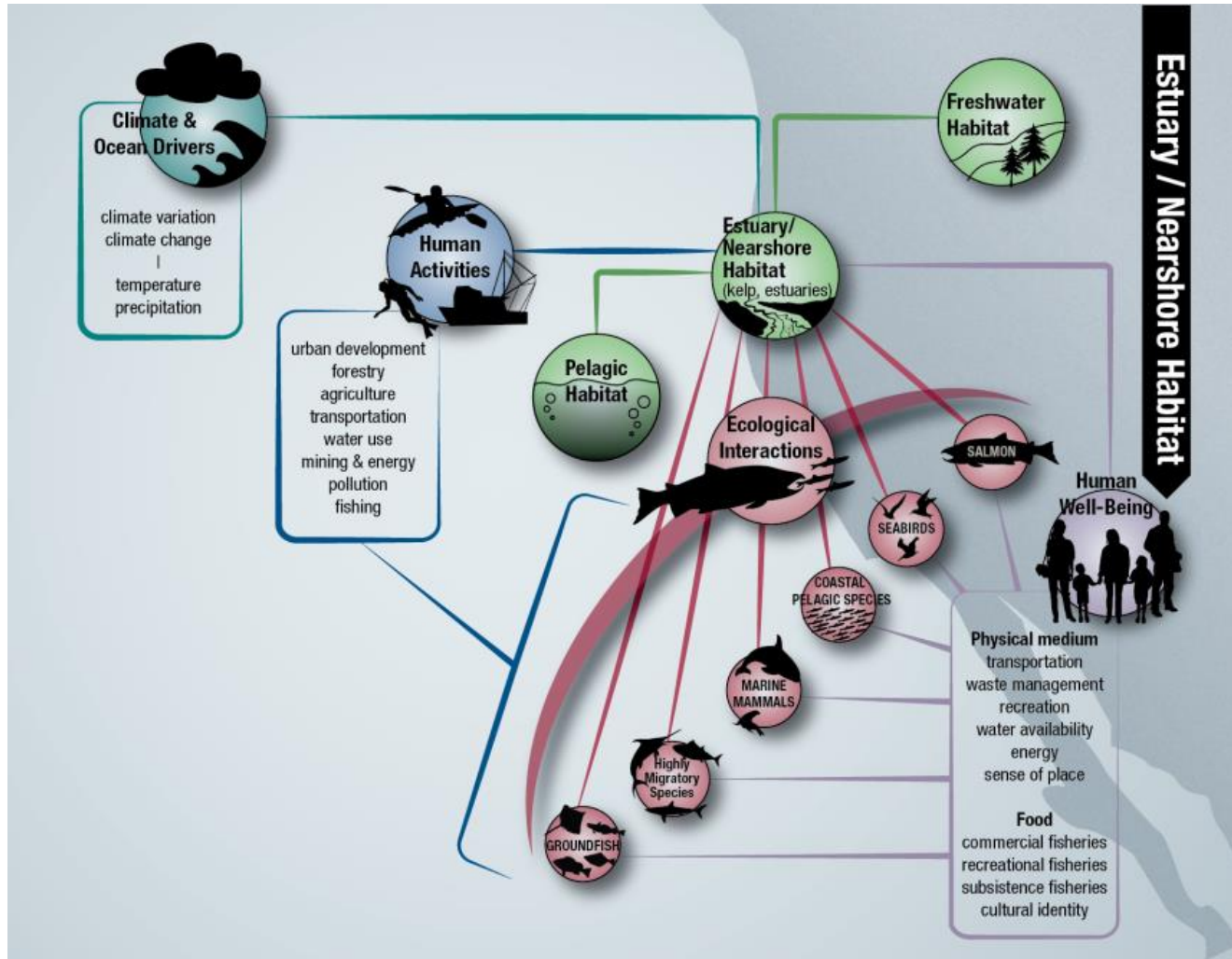
Habitats mediate foodwebs



People share habitat benefits



Habitat-specific conceptual models



Summary of priority indicators

Macrohabitat	Indicator type	Mapping	Time series
Freshwater	Quantity	River discharge	River discharge
		Snowpack	Snowpack
	Quality	% of network accessible	
		Temperature	Temperature
	Pressure	Riparian condition	
		% agriculture	% agriculture
Estuary/ nearshore	Quantity	% developed/impervious	% developed/impervious
			Number of dams
		SAV extent	SAV extent
		River discharge	River discharge
	Quality	Estuary wetland area	Sea level rise
		Benthic substrate extent	
		Temperature	Temperature
		Dissolved O ₂	Dissolved O ₂
	Pressure	Nitrogen: Phosphorus	Nitrogen: Phosphorus
			Turbidity
			Chlorophyll a
		% agriculture	% agriculture
		% developed/impervious	% developed/impervious
			Beach closures

Summary of priority indicators

Macrohabitat	Indicator type	Mapping	Time series
Pelagic	Quantity	Euphotic depth	Euphotic depth
		Thermocline depth	Thermocline depth
	Quality	Surface temperature	Surface temperature
		Turbidity	Turbidity
		Chlorophyll a	Chlorophyll a
			Dissolved O₂
			Total forage fish biomass
			Marine survival of salmon
	Pressure	Atmospheric pollution	Atmospheric pollution
		Ship displacement volume	Ship displacement volume
			Commercial fishery landings
Seafloor	Quantity	Substratum types	--
	Quality	Temperature	Temperature
		Dissolved O₂	Dissolved O₂
		Rugosity	
	Pressure	Disturbance from fishing gear	Disturbance from fishing gear

Examples of indicator gaps

Macrohabitat	Missing indicators
Freshwater	Amounts of large woody debris Indices of biotic integrity
Estuary/ nearshore	Extent of salinity zones Establishment of nonnative organisms
Pelagic	Size of large river plumes Size and vectors of eddies Carbonate chemistry
Seafloor	Areal coverage of biogenic habitat Carbonate chemistry

Habitat-based spatial framework



- **Estuary**
 - Head of tide to marine waters
 - Watershed topographic breaks
- **Nearshore**
 - Water column and benthos in the photic zone
 - Littoral drift cells
- **Pelagic**
 - Water column from nearshore to EEZ
 - Water column and bathymetric breaks
- **Seafloor**
 - Benthos from nearshore to EEZ
 - Physiography
(e.g., bathymetry, substrate type)



Habitat-based spatial framework – freshwater



- Six freshwater ecoregions based on biogeography of associated fishes
 - (Abell et al. 2008, BioScience)



Habitat-based spatial framework – freshwater

- Six freshwater ecoregions (Abell et al. 2008, BioScience)
- HUC8



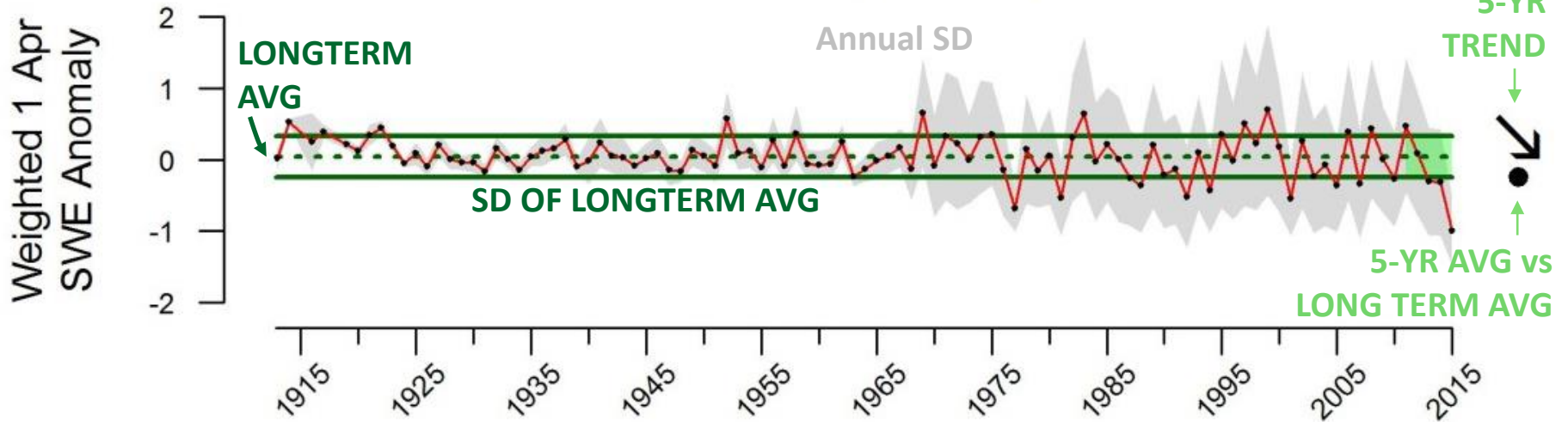
Snow-water equivalent indicator



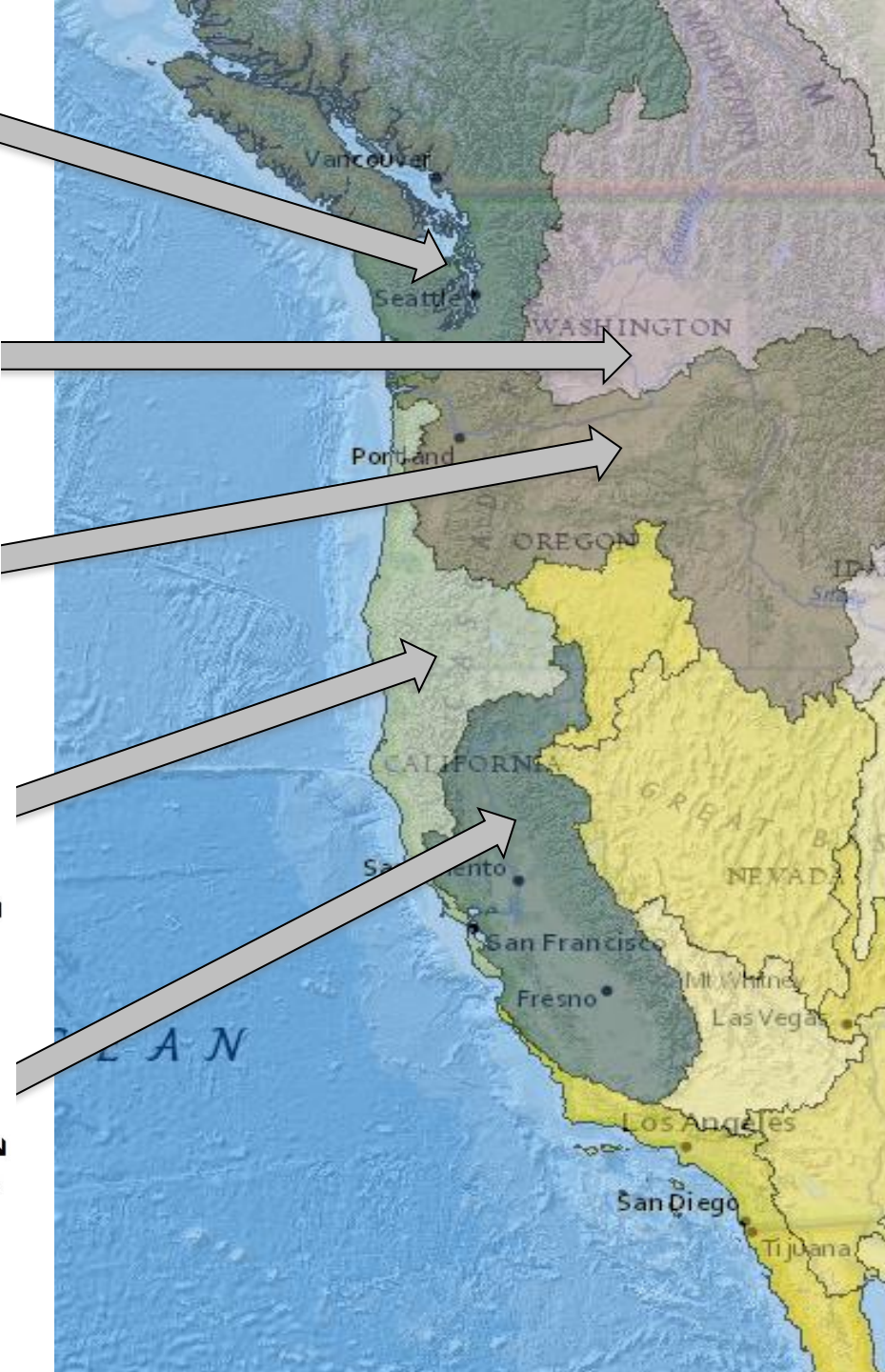
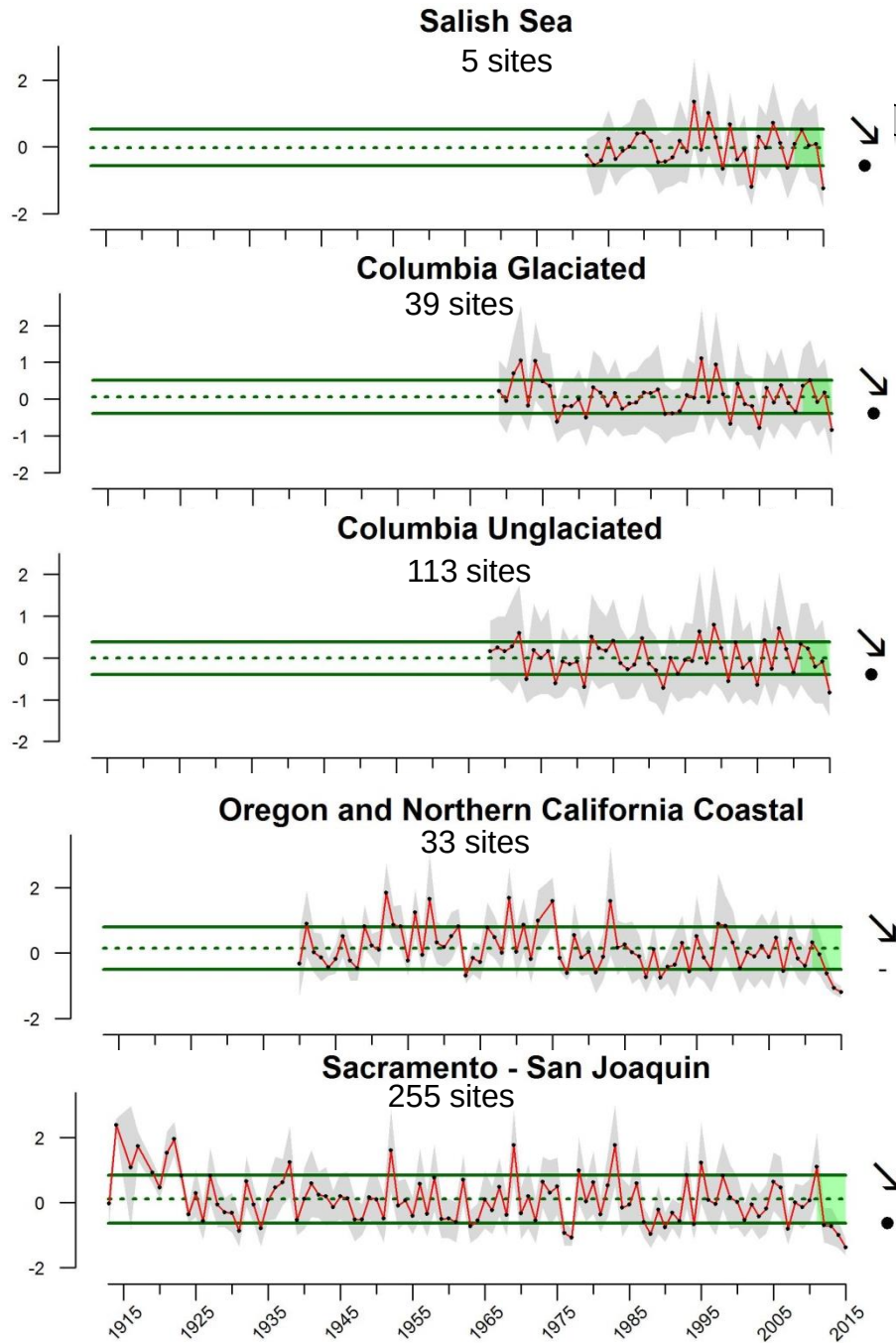
April 1st SWE anomaly in CC



California Current



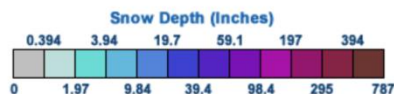
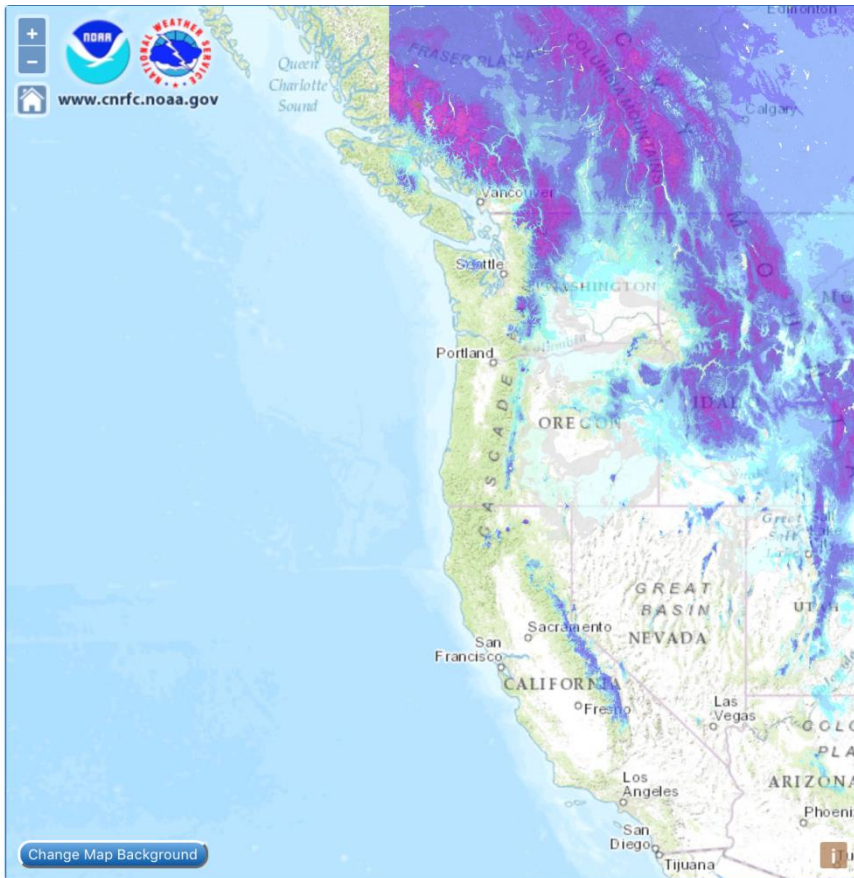
April 1st SWE Anomaly



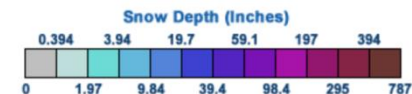
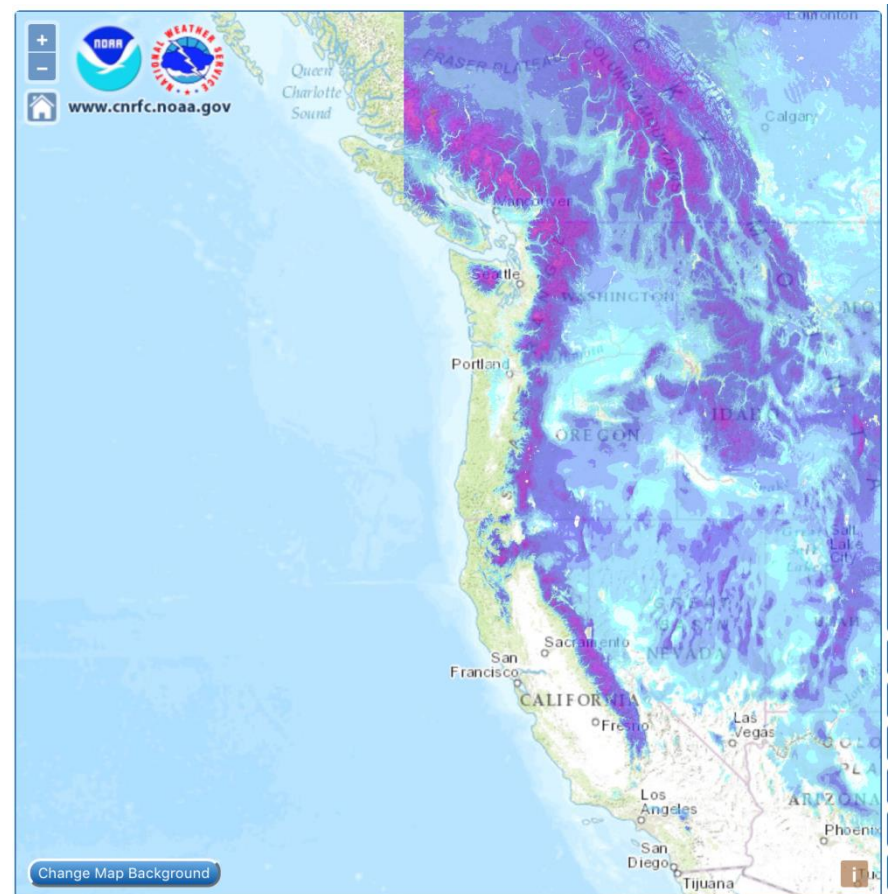
How does snowpack look this year?

NOHRSC Snow Depth (in) different from sites in the 2015 analysis
Snowpack is currently much greater than at this time last year

12 Jan 2015



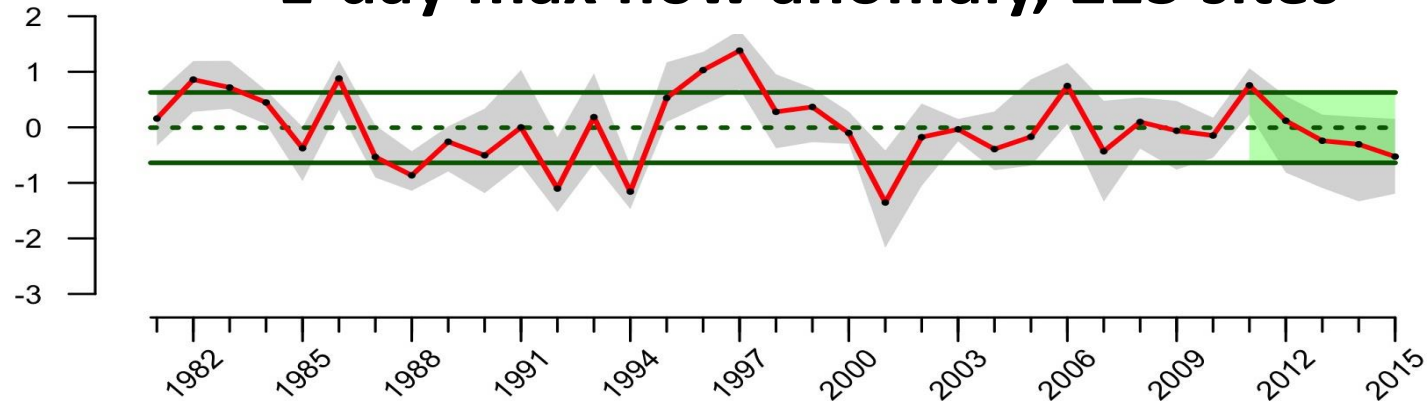
12 Jan 2016



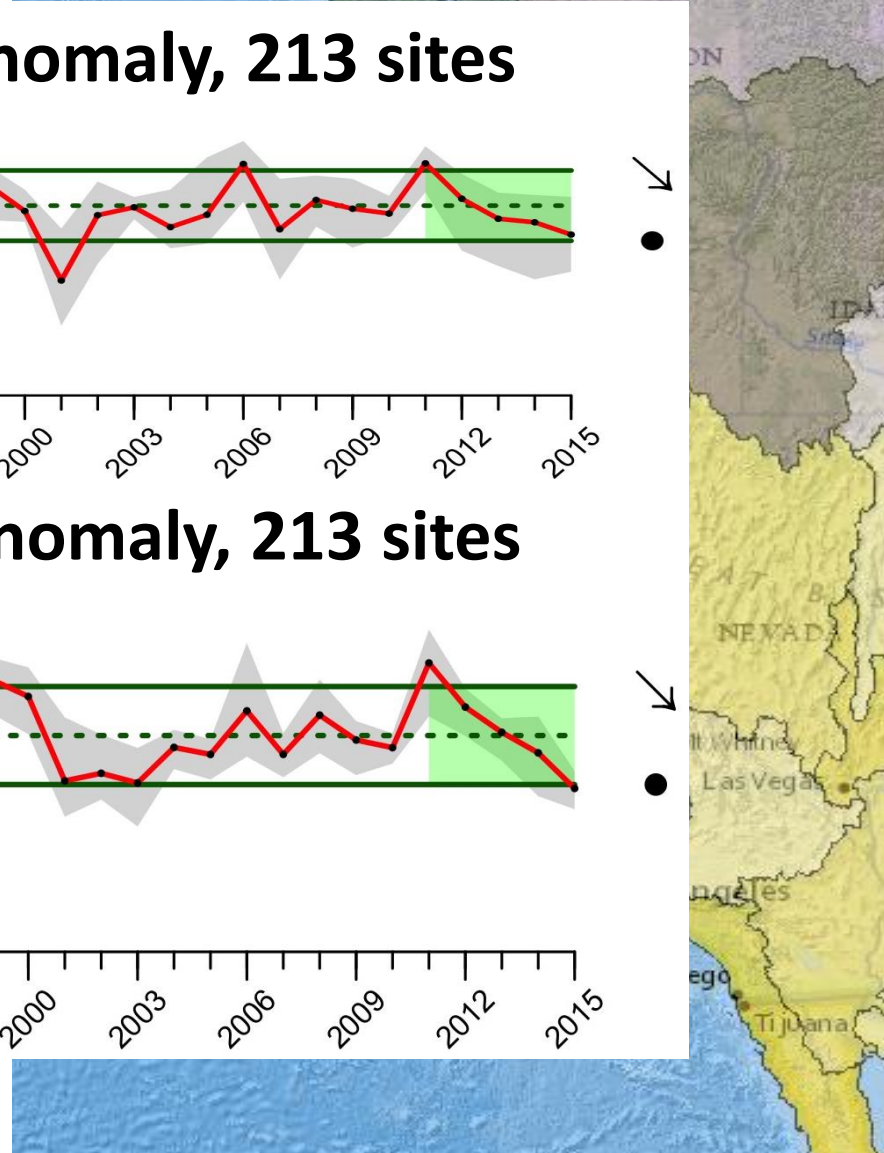
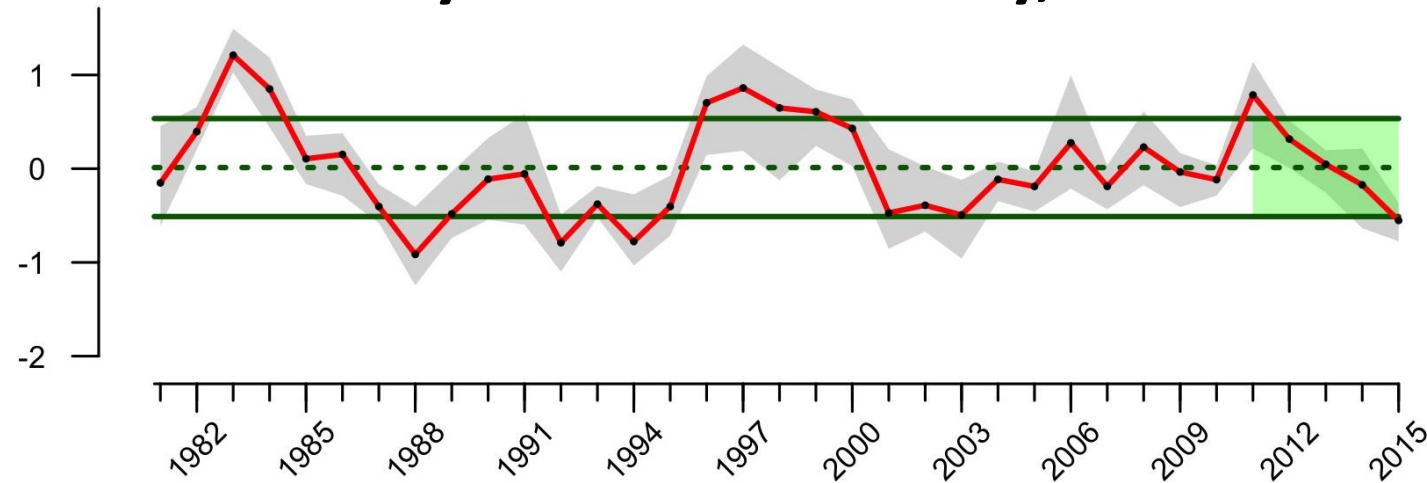
Streamflow indicators



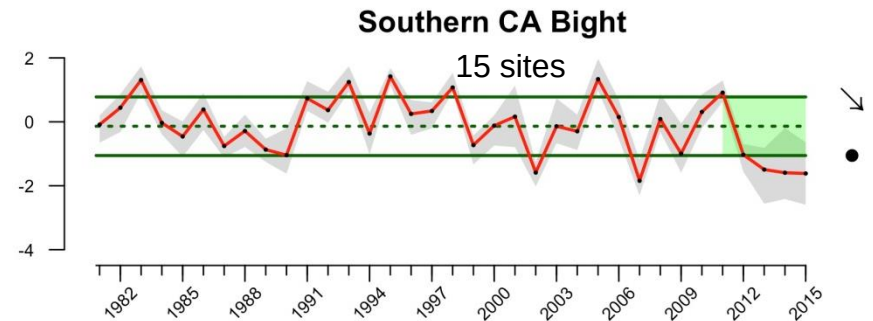
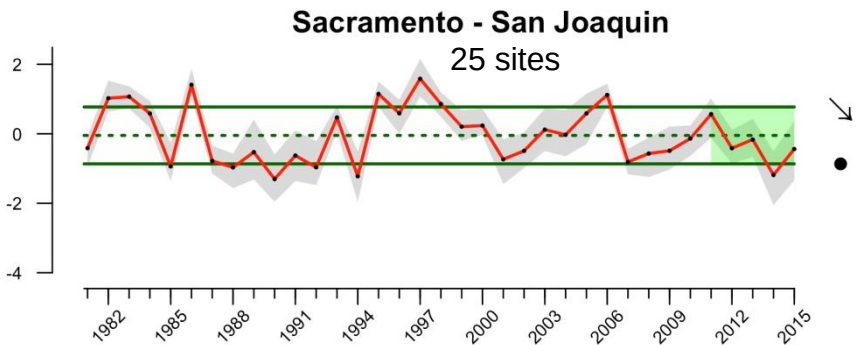
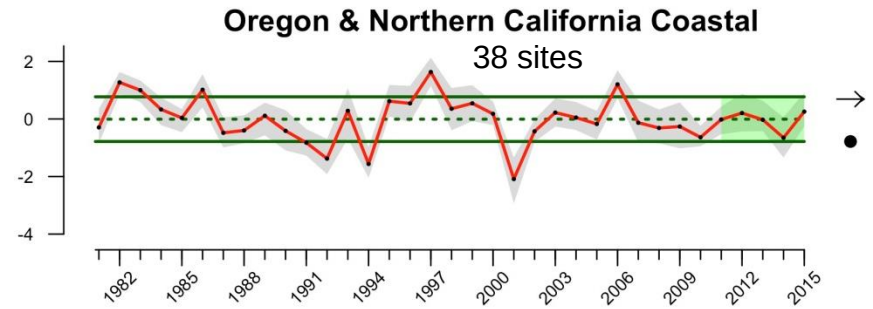
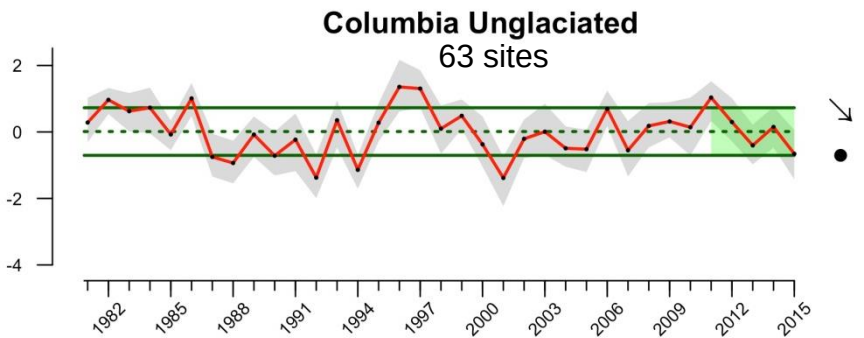
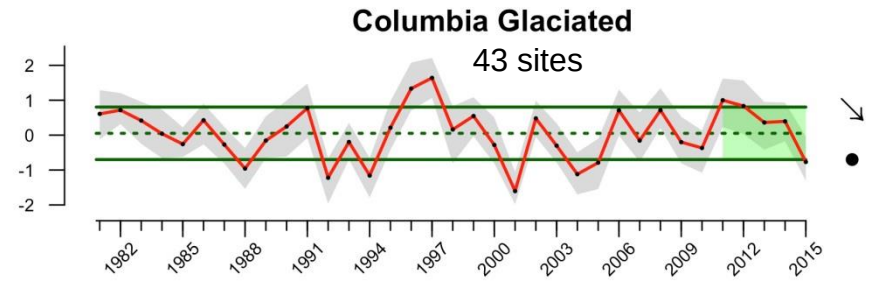
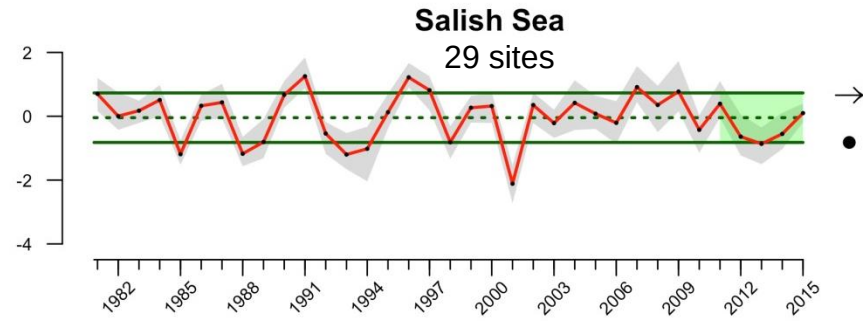
1-day max flow anomaly, 213 sites



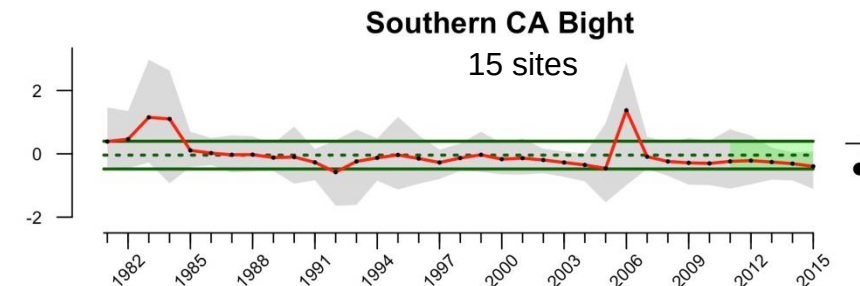
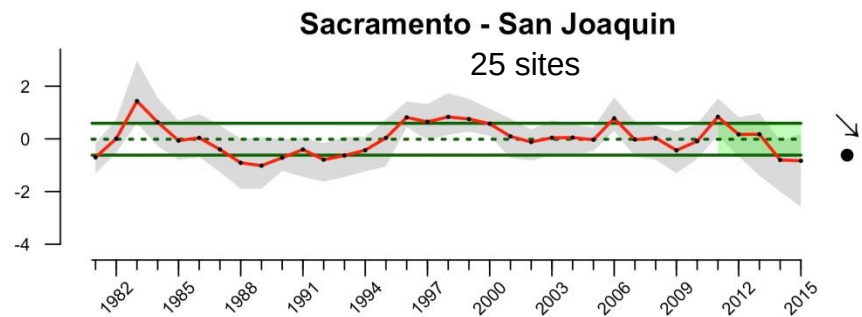
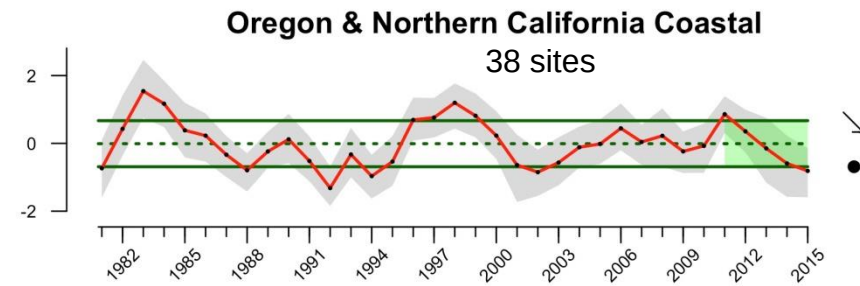
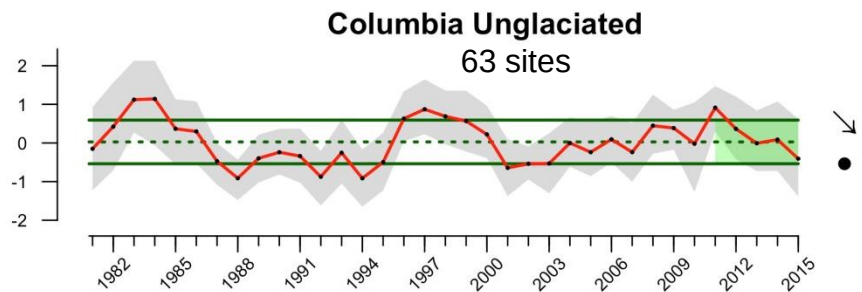
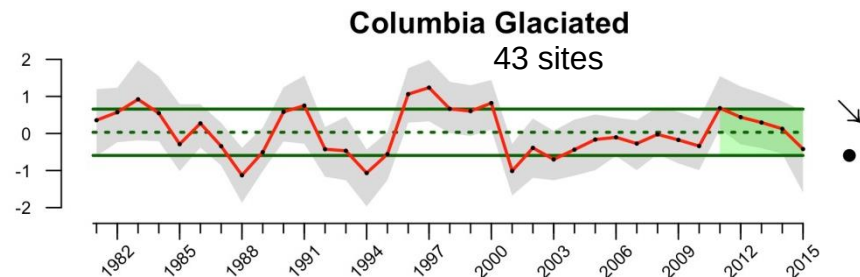
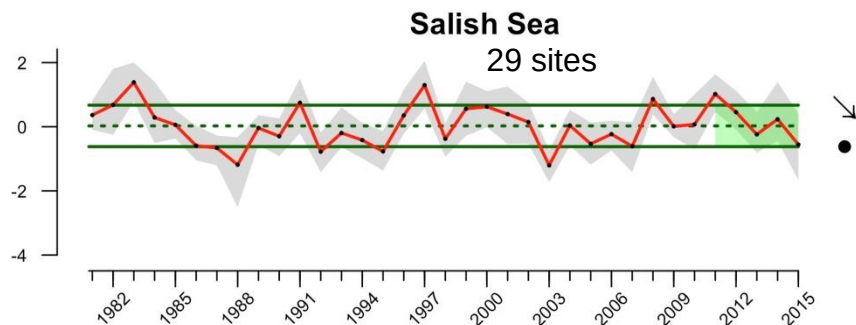
7-day min flow anomaly, 213 sites



1-day max anomaly trends vary across ecoregions



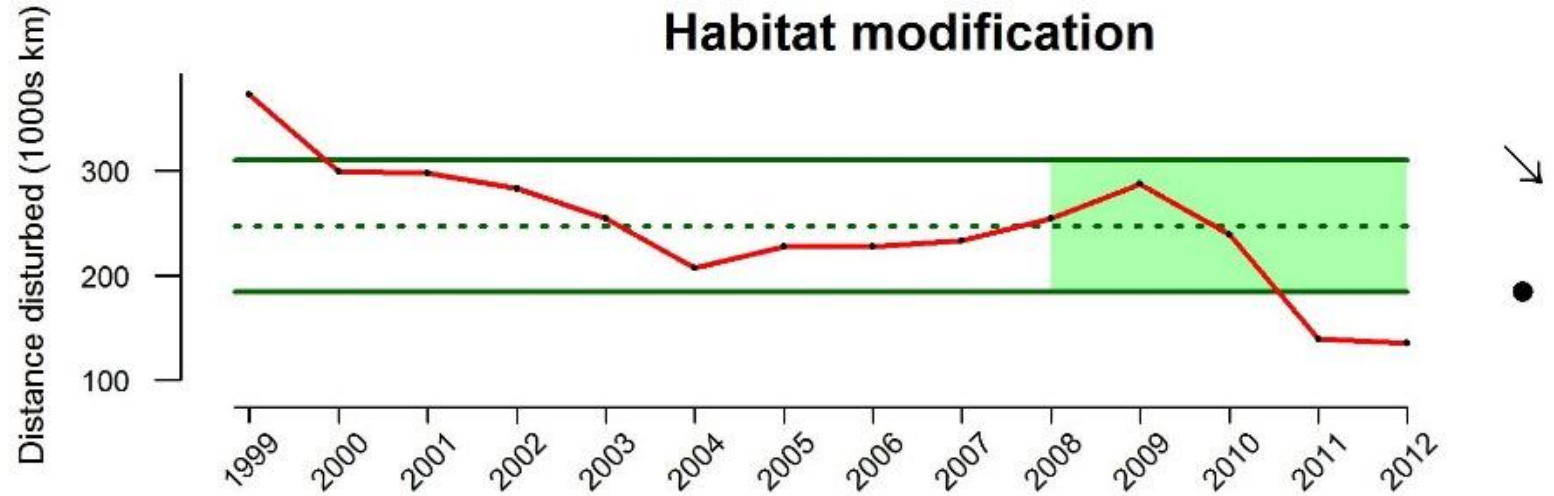
Negative 7-day min anomaly trends across most ecoregions



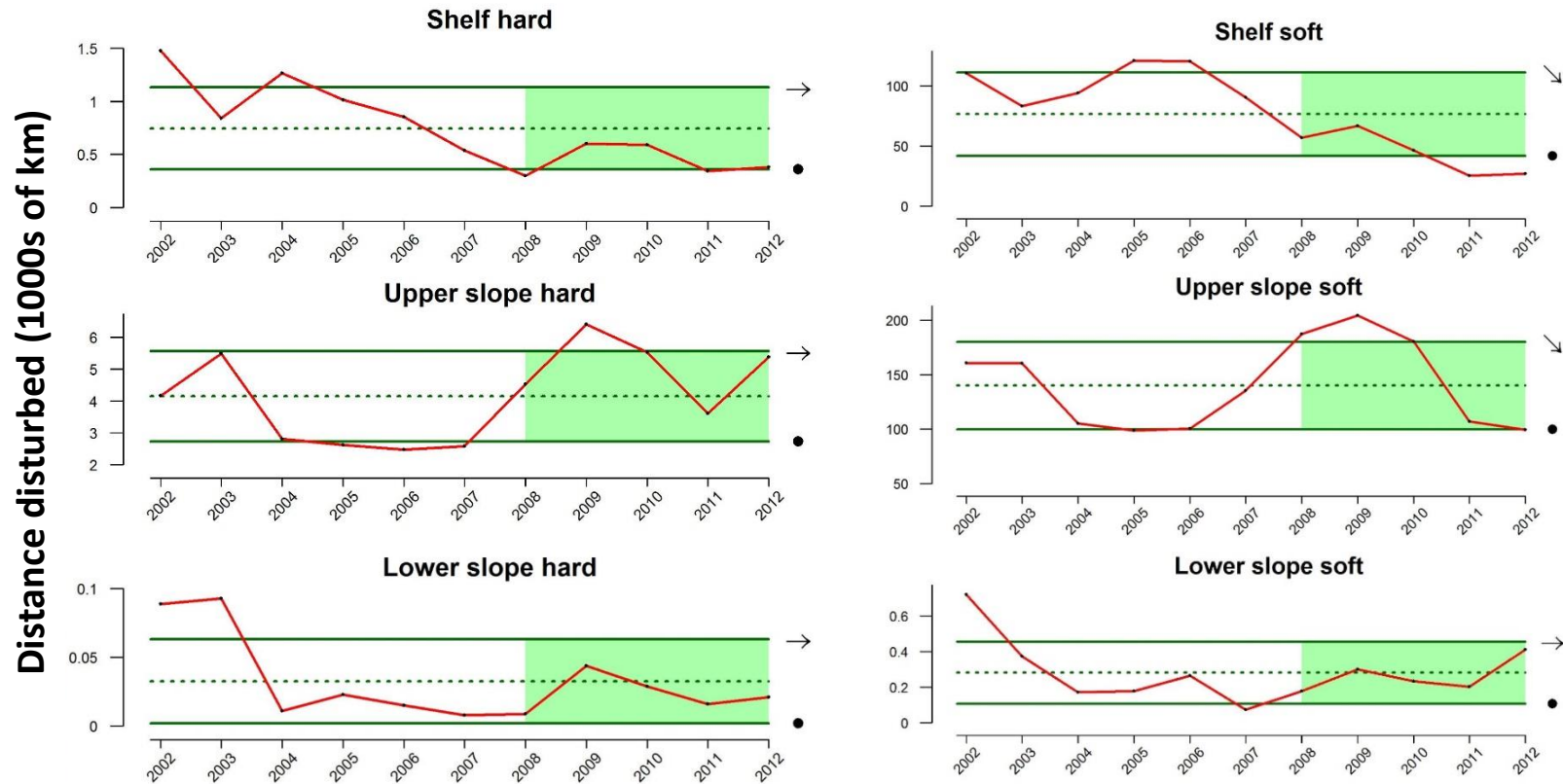
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Disturbance from fishing gear indicator

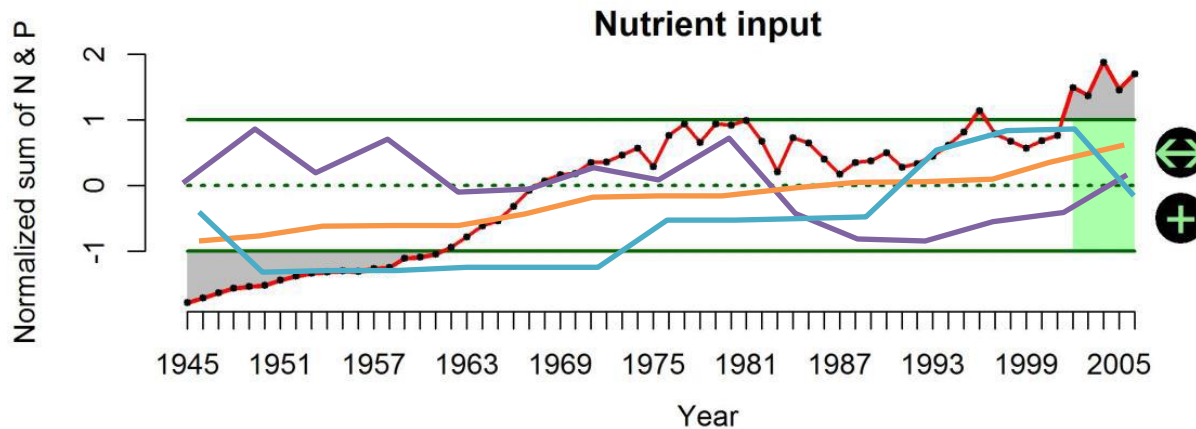


Disturbance from fishing gear



Next steps

- Additional climate sensitive habitat indicators
 - Dissolved oxygen across the water column
 - Mapping coastal systems sensitive to sea level rise
- Put human activities in spatial context



- Time series and maps for SAV



Questions?

What habitat indicators are most important to the Council?

What spatial scales are most relevant to the Council?

How should habitat indicators be vetted (SSC, HC, EWG input?)?

How specific should habitat indicators be to fished stocks?

How important are management-based indicators (e.g., number of EFH habitat consultations)?