Human activity indicators – management levers that translate between ecological and human dimension components

Terrestrial

Marine

Construction

Coastal

Food

Energy

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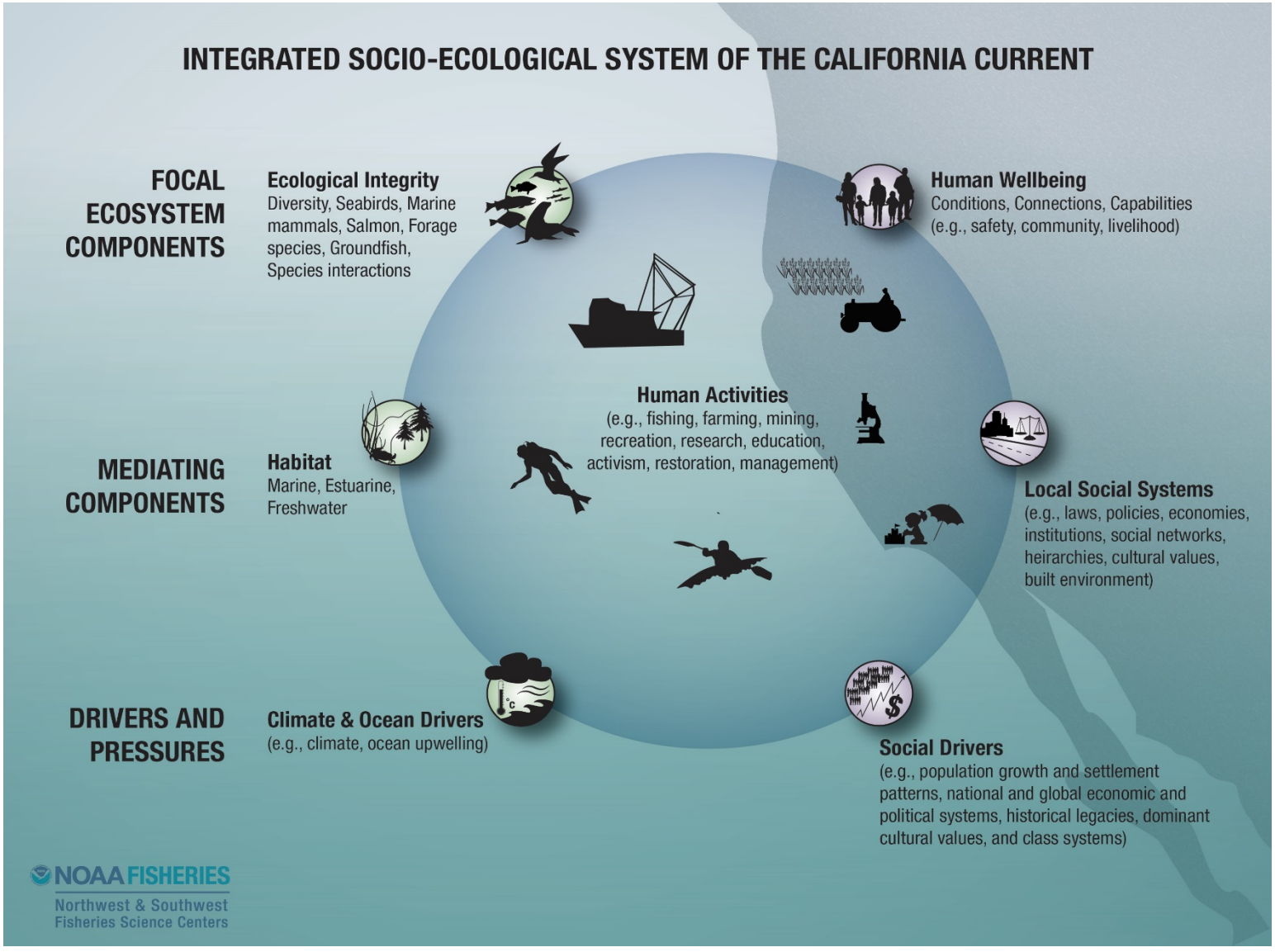
NOAA's Northwest Fisheries Science Center, Seattle, WA USA

Conceptual model of the California Current Integrated Ecosystem Assessment (IEA)



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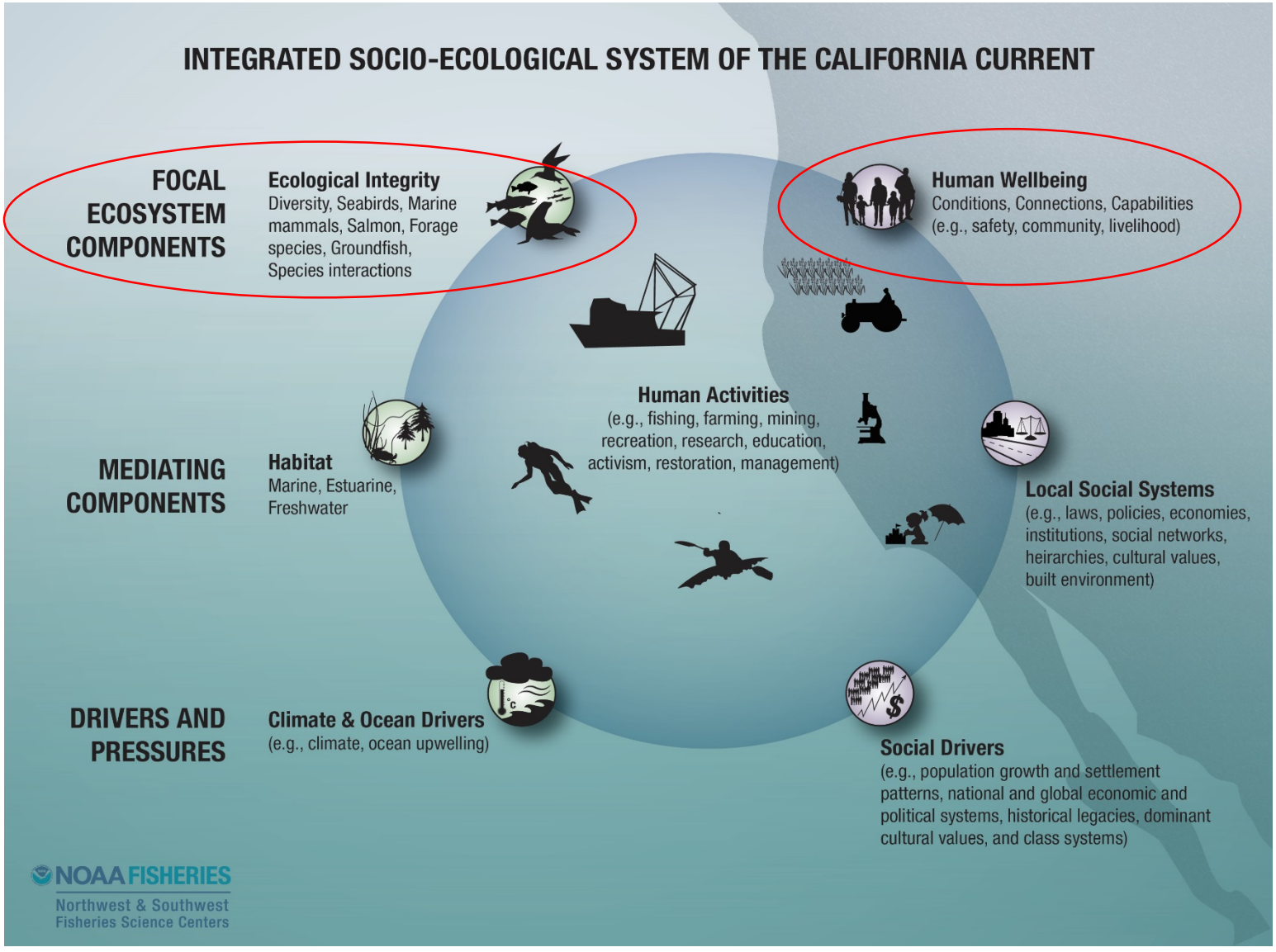

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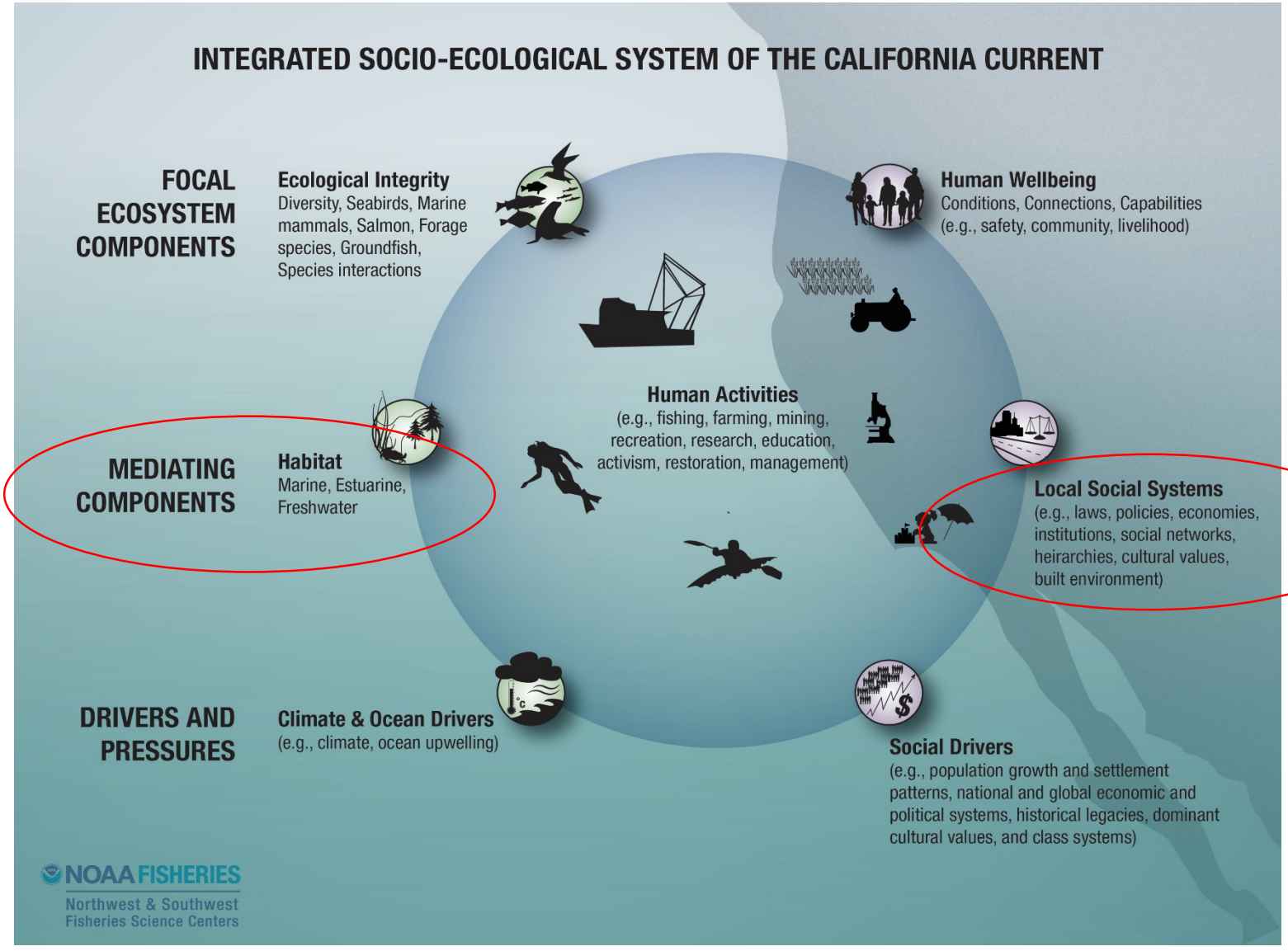

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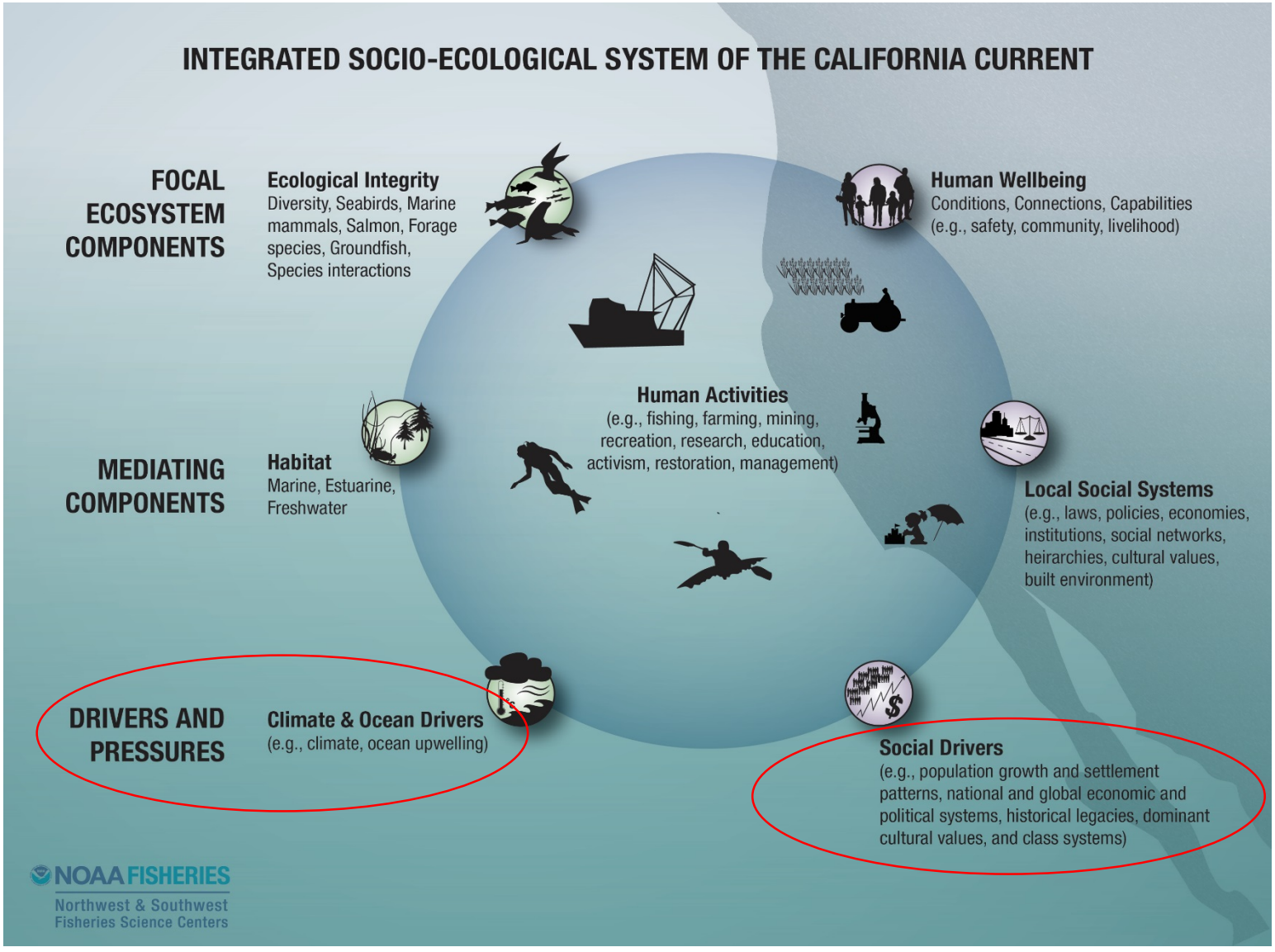

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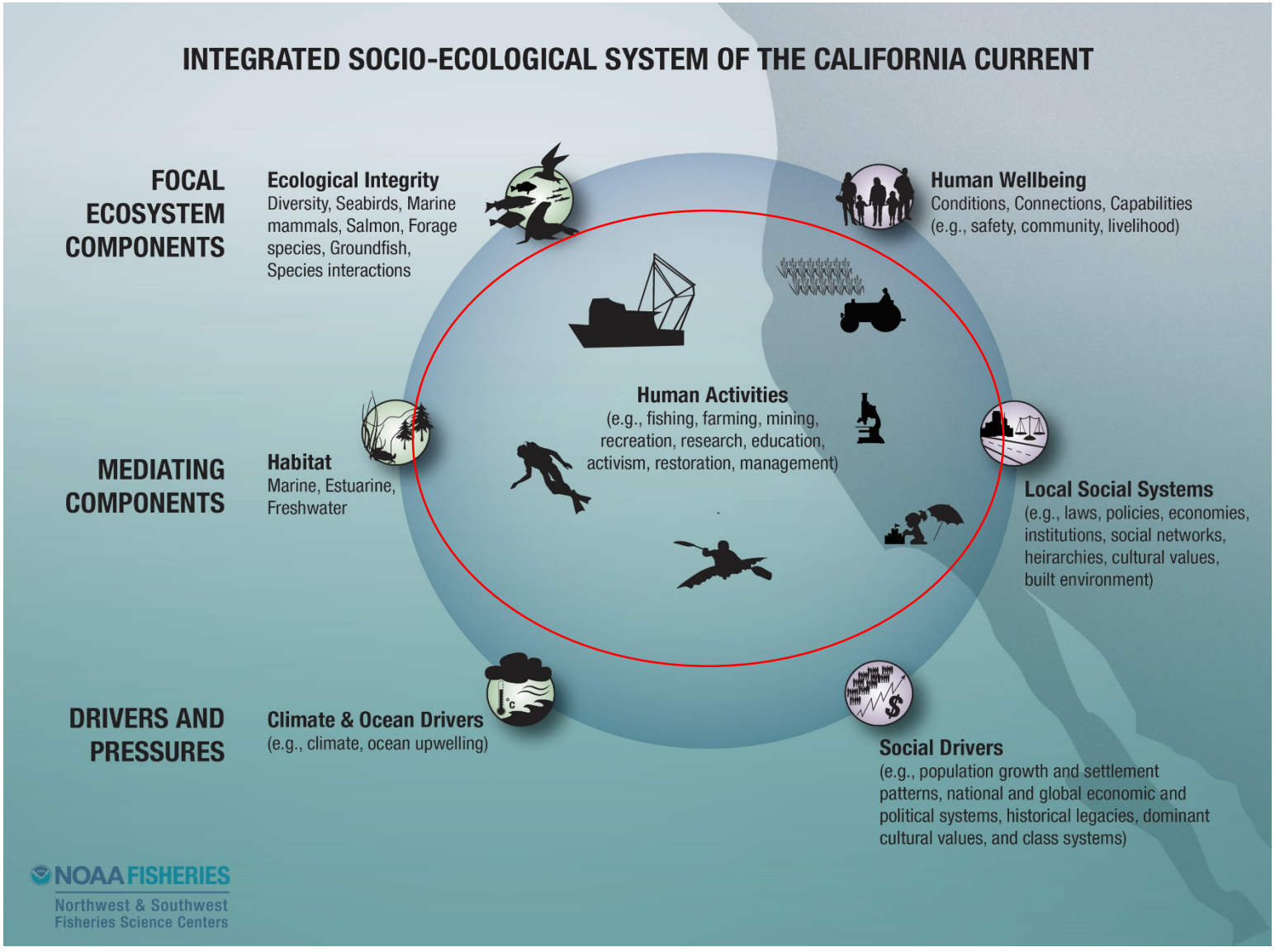

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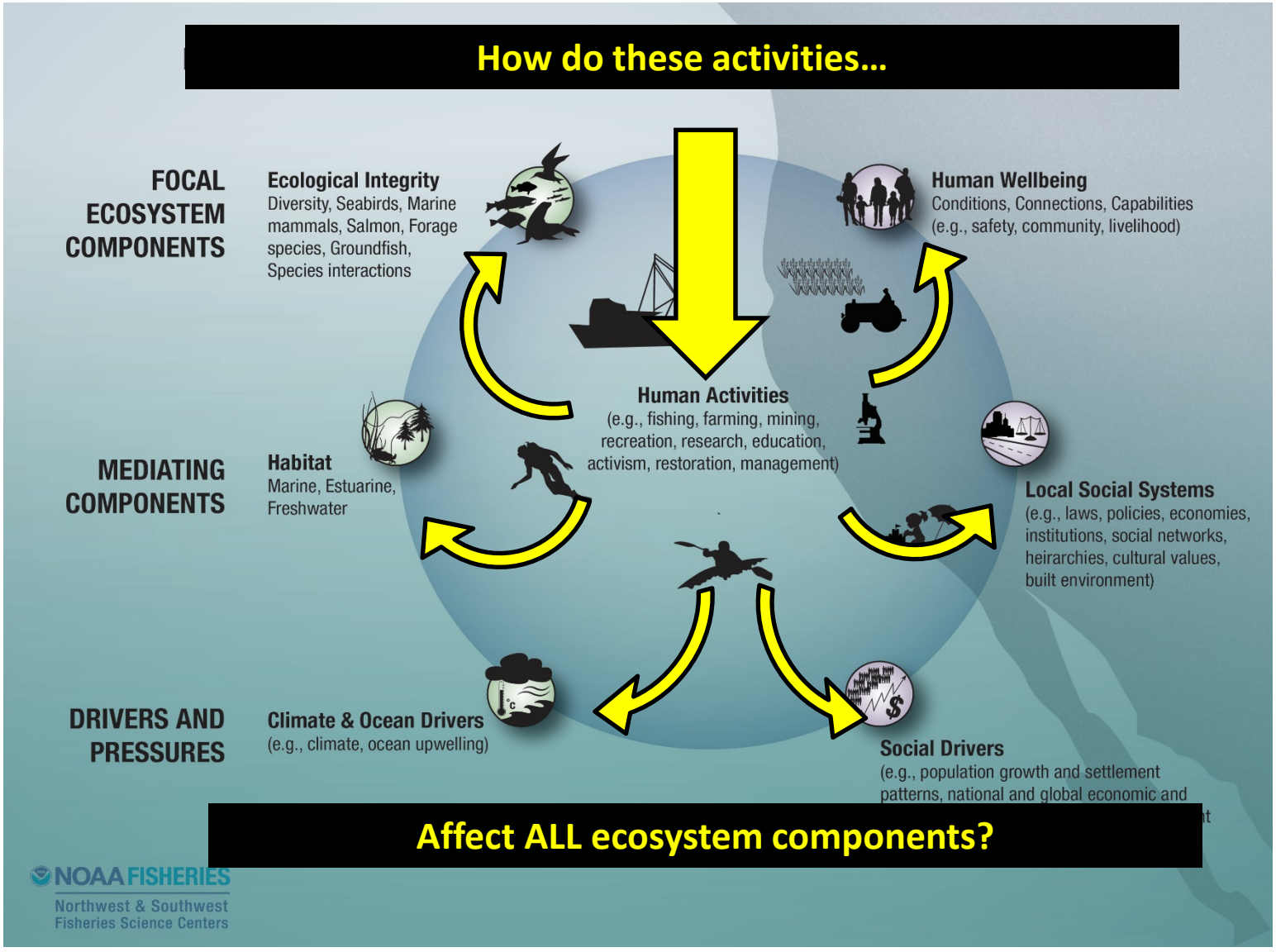
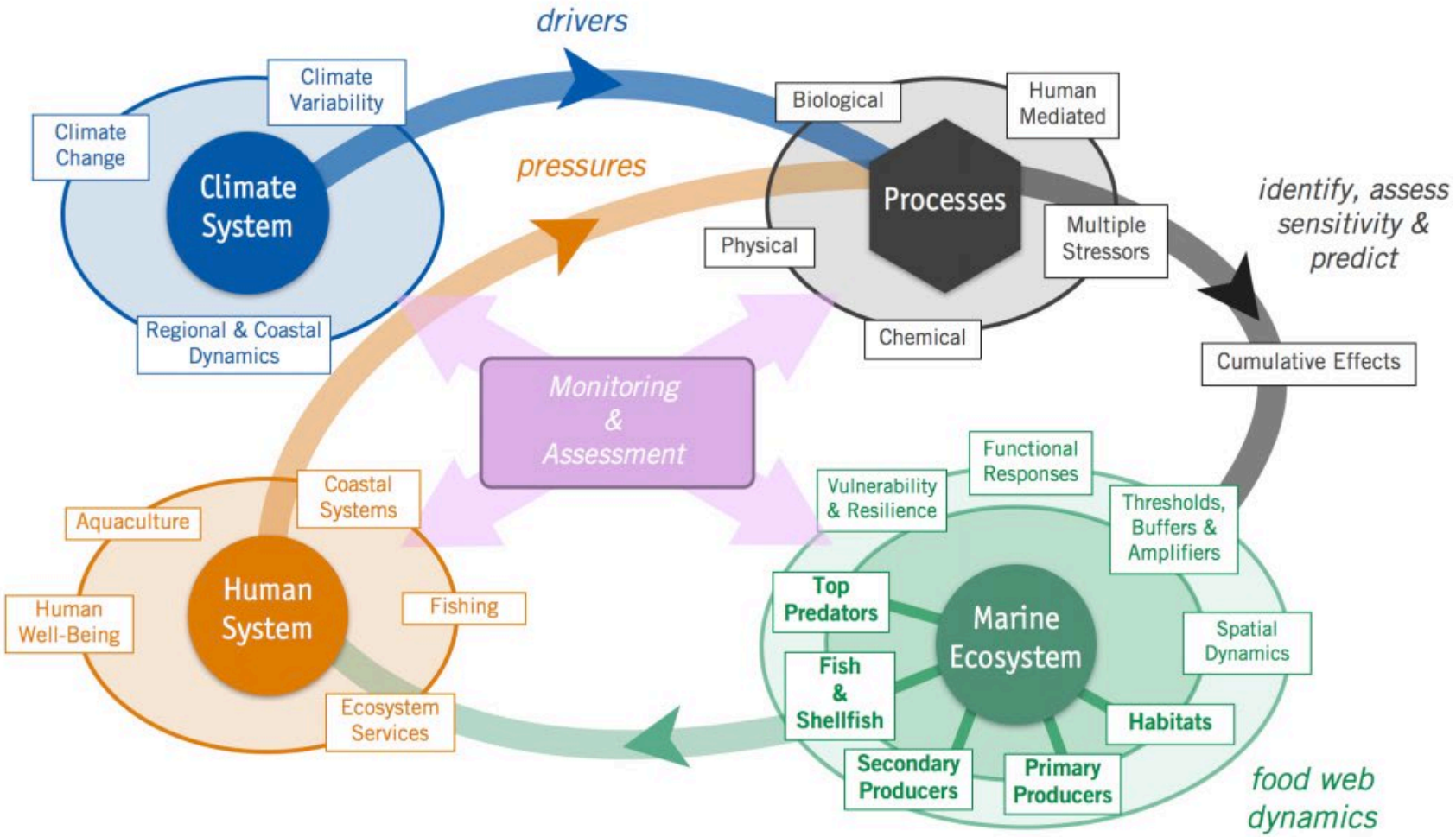


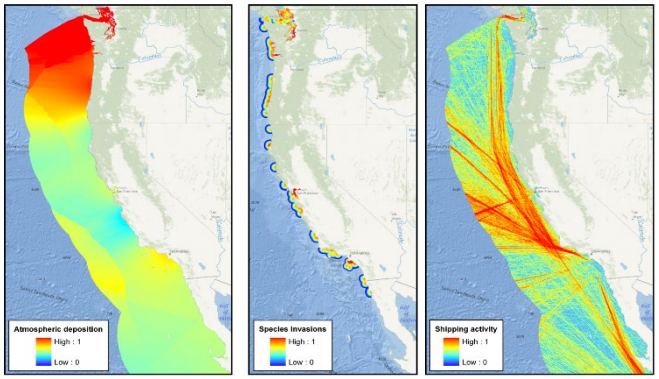
PICES FUTURE Social Ecological Model



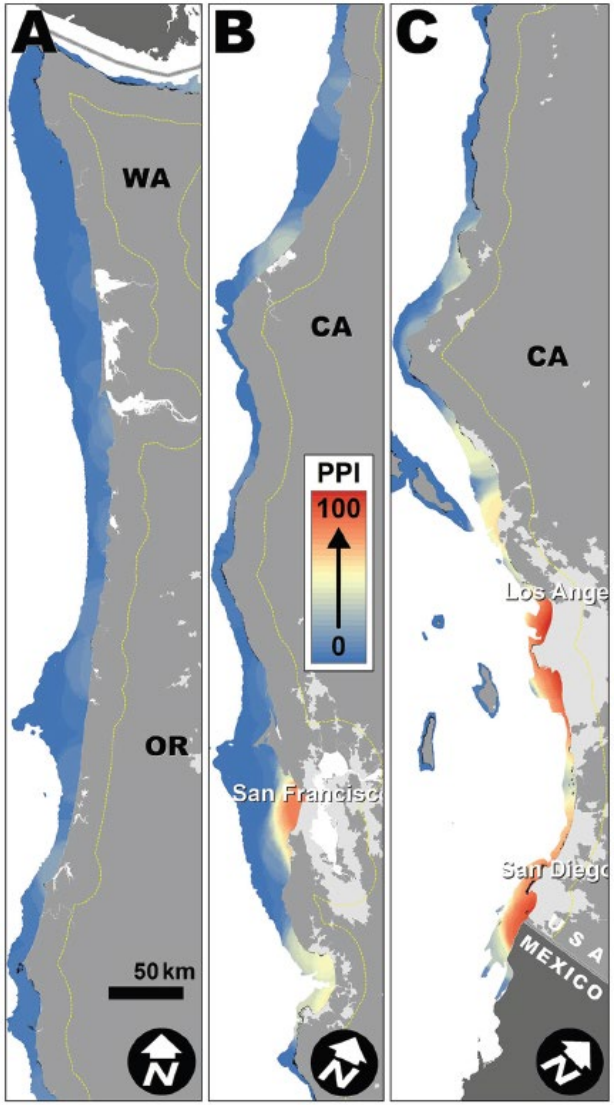
Bograd et al. 2019

Human activities in the California Current

- Ocean-based
  - Commercial shipping activities – marine debris, dredging, ship strikes
  - Energy development – benthic structures, oil and gas activities
- Seafood demand
  - Fisheries – fisheries removals, habitat modification
  - Aquaculture – finfish and shellfish, invasive species
- Land-based
  - Industrial – Organic, Atmospheric & Light pollution, Coastal engineering
  - Agricultural – Nutrient input, Inorganic pollution
  - Energy development – sediment & freshwater input, power plants
  - Recreational use – trampling

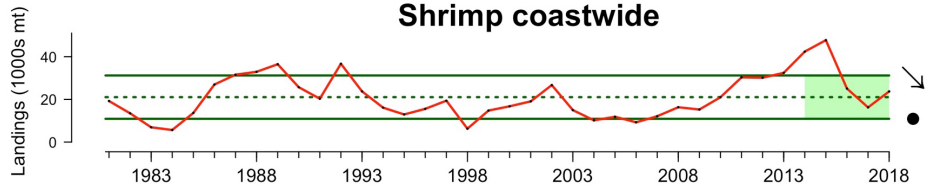


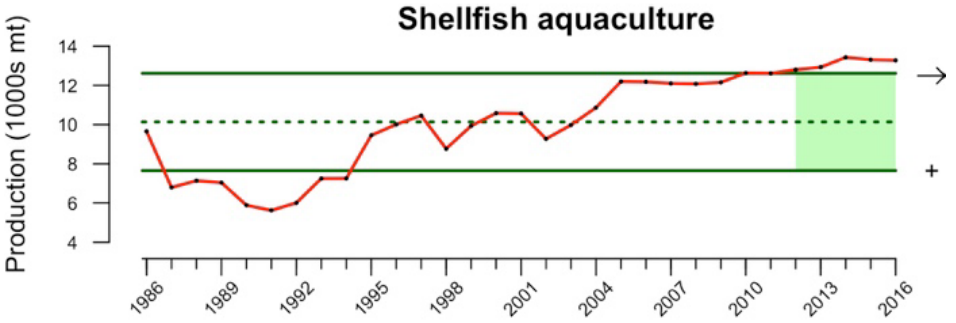
Halpern et al. 2009

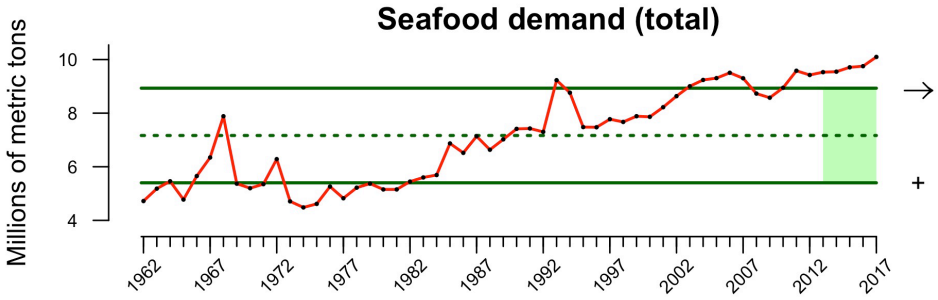


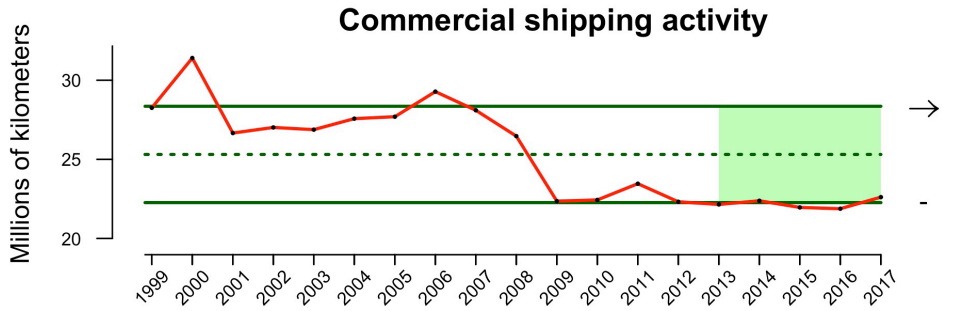
Population proximity index: Feist & Levin 2016

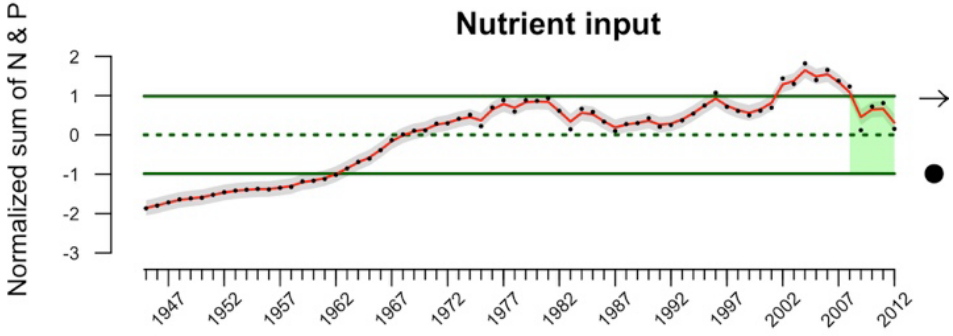
Status and trends of human activities

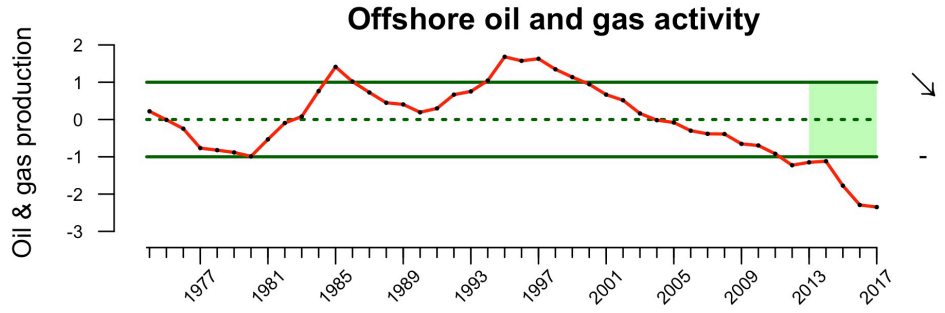






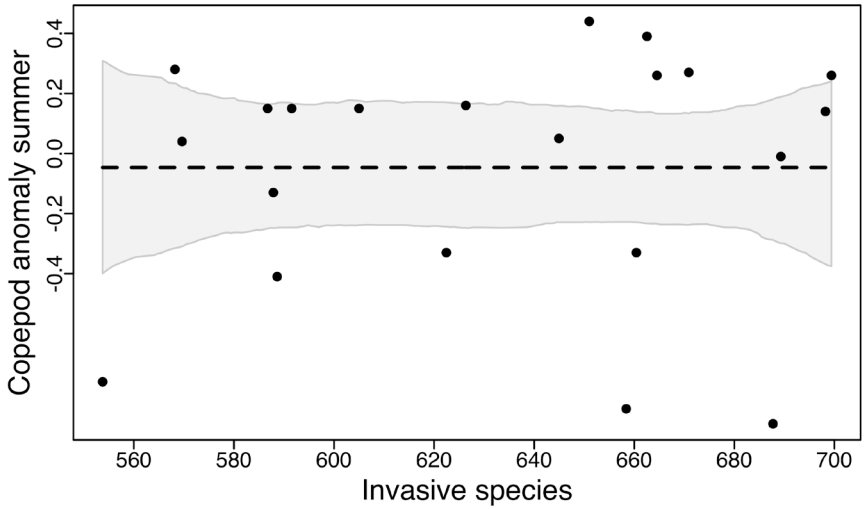


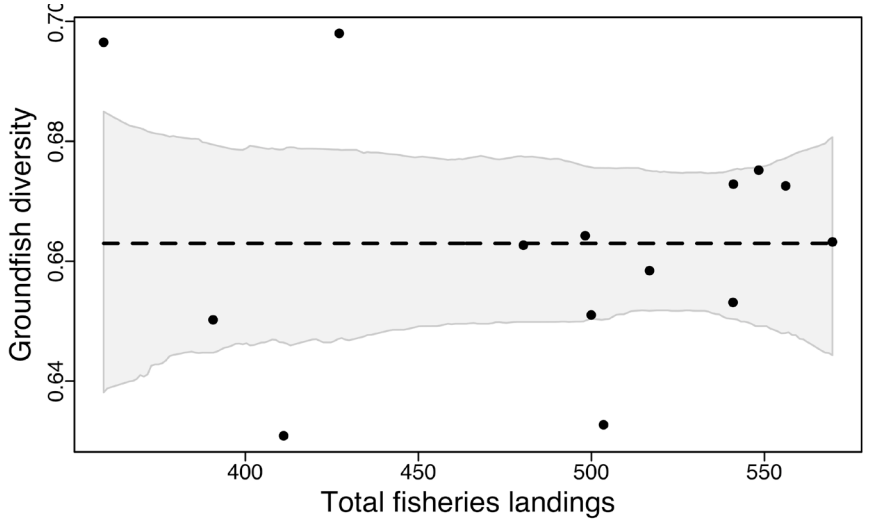


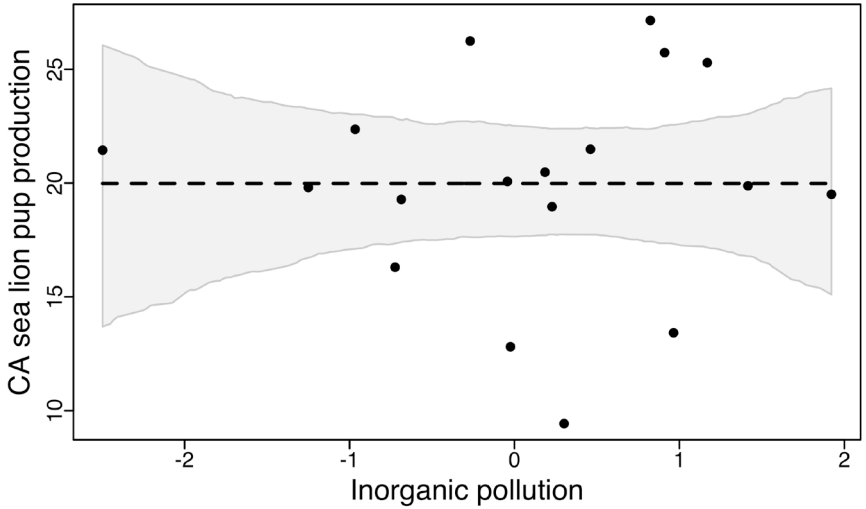


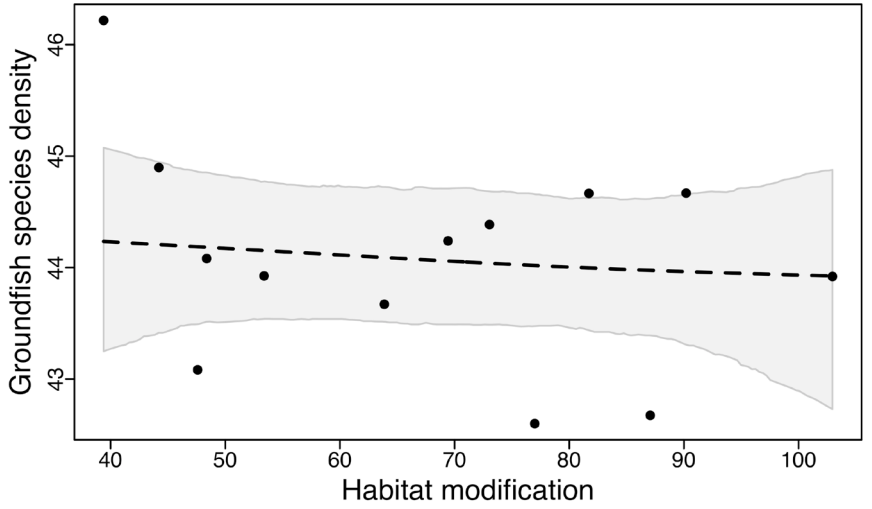
Harvey et al. 2019. State of the California Current Ecosystem.

No relationships or thresholds between human activities and ecosystem indicators







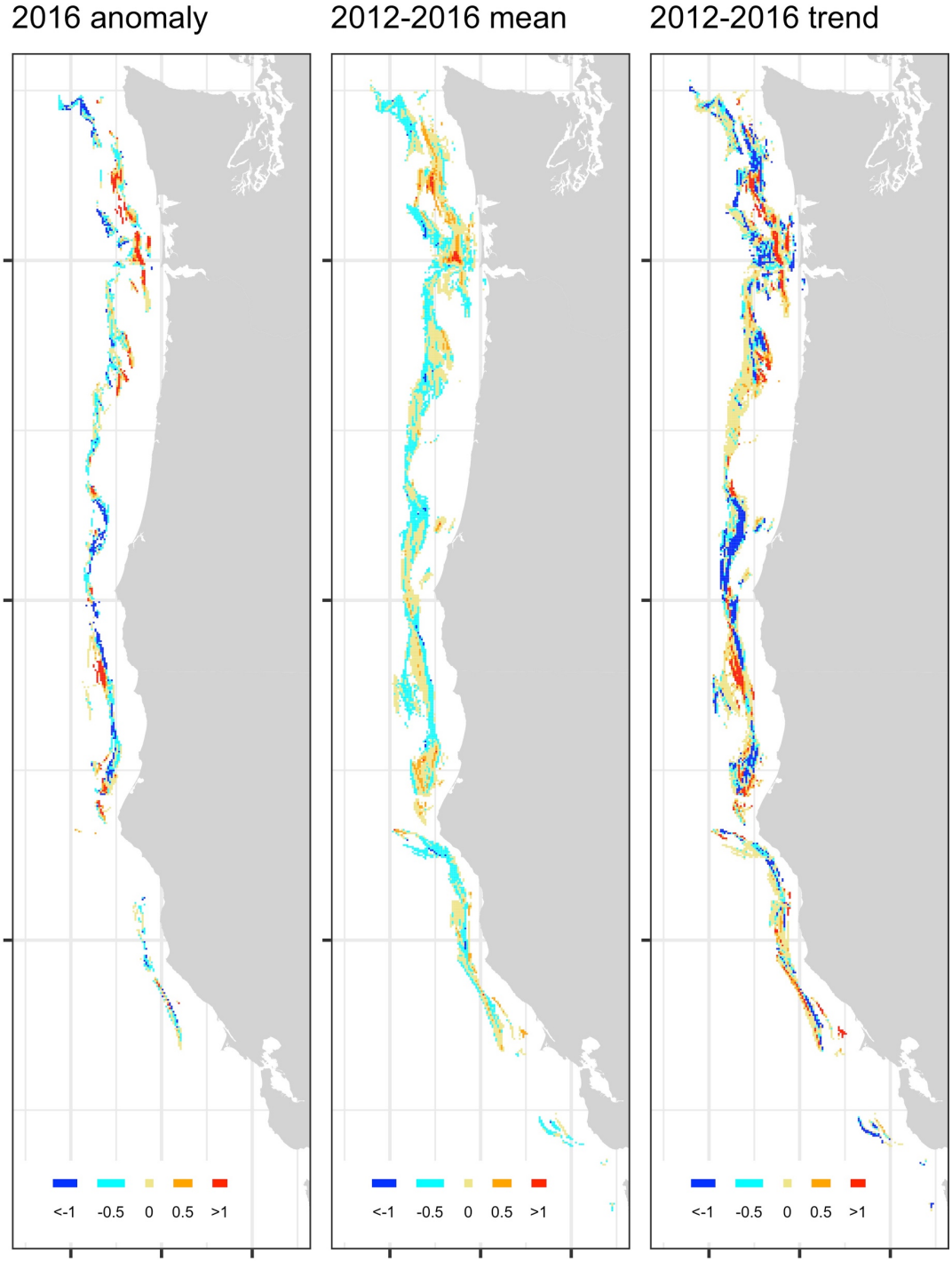


Samhouri et al. 2018

Spatial indicators

Habitat modification

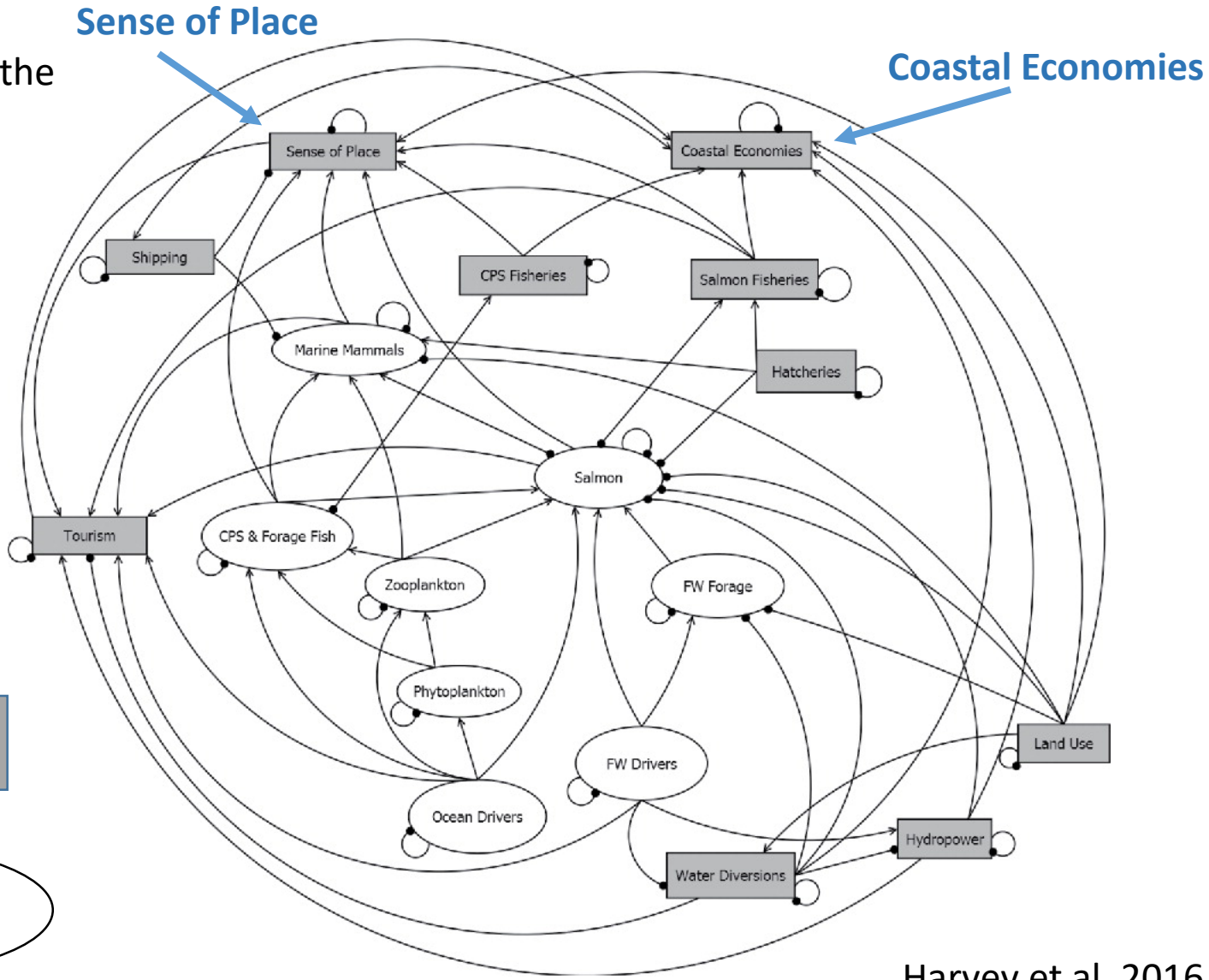
- Red = greater than 1 SD above average conditions
- Blue = greater than 1 SD below average conditions



Harvey et al. 2019. State of the California Current Ecosystem.

Connecting all sides of the conceptual model

Pelagic ecosystem in the California Current

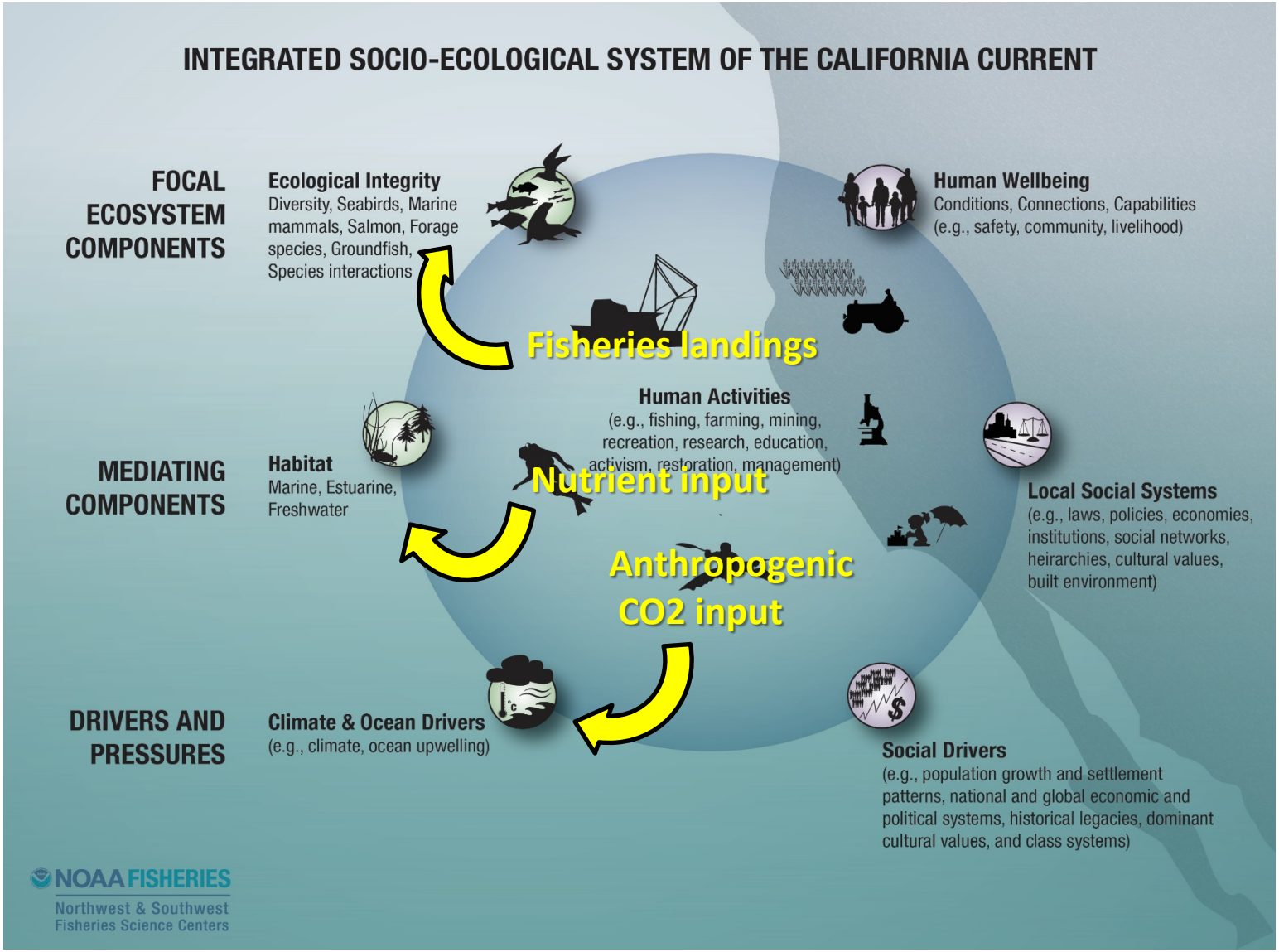


Human Activities

Ecological components

Harvey et al. 2016

How do human activity indicators affect Human Dimensions?



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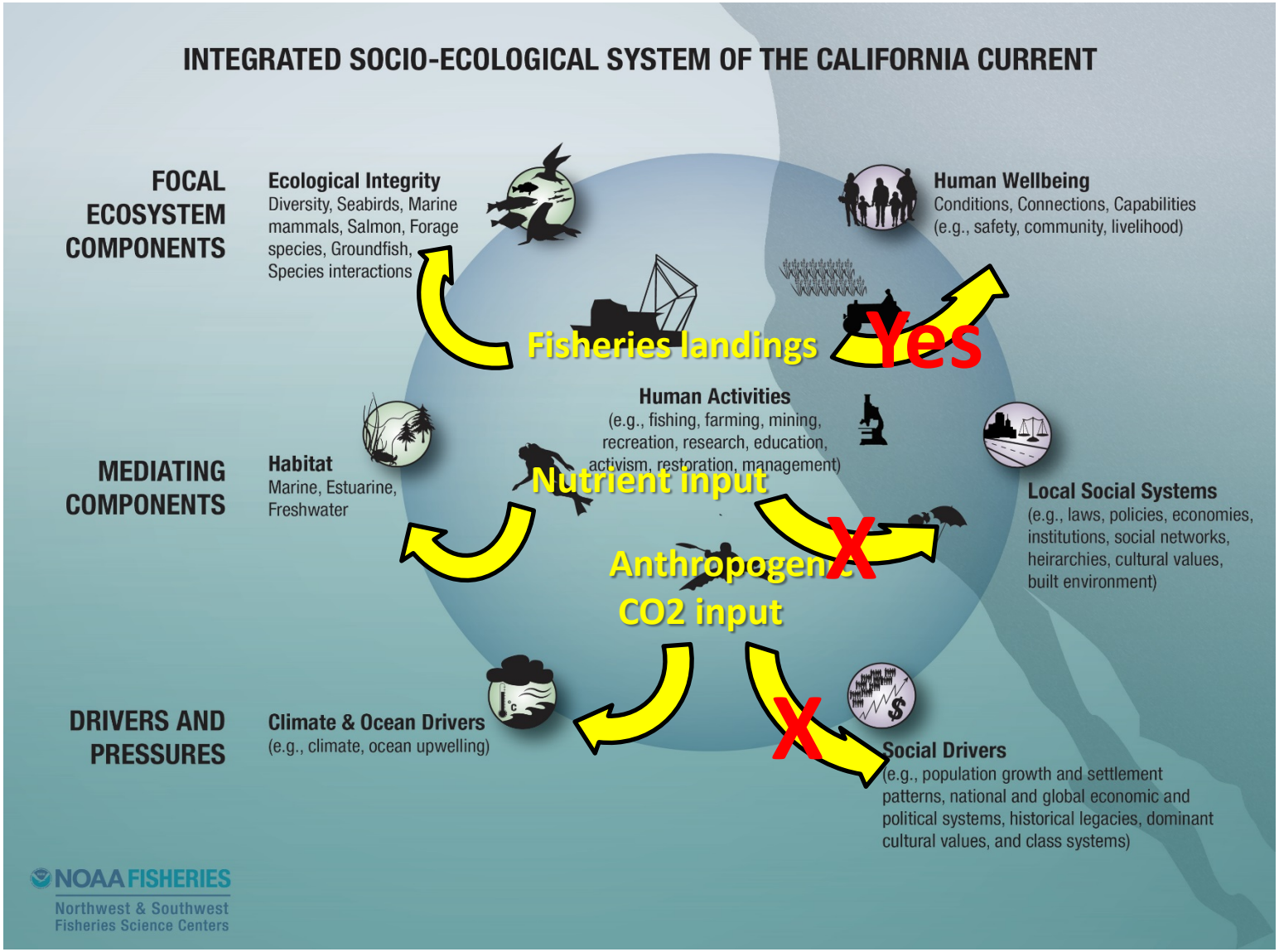
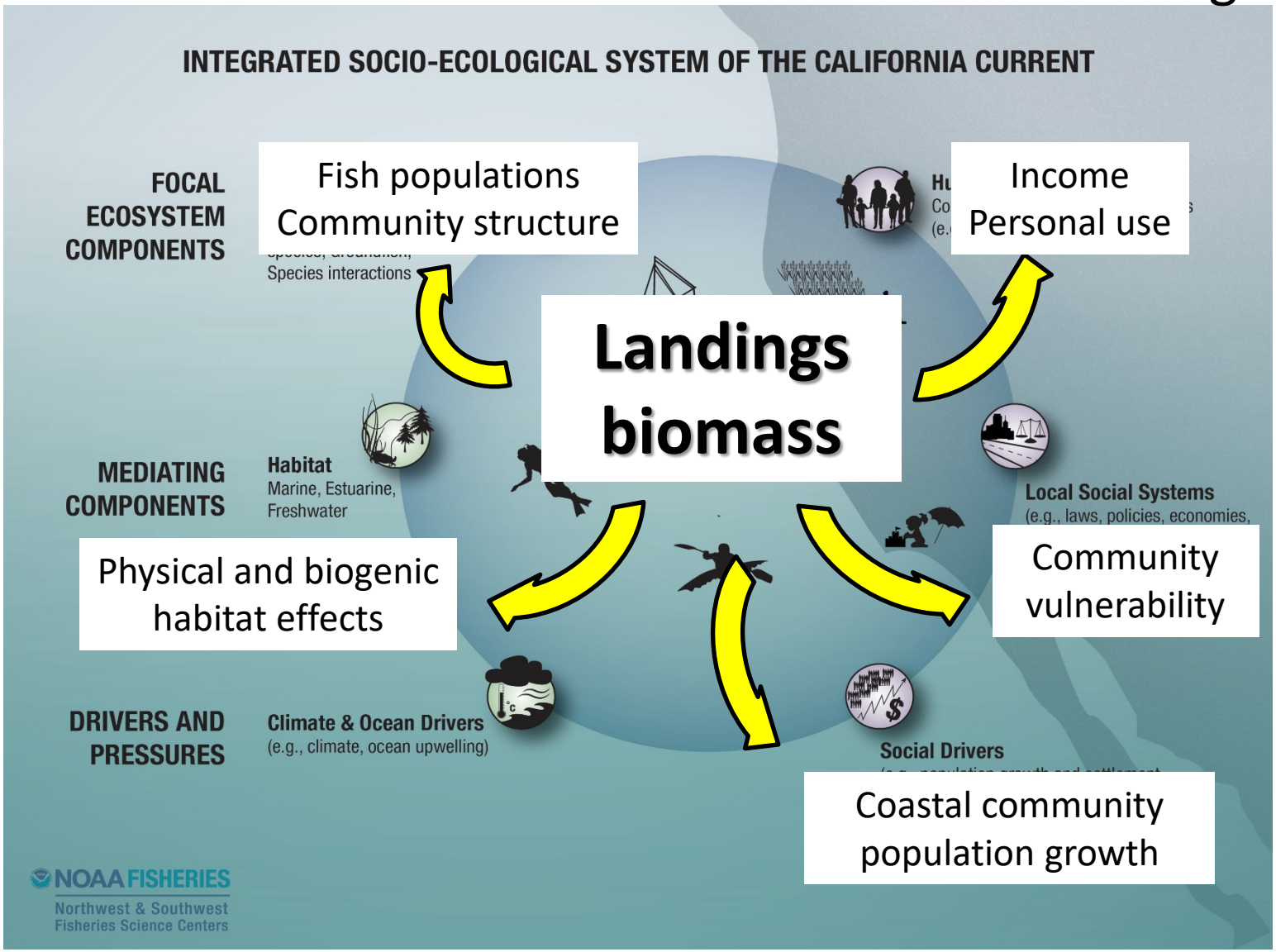


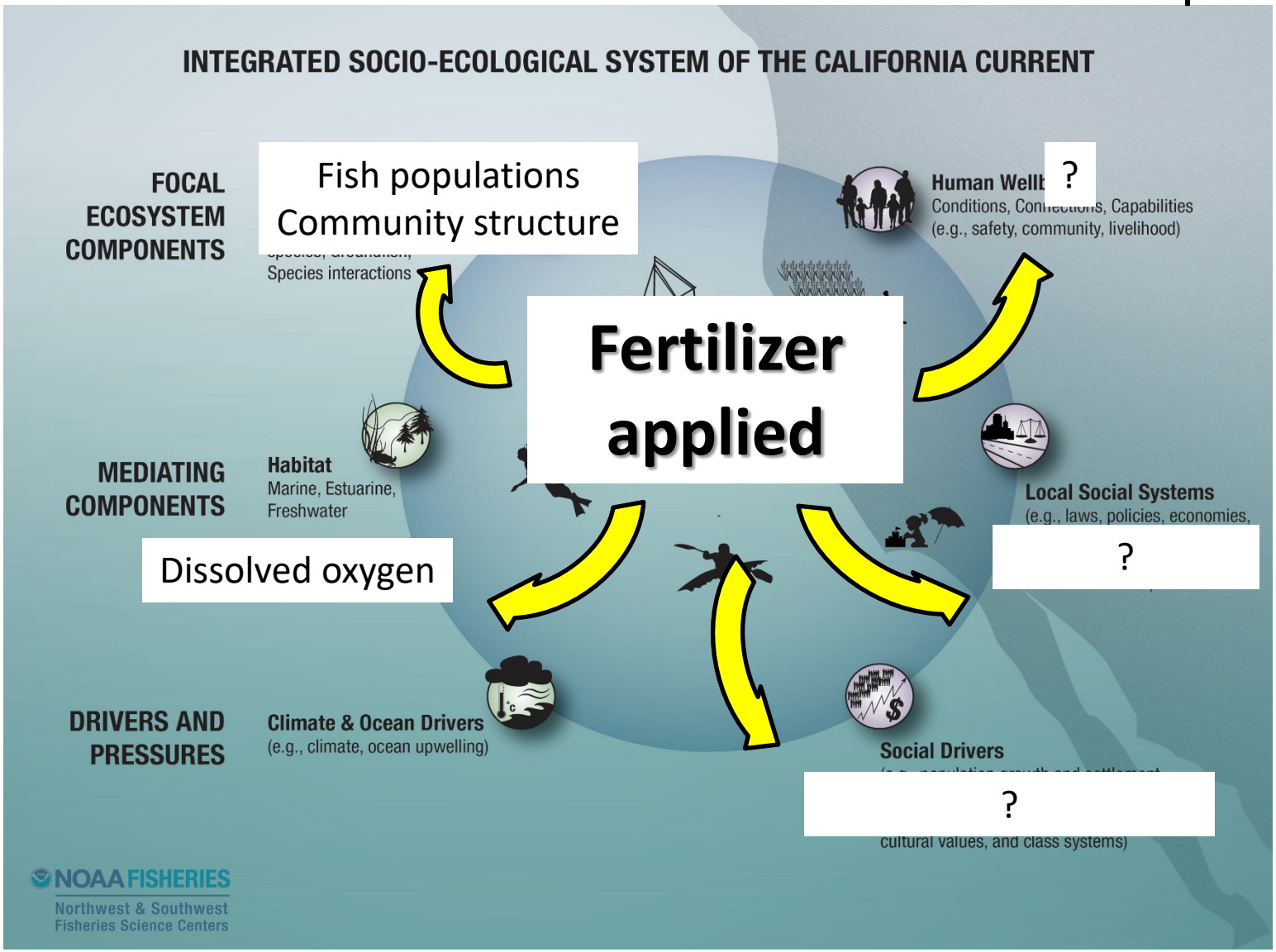
How do human activity indicators affect Human Dimensions?

Fisheries landings

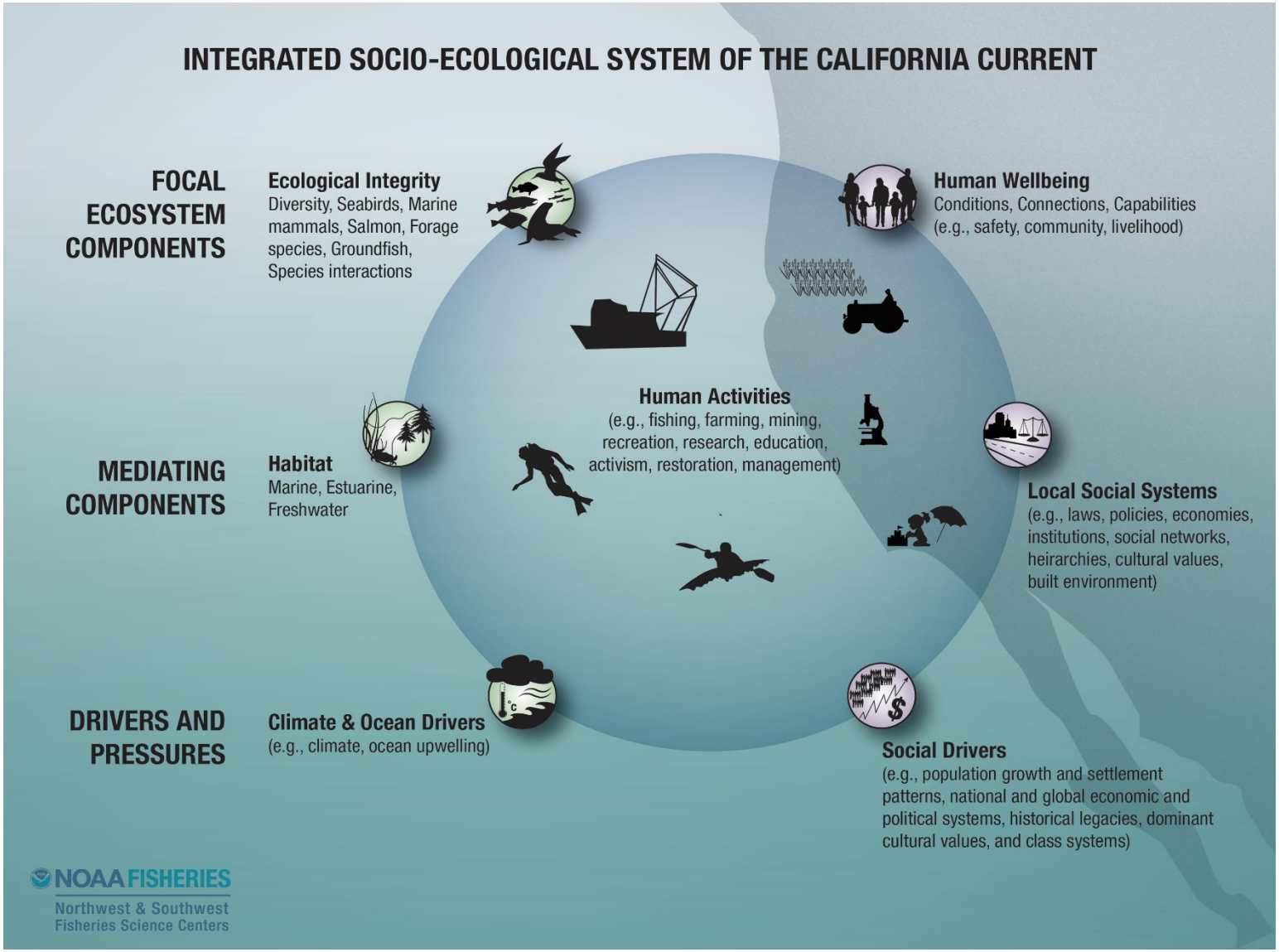


How do human activity indicators affect Human Dimensions?

Nutrient input



Positive impacts and ecosystem engagement indicators



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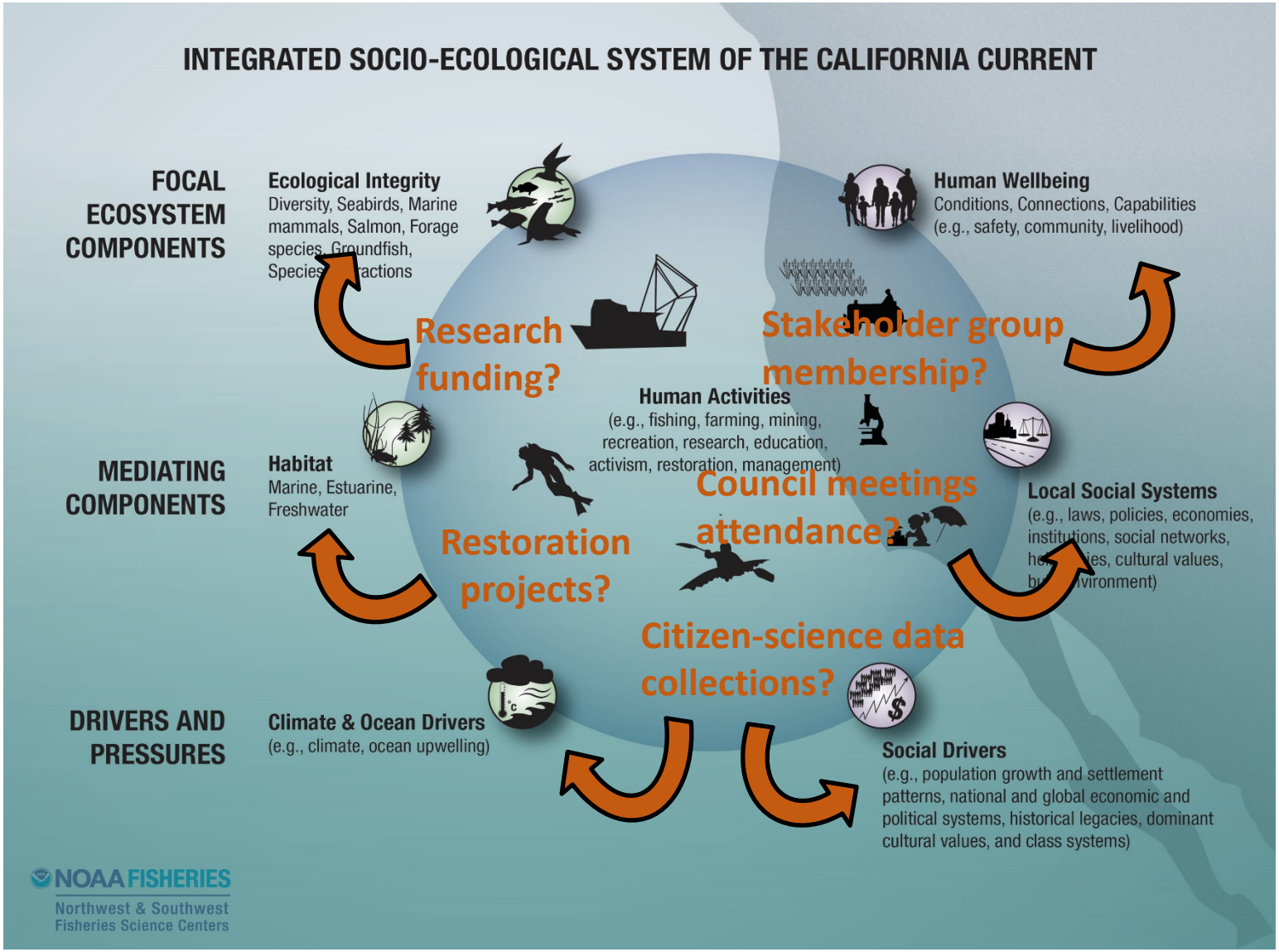

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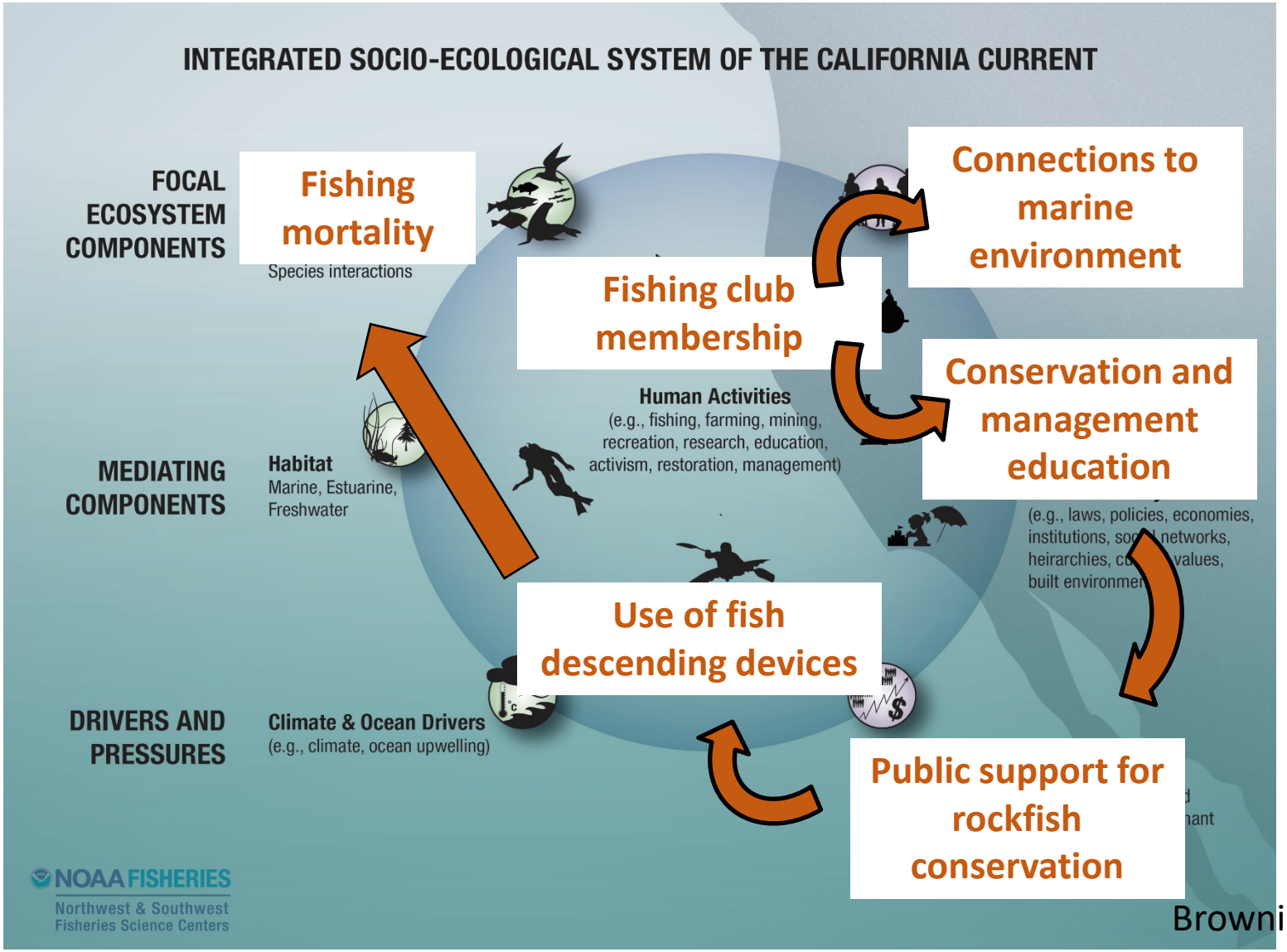
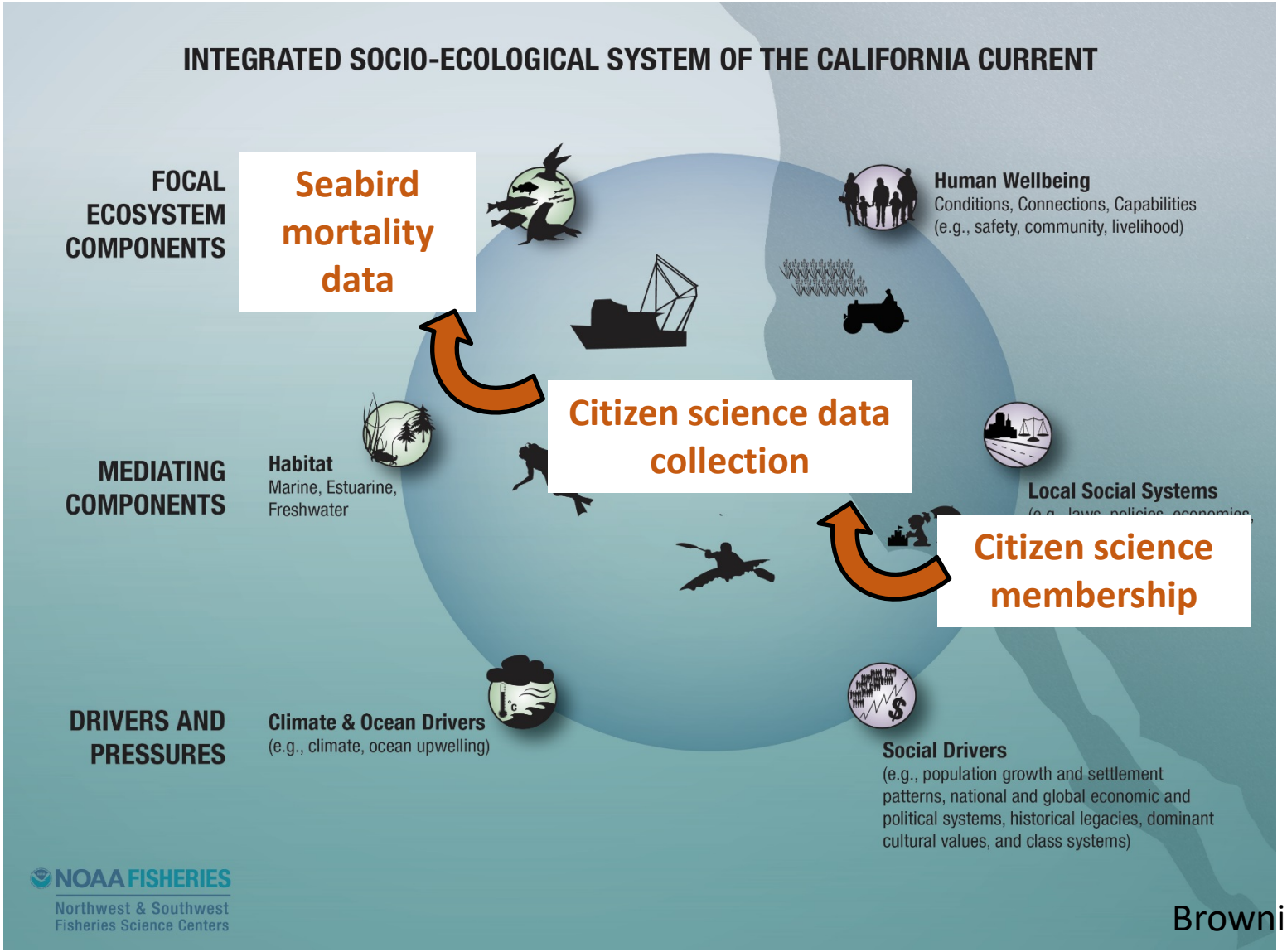


Browning 2013

Positive impacts and ecosystem engagement indicators



Browning 2013

Take home points…

- Indicators of human activities could provide “early warnings” of activities to monitor
- Most useful if human activity data is at comparable spatial and temporal scales to ecological and human dimension data
- Human activity and human dimension indicators should continue to be developed for missing links among nodes of the conceptual model
- ”Positive” indicators of human activities may provide information on the importance of these activities to conservation and management

Questions?

Questions for further discussion

1. Do Human Activity indicators deserve the central role in our conceptual model…or are they just a subset of Human Dimension indicators?

2. What examples do you have of full-circle translations between ecological and human dimension indicators?

3. Do rare events (e.g., river is on fire, 100-year flood) dictate thresholds in human dimension responses such that changes are difficult to predict?