

**NOAA**  
**FISHERIES**

# Fishing Community Reliance and Vulnerability

Economics and Human Dimensions Program Review

Human Dimensions Social Science

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Conservation Biology Division / Ecosystem Science Program

Human Dimensions Team

August 8, 2017

# Personnel, collaborators, funding

*Staff involved in presented research:*

- 4 FTEs
- 2 Contractors

- 2 FTEs at Northwest Fisheries Science Center:
  - Conservation Biology Division (Human Dimensions team)
  - Fishery Resource Analysis and Monitoring Division (Rotational Assignment)
- 2 FTEs at Northeast Fisheries Science Center (NEFSC) / Southeast Regional Office (SERO):
  - NEFSC (Social Sciences Branch)
  - SERO (Economics Branch)
- 2 contractors from Pacific States Marine Fisheries Commission
- *Funding sources and partners: NOAA S & T, IEA Program with some "in kind" research support from Washington Sea Grant*



# Importance of communities research to NOAA's mission

## Big Picture Management:

"To understand and predict changes in... coasts, to share that knowledge and information with others, and to conserve and manage coastal and marine ecosystems and resources."

## Fisheries Management:

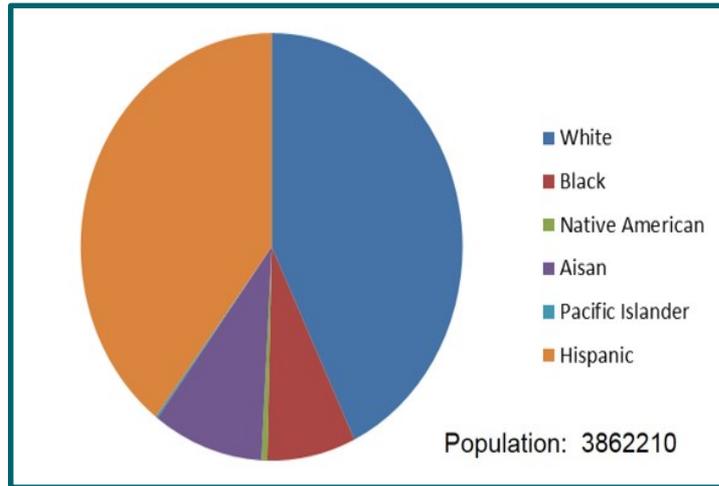
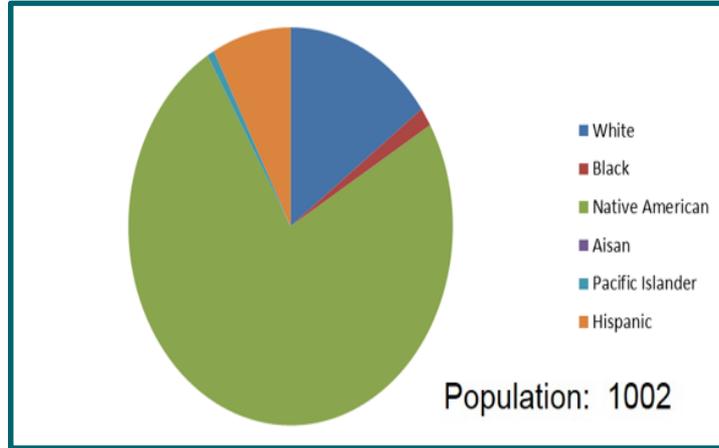
Magnuson-Stevens Fishery Conservation  
and Management Act's  
*National Standard 8*



Neah Bay, WA



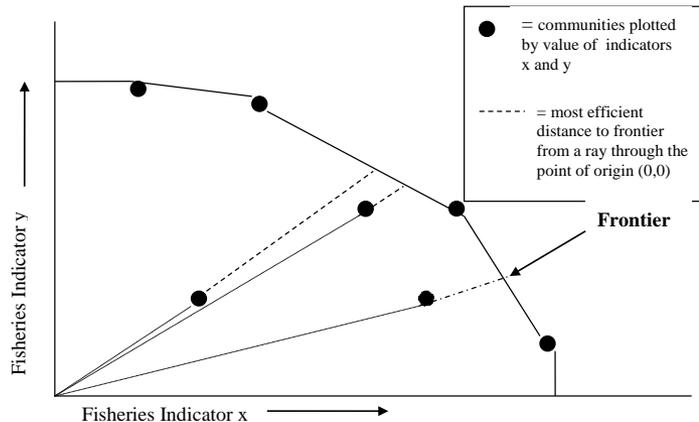
Oregon



Los Angeles, CA

# History: NWFSC Communities Research

- 2004-2007: Data Envelopment Analysis (DEA) methodology used to identify and profile West Coast fishing communities



# History: NWFSC Communities Research

- 2007-2011: In-depth fishing community profiles

NOAA Technical Memorandum NMFS-NWFSC-85



## Community Profiles for West Coast and North Pacific Fisheries

Washington, Oregon, California, and other U.S. States



November 2007

U.S. DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
National Marine Fisheries Service

## Bellingham

### People and Place

#### Location

Bellingham is on Bellingham Bay in north Puget Sound, protected by Lummi Island, Portage Island, and the Lummi Peninsula. Situated in Whatcom County, the city encompasses 25.6 square miles of land and 6.1 square miles of surface water. The nearest major U.S. city is Seattle, a 90-mile drive south, while Vancouver, British Columbia, is a 54-mile drive north. Bellingham's geographic coordinates are lat 48°45'01"N, long 122°28'30"W.

#### Demographic Profile

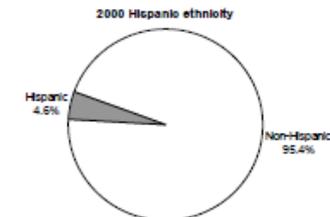
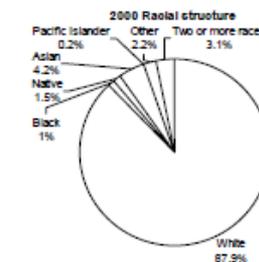
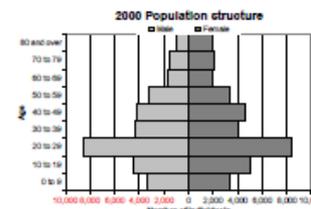
According to the 2000 U.S. Census, Bellingham's population was 67,171, an increase of 28.7% from 1990. The gender composition was 51.4% female and 48.6% male. The median age of 30.4 was lower than the national median of 35.3. Approximately 67.1% were between the ages of 18 and 60. Of the population 18 years of age and older, 90.0% had a high school education (including equivalency) or higher, 25.1% had earned a bachelor's degree or higher, and 8% had obtained a graduate or professional degree; the national averages were 79.7%, 22.3%, and 7.8% respectively.

The vast majority of Bellingham's racial structure recorded by the 2000 U.S. Census was white (87.9%), followed by Asian (4.2%), people who identified with two or more races (3.1%), people who identified with another race (2.2%), American Indian and Alaska Native (1.5%), black (1.0%), and Pacific Islander (0.2%). Ethnicity data indicate that 4.6% identified as Hispanic. In 2000 9.1% were foreign-born, with 38.1% from the Americas outside of the United States, 34.6% from Asian countries, and 25.7% from Europe.

In 2000 61.1% of Bellingham's population lived in family households.

#### History

At the time of the first European settlement, thousands of native people lived in Whatcom County, utilizing forest and marine resources to make their living. Whatcom (meaning "noisy waters") County, derived its name from the sound of a waterfall at the mouth of Nooksack Creek. The tribal population around Bellingham was quite diverse when Europeans first arrived. In 1857 Edmund Fitzhugh, the first Indian agent of Washington Territory, reported a population of 510 Lummi, 450 Neuk-sacks, 150 Samish, and about 200 Sticks or Neukwers and Sia-man-nas.<sup>1</sup>



# Community Social Vulnerability and Fishing Indices: Objectives

- Construct indices – through secondary data – as measures of coastal community vulnerability
- Use indices to track community and ecosystem changes over time
- Test an established methodology in a new socio-ecological context



**To cite this article:** Lisa L. Colburn & Michael Jepson (2012): Social Indicators of Gentrification Pressure in Fishing Communities: A Context for Social Impact Assessment, *Coastal Management*, 40:3, 289-300

**To link to this article:** <http://dx.doi.org/10.1080/08920753.2012.677635>



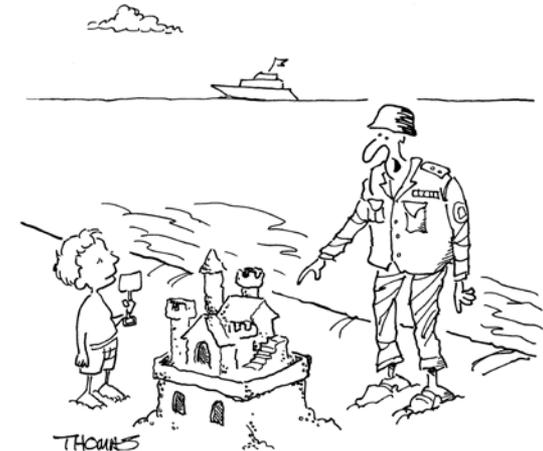
## How to Cite

Jepson, M. (2007), Social Indicators and Measurements of Vulnerability for Gulf Coast Fishing Communities. *NAPA Bulletin*, 28: 57–68. doi: 10.1525/napa.2007.28.1.57

# Community Social Vulnerability and Fishing Indices: “Vulnerability”

- Is the *pre-existing condition* that affects a community's (social system's) ability to prepare for and recover from a disruptive event
- Centered in both demographic and socioeconomic *characteristics* of the community that increase or attenuate the impacts of (*hazard*) events (Cutter et al. 2009)

U.S. Department of Commerce  
National Oceanic and Atmospheric Administration  
National Marine Fisheries Service  
NOAA Technical Memorandum NMFS-F/SPO-129  
April 2013



"Not bad kid, but you'd be vulnerable to attacks here and here."

# Data Sources

## Federal agency data

- US Census/American Community Survey (ACS)
- Bureau of Labor Statistics
- County level crime statistics

## State agency data

- Washington Department of Fish and Wildlife
- Oregon Department of Fish and Wildlife
- California Department of Fish and Wildlife

through...

Pacific Fishery Information Network (PacFIN),  
Environmental Systems Research Institute (ESRI)



# Community Social Vulnerability and Fishing Indices: Variables Included

Social Variables	Fishing Variables
Percent unemployed	Commercial fishery landings
Percent with no diploma	Commercial fishery revenue
Percent in poverty	First receivers (buyers)
Percent white alone	Permits
Percent female headed households	Commercial landings per capita
Percent age 0-5	Commercial value per capita
Percent speaks english less than well	First receivers (buyers) per capita
Percent of families below poverty level	Permits per capita
Percent under 18 in poverty	
Percent aged 65 and over in poverty	
Percent household with public assistance	
Percent households w/ social security	
Percent aged 16+ in the civilian labor force	
Percent of females aged 16+ employed	
Median monthly mortgage cost	
Median gross rent	
Median number of rooms	
Percent of housing that are mobile homes	
Percentage employed in farming, fishing, and forestry occupations	
Percentage employed in agriculture, forestry, fishing and hunting, and mining industries	
Percentage of households with income over \$200,000	
Median home value	
Percent with bachelors degree	
Mean retirement income	

# Community Social Vulnerability and Fishing Indices Criteria

-Single factor solution-

Armor's Theta Reliability Coefficient above .500

Kaiser-Meyer-Olkin Measure of Sampling Adequacy above .500

Percent Variance Explained at least 45%

# Factor Analysis Approach and Composite Scores

## Social Vulnerability Indices:

- *Personal disruption +*
- *Population composition +*
- *Poverty +*
- *Labor force structure +*
- *Housing characteristics +*
- *Natural resource +*
- *Wealth and education*  
factor scores

= Social vulnerability indices  
composite score

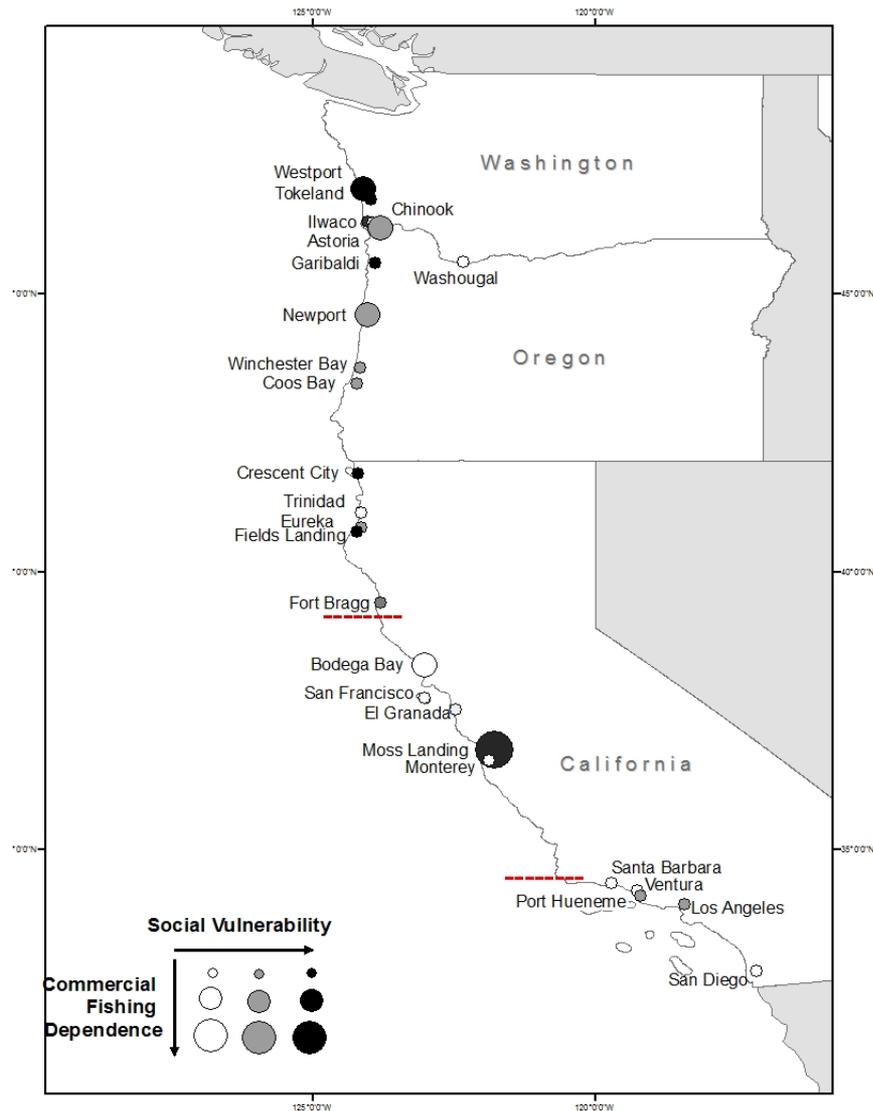
## Fishing Indices:

- *Commercial fishing reliance +*
- *Commercial fishing engagement*  
factor scores



= Fishing dependence indices  
composite score

# State of the California Current: Selected Communities



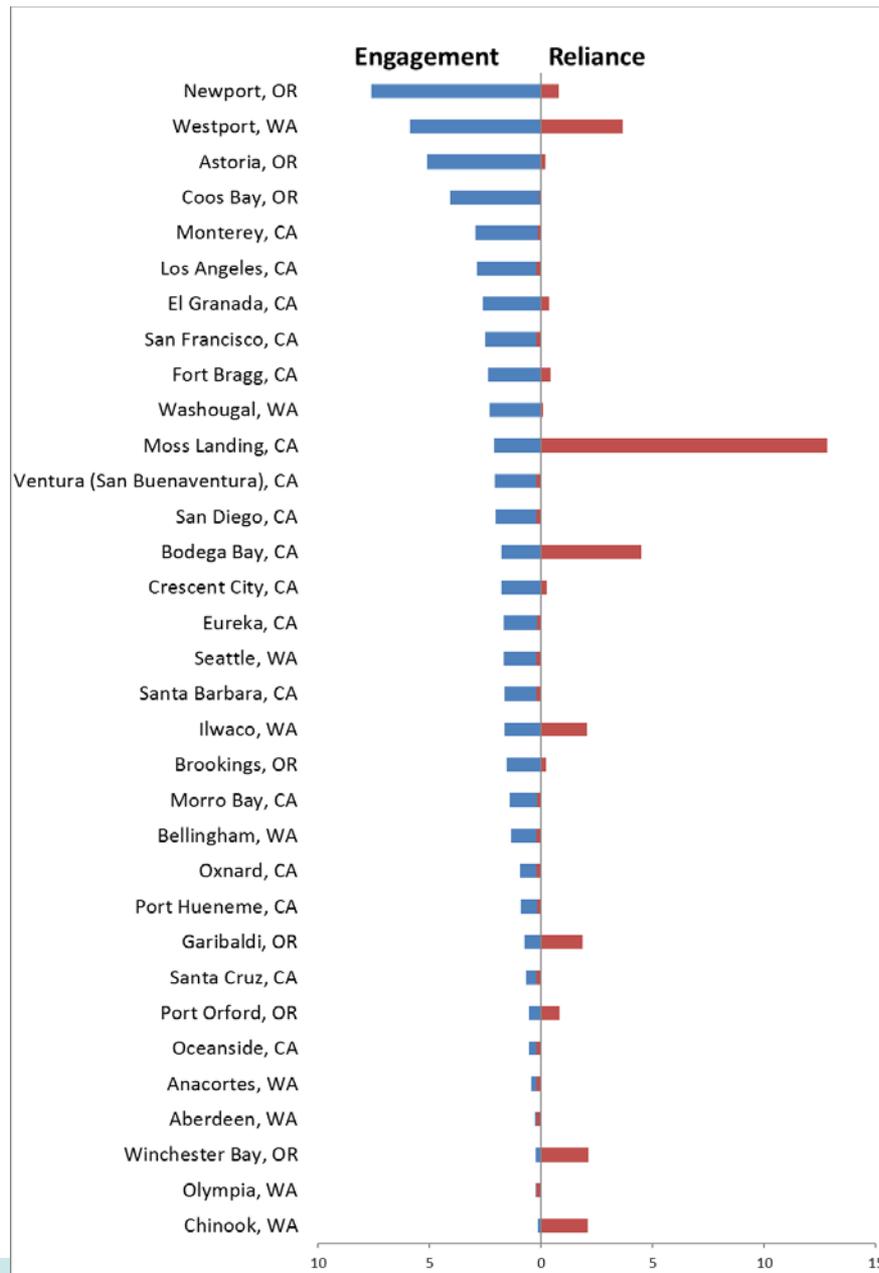
# Community Fishing Reliance vs. Engagement

Community	Pop	Pnds	\$\$	Dlrs	Pmts	Engagement Score
Abc, CA	200	409,496	16,352,316	34	6	5.02
Xyz, WA	1869	97,521,446	59,945,137	43	56	12.68
123, OR	10045	126,859,775	52,570,832	82	94	16.20

Community	Pop	Pnds/Capita	\$\$/Capita	Dlrs/Capita	Pmts/Capita	Reliance Score
Abc, CA	200	312,047	81,761	.17	.03	27.28
Xyz, WA	1869	52,178	32,073	.02	.03	8.19
123, OR	10045	12,629	5,233	.01	.01	2.04

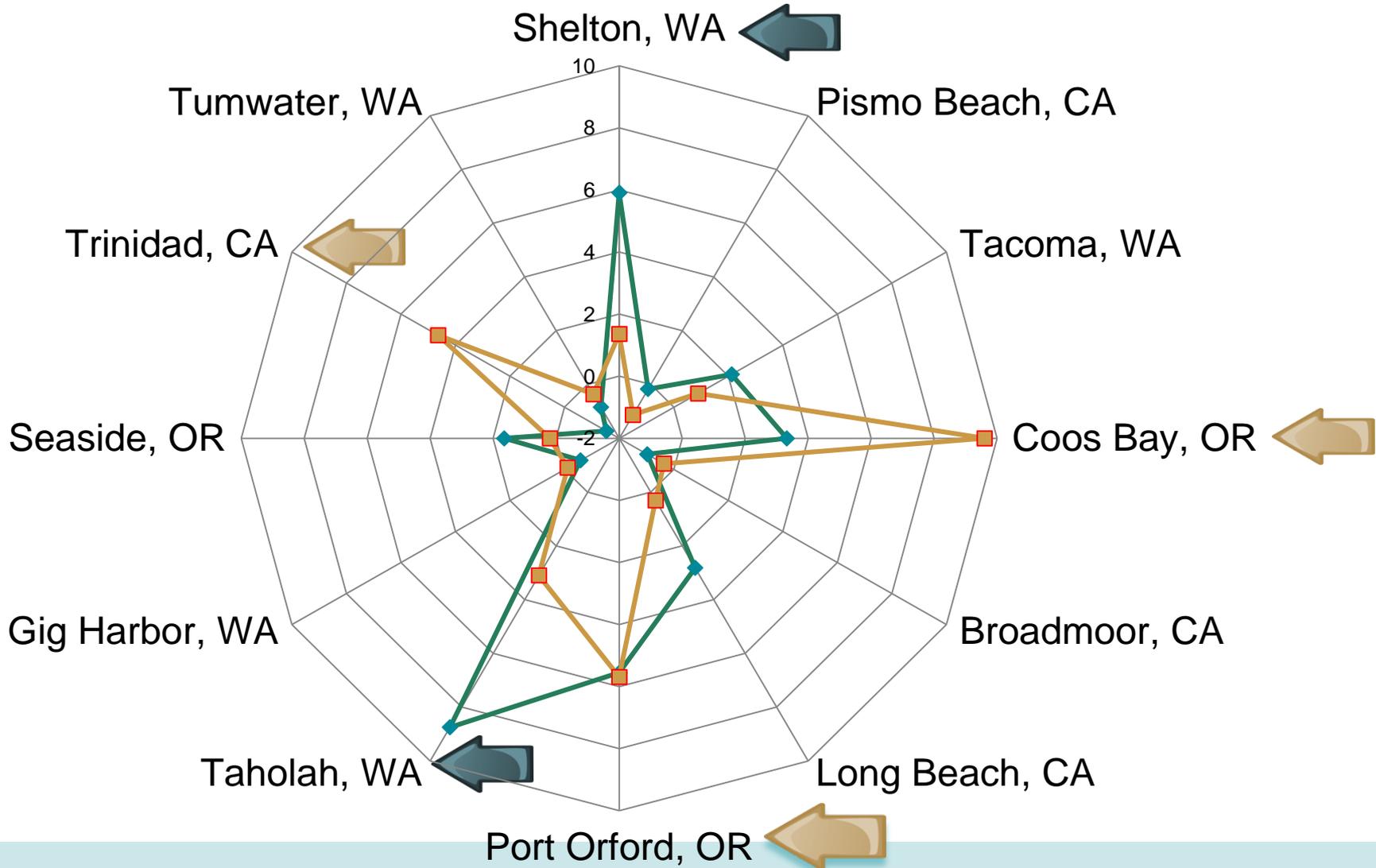
- Commercial fishing reliance +
- Commercial fishing engagement = composite score

Community	Dependence Score	Ranking
Abc, CA	32.81	High
Xyz, WA	20.88	High
123, OR	18.24	High



—◆— Social Vulnerability Composite

—■— Fishing Dependence Composite



# Recreational Fishing Indices: WA/OR results of 2016

## Engagement

Community	Score	Rank
Westport, WA	11.17	high
Ilwaco, WA	4.70	high
Neah Bay, WA	4.09	high
Newport, OR	3.21	high
La Push, WA	1.78	high
Depoe Bay, OR	1.67	high
Garibaldi, OR	1.38	high
Brookings, OR	1.17	high
Coos Bay, OR	0.83	moderate
Chinook, WA	0.66	moderate
Winchester Bay, OR	0.34	low
Pacific City, OR	0.22	low
Bandon, OR	0.11	low
Astoria, OR	0.10	low
Gold Beach, OR	-0.02	low
Florence, OR	-0.12	low
Port Orford, OR	-0.16	low

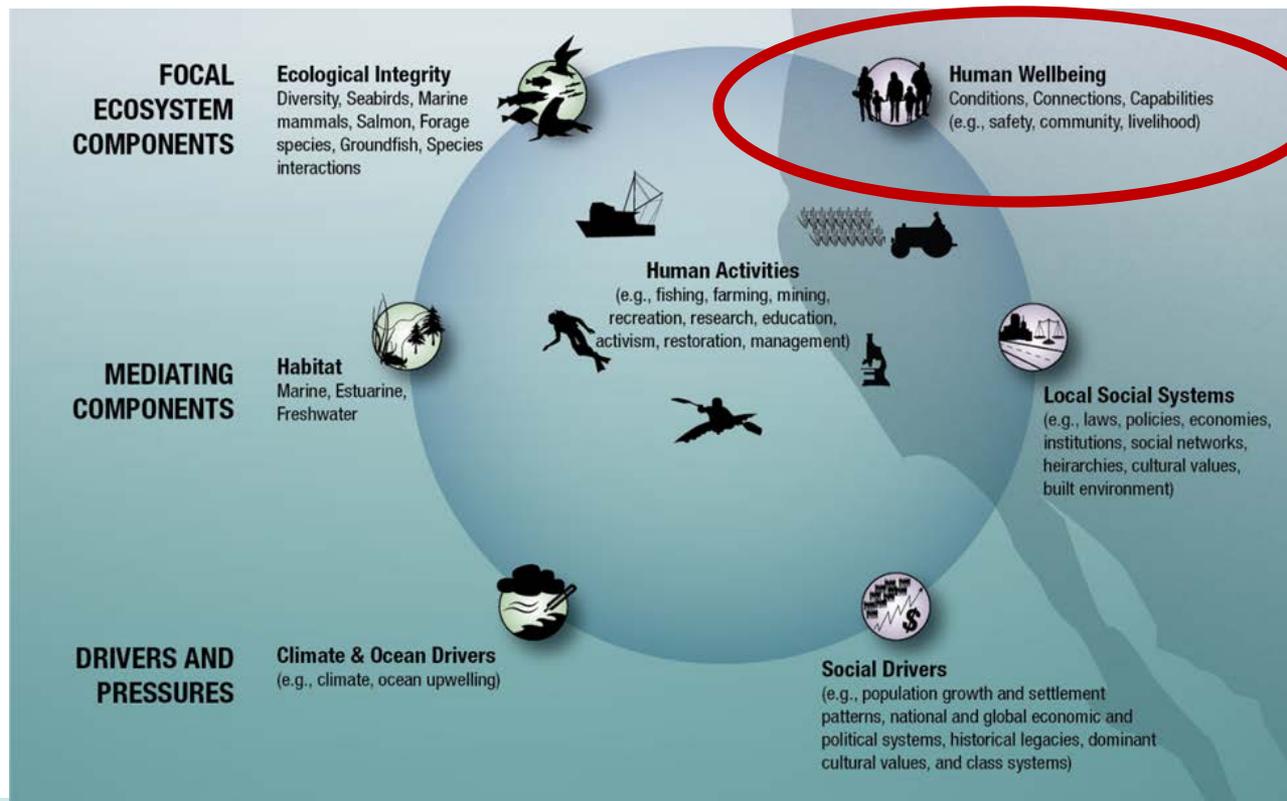
## Reliance

Community	Score	Rank
Westport, WA	8.91	high
Ilwaco, WA	6.45	high
La Push, WA	5.59	high
Neah Bay, WA	4.60	high
Garibaldi, OR	2.20	high
Chinook, WA	1.58	high
Depoe Bay, OR	1.48	high
Winchester Bay, OR	0.99	moderate
Pacific City, OR	0.28	low
Newport, OR	0.27	low
Brookings, OR	0.03	low
Bandon, OR	-0.05	low
Gold Beach, OR	-0.10	low
Coos Bay, OR	-0.11	low
Astoria, OR	-0.16	low
Port Orford, OR	-0.17	low
Florence, OR	-0.18	low

Ranking: High > 1stdev. Moderate: .5 – 1 stdev Low: below 0.5 stdev

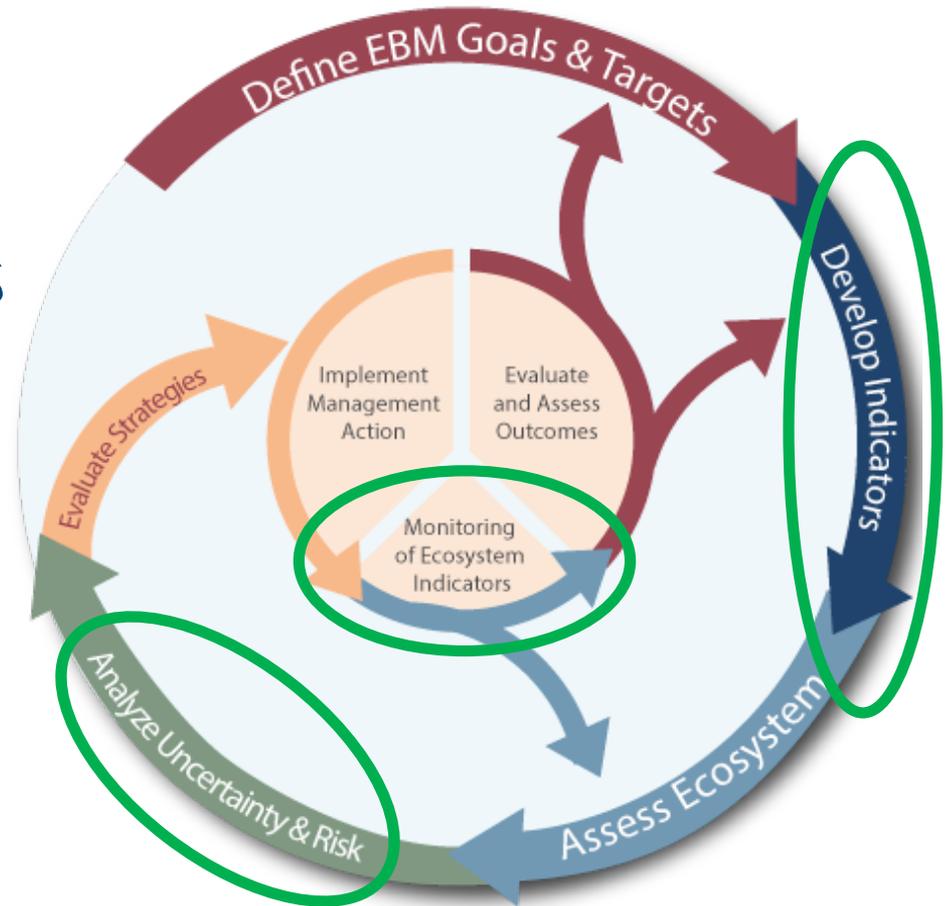
# Ecosystem-based context for work

- Human communities part of comprehensive ecosystem assessment vision
- Questions about the desired system state always societal questions
- An ecosystem assessment for a large marine ecosystem adjacent to a populous coastline *necessitates* human and community analyses



# Integrated Ecosystem Assessment (IEA) Context for Work

- Develops indicators to assess and monitor part of the human dimensions of the CCLME
- Provides a means of developing human-oriented risk assessment



# Community Indicators in Management

- Community-level indicators in annual State of the California Current report to the *Pacific Fishery Management Council*
- Indicators and methodology in the California Current Integrated Ecosystem Assessment (CCIEA)
- Groundfish-specific indices included in five year review report on catch shares and communities
- Approach has been adopted by State of Washington for marine spatial planning



## Strengths:

killing three 'big picture' birds\* with one stone

- Part of a longstanding interest in community-level analyses within NMFS and PFMC (NS 8)
- Partially satisfies the HD indicators needs of the CCIEA
- Part of cohesive national social science effort:

<http://www.st.nmfs.noaa.gov/humandimensions/social-indicators/map>

\*no ESA-listed seabirds were harmed in the making of this idiom



## Strengths, cont'd

- Replicable methodology employed in other regions/marine ecosystems
- Extant data = low cost
- Strong collaborative links to biophysical ecosystem efforts



# Challenges

- Focused thus far on commercial fishing
- Linking ecosystem and social science raises issues of scale
- Provides information on community vulnerability, but does not provide mechanistic, causal links to exogenous shocks or fisheries



# Opportunities

- Model pathway for inclusion of communities data/analyses in other ecosystem contexts/IEAs
- Allows for developing additional, non-commercial indices of human community-ecosystem linkages (see: preliminary rec fishing indices...)
- Springboard for original data collection and research: allows for hypotheses about the salience of community identity in approaches to fishing



Discussion