Incorporating Multiple Community Perspectives in Development of Essential Ocean Variables

Paul A. Covert[1], James P. Mortimor[1], **Spencer Taft**[2], John Konovsky[2], Patrick Lilley[3], Natasha Salter[1] and Janet Mossman[1]

[1] Fisheries and Oceans Canada
[2] Tsleil-Waututh Nation
[3] Kerr Wood Leidal

Establishing EOVs

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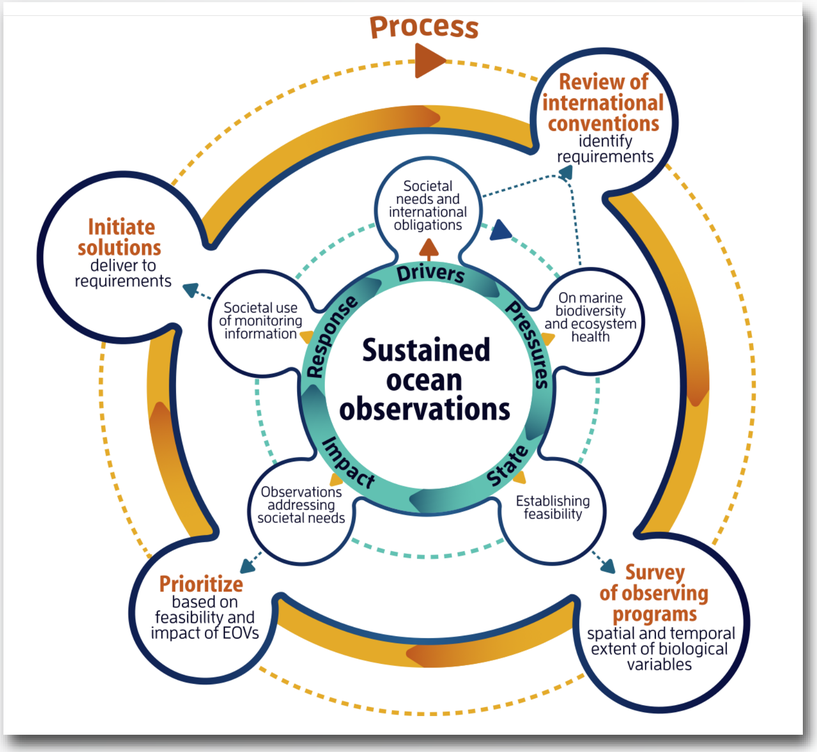
Essential ocean variables for global sustained observations of biodiversity and ecosystem changes

Patricia Miloslavich[1,2,3,4] | Nicholas J. Bax[1,5] | Samantha E. Simmons[6] | Eduardo Klein[2] | Ward Appeltans[7] | Octavio Aburto-Oropeza[8] | Melissa Andersen Garcia[9] | Sonia D. Batten[10] | Lisandro Benedetti-Cecchi[11] | David M. Checkley Jr.[12] | Sanae Chiba[13,14] | J. Emmett Duffy[15] | Daniel C. Dunn[16] | Albert Fischer[17] | John Gunn[3] | Raphael Kudela[18] | Francis Marsac[19,20] | Frank E. Muller-Karger[21] | David Obura[22] | Yunne-Jai Shin[19,23]



Who is society?

Opportunity

Fisheries and Oceans Canada

Community

Methods

Results

Tsleil-Waututh Nation
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Burrard Inlet

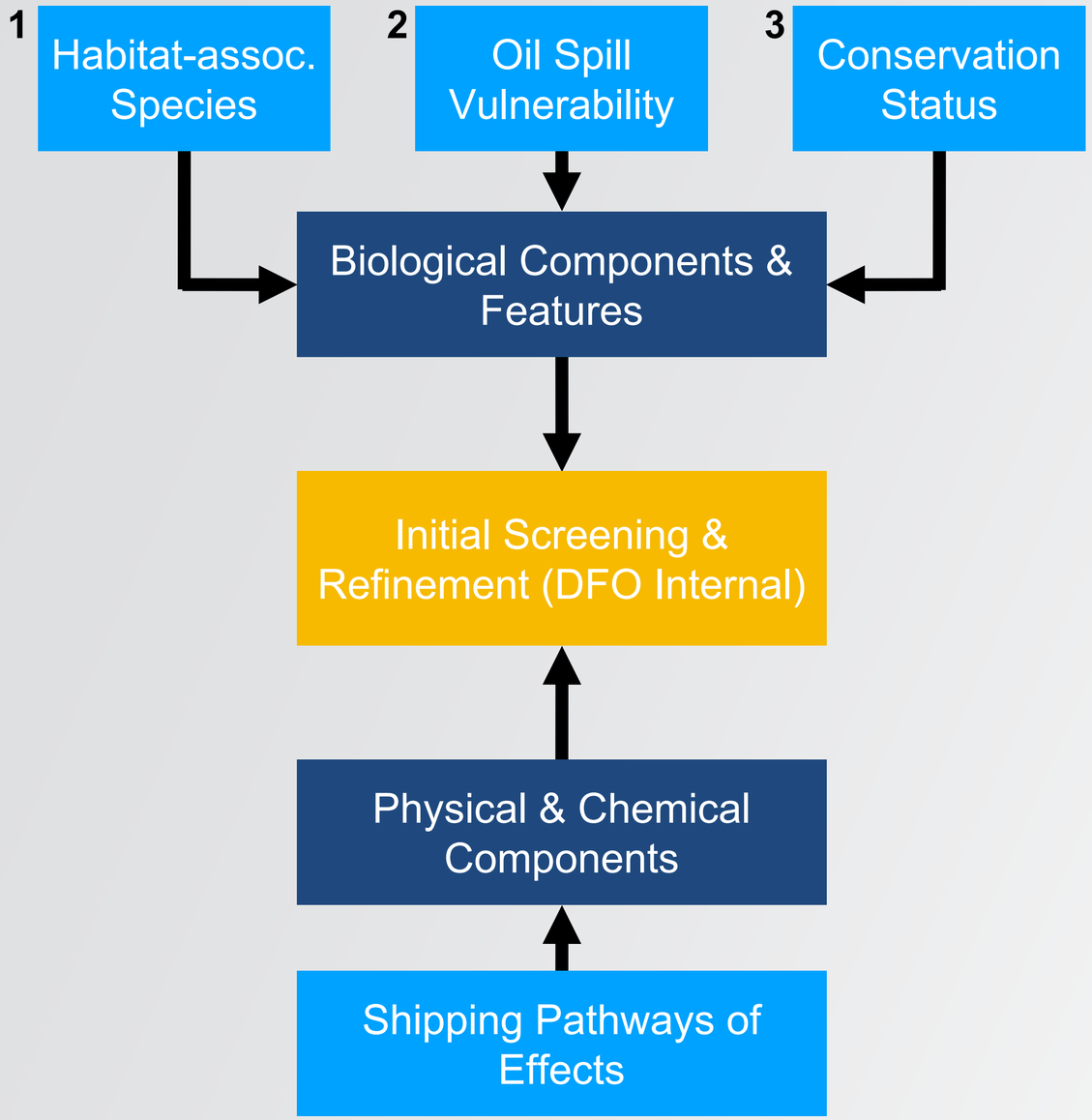
OCEANS PROTECTION PLAN

“By gathering comprehensive current state data, we can better detect changes in the environment over time”

- Characterize the current state of the ecosystem
- Support evidence-based decisions & preserve marine ecosystems
- Inform Transport Canada’s Cumulative Effects of Marine Shipping Framework

What is comprehensive data?

DFO Reaching Out to the “Community”



1 **DFO Science (Pacific Internal)**

2 **DFO Science (Pacific Science Advice)**

3 **Canadian Academic & Gov’t Science (Committee on Status of Endangered Wildlife)**

DFO Scientists (Pacific)

DFO Science (National Science Advice)

Fisheries and Oceans Canada

DFO Resulting Set of Variables

Preliminary Target Components and Features (DFO)		Notes - TWN indicators
Component	Feature	
eagrass	Zostera marina (eelgrass)	**Extent and quality of eelgrass beds is a TWN priority indicator**
altmarsh (saltmarsh grasses, saltmarsh succulents)	Grasses – Carex lyngbyei; Leymus mollis; Succulents – Sarcocornia / Salicornia pacifica; Glaux maritima	
Canopy	Nereocystis leutkana; Egregia; Pterygophora	
Unders		
on Phyt		

Preliminary Target Components and Features (DFO)			Notes - TWN indicators
Group	Component	Feature	
Invertebrates	Infauna - Low mobility Mollusca	Clams	**Clam abundance, distribution, structure and composition - native vs invasive - is a TWN priority indicator**
	Infauna - Low mobility Annelida	Annelids; Myxicola infundibulum	
	Epifauna - Attached sessile Arthropoda	Barnacles	
	Epifauna -Attached sessile Mollusca	Oysters (Olympia oyster), mussels (Mytilus spp).	Oyster abundance, distribution, structure and composition - native vs invasive - is a TWN indicator. Mussel abundance, distribution, structure and composition is a TWN indicator.
	Epifauna - Attached sessile Porifera	Glass sponges	
	Epifauna - Low mobility Mollusca	Snails (e.g. moon snail, Northern abalone), Chitons (esp. Katharina tunicata [black leather chiton])	
	Epifauna - Low mobility Echinodermata	Sea urchins (red urchin, green urchin), Sea cucumbers, Sea stars (esp. Pisaster ochraceus)	Sea urchin abundance, distribution, structure and composition is a TWN indicator.
	Epifauna - Low mobility Cnidaria	Sea pens, Pachycerianthus fimbriatus (tube dwelling anemone)	
	Epifauna - High mobility Arthropoda	Crabs (Cancer magister [Dungeness crab]), shrimp / prawn	**Crab abundance, distribution, structure and composition is a TWN priority indicator.** Prawn abundance, distribution, structure and composition is a TWN indicator.
	Plankton- Low mobility Crustacea	Zooplankton (Copepods; Mysids)	**Zooplankton composition, density and timing is a TWN priority indicator**
	Plankton - High mobility Crustacea	Euphausids	
	Nekton - High mobility Mollusca	Cephalopoda (octopus)	

Preliminary Target Components and Features (DFO)		Notes - TWN indicators
Component	Feature	
chem nent)	Total inorganic carbon (PIC) and total organic matter/carbon (POM/POC)	
mical d)	Nutrients (ammonium, nitrate, nitrite, phosphate, silicate)	Nitroger indicato Phosph
eochemical (water)	Oxygen	Dissol
	Total inorganic carbon (DIC)	Disso prior
	Alkalinity (T_{Alk})	
	CO2 partial pressure (P_{CO2})	
	pH (calculated from DIC and T_{Alk})	pH pr
	Aragonite saturation (calculated from DIC and T_{Alk})	
	Chlorophyll (Fluorescence)	
	Particulate organic carbon & nitrogen	

Preliminary Target Components and Features (DFO)			Notes - TWN indicators
Group	Component	Feature	
Mammals	Cetaceans (Toothed) - Discrete	Resident killer whales; Pacific white sided dolphin	**No. of cetacean sightings by species is a TW priority indicator**
	Cetaceans (Toothed) - Dispersed	Transient killer whales	
	Cetaceans (Baleen) - Discrete		

Preliminary Target Components and Features (DFO)			Notes - TWN indicators
Group	Component	Feature	
Physical	Physical (water)	Surface Currents	
		Winds & Waves	
		Salinity	**Salinity** / conductivity **is a TWN priority indicator**
		Temperature	**Water temperature is a TWN priority indicator**
		Photosynthetically active radiation (integrated or spectral light intensities vs. depth)	
		Turbidity / particle loading (beam attenuation or optical backscatter)	Turbidity / **TSS is a TWN priority indicator**
	Physical (substrate)	Substrate characterization	**% of hardened foreshore (docks, wharf, frontage, rip-rap, etc.) is a TWN priority indicator.** **Extent and quality of estuary habitat is a TWN priority indicator.** (Estuary habitat mapping) Estuary sediment quality is a TWN indicator Extent and quality of mudflats is a TWN indicator. (Mudflat habitat mapping) Mudflat substrate composition is a TWN indicator Extent and quality of sand beaches is a TWN indicator. (Beach habitat mapping) Sand beach substrate composition is a TWN indicator Extent and quality of gravel / cobble beaches is a TWN indicator. (Beach habitat mapping) Gravel / cobble beach substrate composition is a TWN indicator **Extent and quality of spawning beaches is a TWN priority indicator.** (Beach habitat mapping) Spawning beach substrate composition is a TWN indicator **Extent and quality of shellfish beaches is a TWN priority indicator.** (Beach habitat mapping) Shellfish beach substrate composition is a TWN indicator Sediment Quality – Physical Substrate Conditions: **Substrate composition and embeddeness on shellfish harvesting beaches is a TWN priority indicator**

DFO Resulting Set of Variables

Pelagic Subtidal Intertidal

Physical

Temperature
Salinity
Currents
Sediment
Optical Props.
Shoreline Struct.
…

Chemical

Oxygen
Inorg. Carbon
Nutrients
DOM
…

Biological

Phytoplankton
Zooplankton
Invertebrates
Crustaceans
Forage fish
Pelagic fish
Marine Mammals
…

Mandate from TWN Chief and Council

Part of TWN’s Cumulative Effects Monitoring Program

Elders, knowledge holders, youth, staff, and scientists

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TWN Determining Valued Components

Collaborative between staff & community

Draws from existing foundational documents

Open minded, bottom up

Inclusive of any values related to Burrard Inlet

Summary: 2016 Elders & Youth Marine Summit

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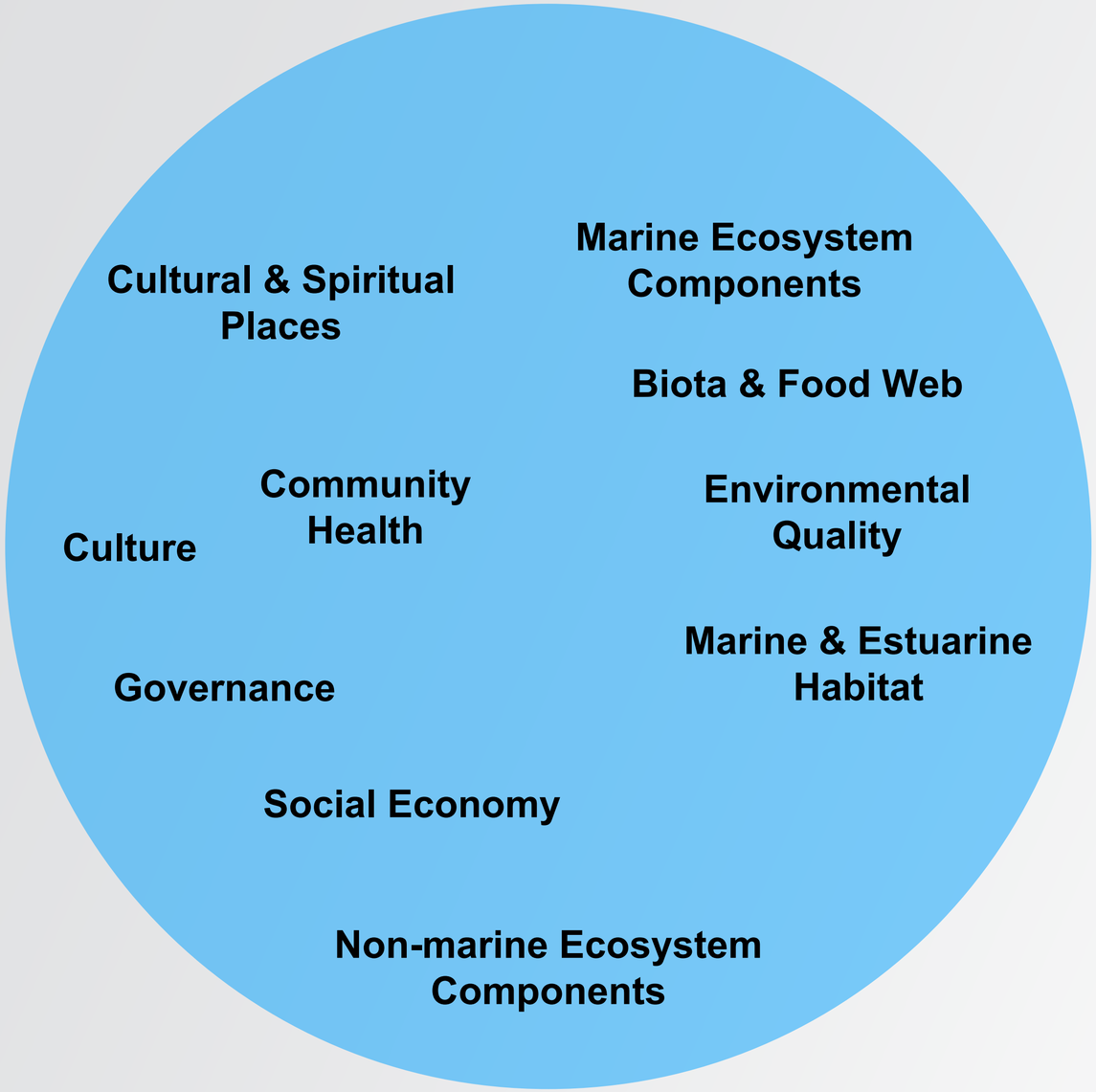
TWN Valued Components



Categories are broad

Encompasses environmental, cultural, and socioeconomic variables

Specific valued components (e.g. clams) can span multiple broad categories

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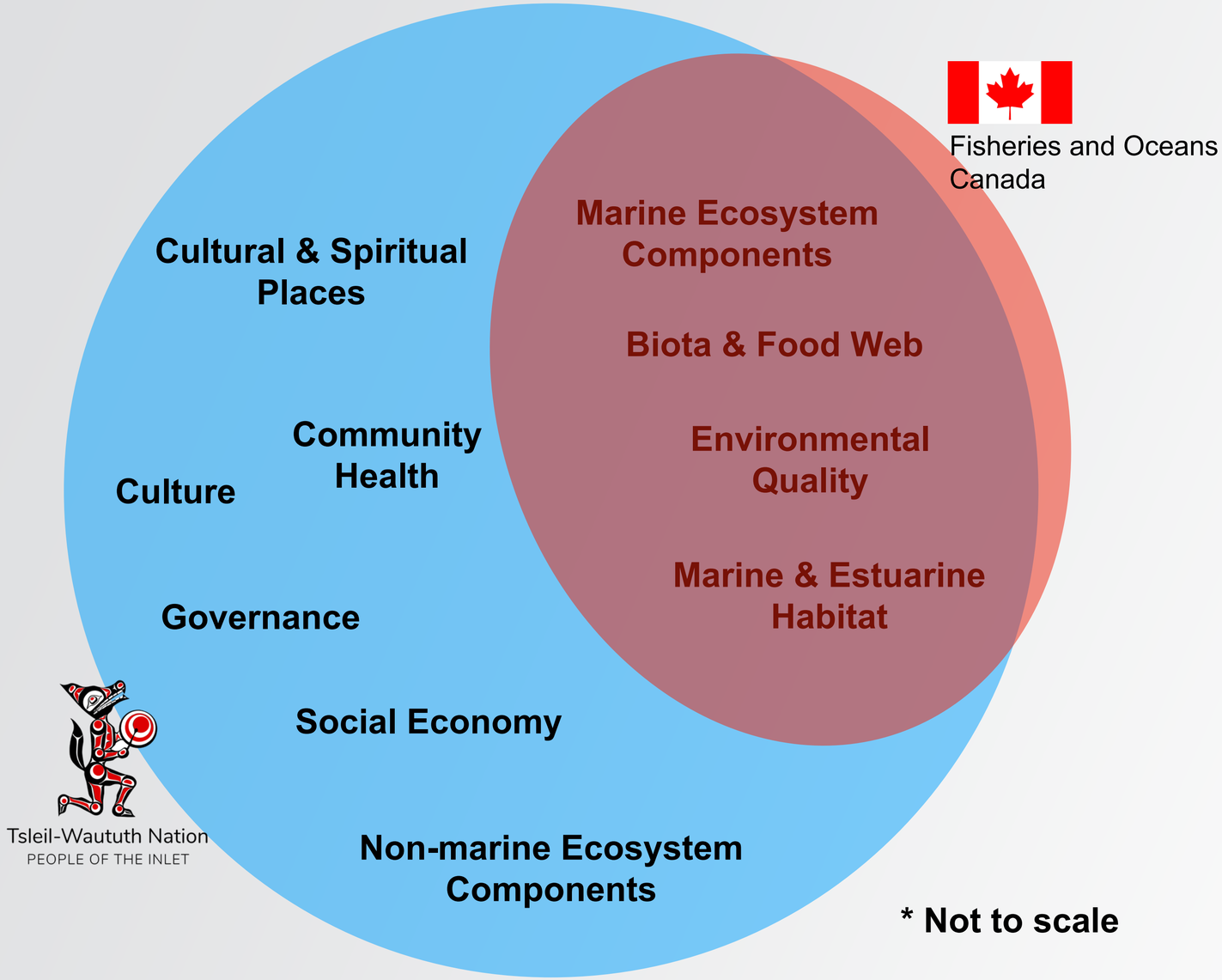
TWN / DFO Valued Components: How do they compare?

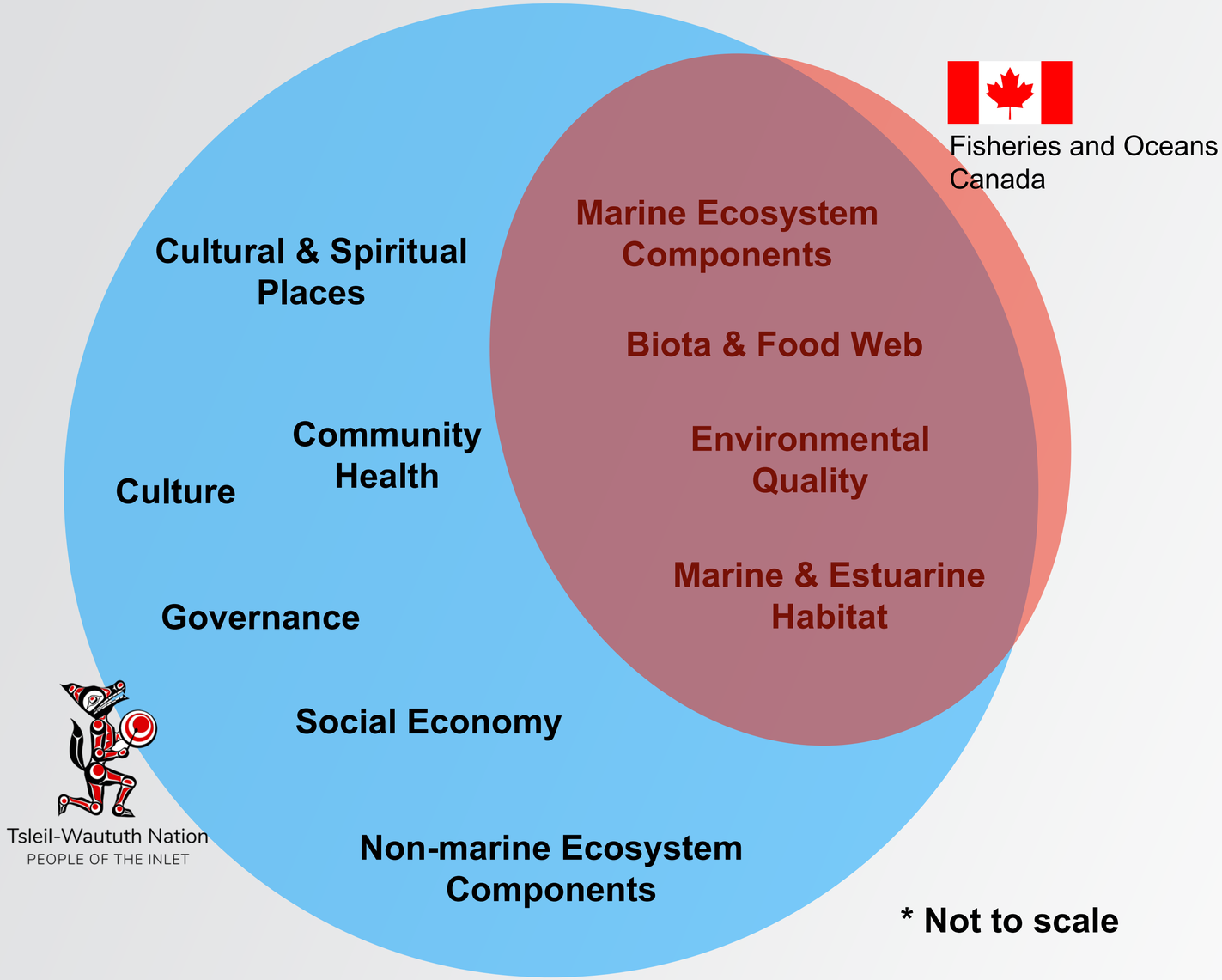


TWN does not draw a line between cultural and environmental values

Marine-related components align very well

DFO limited by jurisdictional exclusion; cannot extend above sea surface or high tide line

TWN / DFO Valued Components: How do they compare?



TWN does not draw a line between cultural and environmental values

Specific valued components (e.g. clams) can span multiple broad categories

TWN Linking Valued Components

TWN does not draw a line between cultural and environmental values

Specific valued components (e.g. clams) can span multiple broad categories

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Summary

Fisheries and Oceans Canada

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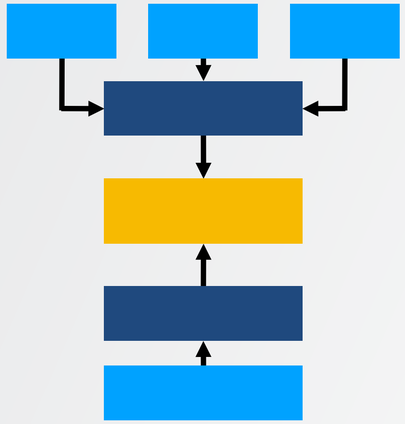
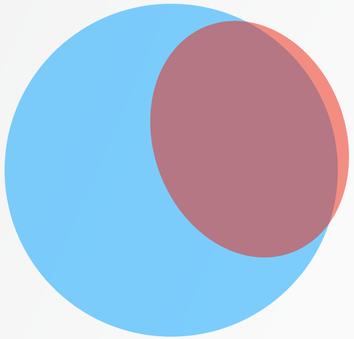
Opportunity to compare two *very* different communities and approaches.



vs.

Resulting valued ecosystem components show considerable overlap. Largest difference is the *human* component.



Recommendations

Health of cultures that depend on the ocean should be included as an essential variable

Collaboration extends beyond being asked to provide input into a process

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