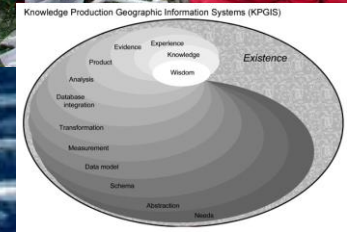
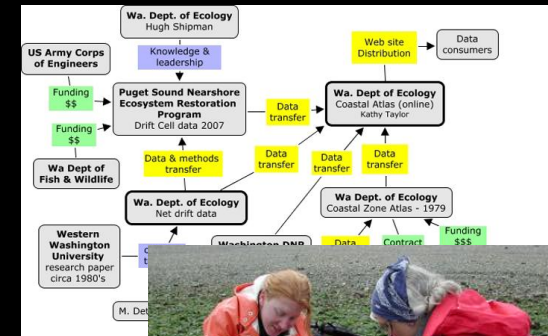


Data Worlds of Puget Sound's nearshore ecosystem

Making sense of middle-spaces in multiorganizational decision environments

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What this presentation is about

Knowledge Production GIS (KPGIS)

The research subjects of this study are GIS situated in postmodern science

Data Worlds theory/method conceptual frame

An approach to trace the constitution and change of social and technical practices that handle and apply spatial data.

Puget Sound nearshore

A case study for these constructs

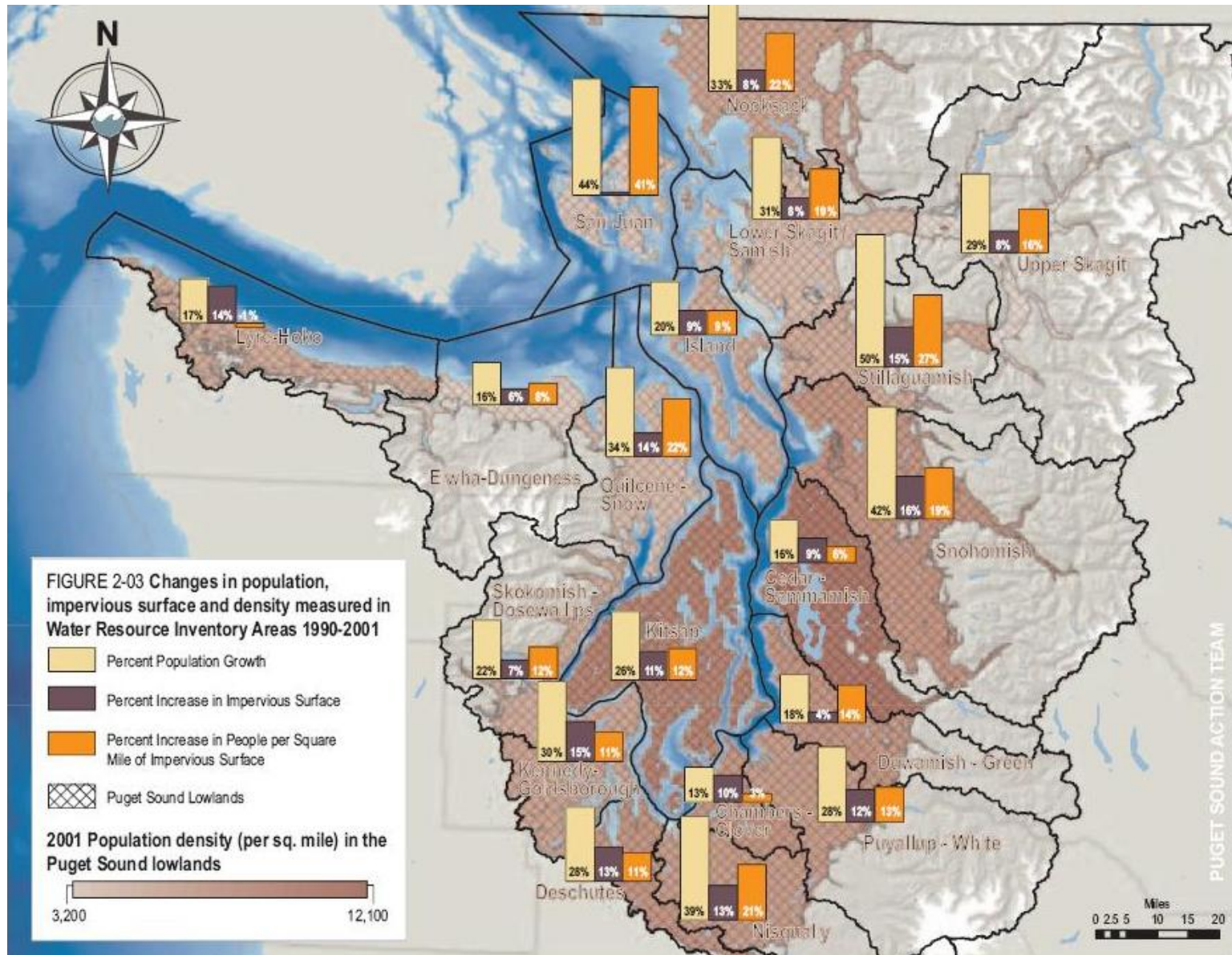
The Puget Sound



“Puget Sound is ecologically delicate and its symptoms of environmental distress are undeniable and getting worse.”

Gov. Gregoire

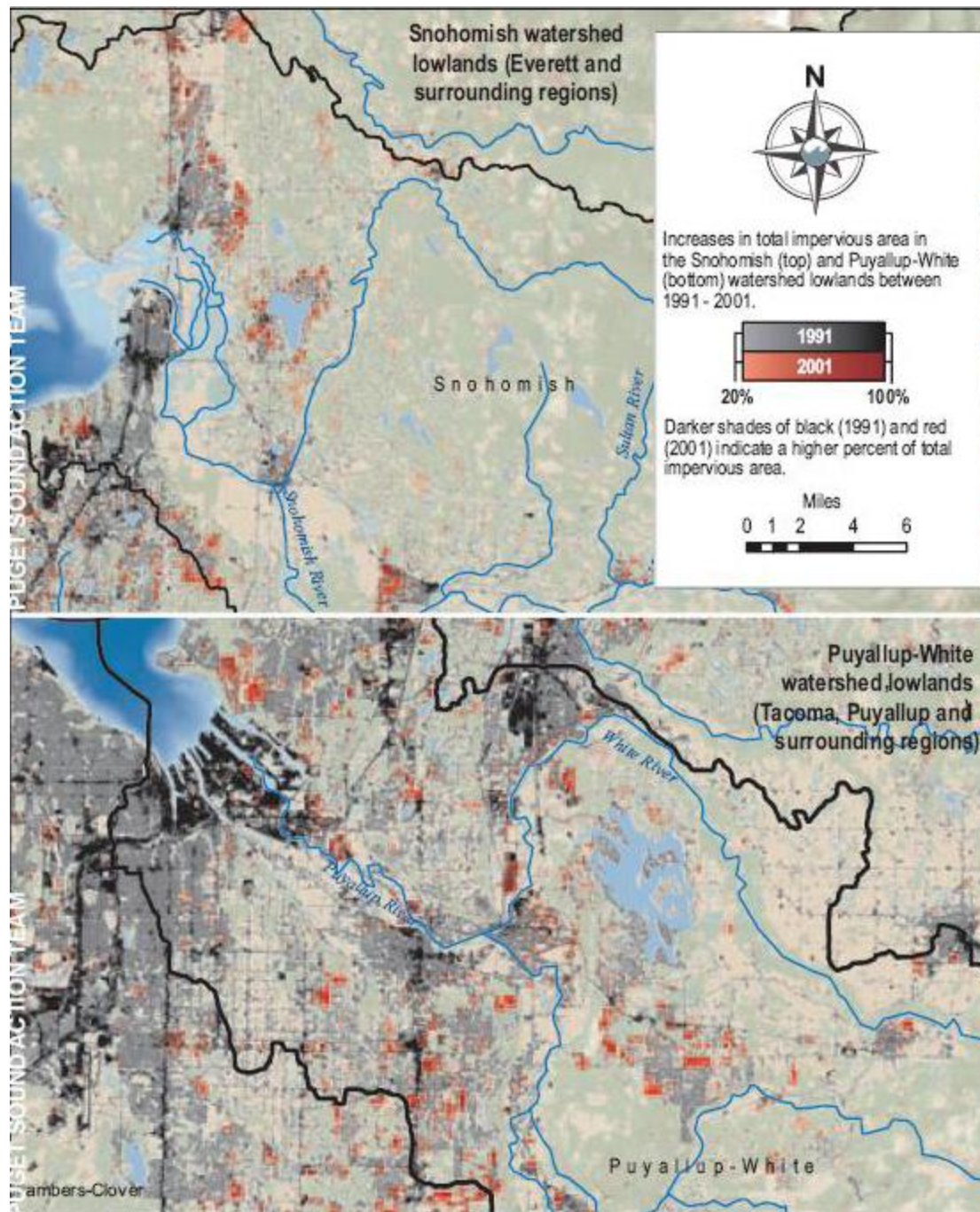
1990-2001 population and impervious surface change



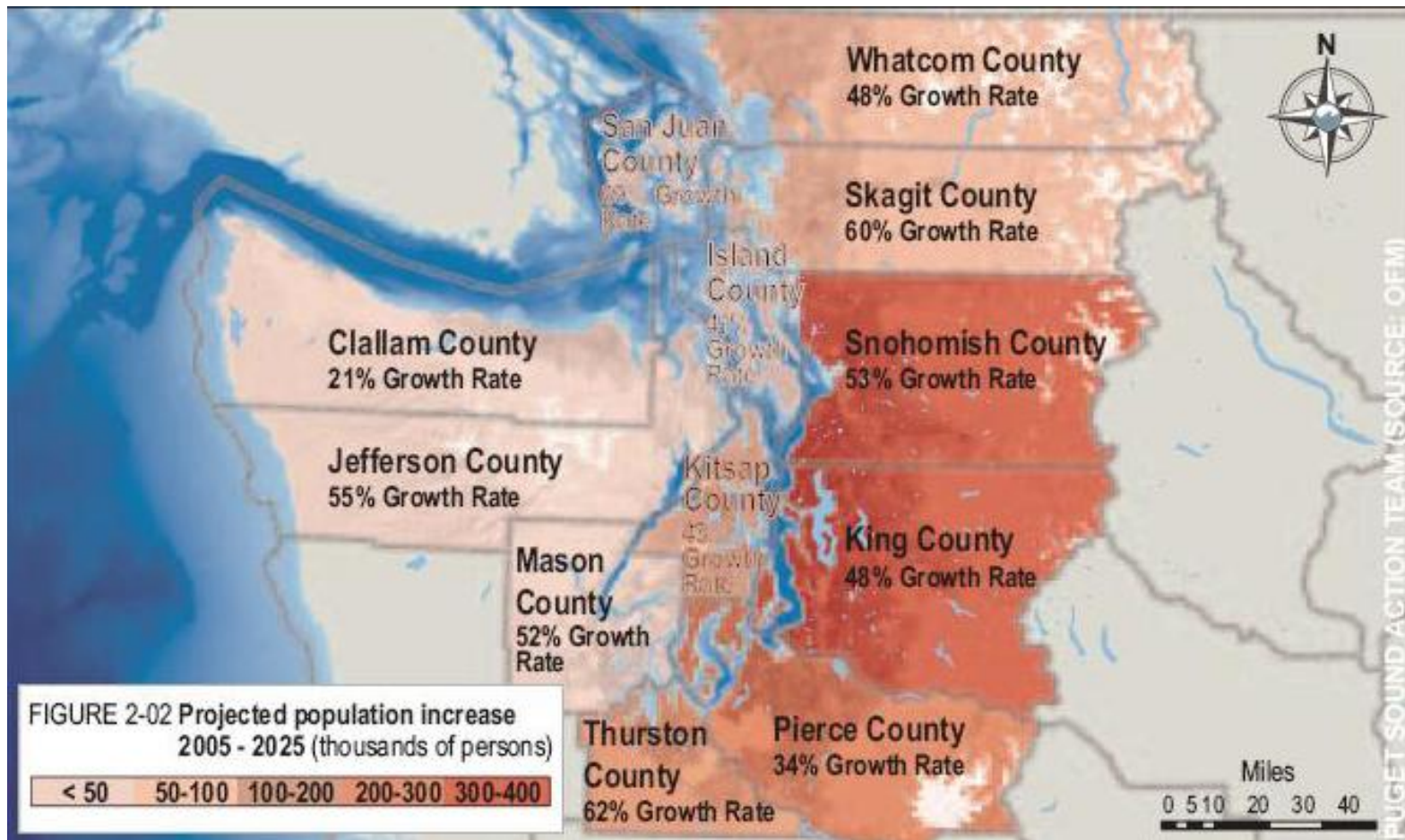
Change in impervious surfaces: 1991-2001

“Stormwater runoff flushes at least 52 million pounds of petroleum, toxic metals and other pollutants into the Sound every year.”

- David Dicks, Executive Director of the Puget Sound Partnership



Predicted population increase: 2005-2025



State and federal threatened or endangered species



State and federal listed species in Puget Sound as of October 2006¹

GROUP	COMMON NAME	STATE STATUS	FEDERAL STATUS
MARINE AND ANADROMOUS FISHES	Chinook Salmon (Puget Sound)	C	T
	Chum Salmon (Hood Canal/ E. Strait of Juan de Fuca)	C	T
	Coho Salmon (Puget Sound/ Strait of Georgia)		C
	Bull Trout (Coastal/Puget Sound)	C	T
	Pacific Hake	C	C
	Pacific Cod	C	
	Walleye Pollock (South Puget Sound)	C	Co
	Pacific Herring (Cherry Point/ Discovery Bay)	C	C
	Brown Rockfish	C	
	Copper Rockfish	C	
	Greenstriped Rockfish	C	
	Widow Rockfish	C	
	Yelloweye Rockfish	C	
	Quillback Rockfish	C	
	Black Rockfish	C	
	China Rockfish	C	
	Tiger Rockfish	C	
Bocaccio Rockfish	C		
Canary Rockfish	C		



GROUP	COMMON NAME	STATE STATUS	FEDERAL STATUS
MARINE MAMMALS	Northern Pacific Humpback Whale	E	E
	Steller Sea Lion	T	T
	Orca	E	E
	Pacific Harbor Porpoise	C	
	Northern Sea Otter	E	Co
BIRDS	Bald Eagle	T	T*
	Canada Goose, Aleutian	M	Co
	Golden Eagle	C	
	Marbled Murrelet	T	T
	Tufted Puffin	C	Co
	Brandt's Cormorant	C	
	Cassin's Auklet	C	Co
	Common Murre	C	
	Western Grebe	C	
Snowy Plover	E	T	
INVERTEBRATES	Olympia Oysters	C	
	Newcomb's Littorine Snail	C	Co
	Pinto (Northern) Abalone	C	

State and Federal Status

E – Endangered

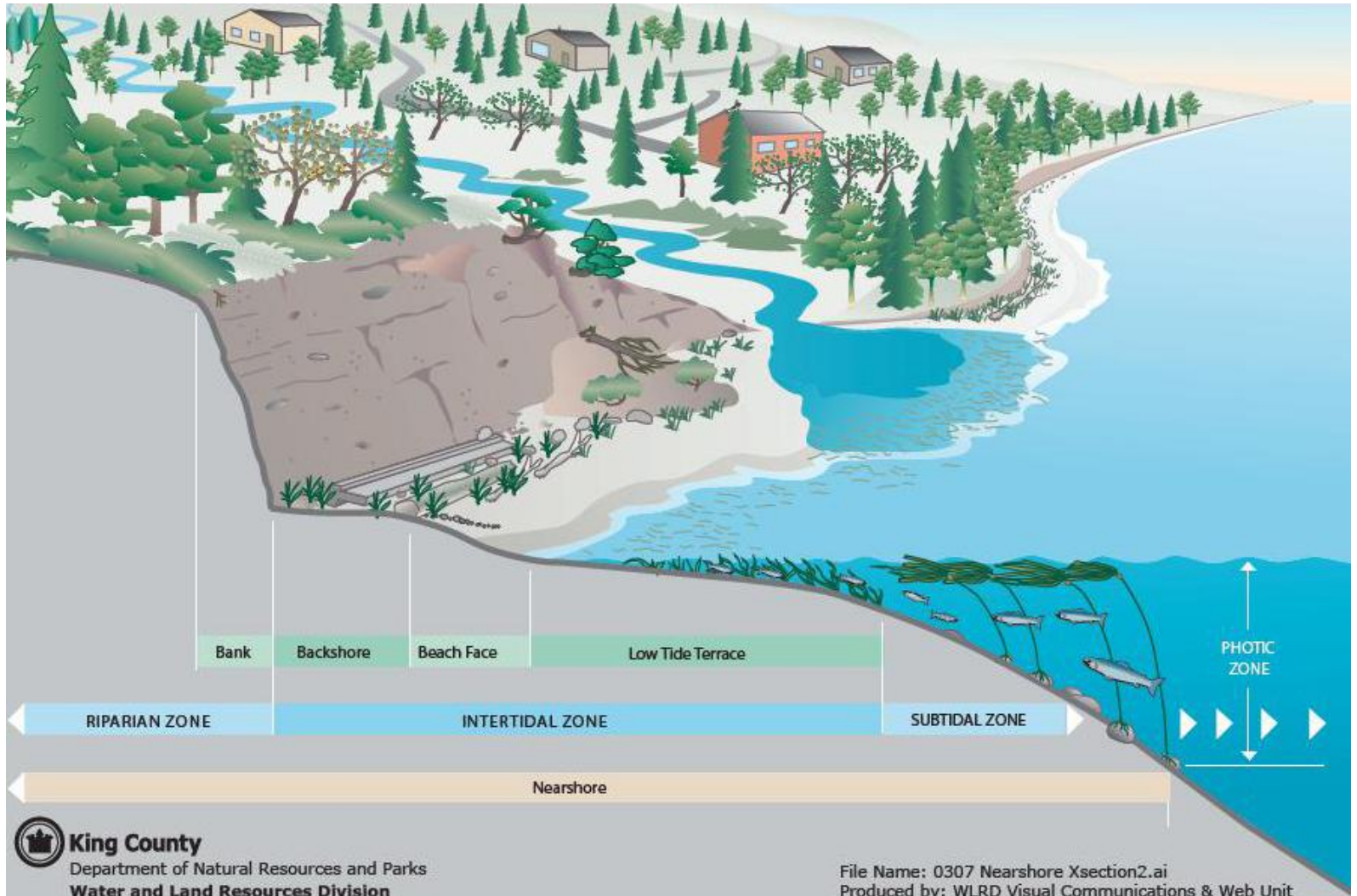
T – Threatened

C – Candidate

Co – Concern

M - Monitor

The nearshore

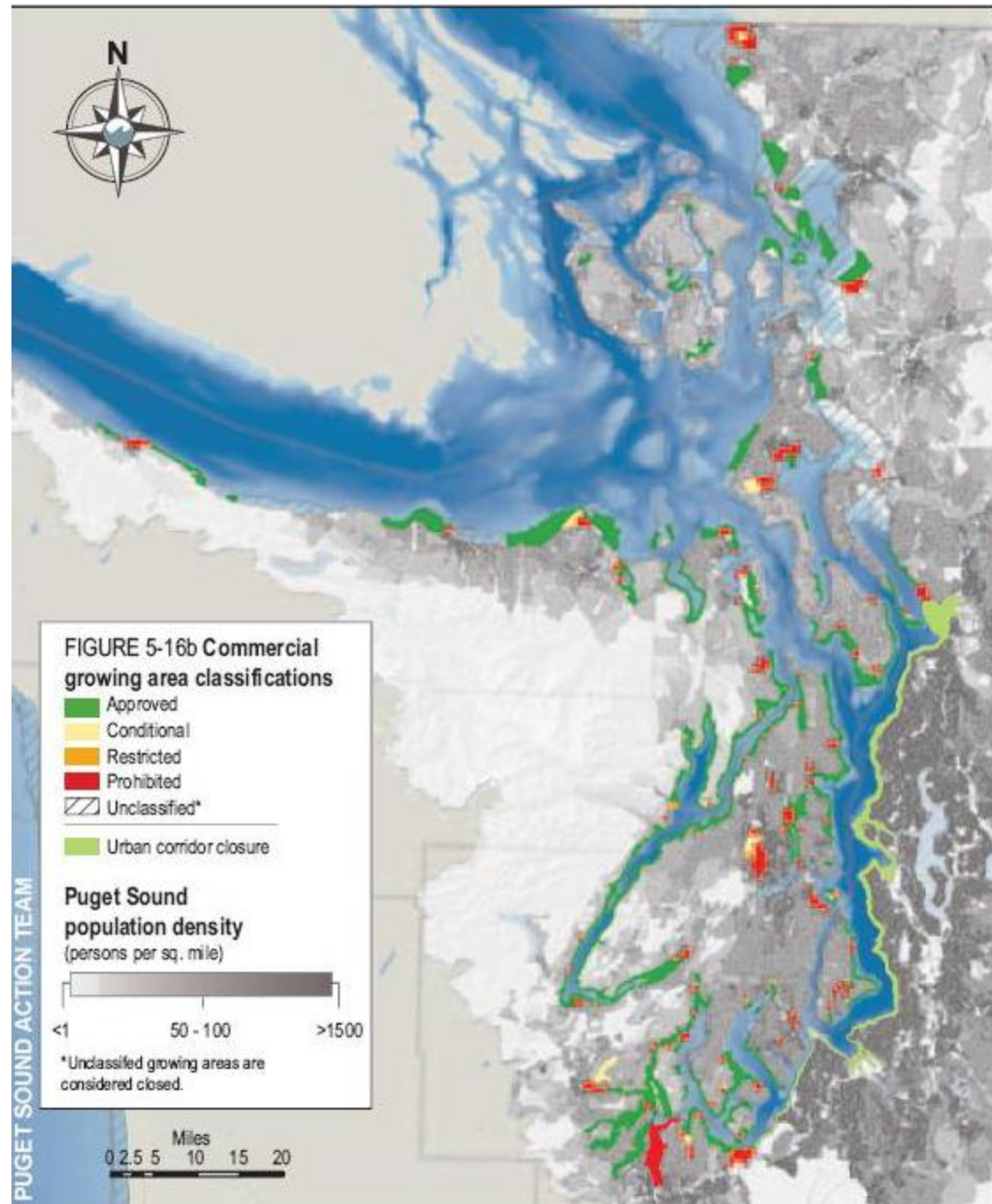


& more nearshore



Shellfish harvest area closures 2007

Loss of 'goods and services



Environmental goods and services worldview

Natural mechanisms and anthropogenic activities

e.g., shoreline modification and dredging, discharges and spills, water flow alteration, logging, agriculture, upland development, biological resource harvest and culture, shipping, climate change, introduction of exotic and invasive species



Marine, freshwater and terrestrial processes

e.g., physical, chemical and biological processes such as element cycling, sediment transport, circulation and tides, primary and secondary production



Habitat types and distribution

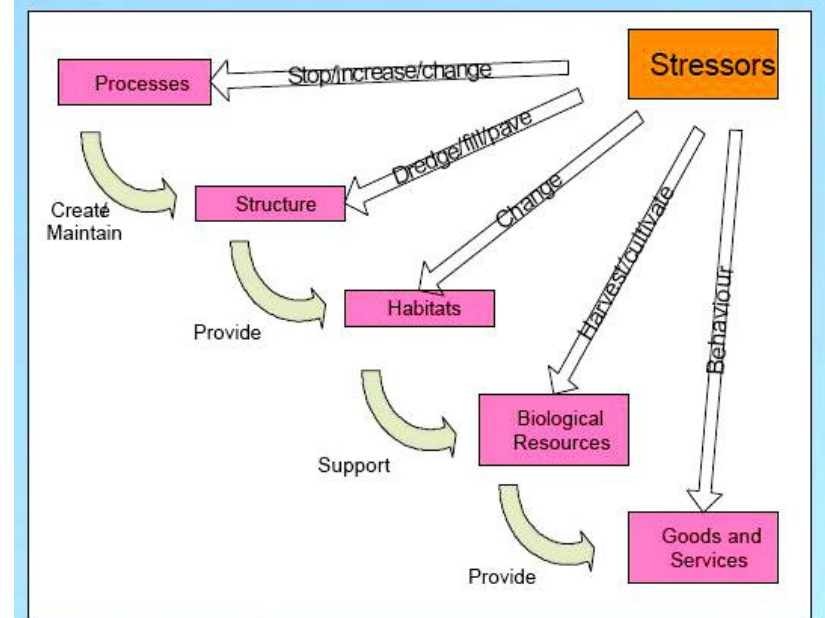
Food web and species dynamics



Status of ecosystem and its services



Human valuation of goods and services and costs of management



The solution is...

A new state agency:



PugetSoundPartnership
our sound, our community, our chance

“The legislature therefore creates a new Puget Sound partnership to coordinate and lead the effort to restore and protect Puget Sound, and intends that **all governmental entities, including federal and state agencies, tribes, cities, counties, ports, and special purpose districts**, support and help implement the partnership's restoration efforts.”

The PSP's five mandates:

- **Prioritize** cleanup and improvement projects
- **Make decisions** on science
- **Coordinate** federal, state, local, tribal and private resources
- Hold people and organizations **accountable for results**
- **Create a roadmap** to make Puget Sound healthy again

The first partners

Washington's Departments of:

Natural Resource

Ecology

Fish & Wildlife

Tribal representatives:

Northwest Indian Fisheries Commission

Non-Profit:

People for Puget Sound

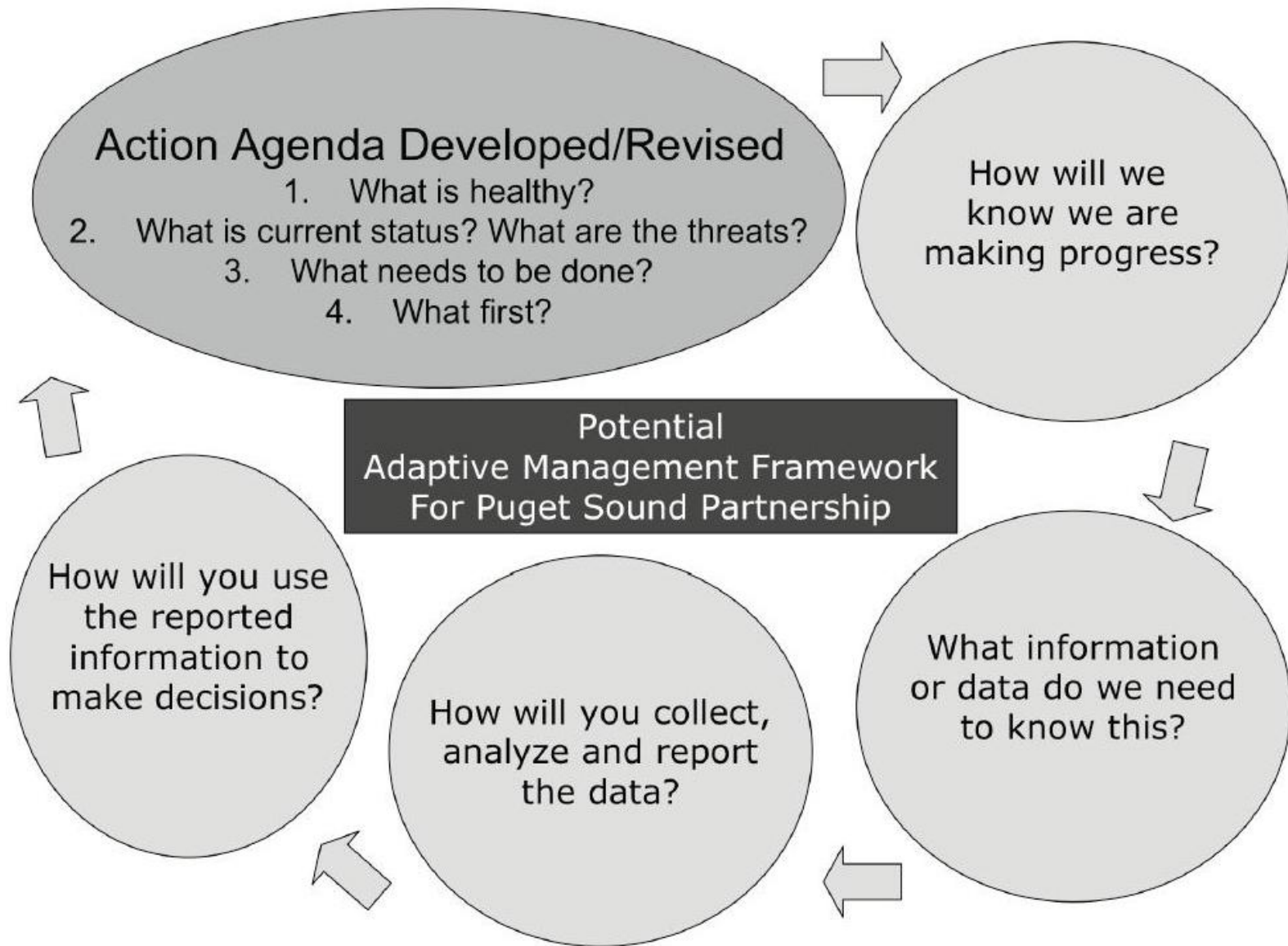
Federal:

United States Army Corps of Engineers

United States EPA

NOAA

The PSP 'Action Agenda' process diagram



PUGET SOUND
nearshore
PARTNERSHIP

A partnership among local, state,



WASHINGTON STATE DEPARTMENT OF
Natural Resources

engineers and other federal agencies, in

Sea Grant
Washington

In partnership with
Northwest Indian
Fisheries Commission



PRISM
PUGET SOUND
REGIONAL SYNTHESIS MODEL



Stillaguamish Tribe of Indians
Natural Resource Department



NED

NORTHWEST
ENVIRONMENTAL
DATA-NETWORK

DEMOS & QUICKSTARTS

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

SSHIAIP Salmon and Steelhead Habitat
Inventory and Assessment Program



US Army Corps
of Engineers®

Department of Ecology
**Shoreline
Management**

Jefferson County
MRC
Marine Resources Committee



Salmon
Recovery
Funding
Board

ISLAND COUNTY
MARINE RESOURCES COM
SCIENCE • EDUCATION • STEWAR



NORTHWEST STRAITS
marine conservation initiative

Organizations want to make,
transfer and reuse data
for multiple purposes

UNIVERSITY OF
WASHINGTON



Access Washington®
Official State Government Web Site

Is this any better?

PUGET SOUND ENVIRONMENTAL MANAGEMENT, CONSERVATION AND RECOVERY Institutional "Map"

POLITICAL AUTHORITIES

Federal Agencies: 9 w/ varied Puget Sound jurisdiction – EPA, USFWS, NOAA, ACOE, Coast Guard, USFS, DOD, NPS, USGS

State Agencies: 10 w/ jurisdiction/role – Ecology, DFW, DNR, Parks, DOH, CTED, Agriculture, Transportation, IAC, Conservation Commission

Treaty Tribes: 18

Counties: 12

Cities: 115

Local Health Jurisdictions: 12

Special Purpose Districts (Ports, PUD's, etc.) 100 plus

Salmon Recovery Funding Board: 5 agency directors and 5 citizens, allocate grant funding for salmon recovery. \$18 million (average) in grants were awarded annually in Puget Sound in FY's 2001 through 2004.

Watershed Planning Structures

- Water quantity planning (2514) entities: 13
- Lead entities (2496) for salmon recovery: 15
- Salmon recovery planning areas under Shared Strategy: 14

REGIONAL BODIES

Puget Sound Action Team Partnership

- Created in law in 1996
- Comprised of 10 state and 3 federal agencies
- Reps. of cities, counties and tribes
- Responsible for Comprehensive Puget Sound Management Plan, Biennial work plans and budgets
- Advised by Puget Sound Council
- \$3 million annual budget; oversees 182 million of spending for 2005-2007 biennium

Northwest Straits Commission

- Established by Congress 1991
- Focused on North Sound, Strait of Juan De Fuca
- Coordinates with 7 Marine Resource Committees
- \$1.6 million annual budget

Hood Canal Coordinating Council

- NGO that serves as a regional council of governments for Hood Canal counties
- Designated as local management board to develop and implement a program of rehabilitation for Hood Canal
- \$635,000 annual budget

Shared Strategy

- Salmon Recovery Regional Organization for P.S.
- Regional board – agencies, tribes, governments, private interests
- Coordinates the work of 14 local planning groups to produce a Puget Sound salmon recovery plan
- \$1.2 million annual budget average

Hood Canal Dissolved Oxygen Program

- Partnership of 28 organizations conducting monitoring and analysis and developing potential corrective actions to address low dissolved oxygen problem in Hood Canal

Puget Sound Restoration Partnership

- Created by MOU to spur restoration of Puget Sound's nearshore environment. Multiple state and federal partners.
- Developing a basin wide conceptual framework
- Assisting others with restoration projects
- \$1 million annual budget each of last 4 yrs.

OTHER KEY INTERESTS AND PLAYERS

Key Involved Interests

- Environmental Community
- Business Community
- Shellfish Growers
- Agricultural community
- Real estate and developers

State Legislature

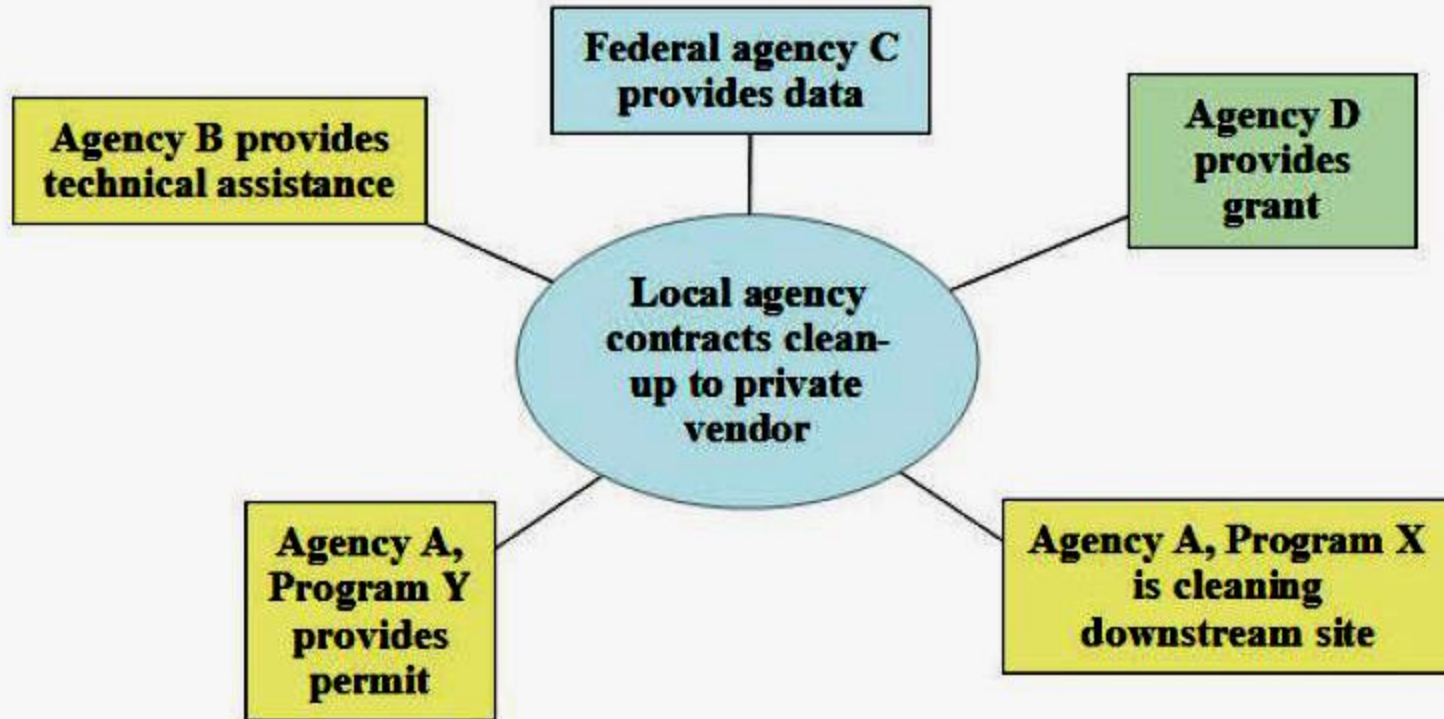
Congressional Delegation




Universities and Research Institutions

- UW, WSU
- SeaGrant and Cooperative Extension
- NOAA Science Center
- Battelle

Hierarchy and accountability is inconsistent

Fragmented Information What is the progress being made?



-  Plan reports information as a single activity/ result
-  Plan reports information as large roll-up
-  Plan does not collect or report information

A difficult environment for GIS?

- Interorganizational coordination
- Granularity of organizational hierarchy and mandate
- Inconsistent & incompatible data
- Standards? Everyone has some
- Recognized data gaps
- Need for best available science
- Budget uncertainty
- When will enough be known to make decisions?
- Will others agree that decisions made are the best choices?

Situated GIS and 'middle spaces'

Knowledge

Legitimacy

History

Credit

Culture

Ownership

Practice

Publication

Society

Power

Technology

Data

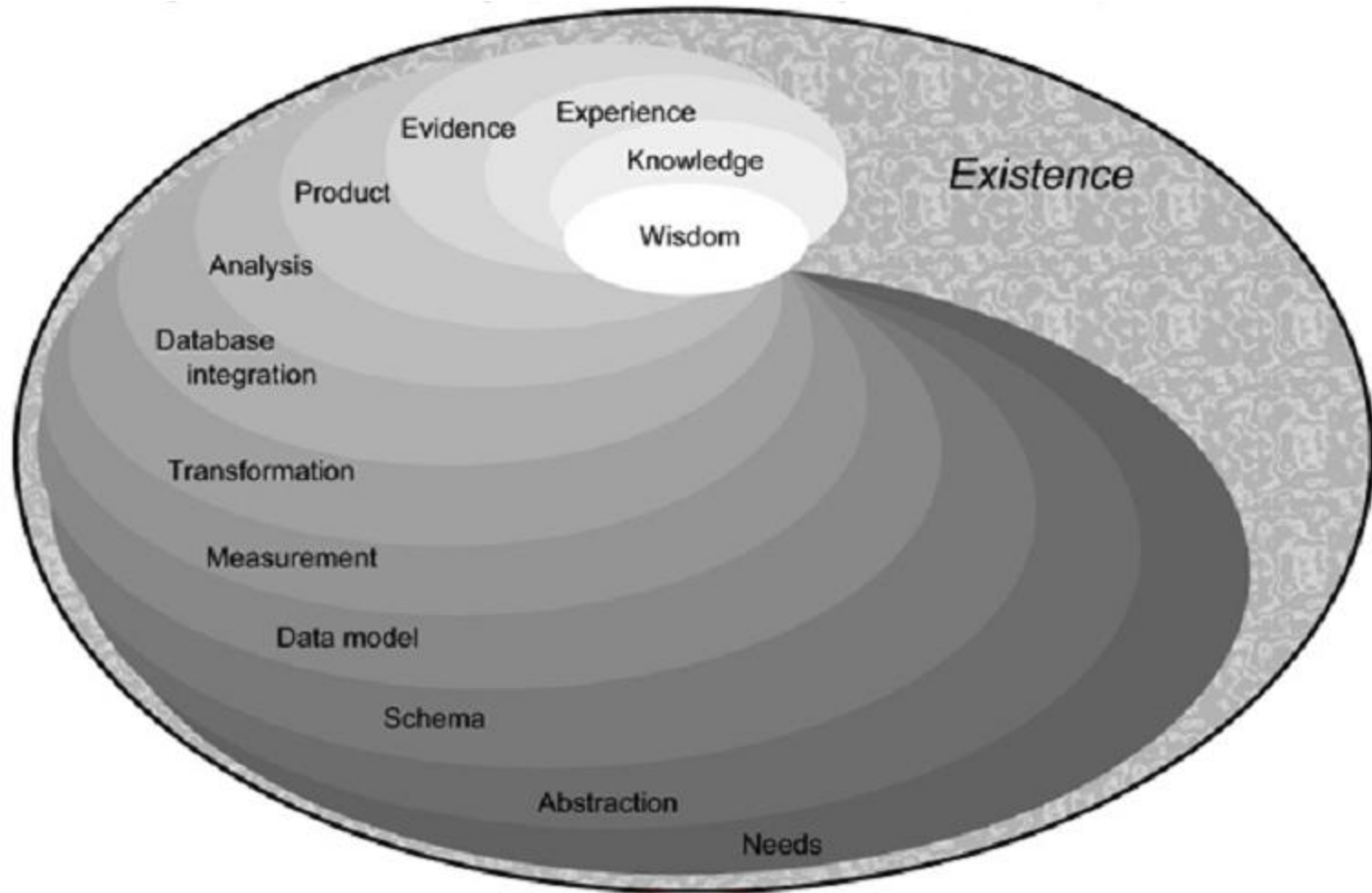
Conflict

Measurement

Funding

Metadata

The research subjects are situated Knowledge Production GIS (KPGIS):



‘Data Worlds’ conceptual framework - Part 1

Data Actor-Networks:

A heterogeneous collection of human, nonhuman and hybrid human/nonhuman actors participating in some collective activity for a period of time. (Latour, Callon, Law)

Almost everything GIS is connected to data like fly-paper. What’s stuck to the data?

Network intermediaries

- Any interaction that produces mutually influential negotiation among actors
- Interaction with intermediaries that exert ‘power at a distance’
- Popular favorites: Money, power, technology, ownership, practice, hierarchy, mandates, knowledge, technology and artifacts for example.

'Data Worlds' conceptual framework – Part 2

Social Worlds

...are loosely or rigid structured units in which people share resources and information. They are characterized by a commitment to common assumptions about what is important, and what should be done. (Clarke, Fujimura and Star)

People cluster around discourses that negotiate and share knowledge and facts. How does interaction create order?

What creates or inspires order?

- Bandwagons: Events or movements that require or inspire a response or choices that create common understanding and order among worlds.
- Mavericks: Entities, often people, who emerge or take action that suddenly changes the discourse.
- Knowledge as part of discourse
- Do-able problems

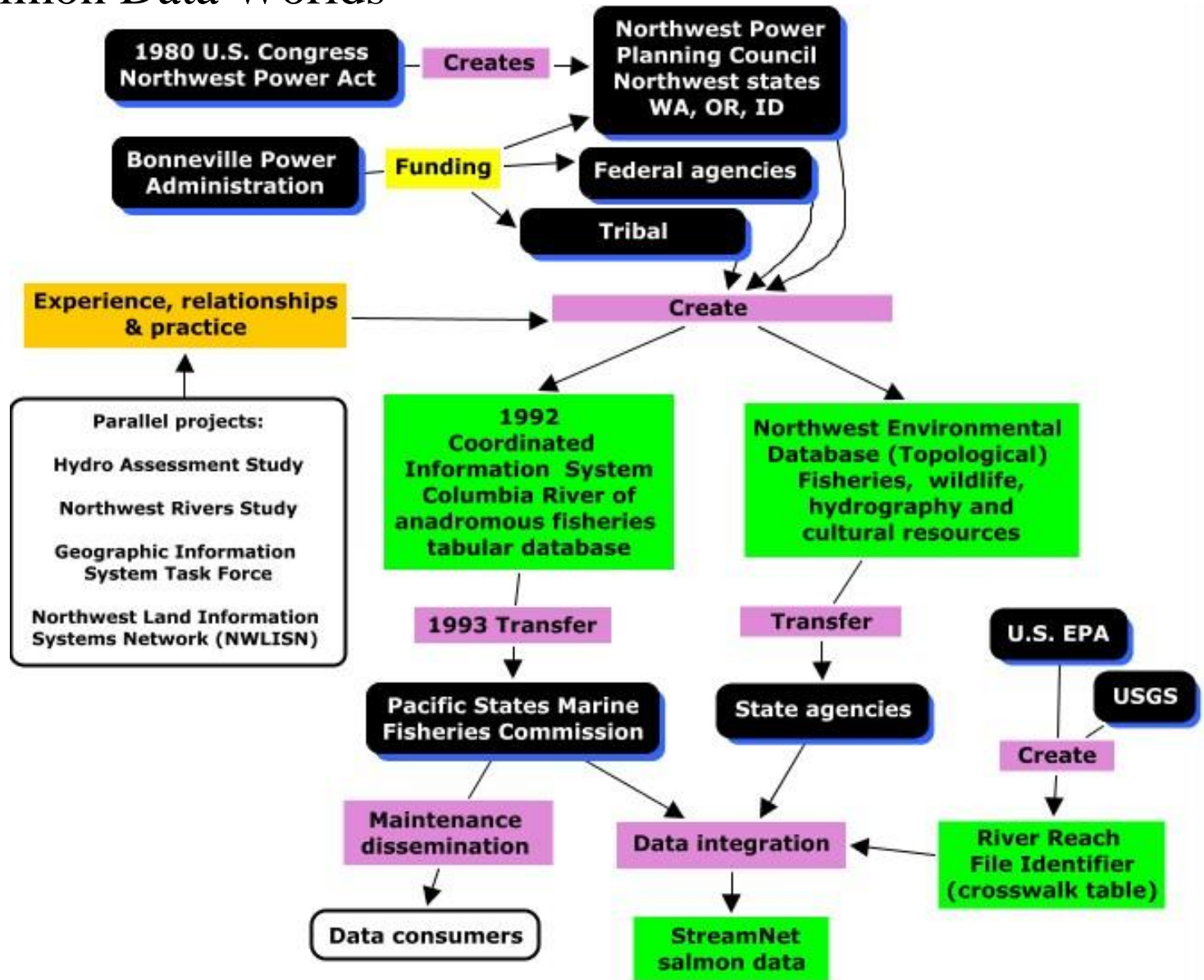
The PSP is a ‘do-able problem’ with a history

- 1985: Puget Sound Water Quality Authority
- 1996: Puget Sound Action Team and the
- 2002: Puget Sound Assessment and Monitoring Program
- 2005 Puget Sound Partnership
- 2008 PSP Action Agenda released

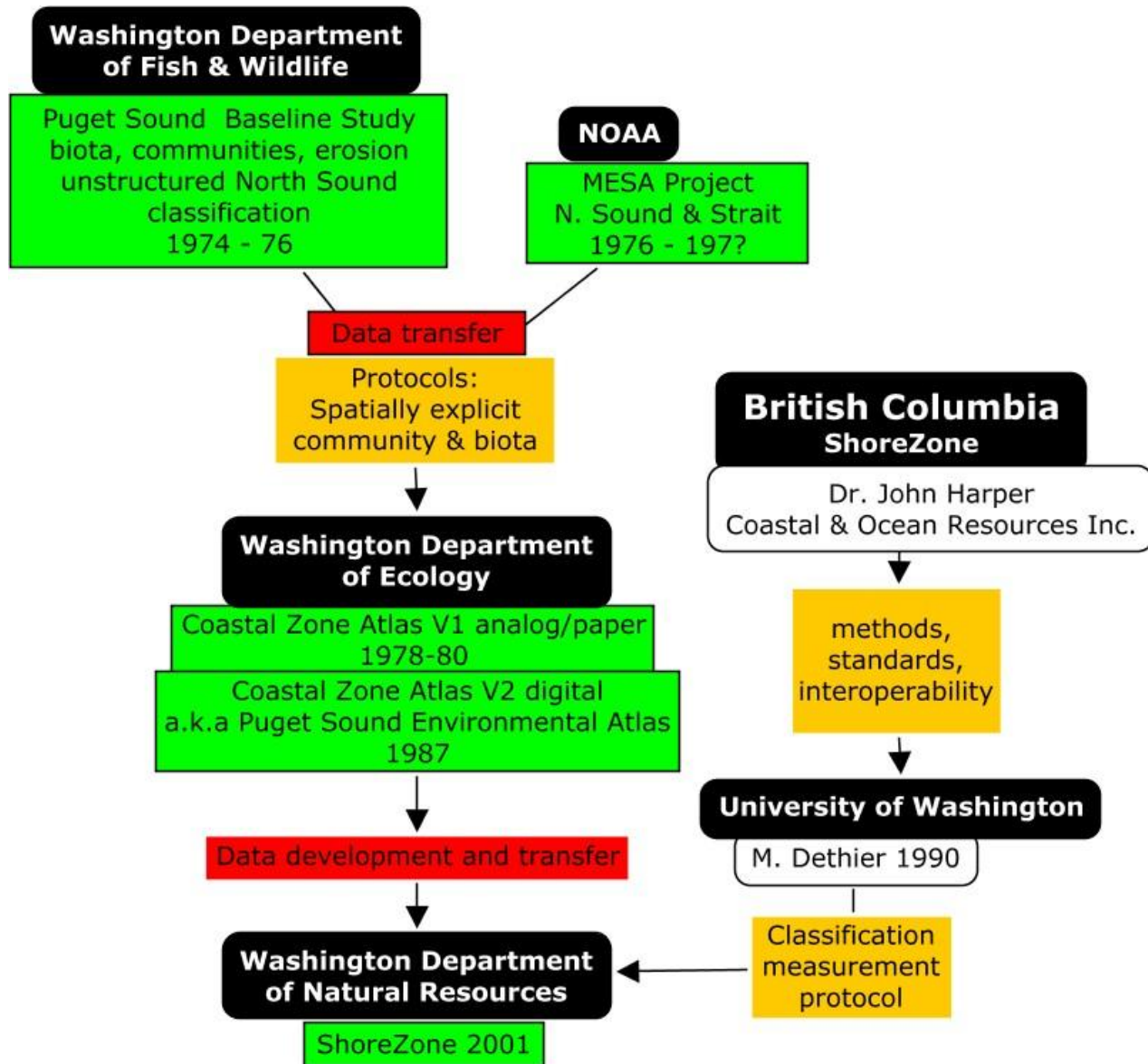
Pre-PSP bandwagon and maverick events

- 1850 Tribal treaties with the state
 - Reservations and half of the salmon harvest
- 1972 Salmon use of the nearshore is identified
- 1973 USEPA Endangered Species Act
- 1974 Judge Boldt Decision
 - Ratifies the Tribes' rights to salmon and management
- 1978 Coastal Zone Atlas published
- 1990s Drastic reduction of herring populations
- 1999 Salmon species are ESA listed

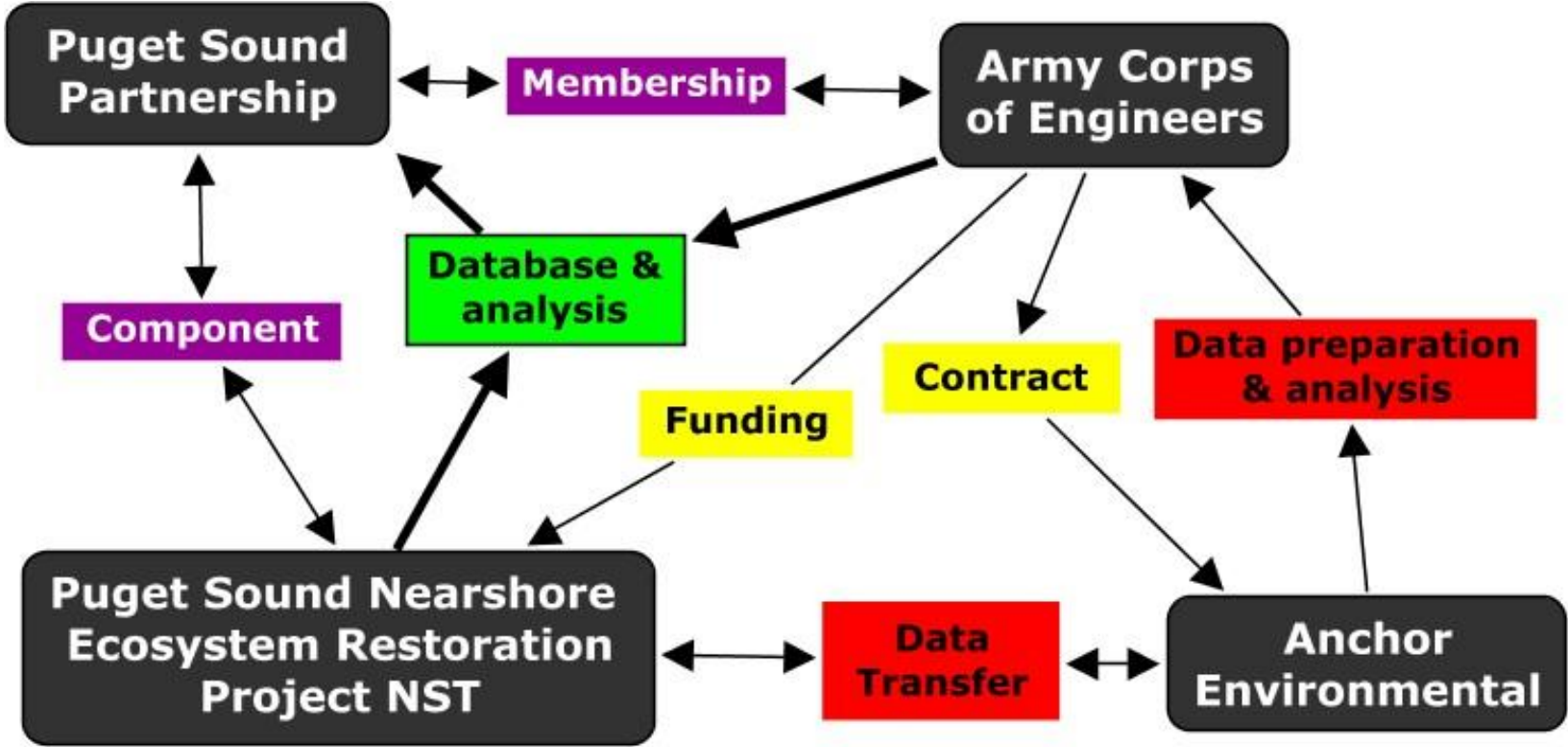
The first salmon Data Worlds



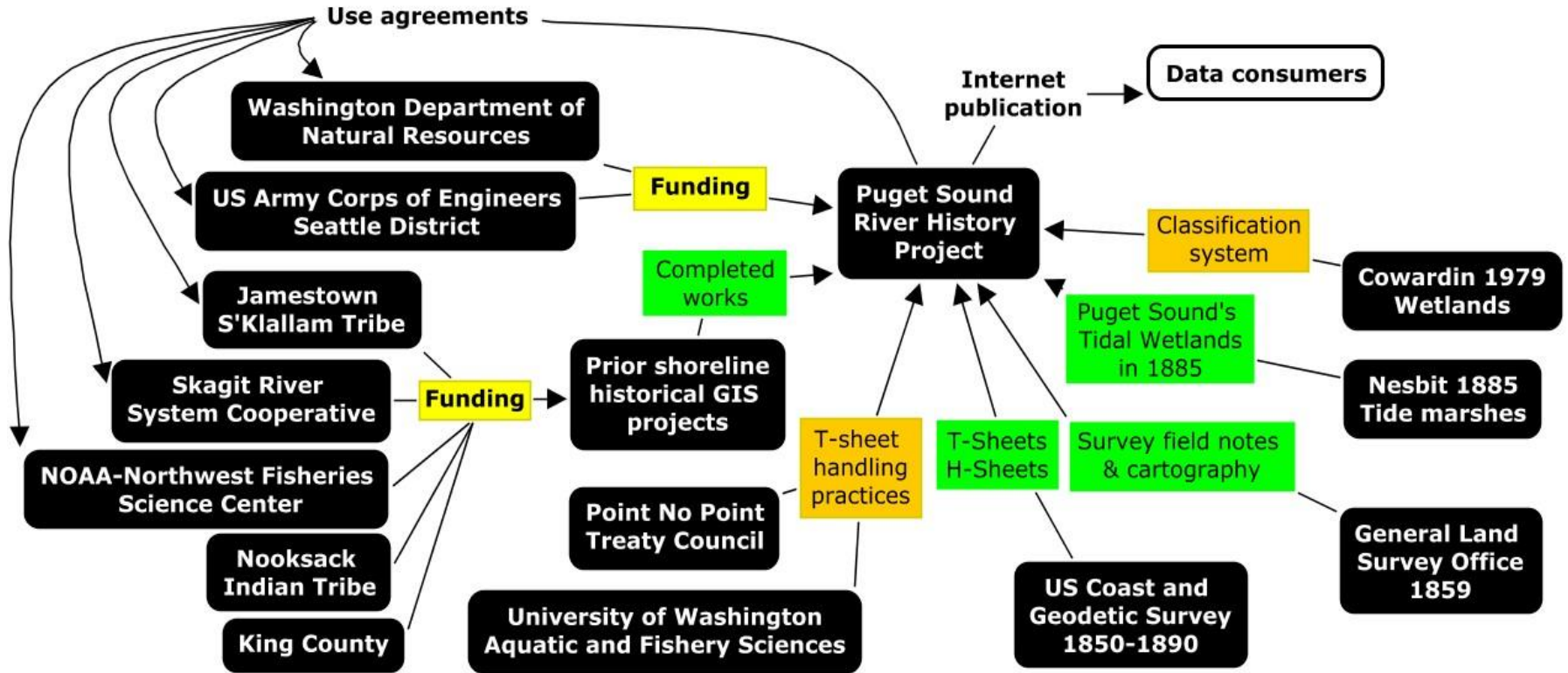
Coastal Zone Atlas Data Worlds 1974-2001



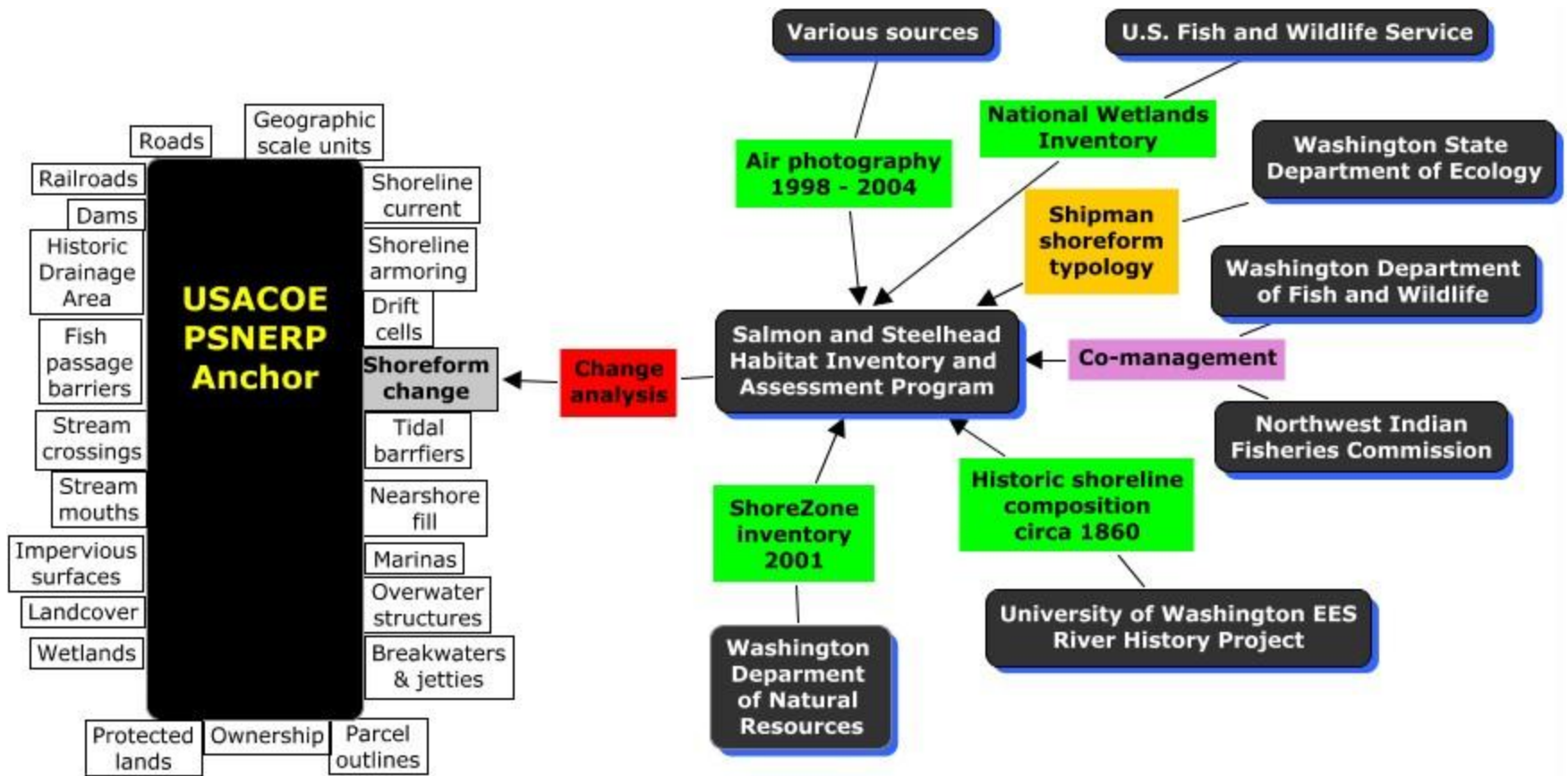
Change analysis project Data Worlds: top level



Puget Sound River History Project



Shoreform Change



Conclusions

- Multi-organizational decision environments are shaped by stabilized relationships with data and knowledge production
- These relationships are not captured in metadata or reportable by individual informants
- The result of a Data Worlds investigation could be valuable ‘training’ tool for examination of interorganizational relationships
- People new to a decision making environment will benefit from a Data Worlds investigation