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Response Tradeoffs

- People expect a lot from clean-up (response)
- But many are are reluctant to accept some options, especially use of:
  - Dispersants
  - Open water and shoreline burning

Response Options

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Why Does it Matter?

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Question

For Oil Spill Response Planning…How Can We Objectively Compare and Come to Consensus on Effectiveness, Effects and Benefits of Response Options?

One Answer:

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Consensus Ecological Risk Assessment

What is Consensus ERA?

- A consensus-building process using Risk Assessment as a Framework
- All trustees and responders working together in a facilitated workshop and focused on a specific scenario

Risk Assessment Process

- Hazard Assessment
- Exposure Assessment
- Estimate Actual Risks
- Risk Comparison, Communication and Management

ERA Step 1

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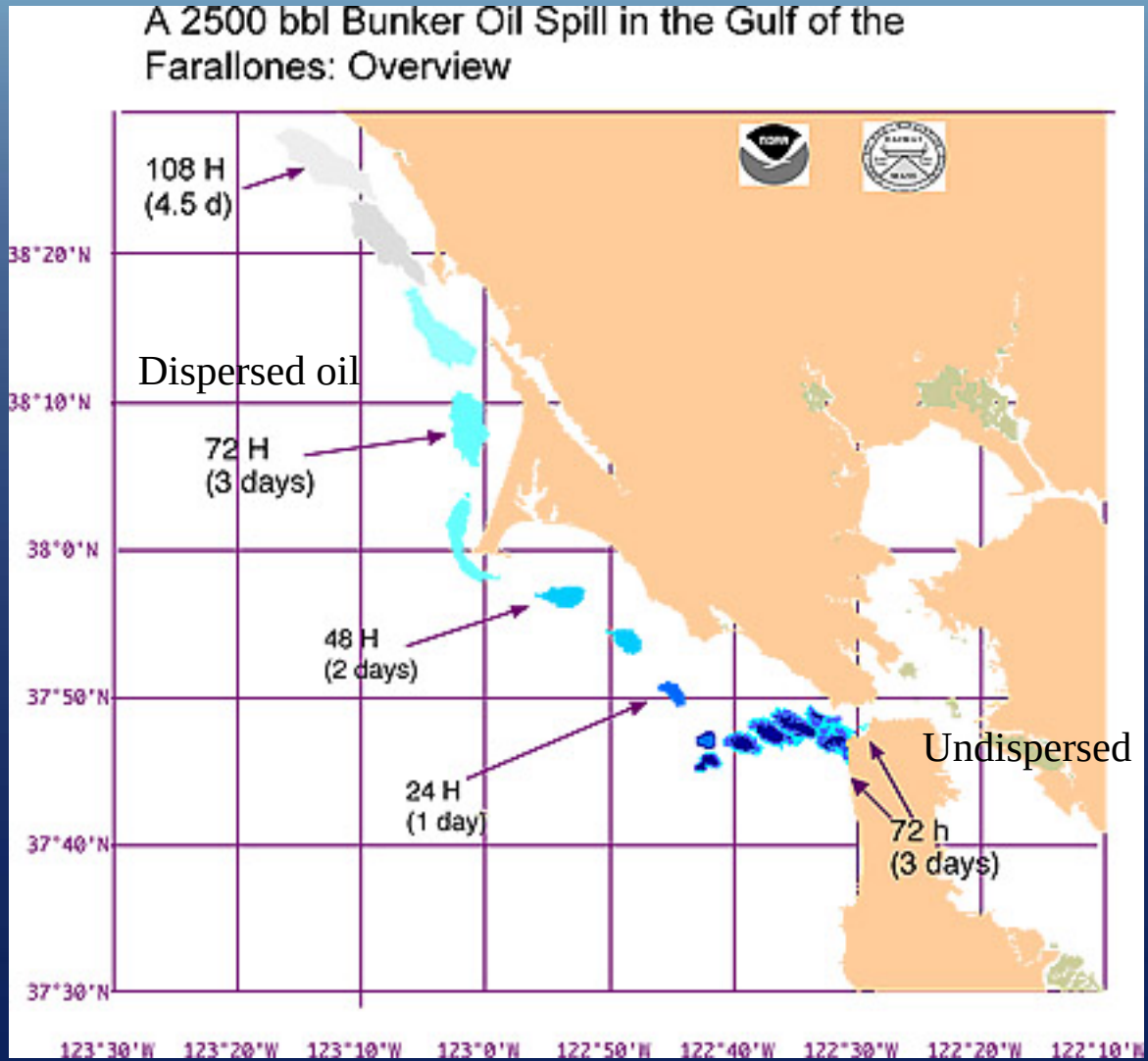
Develop a Scenario

- Amount and type of oil
- Response Options to Consider
- Spill time, season, and location
- Weather and sea state forecast
- Trajectory and time to beaching

A Scenario



Using modeling and scenario building to look at benefits and risks

ERA Step 2

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Quantify Response Options and their Effectiveness

- List all response options we wish to consider
- Agree on an EFFECTIVENESS of each response option for THIS scenario

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Typical Response Effectiveness for Coastal Oil Spills

- No Response (the base comparison) 0%
- Mechanical (Boom and skim) 10 to 25%*
- In Situ Burning 30%
- Dispersion, Low 35%
- Dispersion, High 80%
- Shoreline Clean Up 10 to 25%

* Now 80% in Prince William Sound. Alyaska, 2006

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Identify Additional Response Considerations

- Remoteness of site
- At sea storage capacity
- Waste generation and handling
- Impacts of vessel & aircraft activity
- Etc

ERA Step 3

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Identify Resources at Risk

- List all habitats in path(s) of the spill
- List Endangered and Threatened species in the path of the spill
- Build a matrix of all habitats and species of concern

Habitats

Terrestrial
Intertidal
- Rocky
- Boulder-cobble
- Sand beach
- salt marsh

Shallow Subtidal
- Eelgrass bed
- Coral reef

Benthic

Open Water
- Surface
- Upper Mixed Layer
- Below Mixed Layer

Species

- Deer
- River otter
- Snowy plover
- Lizard
- Pipping plover
- Bald eagle
- Mussels
- seaweeds
- Black abalone
- Softshell clam
- Razor clam
- Kelp bed
- Oyster beds
- Diving ducks
- Sea otter
- Wading birds
- Spartina marsh
- Forage fish
- Juvenile salmon
- Roseatte tern
- Sea turtles
- Crab, Lobster
- Sea cucumber
- Flounder
- Cod
- Rockfish
- halibut
- Fish farms

Develop A Risk Matrix

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Recovery Time

% of Population

	> 10 Years	5-10 Years	2-5 Years	< 1 Year
75-100%	1A	1B	1C	1D
50-75%	2A	2B	2C	2D
20-50%	3A	3B	3C	3D
<20%	4A	4B	4C	4D

ERA Step 4

For Each Response, estimate Injuries:

- Percent of Population or Habitat Injured
- Recovery Time of Injured Resource

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Do Nothing…

- Often imposed by environmental conditions, habitat, or nature of the oil spill

Portland, ME 10/06/96

07/23/97

Talk about who gets hurt and how much?

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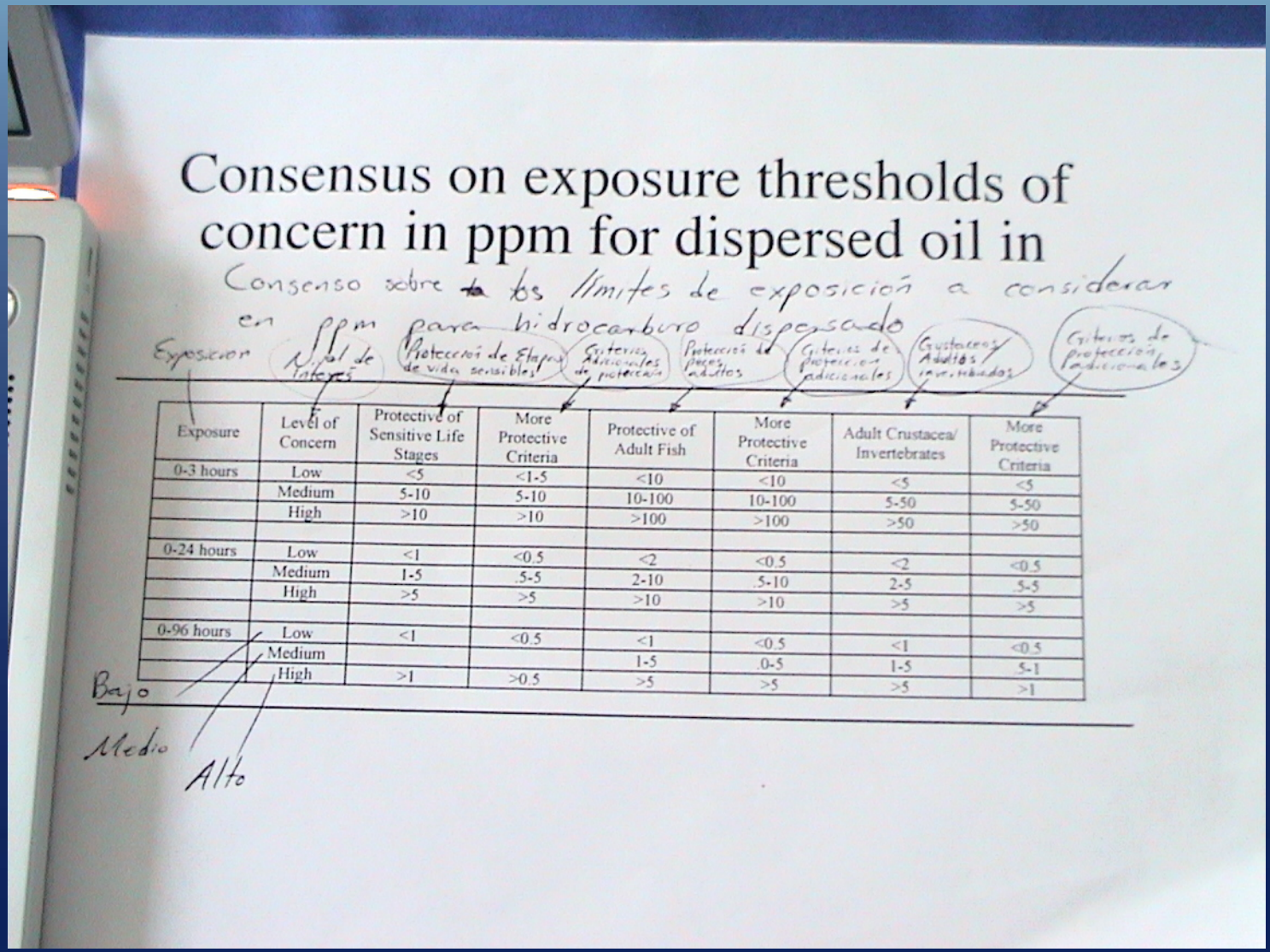

Consensus on exposure thresholds of concern in ppm for dispersed oil in

Consenso sobre los límites de exposición a considerar en ppm para hidrocarburo dispersado

Exposure	Level of Concern	Protective of Sensitive Life Stages	More Protective Criteria	Protective of Adult Fish	More Protective Criteria	Adult Crustacea/ Invertebrates	More Protective Criteria
0-3 hours	Low	<5	<1-5	<10	<10	<5	<5
	Medium	5-10	5-10	10-100	10-100	5-50	5-50
	High	>10	>10	>100	>100	>50	>50
0-24 hours	Low	<1	<0.5	<2	<0.5	<2	<0.5
	Medium	1-5	.5-5	2-10	.5-10	2-5	.5-5
	High	>5	>5	>10	>10	>5	>5
0-96 hours	Low	<1	<0.5	<1	<0.5	<1	<0.5
	Medium			1-5	.0-5	1-5	.5-1
	High	>1	>0.5	>5	>5	>5	>1

Bajo

Medio

Alto

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Resource Trusteess work through the matrix…

Hypothetical Outcome for One scenario and One Work Group

Response Option	Oyster catcher	Pink salmon	Pacific herring	Eel Grass
No Response	2A	3A	4C	4D
Mechanical 25% Effective	2B	3A	4C*	4D*
Dispersion 50% Effective	3B	4A	3B	4D
Burning 25% Effective	3B	4A	4C	4D

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Hypothetical Outcomes for Three Work Groups

Response Option	Sea Birds	Mangrove	Coral Reef	Sea Grass
No Response	2A, 1A, 2C	3A,3A,4A	4C, 1A,3C	4D,1A, 4D
Mechanical 25% Effective	2B,2B, 3B	3A, 3B,3B	4C*, 1C, 3D	4D*, 1C, 3D
Dispersion 50% Effective	3B, 2B 3C	4A,4A,4A	3B,1A, 1C	4D, 1A, 1C
Burning 25% Effective	3B	4A4B,4C	4C, 1C,3D	4D, 1C, 3D

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Why Do Group Scores Differ?

- "We disagreed on the number of sea birds in the path of the spill…"
- "We need to know more about the recovery rate of coral exposed to dispersed oil at these concentrations…"
- "We thought the skimmers would rip up the sea grass beds…"

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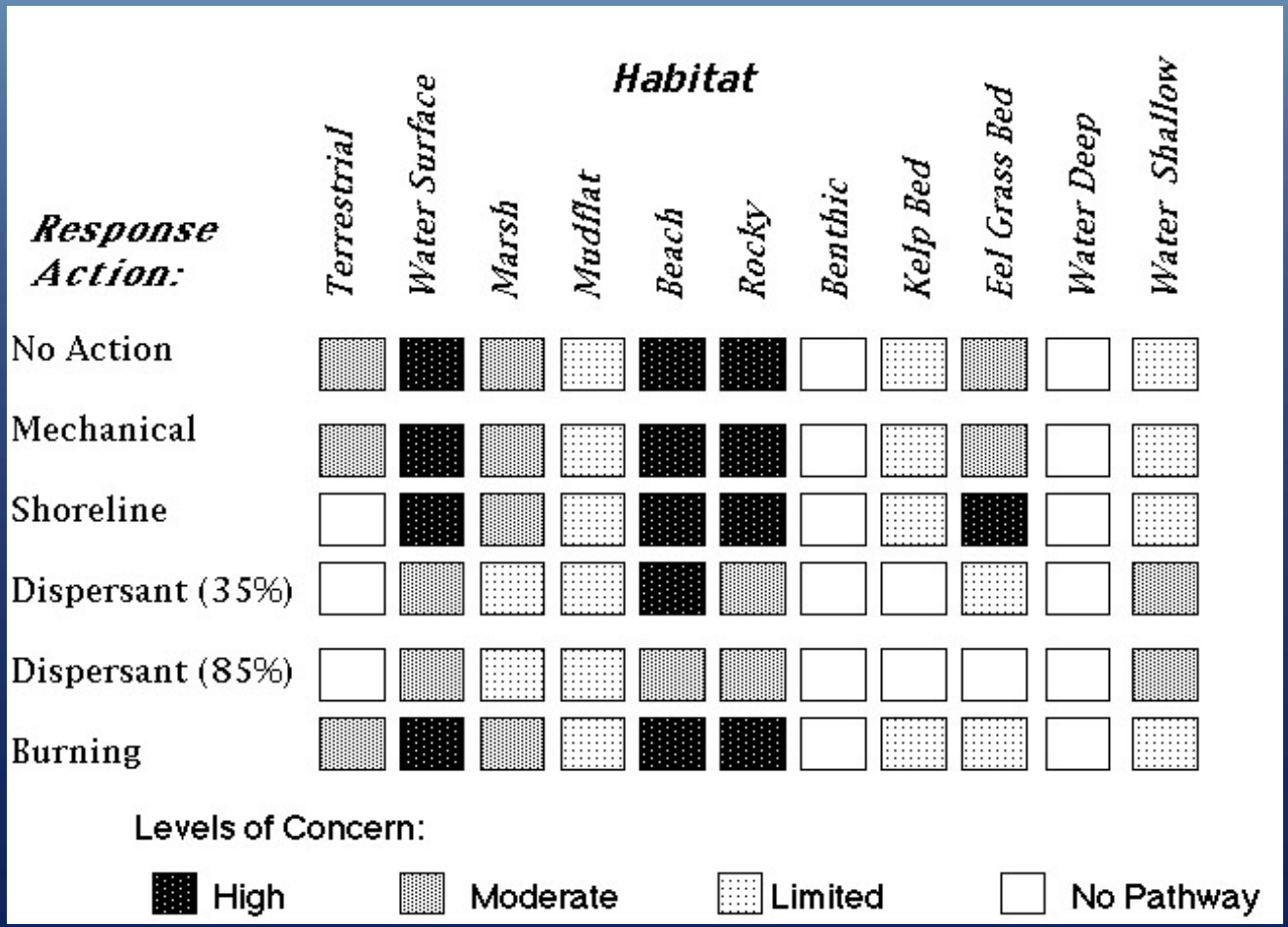
Compare Risks Among All Resources and Habitats



(this example is overly simplified)

Output and Outcomes of Consensus ERA

- Focuses on the Resources at Risk
- Compares Ecological recovery under 3 or more response strategies
- Better idea of Risk Reduction from each Response Option
- Reality check on Expectations in Spill response
- Input for Revising Response Plans
- Makes Uncertainties Explicit
- Provides Priorities for Research and Development

Locations of ERA's

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- Puget Sound (1998-2000)
- Galveston Bay (1999)
- San Francisco Bay (1999)
- Mississippi Sound (2000)
- Long Island Sound (2001)
- Santa Barbara Channel (2002)
- Chesapeake Bay (2002)
- Upper Florida Keys (2002)
- Upper Florida Keys (2002)
- Casco Bay, Maine (2003)
- Ensenada, BC Mexico (2003)
- Caribbean (Virgin Is) (2003)
- Upper Mississippi River (2004)
- Olympic Coast, WA (2005)
- Delaware Bay (2006)
- Alaska (none yet)

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So….
where do get data to estimate population-scale effects AND population recovery times?

Answer: Long-Term Case Histories

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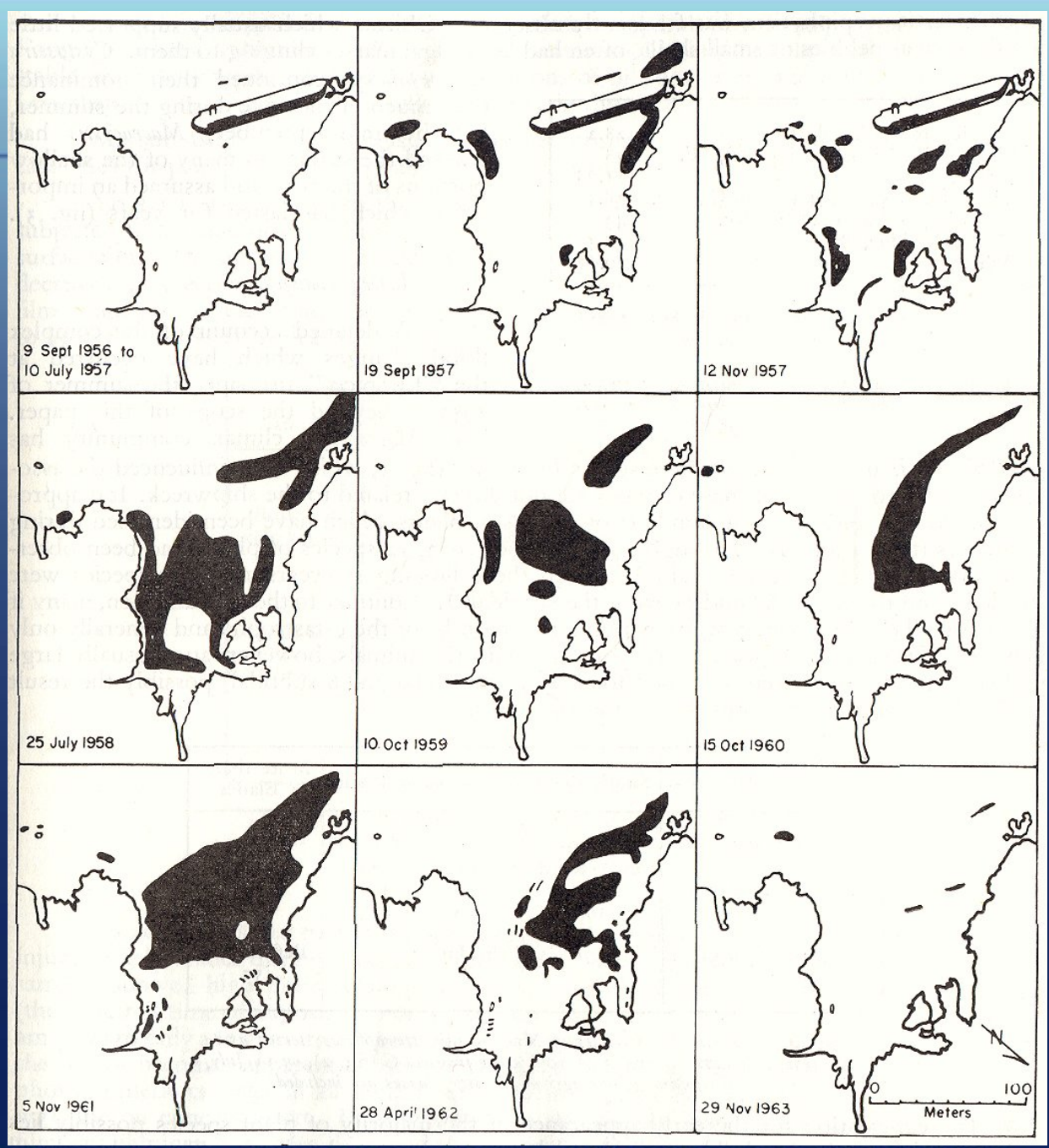
- March 29, 1957
- 31 20 59.5 N, 116 28 W

- Unocal Dark Diesel
- 59,000 bbls (2.48 m gal)
- Initial release: 800,000 gal
- Continued release-2 mos.
- No Clean up. No salvage
- **Biological monitoring, 23y**

Wheeler J. North Photo April 25, 1957

Time History of Kelp Canopy



Courtesy:
Wheeler J. North
(

Dr. North Passed Away Dec., 2002

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Spring, 1997
Port Townsend, WA

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ERA or NEBA?

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Net Environmental Benefit

The gains in environmental services or other ecological properties attained by actions, MINUS the environmental injuries caused by those actions.

Net Environmental Benefit Analysis

A methodology for RANKING the Net Environmental Benefits associated with MULTPLE management options.