Coastal Response Research Center

Amy Merten
NOAA Office or Response & Restoration

Aug 15-16, 2006

PAH Toxicity Summit I
Seattle, WA

Outline

- Overview of Coastal Response Research Center's missions and activities
- Highlight Agenda for PAH Toxicity Summit
- Current examples of PAH toxicity issues and NOAA management needs
- Provide examples of successful translation and synthesis of research, complex data sets, and expertise into tools or products
- Goals and Expectations for Next 2 days

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Center Creation

- OR&R/UNH oil spill partnership started in 2002
  - Competitive grants program with CICEET
- Coastal Response Research Center officially formed in 2004
- Co-Directors:
  - UNH – Nancy Kinner
  - NOAA –
    - Amy Merten
    - Carol-Ann Manen (Retired in March 2006)

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- Develop new approaches to spill response and restoration through research and synthesis of information ($2.8M 2002 – 2005)
  - 2006 RFP released May 15 ($1.2 M)
  - Emergency Response Funds
  - Connection to Marine Debris Response – NH Focus, National Impact, Supporting "Safe Seas"

- Serve as a resource for Office of Response & Restoration and across NOAA
  - NOAA Liaisons
  - NOAA PAH Toxicity Summit, Aug 15-16, Seattle, WA
  - Fall Workshop – Integrating Physical and Toxicological models to improve spill response, Sept 26 – 28, Durham, NH
  - OR&R Special Projects (Mini-Sabbaticals)

- Serve as a hub for spill research, development, and technical transfer – Oil spill community (e.g., regional response teams (RRTs), industry, states)
  - Dispersed Oil R&D workshop and report
  - Human Dimensions of Oil Spill Response (Jun 13-15, 2006)
  - Oil-in-Ice Experiments/IPY – Direct funding to NOAA

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Center Appropriation

- Center funded by annual Congressional appropriation
  - Senator Gregg (NH)
  - 2002 Congressional appropriation = $0.5M
  - 2003 Congressional appropriation = $0.75M
- 2004 and 2005 $2M annually appropriated

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Translating R&D into Action -- Evolving Process

Major Emphasis and Unique Aspect of Center

- Established NOAA Toxicity Working Group
- NOAA liaisons for new projects
- NOAA Fall Institute

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Translating R&D – NOAA Toxicity Working Group

- Participants: OR&R, North West Fisheries Science Center and Auke Bay Fisheries Science Center
- Synthesis of Center-funded research
  - 3 approaches to modeling PAH toxicity
  - Toxicity studies on different trophic levels
  - Sophisticated chemical analyses
- Identification of products useful for field
- Identification of remaining gaps:
  - Answer how responsive Center has been to:
    - NOAA
    - NAS Dispersant Study
    - Oil Spill Response Community

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Polycyclic Aromatic Hydrocarbons

NOAA Management Issues

- Short & Long term effects of PAHs on aquatic species due to oil spills
- Sediment Evaluation Framework – WA State
- Dredging-related issues – San Francisco Bay
- Storm-water runoff impacts – Puget Sound Watershed
- Creosote leaching from submerged pilings
- Chronic sediment contamination cleanup and restoration decisions
- Multiple stressors: climate change, other contaminants, multiple sources, habitat squeeze, etc.

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Agenda – Day 1

- **Conceptual Example: How NOAA uses existing complex data to interpret and predict impacts to natural resources from spills ~ Alan Mearns**

- **New Methods for Assessing PAH Exposure & Effects**
  - **Exposure regimes for assessing dispersant and dispersed oil effects on *Cnidarian* spp. ~ Carys Mitchelmore**
  - **Compound-specific toxicities and new tools for elucidating multiple mechanisms using a model species, *Danio rerio* ~ John Incardona**
  - **Acute and chronic effects of crude and dispersed oil on Chinook salmon smolts – use of metabolomic endpoints ~ Ching-Yu Lin**
  - **Integrating multiple endpoints for understanding individual and population effects on sensitive species ~ Carys Mitchelmore**

- **Synthesis Discussion: Using research results into application**

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Agenda Day 2

- **Modeling Effects of PAHs – Ecotoxicology**
  - **Correlating fish growth to dietary exposures of mixtures ~ Jim Meador**
  - **Oil in the environment; development of new study tools ~ Mark Carls**
  - **Impacts of low levels of residual oils on toxicity assessment of oil spills ~ Joy McGrath**
  - **Survival time models to quantitatively predict lethal effects to grass shrimp: pulsed and different duration exposures from spilt oil ~ Michael Unger**
  - **Utility of meiobenthos for risk assessment of low-level crude oil WAFs: rapid copepod-based approaches for evaluating reproductive and population-level toxicity ~ Tom Chandler**

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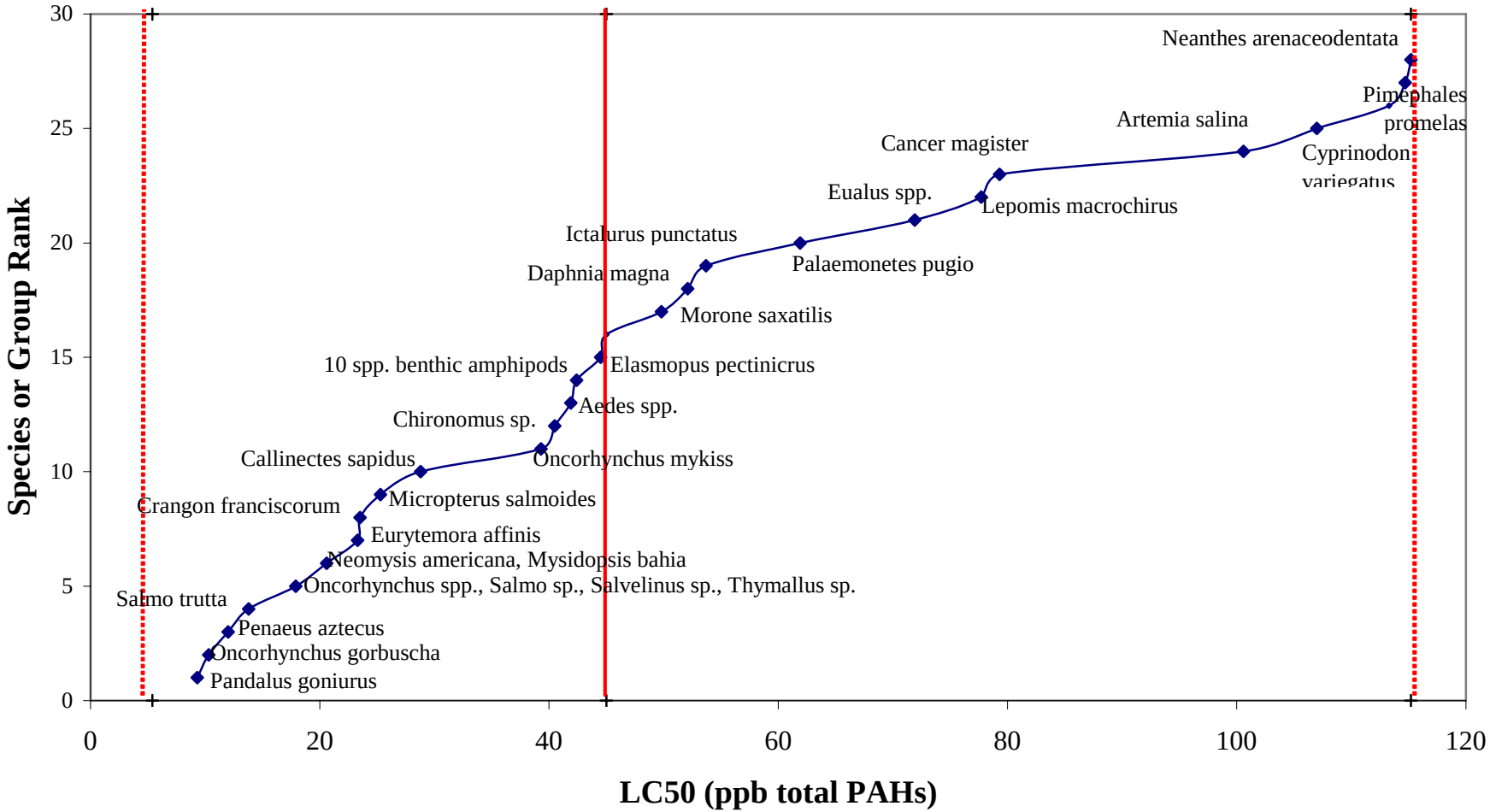
Synthesis Objectives

- Identify areas where data gaps have been filled through collective research
- Identify gaps that remain
- Delineate methods for translating research results to application
- Outline potential products
- Discuss strategies for implementation
  - Workgroups? Contracts? Databases? Manuscripts?

Species Sensitivity Ranking -- PAHs in Crudes and Fuel Oils

Vertical Red Lines are Geometric Mean and Range for 95% of Species

(French McCay, 2002)



Managing Seafood Safety after an Oil Spill

Ruth Yender
Office of Response and Restoration
National Oceanic and Atmospheric Administration
Seattle, Washington

Jacqueline Michel and Christine Lord
Research Planning, Inc.
Columbia, South Carolina

National Oceanic and Atmospheric Administration • NOAA's National Ocean Service • Office of Response and Restoration

Shoreline Assessment Job Aid

National Oceanic and Atmospheric Administration • NOAA Ocean Service

Office of Response and Restoration • Hazardous Materials Response Division

Shoreline Assessment Manual

Third Edition

Office of Response and Restoration

Hazardous Materials Response Division

National Ocean Service

National Oceanic and Atmospheric Administration

7600 Sand Point Way NE

Seattle, Washington 98115

HAZMAT Report No. 2000-1 • August 2000

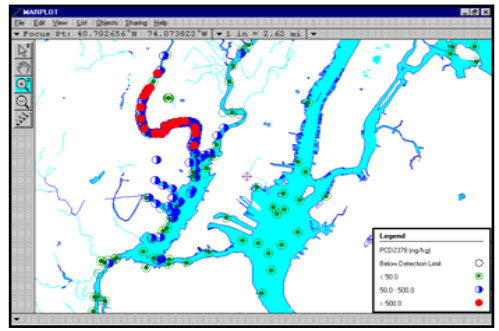
Major Components of CPRD Watershed Projects

- Query Manager Database-Mapping application
- ArcView Watershed GIS Project and Custom Tools
- Watershed Project Webguide

Query Manager Application

- Based on standard relational database structure
- Menu of flexible, built-in database queries to facilitate
  - Data integration and management
  - Data exploration
  - Data delivery/export
  - Data sharing

Query Manager 2.61



- Query Manager Database-Mapping application
  - Self-contained run-time application (free, no software required)
  - Standardized watershed databases include studies from a variety of sources
  - Menu of standard flexible queries for evaluation of sediment (surface and subsurface) chemistry, tissue chemistry, and sediment toxicity
  - Effect models: dioxin toxic equivalency (TEQ), PAH toxic unit, logistic regression model probability of toxicity
  - Application and Databases Downloadable from CPRD web site: http://response.restoration.noaa.gov/cpr/watershed.html

Query Manager Risk Models

- PAH toxic unit models
  - EPA Equilibrium partitioning model based on 13 individual PAHs (DiToro & McGrath 2000; Swartz et al. 1995)
- Dioxin toxic equivalency (TEQ) model
  - Calculates TEQs based on tissue concentrations of dioxin, dibenzofuran, and PCB congeners for birds, fish and mammals
- Logistic regression probability of toxicity
  - Mixture model predicts the probability of toxicity (proportion of samples expected to be toxic) from sediment chemistry based on 37 individual chemical models (Field et al. 2002)

Synthesis Objectives

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For More Information:
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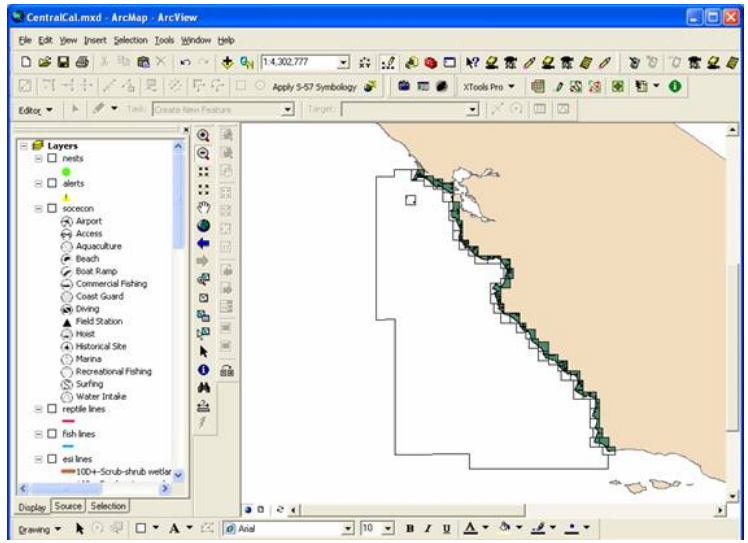
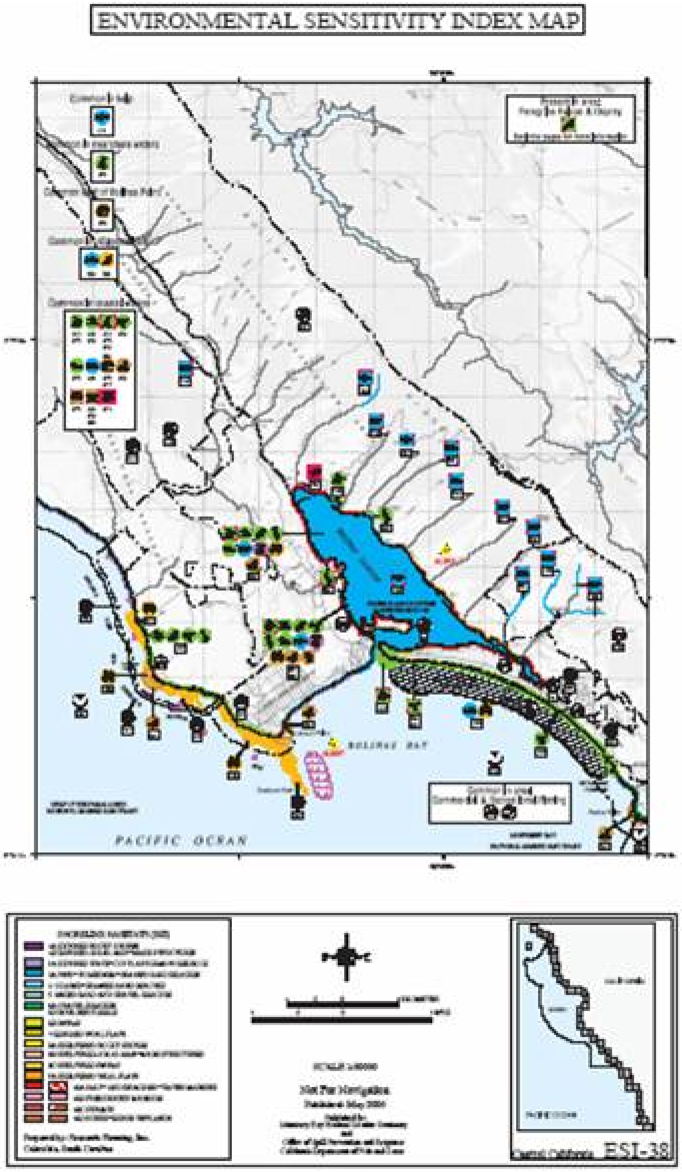
Environmental Sensitivity Index Maps

- Designed to identify vulnerable coastal locations before a spill happens, so that protection priorities can be established and cleanup strategies identified
- ESI maps serve as quick references for oil and chemical spill responders and coastal zone managers.
  - ***Shorelines*** *are ranked based on their physical and biological character, then color-coded to indicate their sensitivity to oiling.*
  - *Sensitive* ***biological resources****, such as seabird colonies and marine mammal hauling grounds, are depicted by shaded polygons and symbol icons to convey their location and extent on the maps.*
  - *ESI maps also show sensitive* ***human-use resources****, such as water intakes, marinas, and swimming beaches.*

- Designed in coordination with local resource experts
- Provide a list of the various species at risk within a divisional boundary





Central California: ESIMAP 38

BIOLOGICAL RESOURCES:

BIRD:

FISH:

HABITAT:

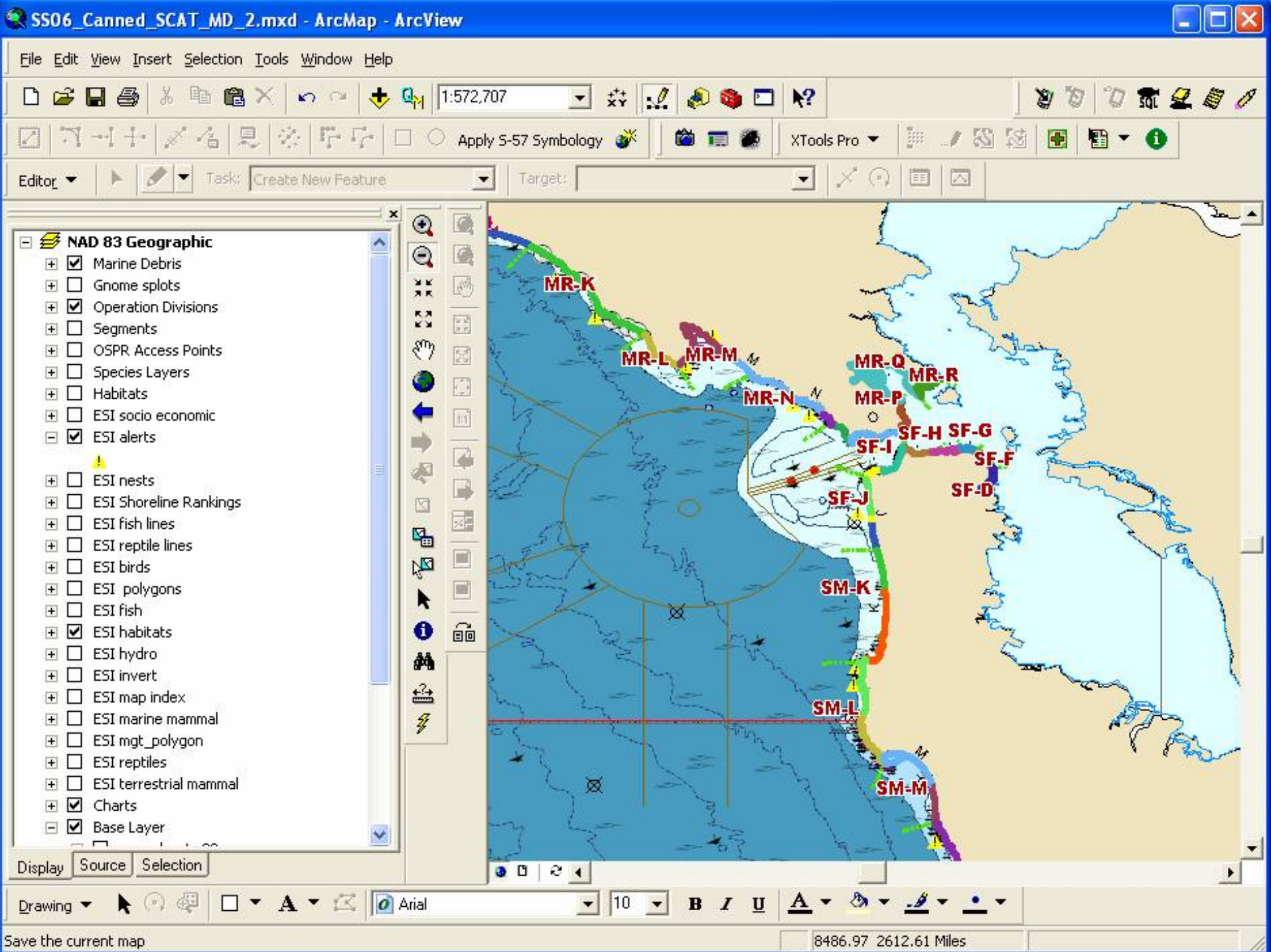
INVERTEBRATE:

MARINE MAMMAL:

Biological information shown on the maps represents known concentration areas or occurrences, but does not necessarily represent the full distribution or range of each species. This is particularly important to recognize when considering potential impacts to protected species.

BIRD:

RAR#	Species	S	F	Conc.	J	F	M	A	M	J	J	A	S	O	N	D	Nesting	Migrating	Molting
316	Western snowy plover		T	MEDIUM	X	X	X	X			X	X	X	X	X	X	-	-	-
317	Shorebirds				X	X	X	X	X		X	X	X	X	X	X	-	-	-
318	Brandt's cormorant			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
	Brown pelican	E	E	17-5000 INDIV.	X	X	X	X	X	X	X	X	X	X	X	X	-	JUL-NOV	-
	Dabbling ducks				X	X	X	X	X			X	X	X	X	X	-	SEP-MAR	-
	Diving birds				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
	Diving ducks			HIGH	X	X	X	X	X			X	X	X	X	X	-	SEP-MAY	-
	Gulls				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
	Osprey				X	X	X	X	X	X	X	X	X	X	X	X	-	FEB-JUL	-
	Raptors				X	X	X	X	X	X	X	X	X	X	X	X	-	AUG-NOV	-
	Wading birds			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
324	California black rail	T			X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUN	-	-
325	Gulls				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
	Raptors				X	X	X	X	X	X	X	X	X	X	X	X	-	AUG-NOV	-
	Shorebirds				X	X	X	X	X		X	X	X	X	X	X	-	-	-
	Wading birds				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
327	Brown pelican	E	E		X	X	X	X	X	X	X	X	X	X	X	X	-	JUL-NOV	-
328	Shorebirds				X	X	X	X	X		X	X	X	X	X	X	-	-	-
329	Wading birds			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	FEB-AUG	-	-
330	Double-crested cormorant			1 INDIV.	X	X	X	X	X			X	X	X	X		-	-	-
413	Diving birds			15000 INDIV.		X	X	X	X	X	X						FEB-AUG	-	-
	Gulls			20000 INDIV.		X	X	X	X	X	X						FEB-AUG	-	-
	Seabirds			300000 INDIV.		X	X	X	X	X	X						FEB-AUG	-	-
673	Cassin's auklet			LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
	Clark's grebe			MODERATE	X	X	X	X				X	X	X	X		-	MAR-APR SEP-NOV	-
	Common murre			MODERATE	X	X	X	X	X	X	X	X	X	X	X	X	-	-	JUL-SEP
	Cormorants			MODERATE	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
	Eared grebe			LOW	X	X	X	X				X	X	X	X		-	MAR-APR SEP-OCT	-
	Gulls			MODERATE	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
	Horned grebe			LOW	X	X	X	X				X	X	X	X		-	OCT-APR	-
	Pacific loon			MODERATE	X	X	X	X	X				X	X	X		-	OCT-MAY	-
	Pelicans			MODERATE			X	X	X	X	X	X	X	X	X	X	-	JUL-NOV	-
	Phalaropes			LOW	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
	Pigeon guillemot			LOW		X	X	X	X	X	X	X	X				-	-	-
	Rhinoceros auklet			MODERATE	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
	Shearwaters			LOW-HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
	Surf scoter			MODERATE	X	X	X	X				X	X	X	X		-	MAR-APR SEP-DEC	-
	Western grebe			MODERATE	X	X	X	X				X	X	X	X		-	MAR-APR SEP-NOV	-
	White-winged scoter			MODERATE	X	X	X	X					X	X	X		-	MAR-APR	-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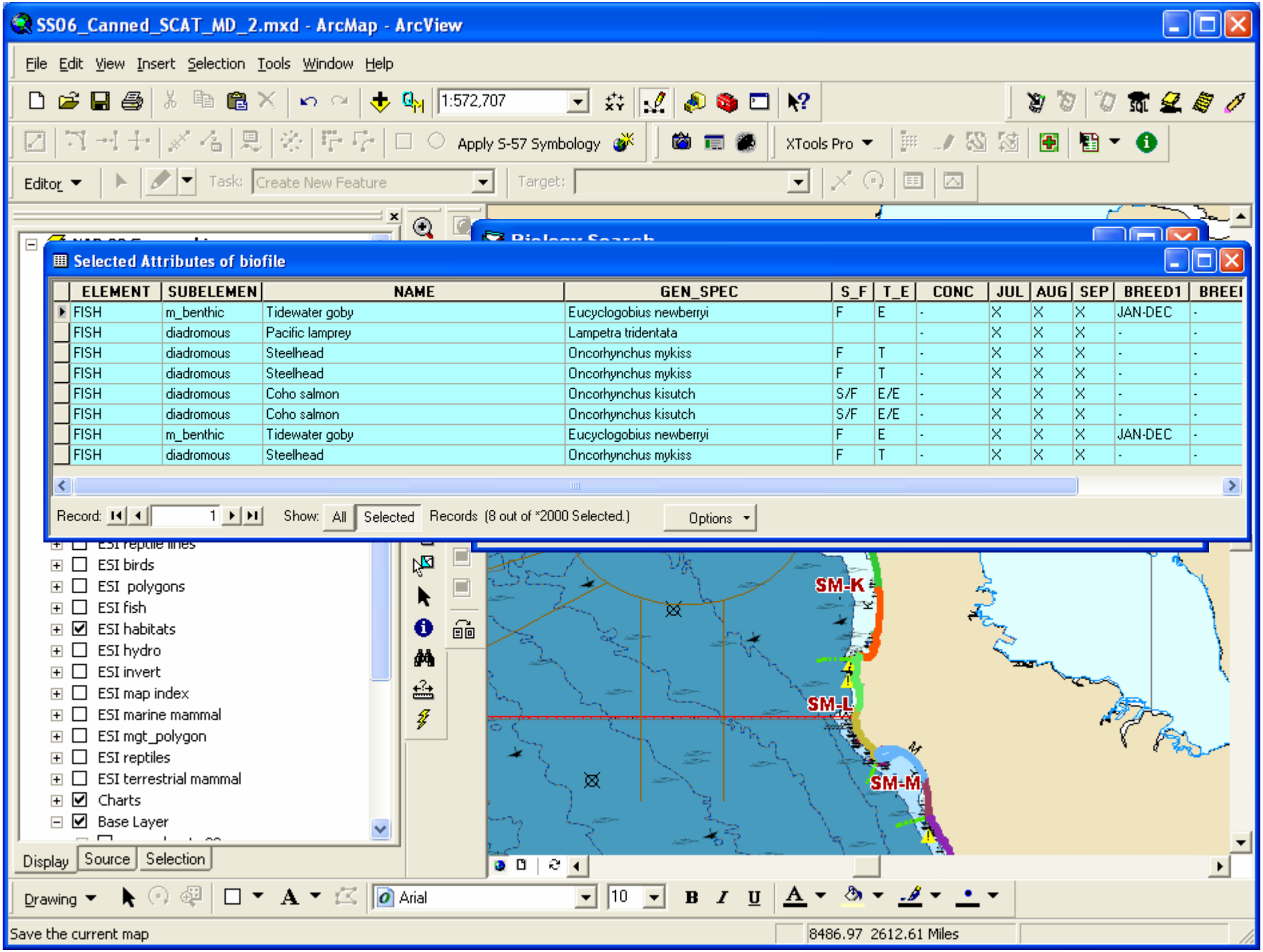
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