Use of Trajectory Modeling To Analyze Variations On the Response Strategies for Inland Spills

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Key Response Questions

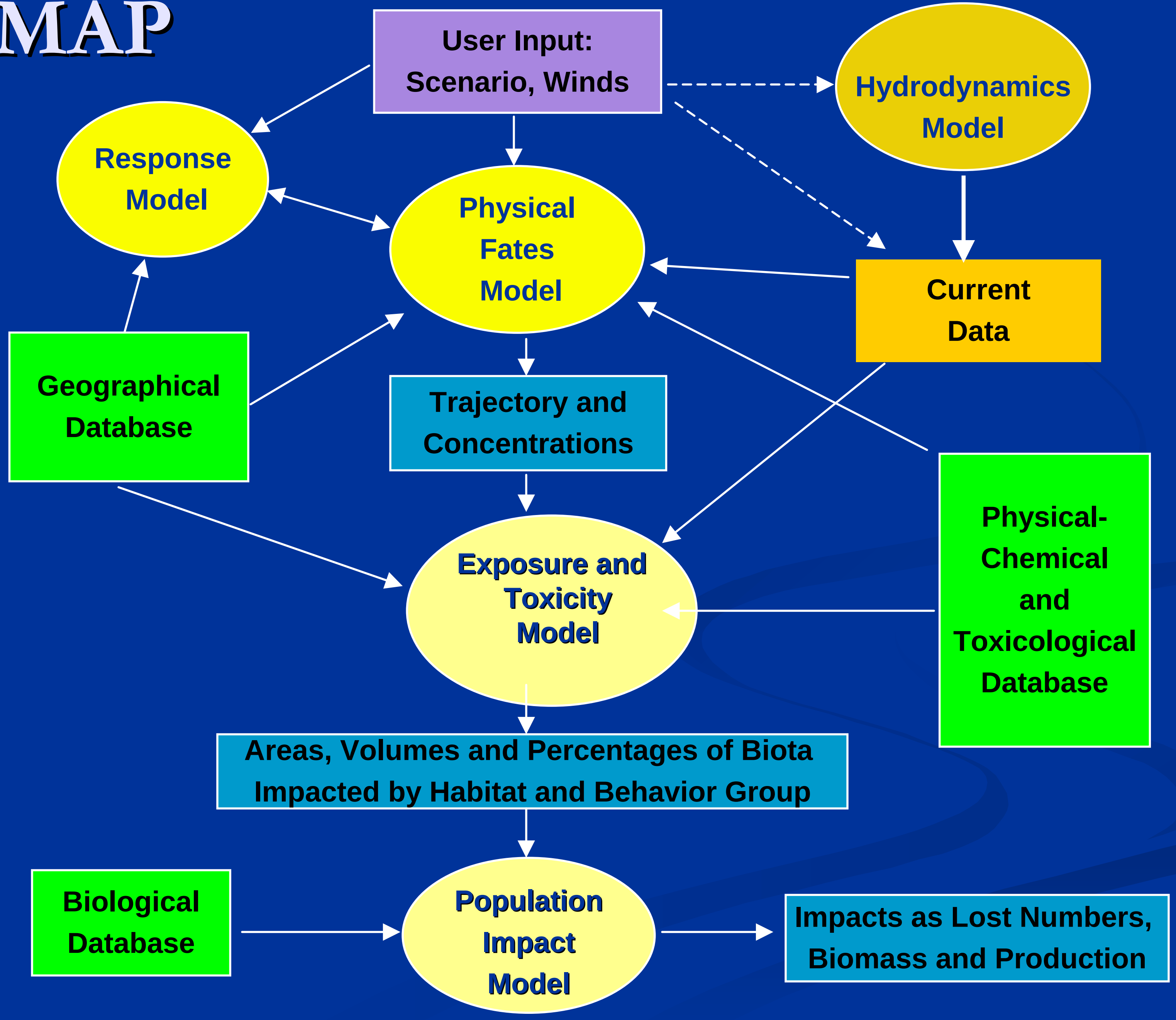
- How can we maximize effectiveness of oil removal operations for specific types of spill situations in inland areas?
- How might the outcomes have been different with a variation on the response employed?
- What is the optimal response strategy for a particular location and situation?
- How can we better train responders to think strategically to minimize spill impacts when there are fewer real spills?

One approach:

SIMAP

- ASA developed Natural Resource Damage Assessment Models for CERCLA and OPA NRDA Regulations (1984-1996)
- ASA has continued development as SIMAP (Spill Impact Model Application Package)

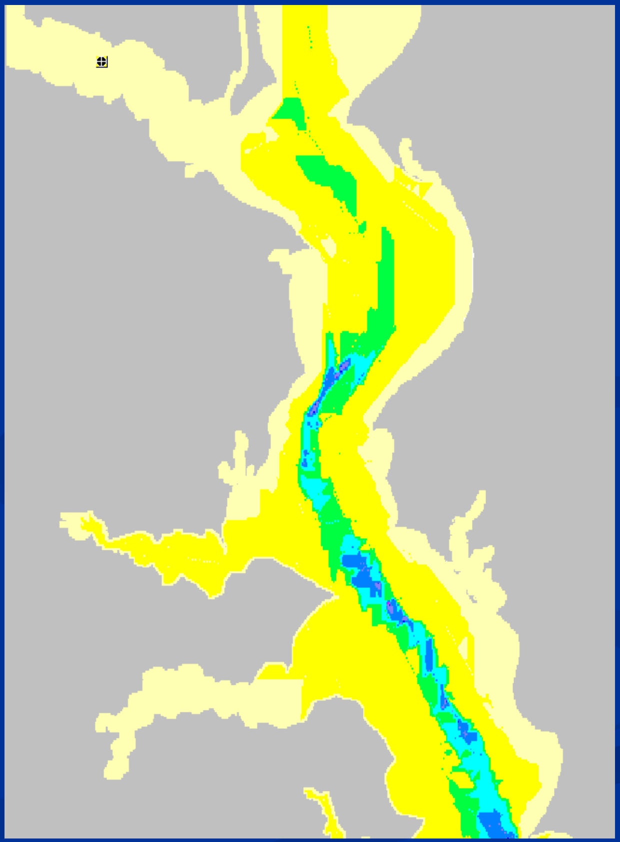
SIMAP

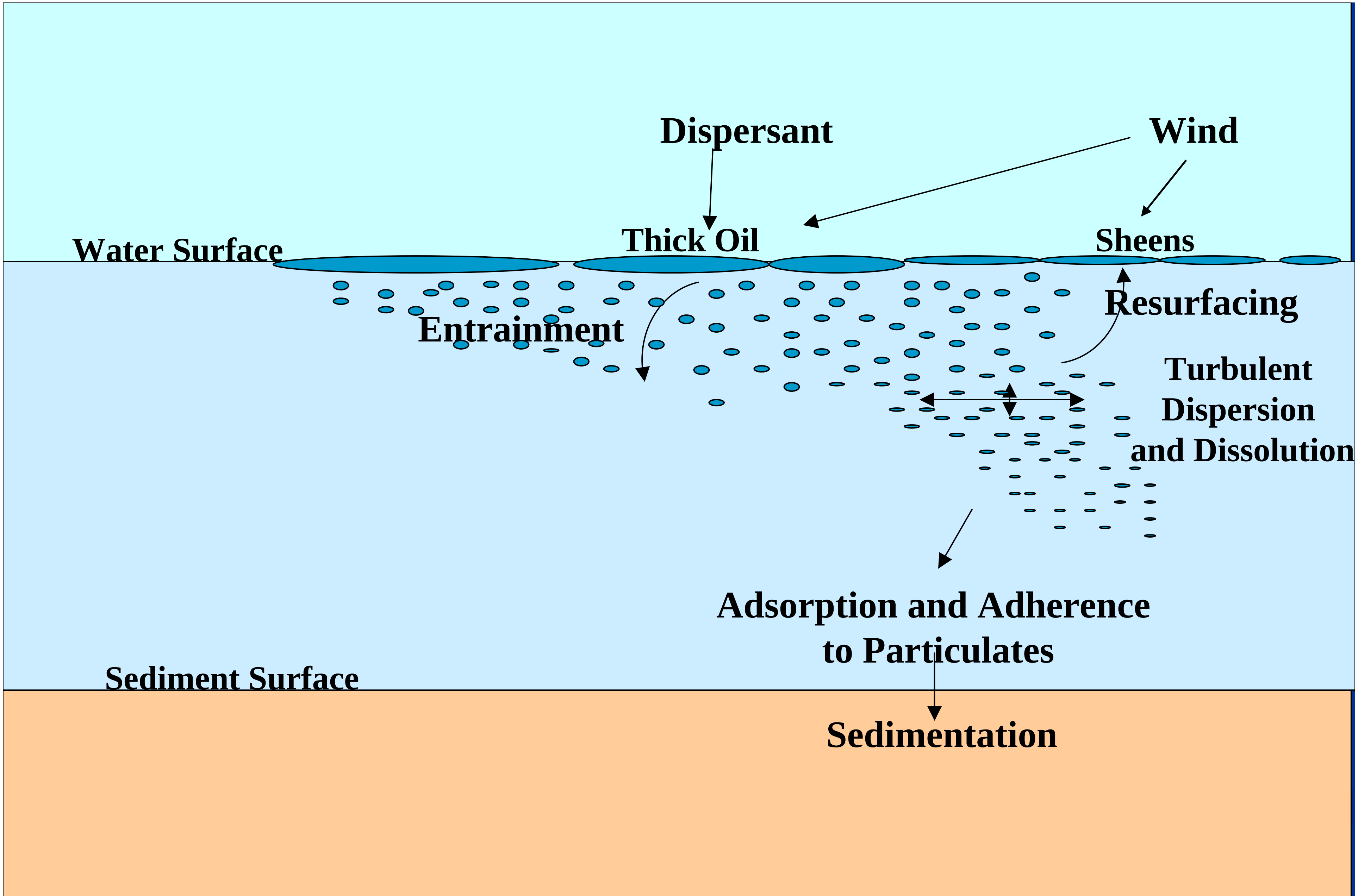

User Input: Scenario, Winds
Hydrodynamics Model
Response Model
Physical Fates Model
Current Data
Geographical Database
Trajectory and Concentrations
Physical-Chemical and Toxicological Database
Exposure and Toxicity Model
Areas, Volumes and Percentages of Biota Impacted by Habitat and Behavior Group
Biological Database
Population Impact Model
Impacts as Lost Numbers, Biomass and Production

Scenario Specifications

User-specified or based on actual historic spill

- Date, time, duration
- Location
- Fuel/oil type and characteristics
- Amount
- Environmental conditions
  - Winds
  - Currents
  - Temperature
  - Salinity
- Geographical data
  - Shoreline and habitat type
  - Depth



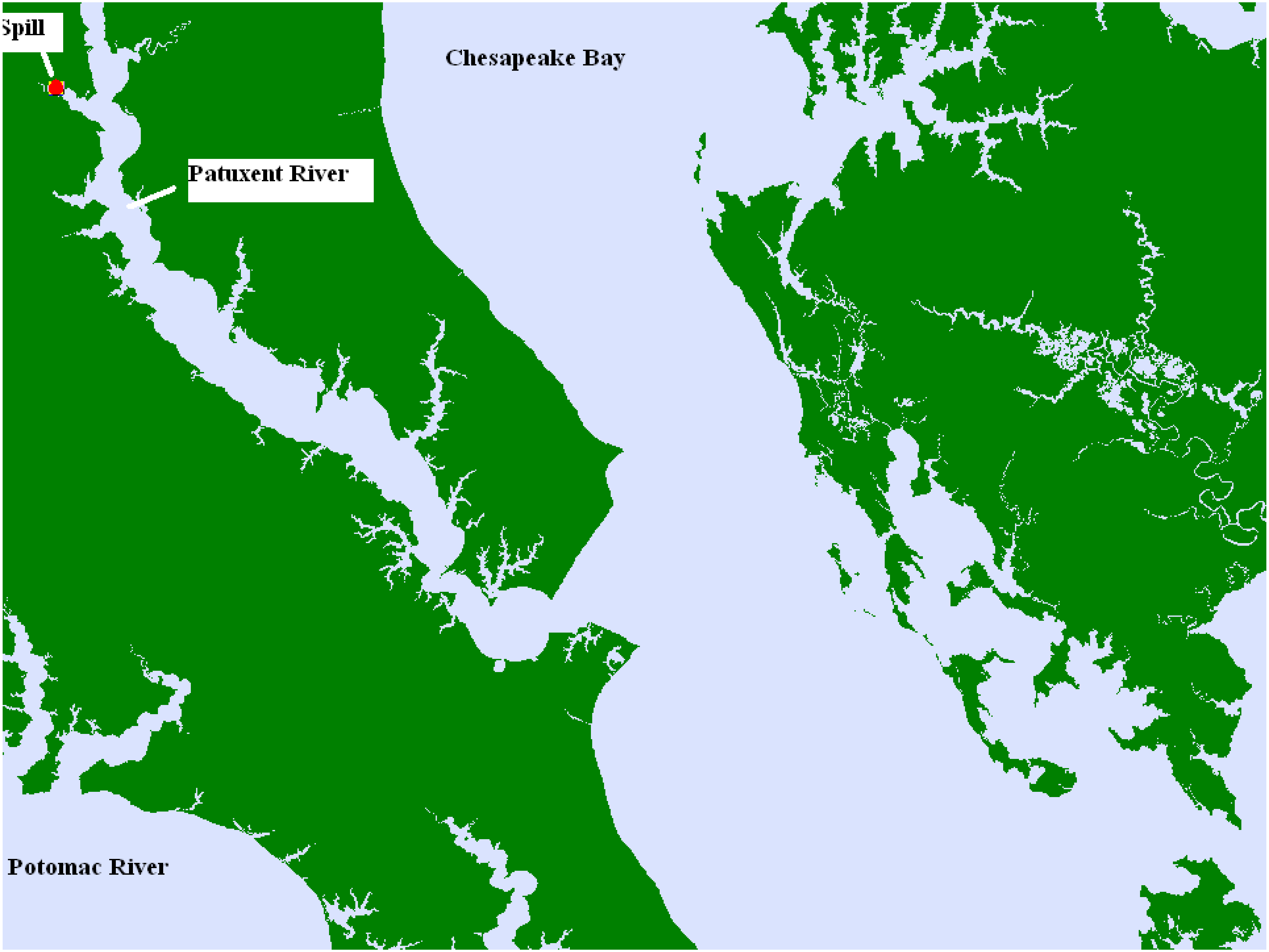


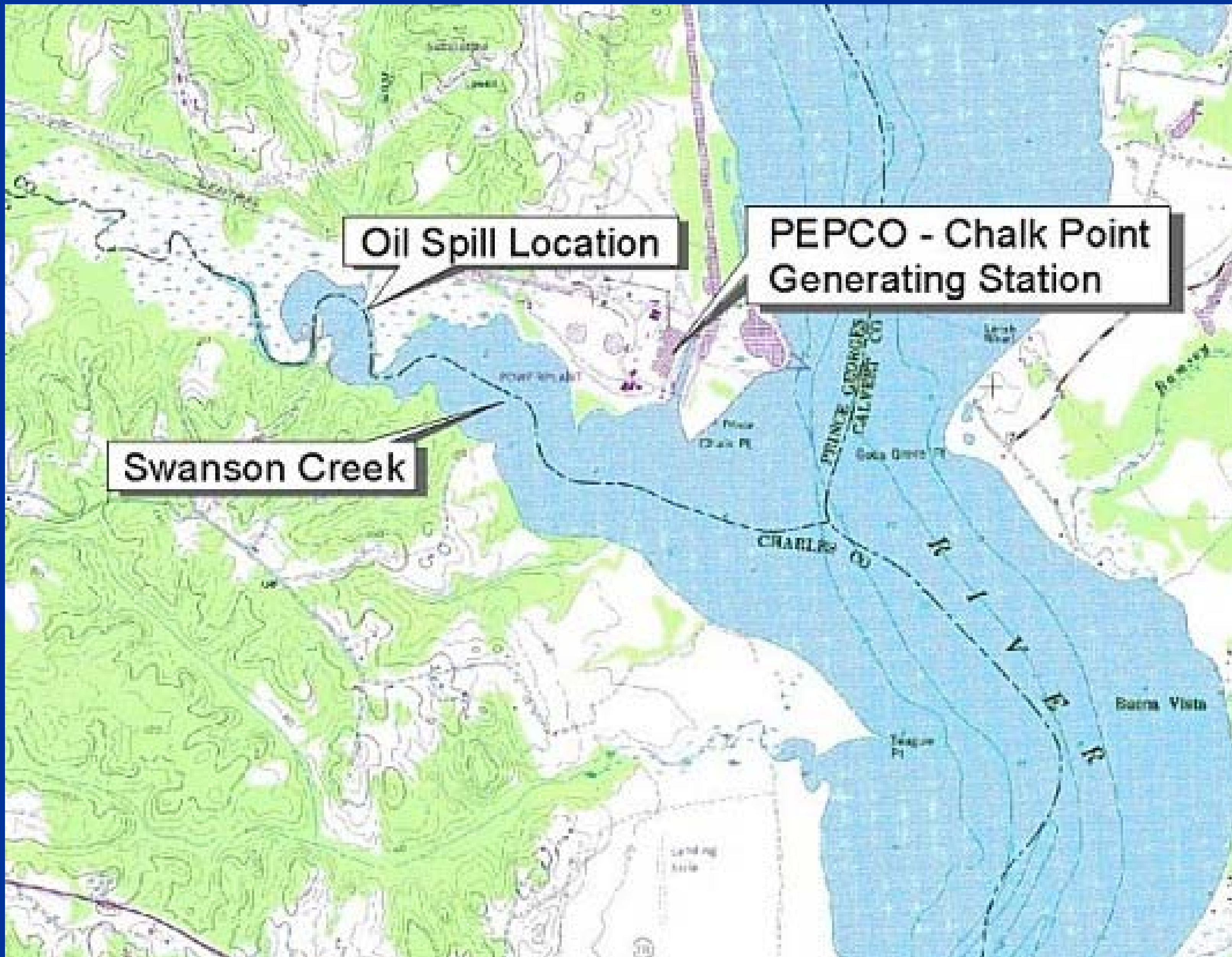
Processes Modeled by SIMAP for Crude and Fuel Oils

Case Study

Why this spill is instructive:

- Caused extensive impacts to wetlands after failures to follow through on directives set forth by the FOSC
- Involved the deployment of defective, poorly-maintained boom that broke
- Arrival of a storm on the second day after the spill created challenges for responders.

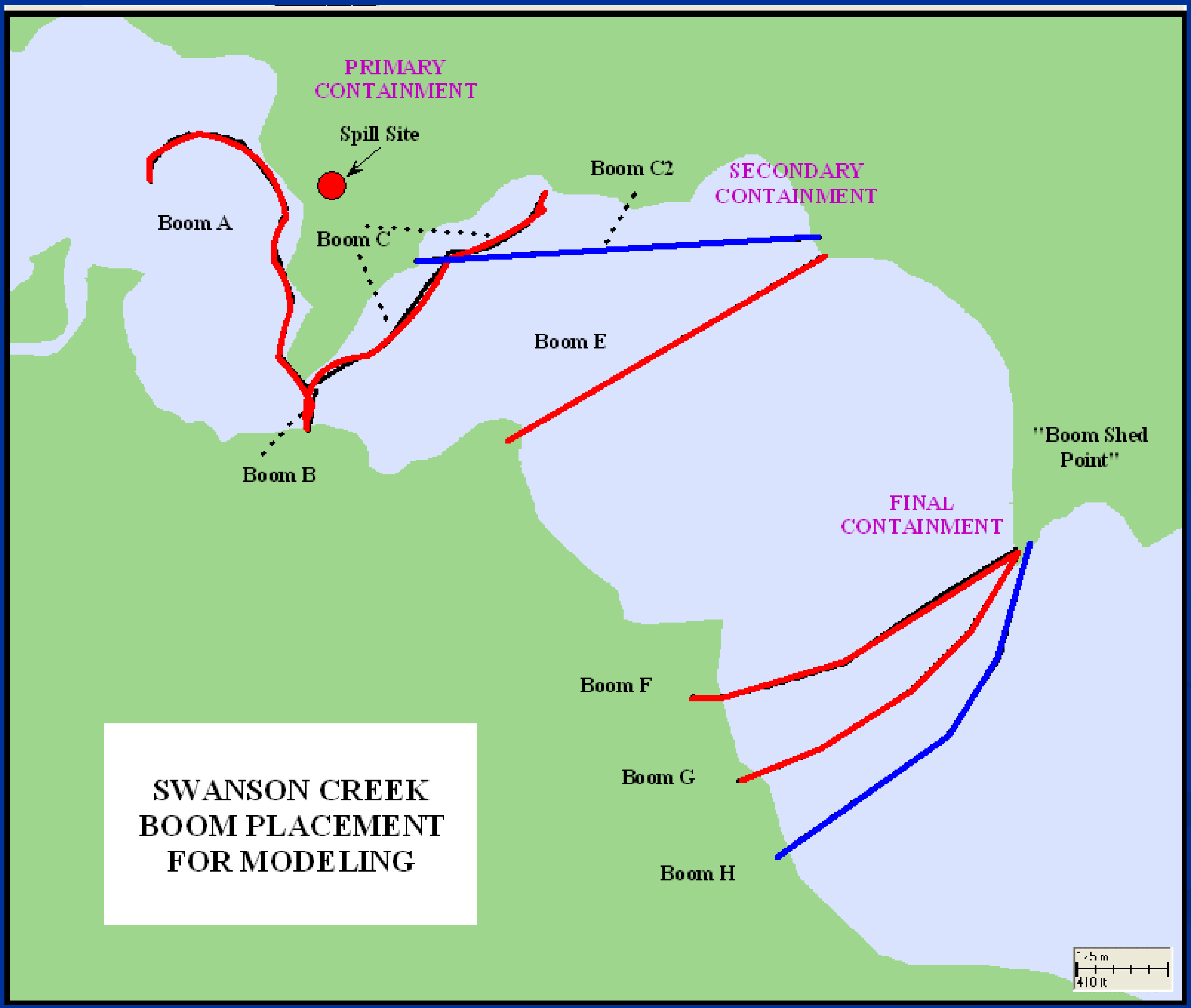

Spill
Chesapeake Bay
Patuxent River
Potomac River


Oil Spill Location
PEPCO - Chalk Point
Generating Station
Swanson Creek
R I V E R
Buena Vista

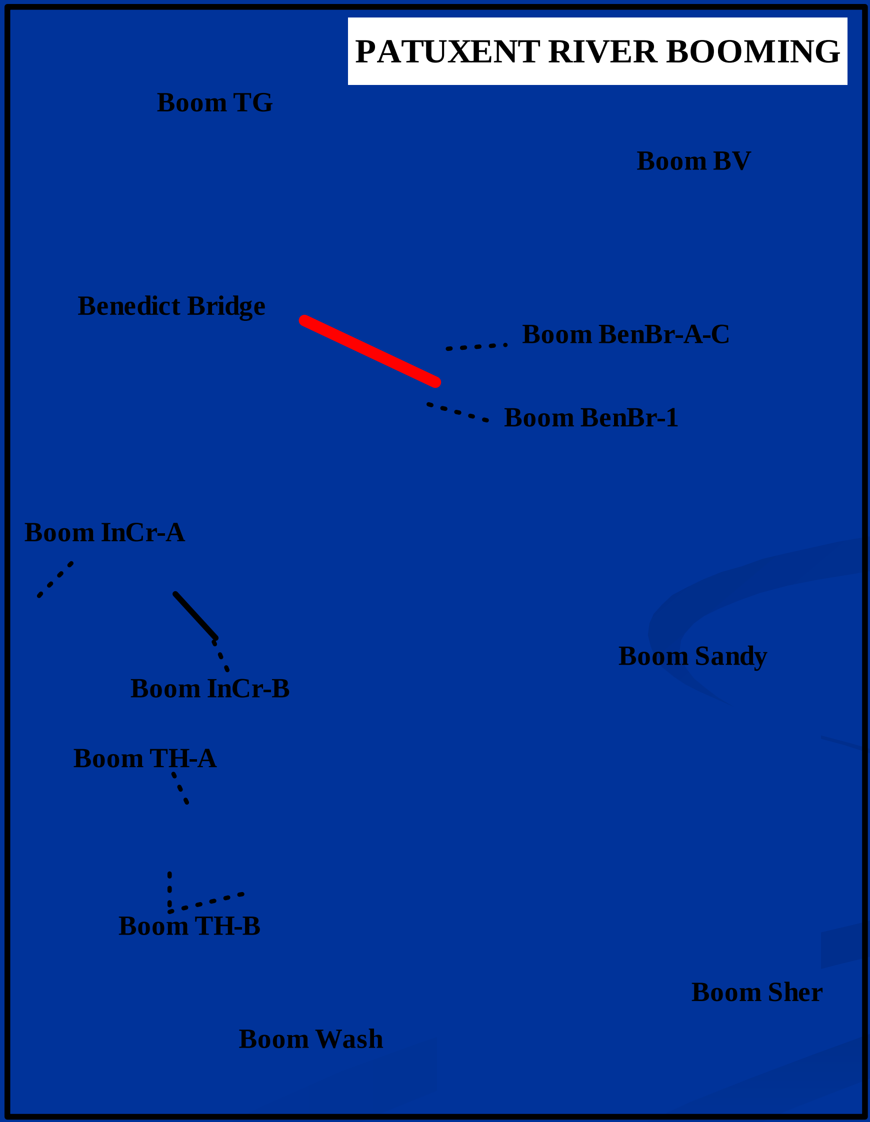
Impacts to Sensitive Wetlands

Impacts to Property

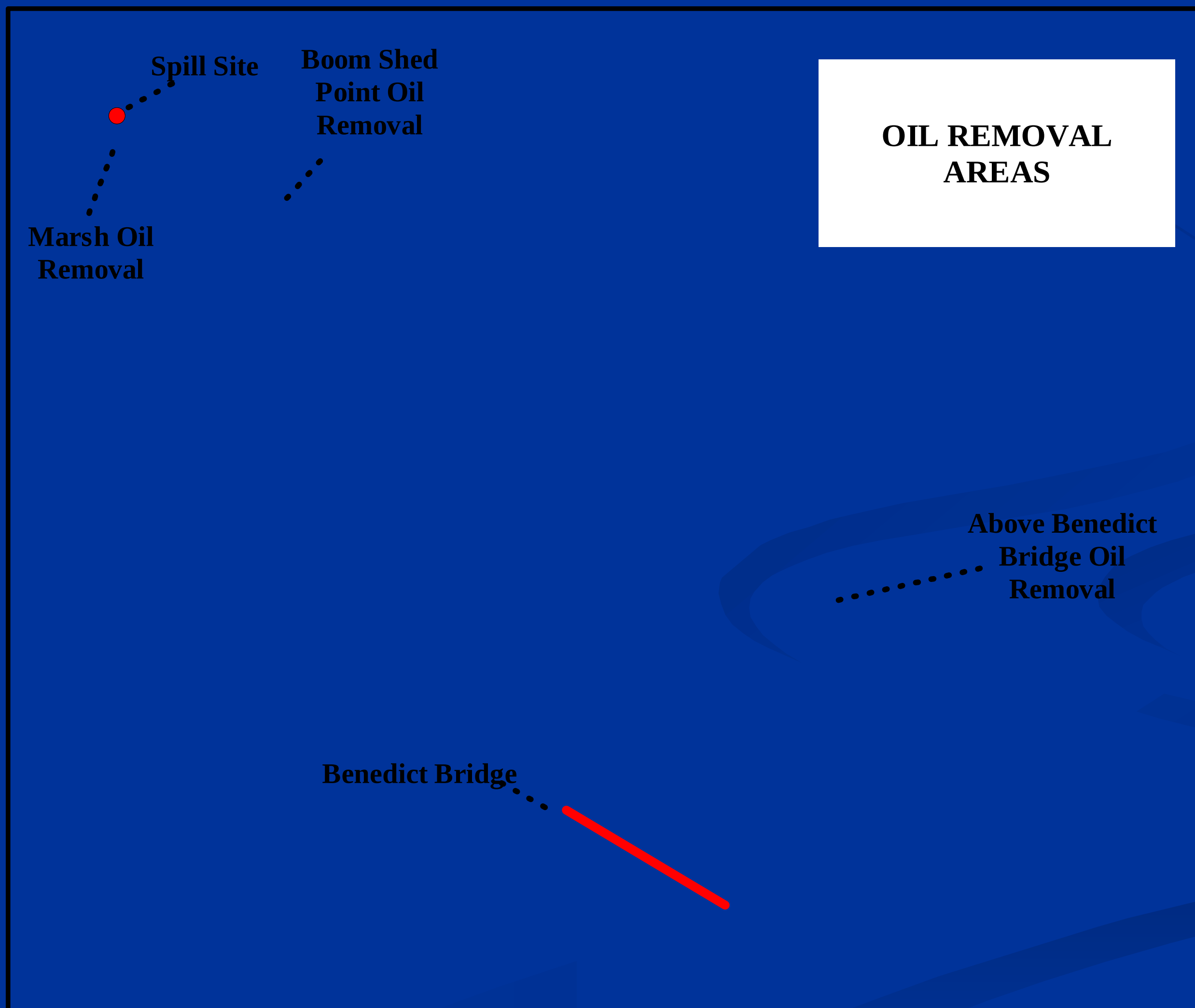
Response: Swanson Creek Booming



Patuxent River Booming



Oil Removal

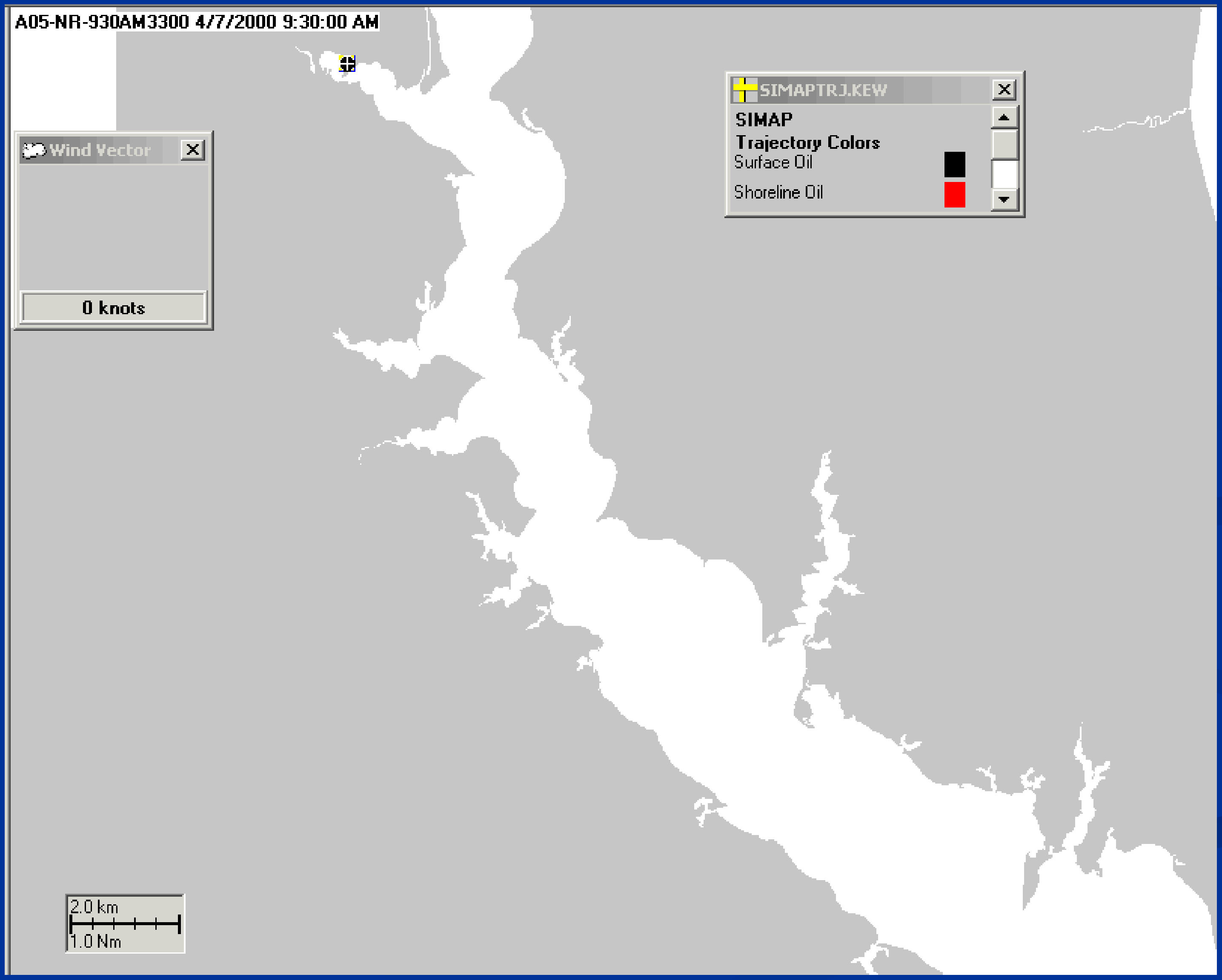

OIL REMOVAL AREAS
Spill Site
Boom Shed Point Oil Removal
Marsh Oil Removal
Above Benedict Bridge Oil Removal
Benedict Bridge

Scenarios Modeled

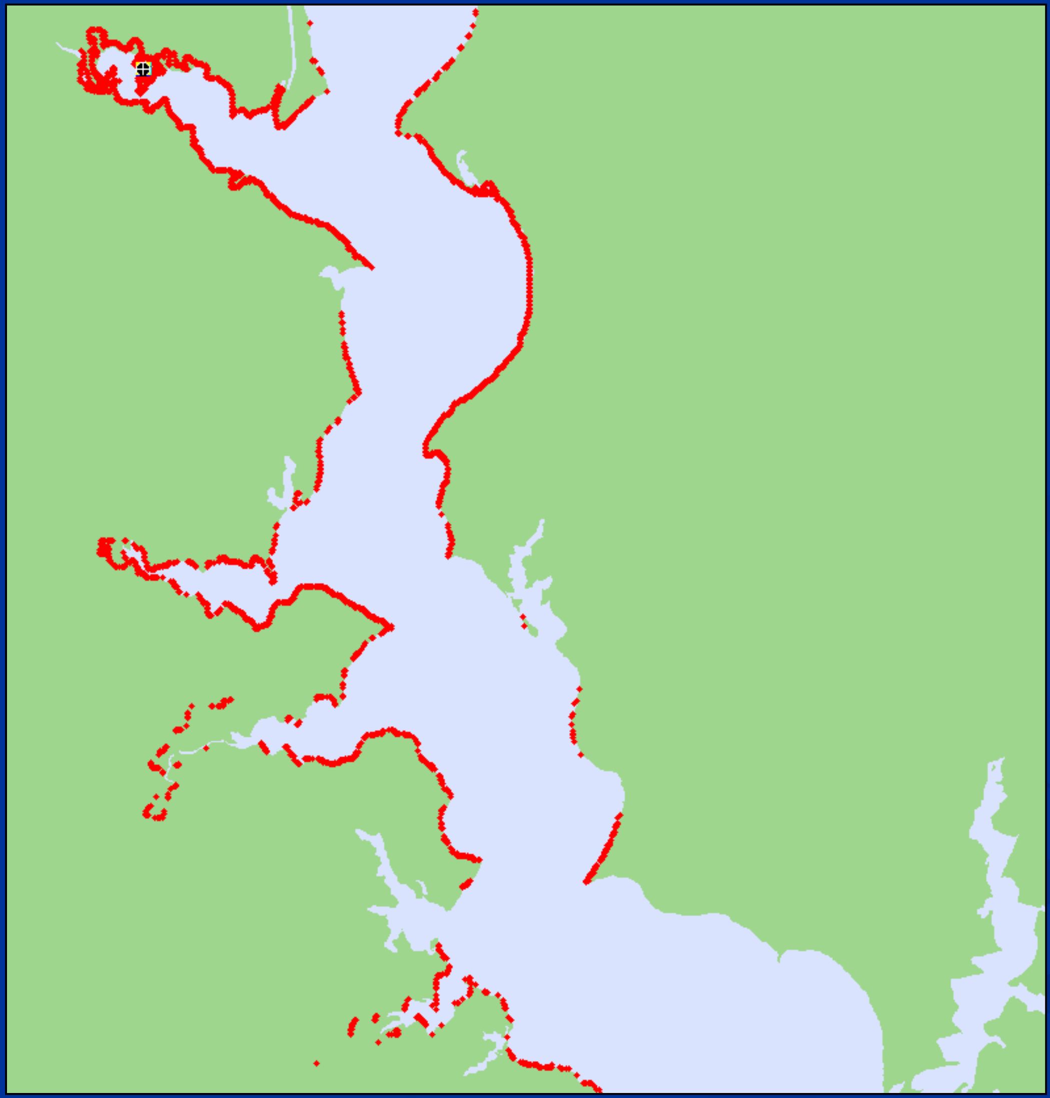
- Actual Swanson Creek response (booms breaking) plus Patuxent River booming as per actual response
- Actual Swanson Creek response (booms in good condition, properly anchored) plus Patuxent River booming as per actual response
- Actual Swanson Creek response (booms breaking) with additional booms deployed as ordered by FOSC plus Patuxent River booming as per actual response
- No response (no booms or removal)

- Actual response ("ACTUAL")
- Actual response with good booming ("A-GOOD")
- Actual response plus FOSC booming ("FOSC")
- No response ("NO RESP")

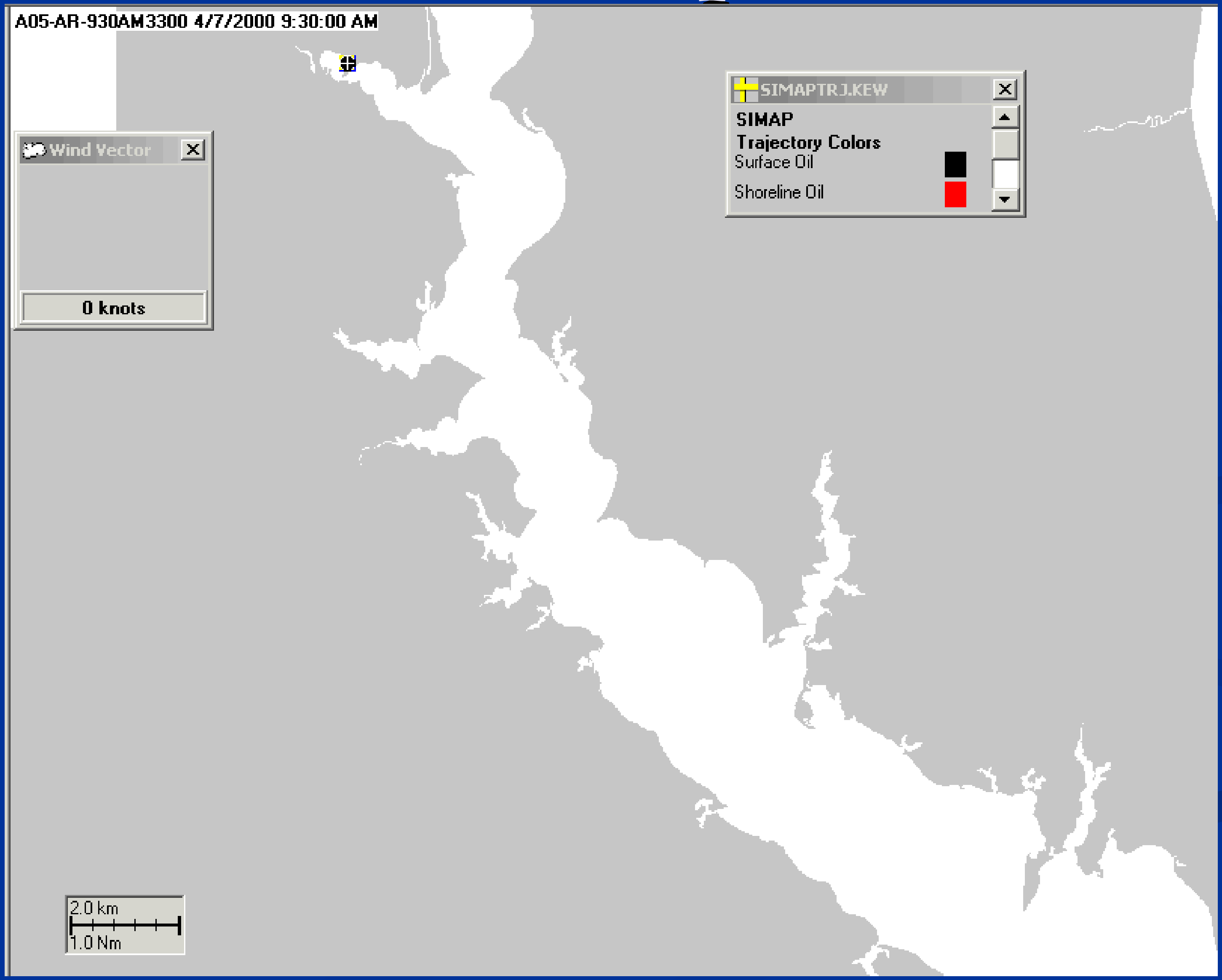
No Response


A05-NR-930AM3300 4/7/2000 9:30:00 AM
Wind Vector
0 knots
SIMAPTRJ.KEW
SIMAP
Trajectory Colors
Surface Oil
Shoreline Oil
2.0 km
1.0 Nm

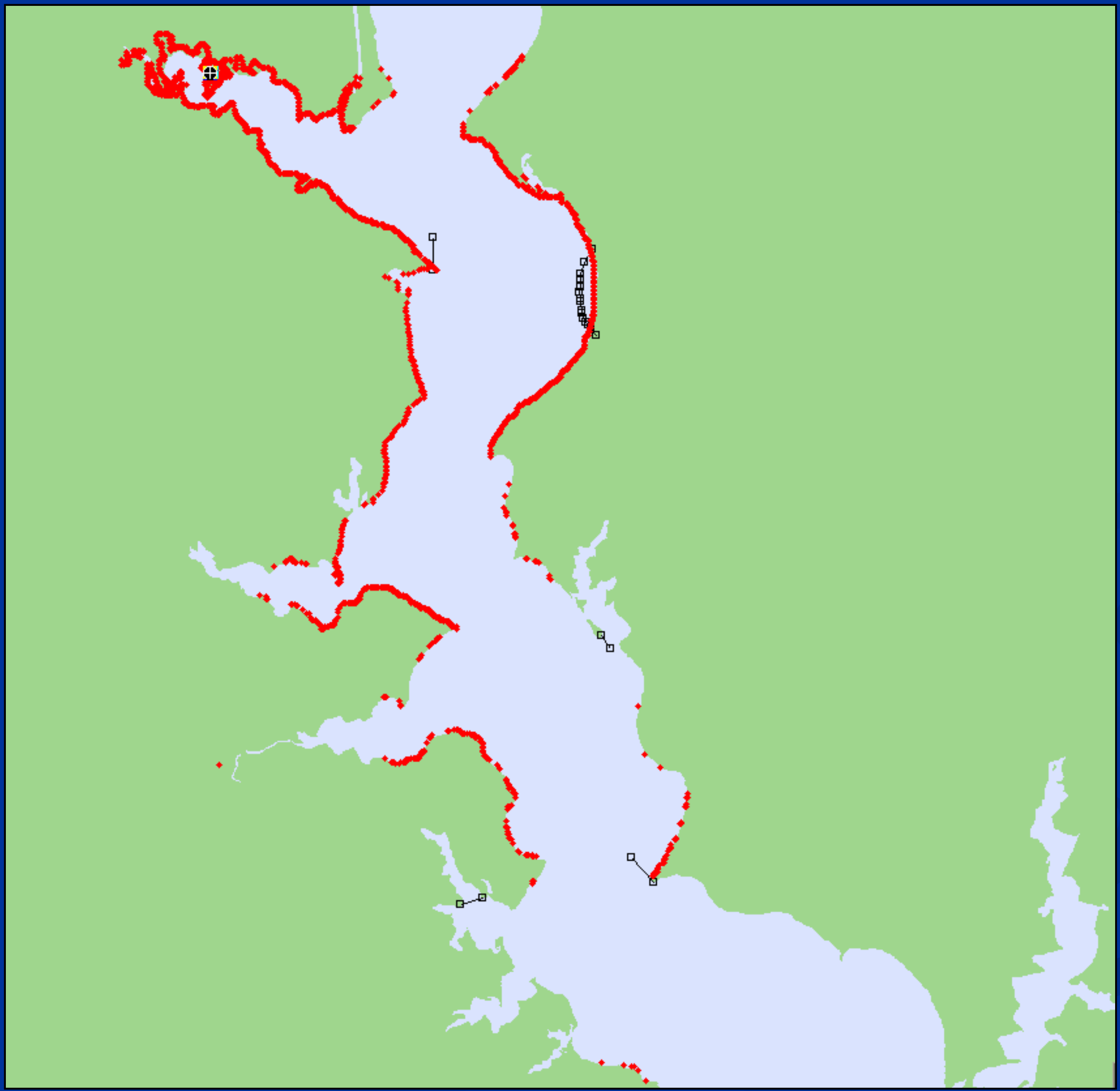
No Response Shoreline Impact



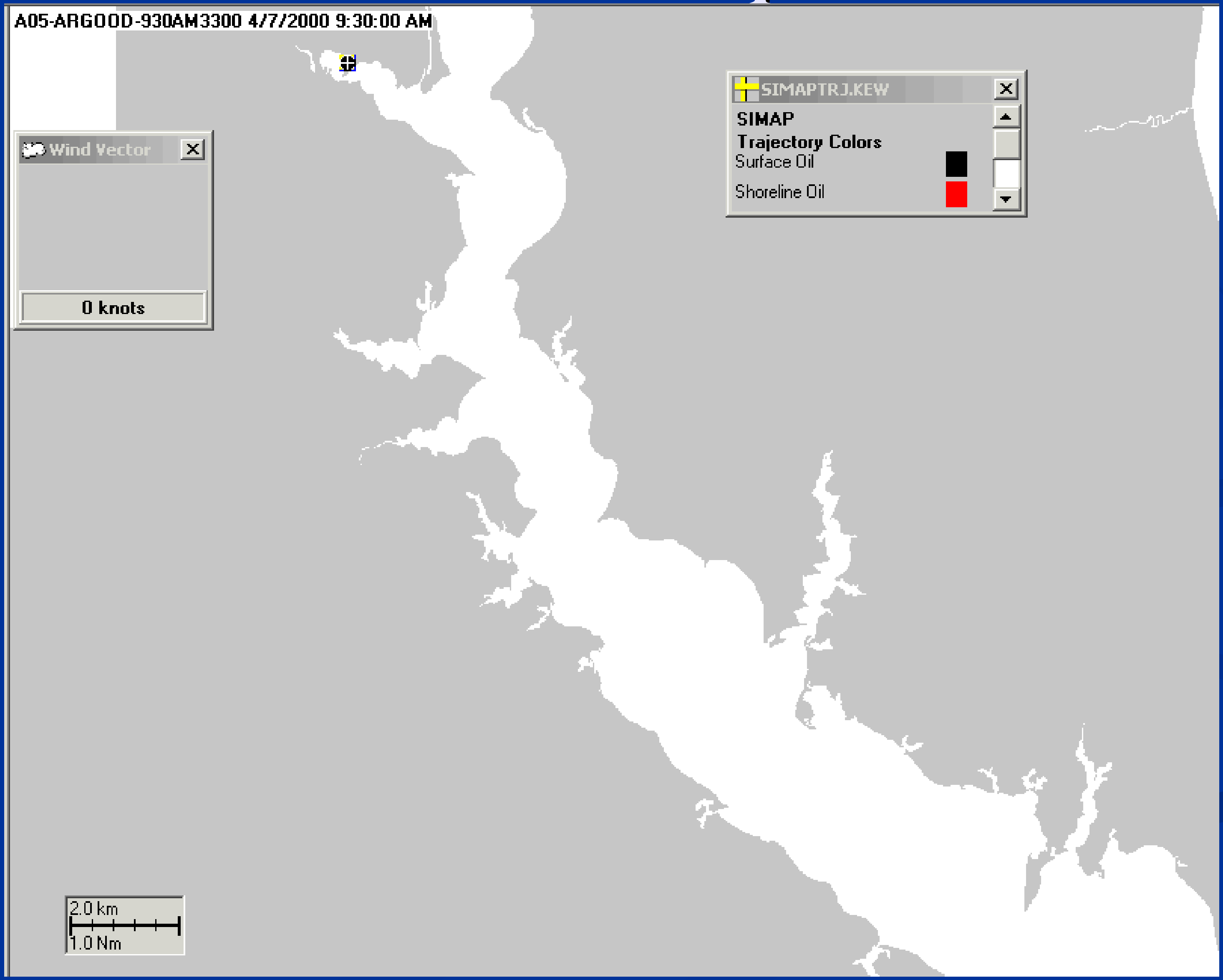
Actual Response



Actual Response Shoreline Oiling

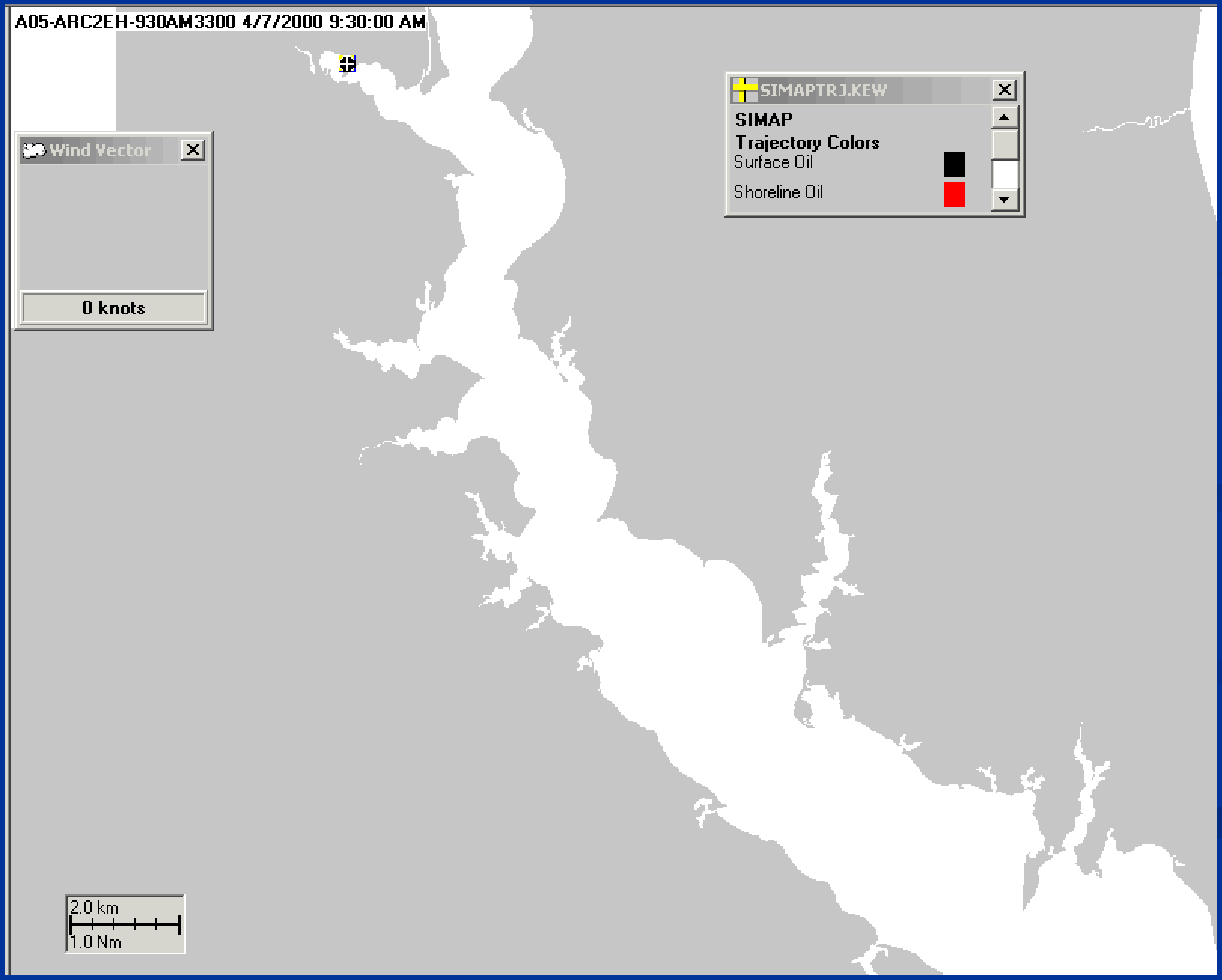


A-Good Response



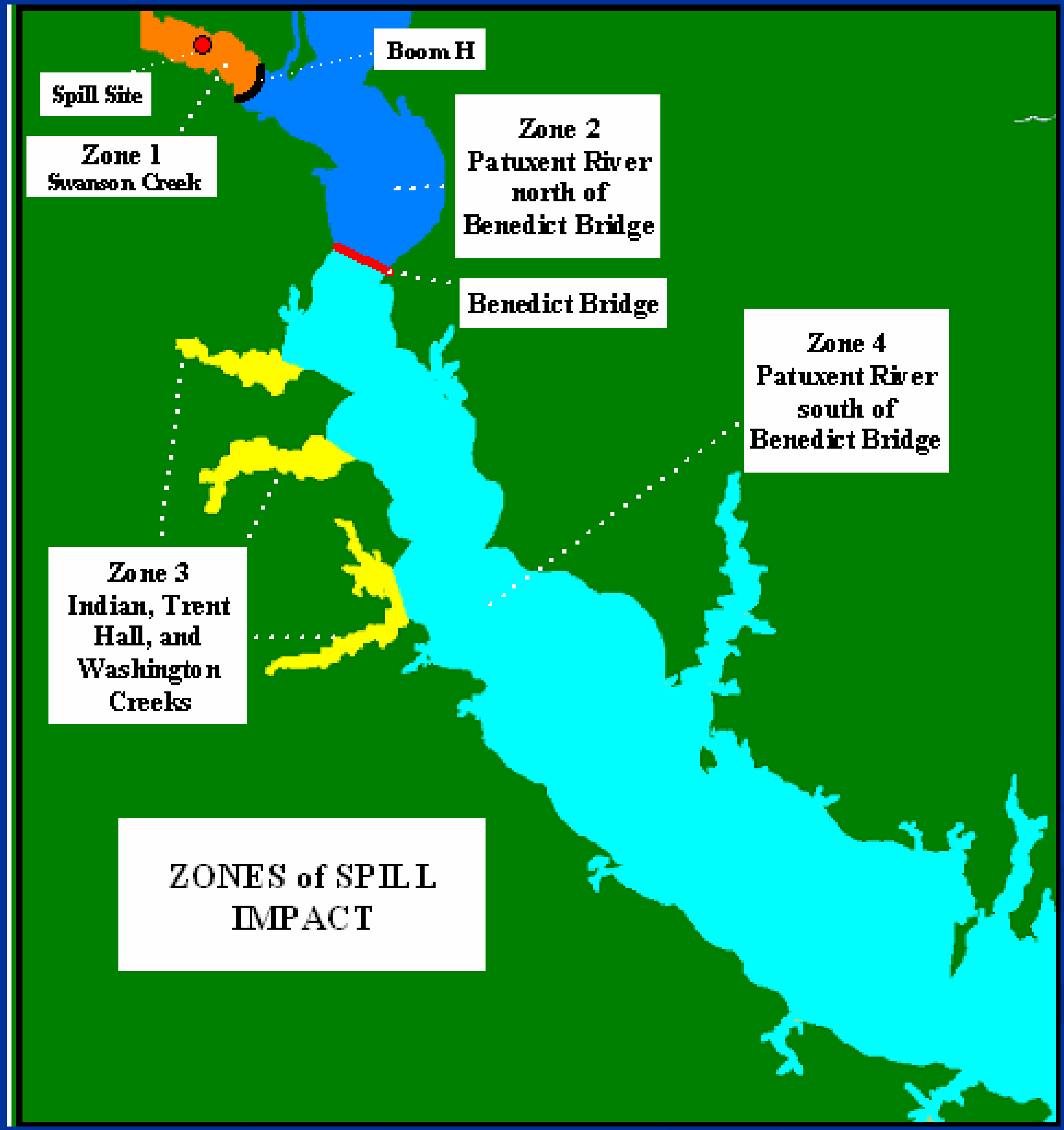
A-Good Response Shoreline Impact

FOSC Response



FOSC Response Shoreline Impact

Zones of Impact



Shoreline Impact (m^2)

Scenario	Total	Zone 1	Zone 2	Zone 3	Zone 4	Outside Swanson Creek
NO RESP	23,029	4,919	6,055	5,178	6,877	18,110
ACTUAL	16,277	5,026	5,947	1,118	4,185	11,250
A-GOOD	9,543	6,573	2,808	9	152	2,969
FOSC	10,285	5,339	4,570	36	340	4,946

Reductions in Shoreline Impact Compared with No Response

Reductions in Shoreline Impact Compared with Actual Response

Reduction in Shoreline Oiling

- Lower response costs
- Less shoreline response required
- Less impact on sensitive wetlands by oil and by response operations
- Fewer wildlife impacts

Evaluating Response Strategies With Modeling

- After a spill to derive "lessons learned"
- Training of spill responders and strategists
- Contingency planning