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:
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)
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
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.

Why this spill is instructive:
Impacts to Sensitive Wetlands
Impacts to Property
Actually deployed FOSC ordered, but not deployed

Response: Swanson Creek Booming
Oil Removal

OIL REMOVAL AREAS

- Spill Site
- Boom Shed Point Oil Removal
- Marsh Oil Removal
- Above Benedict Bridge Oil Removal
- Benedict Bridge
- 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
No Response Shoreline Impact
Actual Response
A-Good Response
A-Good Response Shoreline Impact
FOSC Response Shoreline Impact
Zones of Impact

- Spill Site
- Zone 1: Swanson Creek
- Zone 2: Patuxent River north of Benedict Bridge
- Zone 3: Indian, Trent Hall, and Washington Creeks
- Zone 4: Patuxent River south of Benedict Bridge
## Shoreline Impact (m²)

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Total</th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
<th>Zone 4</th>
<th>Outside Swanson Creek</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NO RESP</strong></td>
<td>23,029</td>
<td>4,919</td>
<td>6,055</td>
<td>5,178</td>
<td>6,877</td>
<td>18,110</td>
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<tr>
<td><strong>ACTUAL</strong></td>
<td>16,277</td>
<td>5,026</td>
<td>5,947</td>
<td>1,118</td>
<td>4,185</td>
<td>11,250</td>
</tr>
<tr>
<td><strong>A-GOOD</strong></td>
<td>9,543</td>
<td>6,573</td>
<td>2,808</td>
<td>9</td>
<td>152</td>
<td>2,969</td>
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<tr>
<td><strong>FOSC</strong></td>
<td>10,285</td>
<td>5,339</td>
<td>4,570</td>
<td>36</td>
<td>340</td>
<td>4,946</td>
</tr>
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</table>
Use of good-condition boom with good installation reduces shoreline oiling outside Swanson Creek by 84% and keeps nearly 100% of oil out of Zones 3 and 4 compared with no response.

Following FOSC directives after failed booming keeps 73% of oil from leaving Swanson Creek.

### Reductions in Shoreline Impact

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Reductions in Shoreline Impact Compared with Actual Response

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<th>Scenario</th>
<th>Use of good-condition boom with good installation reduces shoreline oiling outside Swanson Creek by 74% and keeps nearly 100% of oil out of Zones 3 and 4 compared with actual response; reduces overall shoreline area impacted by 41%</th>
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<td>Following FOSC directives after failed booming keeps 56% more oil from leaving Swanson Creek than actual response, and reduces shoreline area oiled by 37%</td>
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</table>
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