

## Geospatially-Enabled Geographic Response Plans

Derrick Miller

Michael Alfultis

Science Department  
US Coast Guard Academy

### **Abstract**

Geographic Response Plans (GRPs) are designed to aid in the initial response (first 24 hours) to an oil or other hazardous material spill. Typically distributed in PDF format, GRPs contain sections on Protection/Collection Strategies, Shoreline Countermeasures, Sensitive Resource/Wildlife Areas, and Logistics. The existing PDF Format of these GRP's does not fully leverage geospatial information, separates position and attribute information, and makes it difficult to see geospatial relationships/inter-relations. By converting these GRPs from a PDF to a fully geospatially-enabled format, the information contained in the GRPs can be more fully leveraged for decision-making during a response situation. This presentation will highlight work done to date, provide some examples of geospatially-enabled GRPs, and discuss lessons learned and future work.

### **Introduction**

Geographic Response Plans (GRP's) are site-specific response plans for oil and other hazardous materials spills. They are used during the early stages of a spill, which lasts from the time a spill occurs until the Unified Command is operating and/or the spill has been contained and cleaned up. Generally this lasts no more than 24 hours. The response strategies contained in these GRP's are tailored to a specific beach, shore, or waterway, prioritizes resources to be protected, and allows for immediate and proper action. By using this plan, the first responders to a spill can avoid the initial confusion that generally accompanies any spill (Northwest Committee, 2005). Each GRP has two priorities:

“Identify sensitive natural, cultural or significant economic resources; and

Describe and prioritize response strategies.” (Washington State Department of Ecology, 2007)

In order to meet these requirements, each GRP is divided into several well defined sections; detailed site description, reference maps, protection and collection strategies, shoreline countermeasures, information on sensitive resources and wildlife, and logistical information.

GRP's are typically developed by the responsible Regional Response Team through collaboration of the Environmental Protection Agency (EPA), U.S. Coast Guard (USCG), state environmental agencies, and other interested parties (shipping and fishing industry, native American tribes). There are 13 Regional Response Teams that have been established by the EPA that are responsible for the planning, training, and coordinated response to an environmental mishap. GRP's are typically distributed via hardcopy or Adobe Acrobat pdf documents.

### **The Need for “Geospatially Enabling” GRP's**

There are several weaknesses in the current form and format of these GRP's. First, since the spatial information is in the form of hardcopy maps in several separate sections, it is very difficult to see the geospatial relationships/interactions between the protection/collection strategies, shoreline countermeasures, and sensitive resources/wildlife. Response personnel are forced to look at the several maps and attempt to integrate/correlate the spatial relationships visually. This makes it difficult to examine relationships such as shoreline countermeasures and the location of logistical materials needed to implement these countermeasures. Second, the spatial location and non-spatial characteristic (attribute) information are separated into a series of maps and data tables (Figures 1 and 2). As such, response personnel again have to visually connect/link the non-spatial information in the data tables to their spatial location indicated on the map. This makes it difficult, for example, to determine the length and type of boom to be deployed at a location indicated on the protection/collection strategies map. Finally, the logistics section contains contact information for equipment caches, air support, access points/boat ramps,

and staging areas, but no information on the location of these assets. Therefore, it is difficult for response personnel to quickly determine the closest available asset during a response.

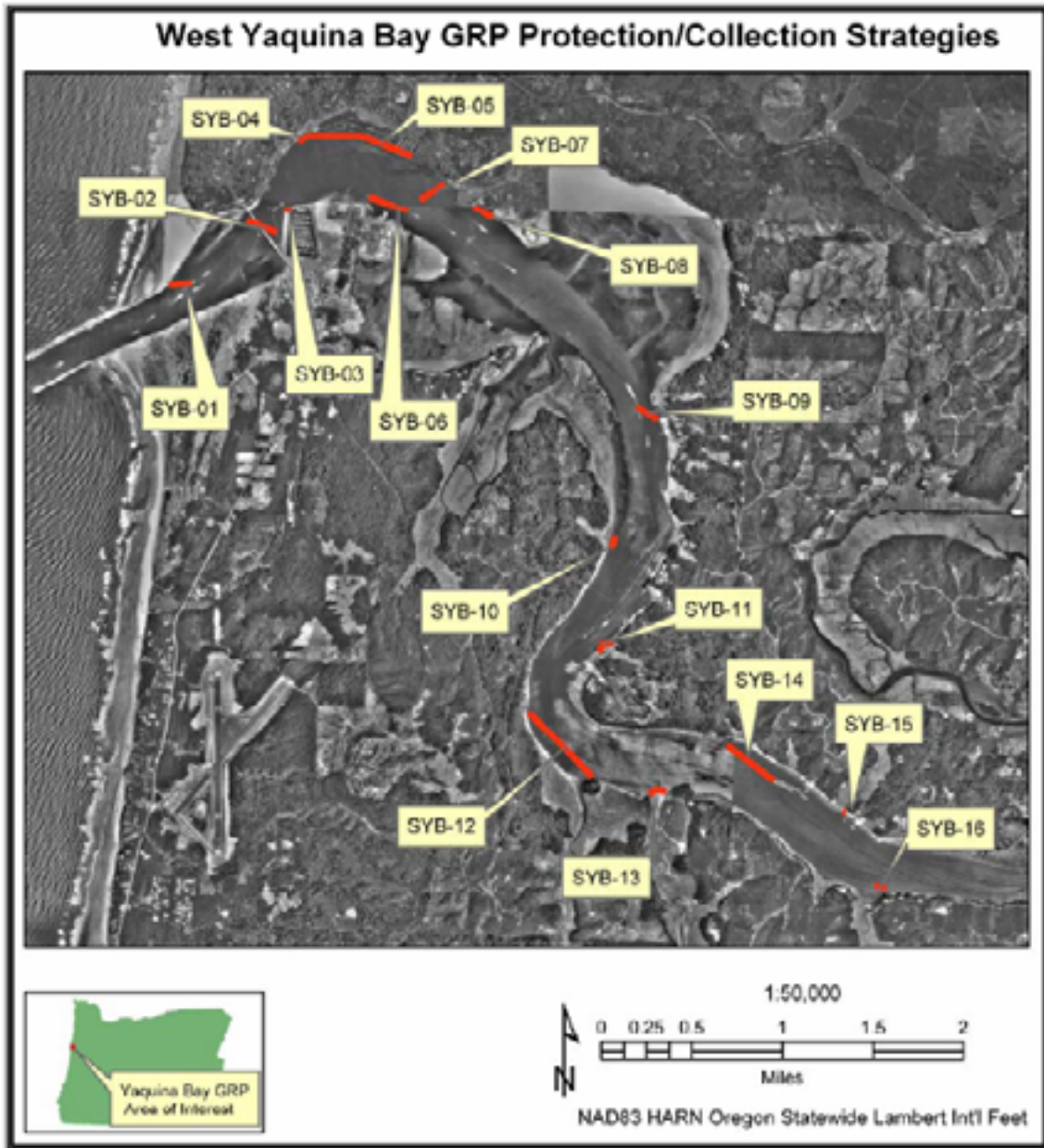


Figure 1. Protection/Collection Strategies Map from Yaquina Bay GRP (Northwest Committee, 2005)

Table 4-1. West Yaquina Bay Protection/Collection Strategies Information

Strategy Number	Status	Location	Response Strategy	Length & Type of Boom	Strategy Implementation /Feasibility	Staging Area	Site Access	Resources Protected & comments
SYB-1	Field tested 3/5/2005. Strategy changed	Entrance to Yaquina Bay - N Entrance breakwater jetty	Deflection to S side of entrance for shoreline collection on W side of Marina jetty.	700' hard	Anchor boom to jetty at SE point where breakwater jetty begins angling to NE. Boom should extend out to secured to Green buoy #7.	South Beach Marina	By boat from marina or USCO Station. By land from State park.	Yaquina Bay
	Replaces SYB-34	44° 37.1' N 124° 54.07' W						
SYB-2	Field tested 3/5/2005. Strategy changed	Entrance to Yaquina Bay - S Bridge Pier pilings to South Beach Marina W Jetty.	Deflection for shoreline recovery on sand beach	900' hard	Deploy boom on angle from anchoring point on Western most piling protecting S pier of bridge, through fish pier, to anchoring point 1/2 way down W side of W Marina Jetty. Use fish pier as center anchoring point. Lay any excess boom less than one section along jetty apron.	South Beach Marina	By boat.	Yaquina Bay
	Replaces SYB-2 & 3	44° 37.52' N 124° 53.65' W						
SYB-3	Field visit 3/5/2005. Not tested due to marina traffic	South Beach Marina	Protection by Encapsulation	400' hard	Boom from west entrance jetty to east entrance jetty to encapsulate marina.	South Beach Marina	By boat.	Economic & recreational
	Replaces SYB-1	44° 37.45' N 124° 53.15' W						
SYB-4	Field visit 3/5/2005	Newport Shrimp	Protection	500'	Encapsulate Newport Shrimp and Undersea Gardens.	Newport	Boom should be delivered to site by boat. Water access from shoreline is limited.	Economic
	Replaces SYB-33	44° 37.77' N 124° 53.15' W						
SYB-5	Field test 3/5/2005	Embarcadero	Protection	3,500'	Deploy 3,500' of boom from as shoreward point E of Dock E and extending to a shoreward point just E of Newport Shrimp Plant. Boom should be deployed in overlapping legs of 500'-800'. This configuration will allow egress/ingress gates when all conditions allow for boat movements in and out of harbor.	Newport	Boom can be delivered to site by either truck or boat. Boat will be required to anchor boom in channel.	Economic
		44° 37.72' N						
		124° 52.42' W						
		To						
Replaces SYB-32	44° 37.83' N 124° 53.38' W							

Figure 2. Non-Spatial Information associated with Protection/Collection Strategies for Yaquina Bay shown in Figure 1 (Northwest Committee, 2005)

**“Geospatially-Enabled” GRP’s**

These GRP’s can be made more effective during a response if all the information contained in the separate sections of the hardcopy GRP were converted to a digital format and incorporated into a geographic information system (GIS). In this format, the reference maps, protection and collection strategies, shoreline countermeasures, sensitive resources and wildlife, and logistical sections would be represented as different thematic layers in the GIS. Spatial relationships/interactions can now be quickly determined by displaying the layers of interest/concern in the same geospatial display to examine gaps, overlaps, and other spatial relationships. In addition, since the location and non-spatial attribute (characteristic) information are combined in any GIS display, response personnel can quickly determine what type of boom has been recommended to be deployed at a given location (Figures 3 and 4), or what type of wildlife is in a sensitive area and the time of year they are actually present in that area. Finally, position information for all logistics assets was determined so that these assets can be displayed and queried.

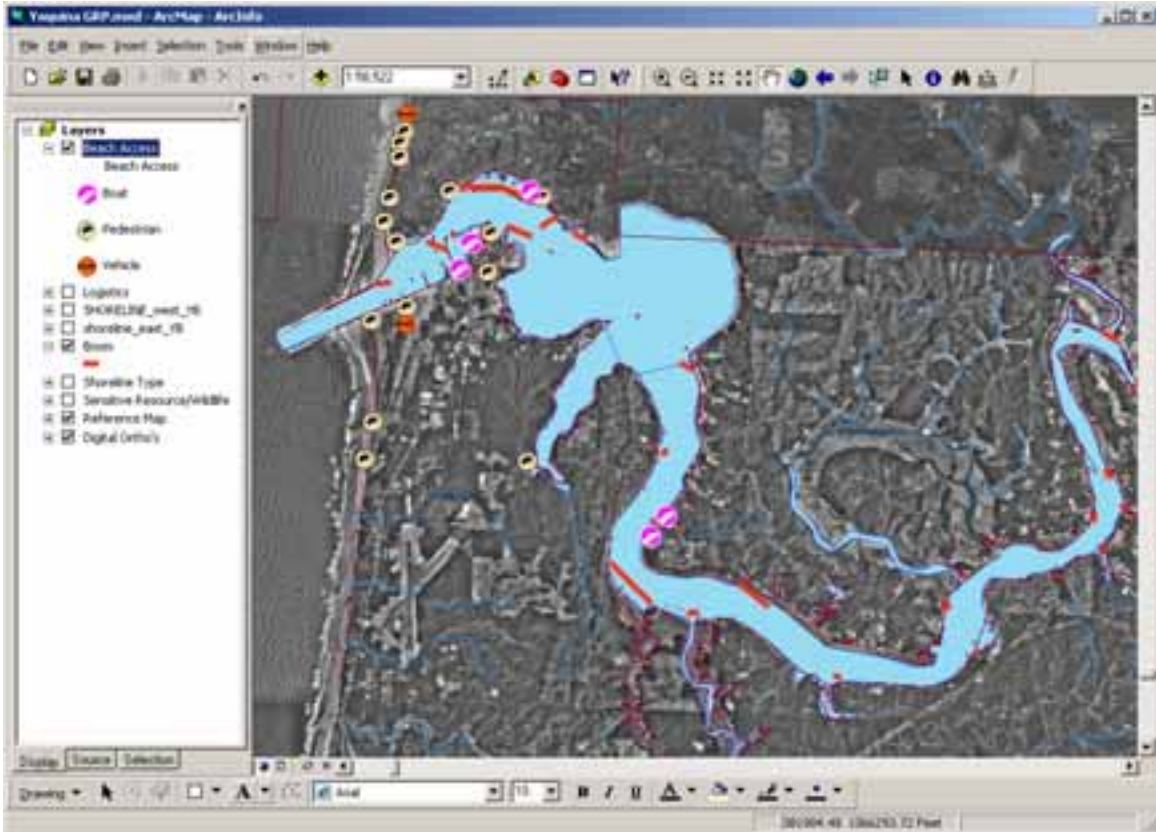


Figure 3. GIS Display of Protection/Collection Strategies for Yaquina Bay with Access Points.



Figure 4. Non-Spatial Attribute Information associated with Strategy Number SY-12 displayed within GIS using Identify Tool.

## Conclusions

“Geospatially-Enabled” GRP’s have been developed for Yaquina and Coos Bay along the Oregon Coast. Plans are to continue development of these plans for the rest of the Oregon Coast. In order to expand this effort further, the various Regional Response Teams must collaborate on the development of a GRP Data Model.

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## **References**

Northwest Committee (2005). Yaquina Bay, Oregon, Geographic Response Plan. Retrieved May 11, 2007 from <http://www.deq.state.or.us/lq/cu/emergency/geographic.htm>.

Washington State Department of Ecology (2007). Geographic Response Plans. Retrieved May 11, 2007 from <http://www.ecy.wa.gov/programs/spills/preparedness/GRP/introduction.htm>.

## **Author Information**

Derrick Miller  
Cadet 1/c  
U.S. Coast Guard Academy  
Science Department  
27 Mohegan Avenue  
New London, CT 06320-8101  
860-444-8632  
860-444-8627 (fax)  
dmiller@cadetmail.uscga.edu

Michael A. Alfultis  
Head, Department of Science  
U.S. Coast Guard Academy  
27 Mohegan Avenue  
New London, CT 06320-8101  
860-444-8632  
860-444-8627 (fax)  
Michael.A.Alfultis@uscg.mil