

**GEOGRAPHIC RESPONSE PLAN  
OIL SPILL RESPONSE**

**COMPANION  
MANUAL**

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE  
OFFICE OF SPILL PREVENTION AND RESPONSE

MARCH 2019



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## **Before you print this document:**

**This document is intended, and designed, to be printed out on 2-sided pages.**

**The following pages are provided in “landscape” orientation, paper size 11 x 17:**

- Section 2, Table 2-3, pages 17-18

**All other chapters and appendices are oriented in “portrait,” 8.5 x 11.**

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# **Geographic Response Plan Companion Manual**

## **Development and Use of this Manual**

The Geographic Response Plan Companion Manual (GRP CM) was created during the development of the inland geographic response plans. Each section of the GRP CM is consistent for each of the GRPs developed by the California Department of Fish and Wildlife (CDFW), Office of Spill Prevention and Response (OSPR); in order to create more streamlined GRPs and minimize redundancy, we developed the GRP CM to house information that might be referenced during spill response but was not specific to any individual GRP. Each section is intended to provide reference information for various components of oil spill response and roles in the Incident Command Post (ICP) and in the field.

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# Geographic Response Plan Companion Manual

## Acronyms

### A

**ADC** Accredited Disaster Council

**API** American Petroleum Institute

**ART** Applied Response Technologies

### C

**CA** California

**Cal OES** California Office of Emergency Services

**CalEPA** California Environmental Protection Agency

**CDFW** California Department of Fish and Wildlife

**CERT** Community Emergency Response Team

**CFR** Code of Federal Regulations

**CFS** Cubic Feet per Second

**CHRIS** California Historical Resources Information Center

**CUPA** Certified Unified Program Agency

### D

**DOI** Department of the Interior

**DOT or (USDOT)** US Department of Transportation

**DSW** Disaster Service Worker

**DSWVP** Disaster Service Worker Volunteer Program

**DTSC** California Department of Toxic Substances Control

### E

**ESI** Environmental Sensitivity Index

**EU** Environmental Unit

**EUL** Environmental Unit Leader

## **E**

**FGC** Fish & Game Code

**FOSC** Federal On-Scene Coordinator

## **G**

**GC** Government Code

**GCM** GRP Companion Manual

**GPS** Global Positioning System

**GRP** Geographic Response Plan

## **I**

**IC** Incident Commander

**ICP** Incident Command Post

**ICS** Incident Command System

**ISB** In-Situ Burning

## **M**

**MAC** Multi-Agency Coordination

**MMAA** Master Mutual Aid Agreement

**MLD** Most Likely Descendant

## **N**

**NAGPRA** Native American Graves Protection and Repatriation Act

**NAHC** Native American Heritage Commission

**NCP** National Contingency Plan

**NEBA** Net Environmental Benefit Analysis



**NGO** Non-Governmental Organization  
**NOAA** National Oceanic and Atmospheric Administration  
**NRC** National Response Center  
**NRDA** Natural Resource Damage Assessment  
**NRT** National Response Team  
**NWVP** Non-Wildlife Volunteer Program

## **O**

**OPA 90** Oil Pollution Act of 1990  
**OSC** On-Scene Coordinator  
**OSCA** Oil Spill Cleanup Agent  
**OSLTF** Oil Spill Liability Trust Fund  
**OSPR** Office of Spill Prevention and Response  
**OWCN** Oiled Wildlife Care Network

## **P**

**PPE** Personal Protective Equipment  
**PRC** Public Resources Code

## **R**

**RCP** Regional Contingency Plan  
**RP** Responsible Party  
**RRT** Regional Response Team

## **S**

**SCAT** Shoreline Clean-Up and Assessment Technique  
**SIMA** Spill Impact Mitigation Assessment  
**SOFR** Safety Officer  
**SOSC** State On-Scene Coordinator

**SWA** Surface Washing Agent

**I**

**TPH** Total Petroleum Hydrocarbons

**TSD** Treatment, Storage, and Disposal

**U**

**UC** Unified Command

**USBR** United States Bureau of Reclamation

**USCG** United States Coast Guard

**USEPA** United States Environmental Protection Agency

**USFWS** United States Fish & Wildlife Service

**USGS** United States Geological Survey

**V**

**VC** Volunteer Coordinator

**VU** Volunteer Unit

**VUL** Volunteer Unit Leader

**W**

**WISER** Wireless Information System for Emergency Responders

**WRP** Wildlife Response Plan

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# Geographic Response Plan Companion Manual

## Section 1 - Oil Spill Response Methods

### 1.0 Introduction

The appropriate response method for a given release will be dictated by the type and volume of material released, the location of the release and of the response actions, river and weather conditions, and the time required to implement the response strategies.

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) provides the organizational structure and procedures for preparing for and responding to discharges of oil and releases of hazardous substances, pollutants, and contaminants:

[http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr300\\_main\\_02.tpl](http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr300_main_02.tpl)

Table 1-1 below provides information on various response methods by product group and waterbody type. It should be noted that the Response Strategy Detail Sheets in Chapter 3 of the geographic response plans (GRPs) already provides suggested oil spill response methods at the pre-identified response strategy sites and the table below can be utilized for those sites that have not already been vetted with an oil spill response organization (OSRO).

**1.1 Oil Spill Response Methods Matrix** (Adapted from NOAA and API, *Options for Minimizing Environmental Impacts of Freshwater Spill Response*, 1994; and API *Options for Minimizing Environmental Impacts of Inland Spill Response*, API Technical Report 425, October 2016; Table populated by Subject Matter Experts from Oil Spill Response Organizations and CDFW/OSPR.)

Oil groups differ from each other in their viscosity, volatility, and toxicity. **Viscosity** refers to an oil's resistance to flow; **volatility** refers to how quickly the oil evaporates into the air; and **toxicity** refers to how toxic, or poisonous, the oil is to either people or other organisms.

When spilled, the various groups of oil can affect the environment differently; they also differ in how difficult they are to clean up. Spill responders group oil into five basic groups, as listed below, along with a general summary of how each group can affect shorelines.

#### Group 1: Very Light Oils (Gasoline)

- Very volatile and evaporate quickly with no residue (in a matter of hours for spills to water)
- Relatively soluble, however some soluble components are more likely to volatilize into the air than to partition into water under most environmental conditions
- Low viscosity; spread rapidly into thin sheens
- Readily penetrate into porous substrates but are not sticky
- High acute toxicity but short-term exposure due to rapid evaporation
- High risk of ignition and air quality concerns for responders and the public

## **Group 2: Light Oils (Diesel, Jet Fuel, No. 2 Fuel Oil, Kerosene, Very Light and Light Crudes)**

- Volatile, with refined products leaving little to no residue. Crude oils can have residue after evaporation is complete
- Moderately soluble and toxic with dissolved components somewhat persistent as partitioning into air is slower
- Low to moderate viscosity; spread rapidly into thin slicks on water
- Do not readily emulsify except in cold temperatures
- Readily penetrate porous substrates

## **Group 3: Medium Oils (Most Crude Oils)**

- Moderately volatile
- For crude oils, up to one-third can evaporate in the first 24 hours
- Moderate to high viscosity; spread into relatively thick slicks
- Can form stable emulsions which increases viscosity
- Many have limited solubility
- Are more bioavailable/toxic than lighter oils (because they persist longer), so that animals in water and sediments are more likely to be exposed
- Can penetrate porous substrates
- Persistent residues can have long-term toxicity

## **Group 4: Heavy Oils (Heavy Crude Oils, No. 6 Fuel Oil, Bunker C)**

- Very little product loss by evaporation or dissolution (with exception of diluted bitumen products where the diluent component may evaporate over time)
- Very viscous to semi-solid; can be heated during transport
- Can form stable emulsions which increases viscosity but tends to break into tar balls quickly
- Low acute toxicity to water-column biota
- Penetration into substrates can be limited at first but can increase over time
- Can cause long-term effects via smothering or coating, or as residues in a water column and sediments, though generally less bioavailable than lighter oils

## **Group 5: Non-floating Oils (Slurry Oils, Coal Tar Oils, Carbon Black Feedstock, Very Heavy Crude Oils)**

- For guidance on the detection and recovery of non-floating oils, see API (American Petroleum Institute) Technical Report 1154-2, Sunken Oil Detection and Recovery Operational Guide, February 2016, <http://www.oilspillprevention.org/~media/Oil-Spill-Prevention/spillprevention/r-and-d/inland/sunken-oil-ops-guide.pdf>.

**Table 1-1 below presents recommended oil spill response methods for each oil group. These methods may not be the best in every situation and should be evaluated on a case-by-case basis.**

**Table 1-1: Response Methods Matrix Table**

**A = Recommend**  
**B = Consider**  
**C = Not Recommended**

<b>Response Method &amp; Water Body Type†</b>		<b>Group 1: Very-Light Oil Products (Gasoline)</b>	<b>Group 2: Light-Oil Products (Diesel, Jet Fuel, No. 2 Fuel Oil, Light Crudes)</b>	<b>Group 3: Medium-Oil Products (Most Crude Oil)</b>	<b>Group 4: Heavy-Oil Products (Heavy Crude Oils)</b>
Diversion Booming	Open Water	B	B	B	B
	River	B	B	B	B
	Creek	C	C	C	C
	Wetland	B	B	B	B
	Concrete-lined Channel/Aqueduct	C	B	B	B
Exclusion and Deflection Booming	Open Water	A	A	A	A
	River	B	B	B	B
	Creek	C	C	C	C
	Wetland	A	A	A	A
	Concrete-lined Channel/Aqueduct	C	B	B	B
Containment Booming	Open Water	B	A	A	A
	River	A *	A	A	A
	Creek	A *	A	A	A
	Wetland	A *	A	A	A
	Concrete-lined Channel/Aqueduct	C	B	B	B
Sorbents	Open Water	B	B	B	B
	River	B	B	B	B
	Creek	B	B	B	B
	Wetland	B	B	B	B
	Concrete-lined Channel/Aqueduct	A	A	A	A
Filter Barriers	Open Water	C	C	C	C
	River	C	C	C	C
	Creek	A	A	A	A
	Wetland	A	A	A	A
	Concrete-lined Channel/Aqueduct	C	B	B	B

Response Method & Water Body Type†		Group 1: Very-Light Oil Products (Gasoline)	Group 2: Light-Oil Products (Diesel, Jet Fuel, No. 2 Fuel Oil, Light Crudes)	Group 3: Medium-Oil Products (Most Crude Oil)	Group 4: Heavy-Oil Products (Heavy Crude Oils, No. 6 Fuel Oil, Bunker C)
Berming	Open Water	C	C	C	C
	River	C	C	C	C
	Creek	A	A	A	A
	Wetland	B *	B *	B *	B *
	Concrete-lined Channel/Aqueduct	C	C	C	C
Underflow Dams	Open Water	C	C	C	C
	River	C	C	C	C
	Creek	A	A	A	A
	Wetland	B *	B *	B *	B *
	Concrete-lined Channel/Aqueduct	B	B	B	B
Physical Herding	Open Water	B	A	A	A
	River	B	A	A	A
	Creek	B	A	A	A
	Wetland	B	A	A	A
	Concrete-lined Channel/Aqueduct	C	C	C	C
Channel Diversion	Open Water	C	C	C	C
	River	B	B	B	B
	Creek	A	A	A	A
	Wetland	A	A	A	A
	Concrete-lined Channel/Aqueduct	B	B	B	B

Adapted from NOAA and API, *Options for Minimizing Environmental Impacts of Freshwater Spill Response*, 1994; and API *Options for Minimizing Impacts of Inland Spill Response*, 2016; Table populated by Subject Matter Experts from Oil Spill Response Organizations and CDFW/OSPR.

A\* - for working with flammable liquids in this type of environment, the responder should consult with the local fire authority or CUPA prior to the deployment of containment booms.

B\* - wetlands are highly sensitive and any response actions in wetland habitat should be addressed at the time of the incident using site-specific information provided by a regulatory agency environmental scientist/resource trustee prior to deployment of this type of equipment in a wetland environment and considering the net environmental benefit.

† Water Body Type definitions can be found in Table 2-2, Section 2, of the GRP CM.



## 1.2 Water Velocity and Boom Placement

The velocity of flowing water significantly affects the selection of appropriate booming strategy. It is important to note that the velocity (speed) of moving water is different than the flow (volume) of moving water. The velocity of water is the distance it moves with respect to time, and for a river, is typically measured in knots, feet per second, or meters per second. The flow of water is the volume of water moving through a specific area, and for a river, is typically measured in cubic feet per second or cubic meters per second. Converting between the two requires knowledge of the size of the flow channel (width and depth). As such, there is no standard or simple conversion between the two. The following discussions provide guidance to estimate water velocity, and expected trajectory, and to use that information to appropriately select and deploy a booming strategy.

### Water Speed and Boom Deployment Angle

Measure the speed that water is moving by anchoring a line with two floating markers/buoys attached that are spaced 100 feet apart. Time the movement of floating debris between the two buoys, and then use Table 1-2 to estimate the water speed based on the travel time of the debris between the two buoys. You can also measure 100 feet along a straight portion of riverbank or shoreline, and time the movement of debris between those points, but this method is generally less accurate than using the buoys. The maximum boom deployment angle is also provided in the table and in Figure 1-1, based on the water speed measurements.

**Table 1-2: Water Speed Drift Measurement and Boom Deployment**

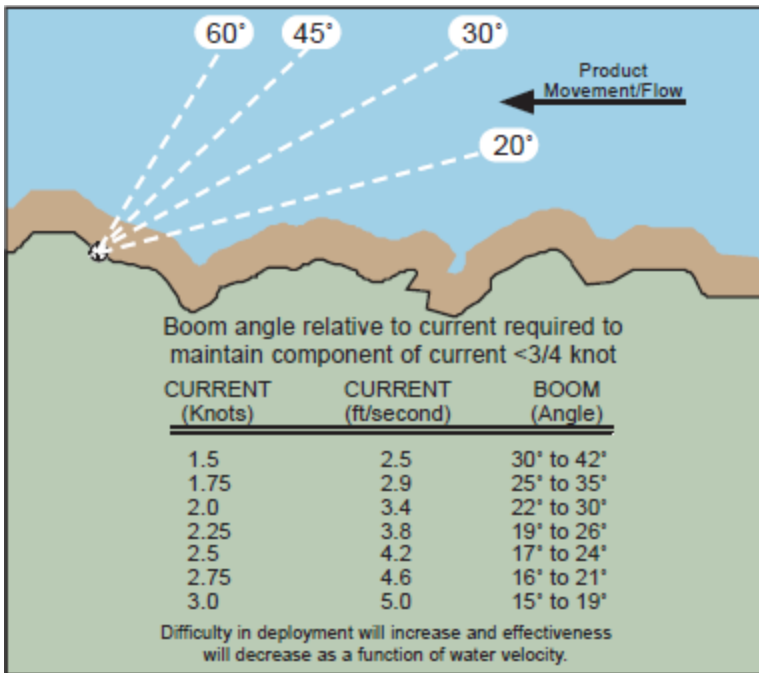
Time to Drift 100 feet (seconds)	Velocity (feet/sec)	Velocity (meters/sec)	Velocity (knots)*	Max Boom Angle (degrees)	Boom Required for 100-foot Profile to Current (feet)	General Boom Strategy
30	3.33	1.0	1.98	20	300	Cascading Deflection/ Diversion Boom with Short Skirt (<6 –inches)
60	1.7	0.5	1.0	45	150	Deflection/Diversion/ Cascade Containment
90	1.1	0.34	0.65	>45	<150	Diversion/Deflection/ Containment/ Cascade Containment
120	0.83	0.25	0.49	>45	<150	Diversion/Deflection/ Containment
180	0.55	0.16	0.32	90	100	Diversion/Deflection/ Containment

\*knots = nautical miles/hour

Adapted from *Oil Response in Fast Water Currents: A Decision Tool*. (USCG and US DOT, 2002) Note: Surface velocity is higher than bottom velocity due to friction from bottom substrate.

For a 100-foot section of boom perpendicular to a two-knot flow, the line force is greater than 250-pounds. Proper deployment angles to manage load and properly sized equipment (boat motor power) are essential for safe boom deployment.

**Figure 1-1: Boom Deployment Angles Based on Current Velocity**



Southeast Alaska Petroleum Response Organization, *SEAPRO Response Operations Manual*, 2004.

The distance covered by released material will depend on current flow conditions as well as the release location, downstream channel configuration and substrate characteristics. Table 1-3 provides generalized information to estimate the distance a release will cover during different flow conditions assuming a constant or average velocity.

**Table 1-3: Distance Covered Based on Flow Conditions**

Time to Drift 100 feet (seconds)	Average Velocity (feet/second)	Average Velocity (knots)	Distance Covered in 6 Hours (miles downstream)	Distance Covered in 12 Hours (miles downstream)	Distance Covered in 24 Hours (miles downstream)
30	3.33	1.98	13.7	27.3	55
60	1.7	1.0	6.9	13.8	28
90	1.1	0.65	4.5	9	18
120	0.83	0.49	3.4	6.8	13.5
180	0.55	0.32	2.2	4.4	8.8

*Feather River Geographic Response Plan*, Arcadis for Union Pacific Railroad, 2017.

Based on the time required to deploy response assets in the field (e.g., boom, skimmers), the incident containment response strategy location should be selected based on a conservative estimate to ensure that there is adequate time to deploy prior to the arrival of the released material. For example, during a relatively high flow condition with an average velocity of 2 knots in the river, if it will take greater than 6 hours, but less than 12 hours to deploy response assets, a site approximately 27 miles downstream should be selected and prioritized to provide full containment (to contain the leading edge of the release). Simultaneously, response strategies should be deployed closer to the release point to contain the majority of the release and/or to facilitate containment of a future expansion of the incident. Note

that these containment priorities follow source control and containment which is always the first priority.

### **Current Drag Force on One-Foot Boom Profile to Current**

The major force exerted on a boom is caused by the water drag on the skirt. Wave forces can increase the drag factor by two to three times depending upon the wave height, period, and loading dynamics. Wind force is less than current and waves but is also a factor. In high current situations, drag is sometimes increased by water piling up on the boom, causing some submergence and increased drag forces, often resulting in mooring or anchoring failure. In this situation, the 100-foot section of 4 X 6 diversion boom [4-inch freeboard (float) and 6-inch draft (skirt/curtain)] should take the hydrodynamic load. A replacement section 50-foot-long can withstand the reduced forces with submerging. The effects of current velocity and boom draft on boom drag force can be seen in Table 1-4. Drag increases with draft in a linear fashion, while current (velocity) increased drag more dramatically (to the square of the velocity) as in Table 1-4.

**Table 1-4: Current Drag Force on One-Foot Boom Profile to Current**

Velocity (feet/second)	Boom Drag Force (pounds)			
	Draft 0.5 Feet	Draft 1.0 Feet	Draft 1.5 Feet	Draft 2.0 Feet
0.8	0.7	1.3	2.0	2.7
1.7	2.7	5.3	8.0	10.7
2.5	6.0	12.0	18.0	24.0
3.4	10.7	21.3	32.0	42.6
4.2	16.7	33.3	50.0	66.6
5.1	24.0	48.0	72.0	95.9
5.9	32.6	65.3	97.9	130.6
6.8	42.6	85.3	127.9	170.6
7.6	54.0	107.9	161.9	215.9
8.4	66.6	133.3	199.9	266.5
9.3	80.6	161.2	241.8	322.5
10.1	95.9	191.9	287.8	383.8
11.0	112.6	225.2	337.8	450.4
11.8	130.6	261.2	391.8	522.3
12.7	149.9	299.8	449.7	599.6
13.5	170.6	341.1	511.7	682.2

Northwest Area Committee, *Grays Harbor Geographic Response Plan*, December 2013.

Towing load can be significant when a boom is anchored on one end and pulled against the current. Boats must have sufficient horsepower and be properly rigged to tow. Lines must be capable of withstanding the forces and the boom must have a tension member capable of high loads (Table 1-5). If the boom is extended behind the tow boat and pulled free in the current, there is only the frictional drag along the boom. Because this drag is a function of the boat speed, proper motor size becomes a function of boom size and length, boat size, and water velocity. Although free towing drag is low, when one end of the boom is anchored to the shore, a small boat may be incapable of positioning the boom

because of the high current drag exerted on the boom. The boom must be able to withstand the forces. The tension member must not become detached from the boom due to differential expansion.

**Table 1-5: Approximate Safe Working Loads/Tensile Strength of New Rope**

Rope Diameter (inches)	Manila No. 1 (3-strand) (pounds)	Nylon (3-strand) (pounds)	Polyester (3-strand) (pounds)
5/16	200 / 1,000	500 / 2,500	500 / 2,500
3/8	270 / 1,350	700 / 3,500	700 / 3,500
7/16		1,140 / 5,700	
1/2	530 / 2,650	1,250 / 6,250	1,200 / 6,000
5/8	880 / 4,400	2,100 / 10,500	1,950 / 9,750
3/4	1,080 / 5,400	2,750 / 5,400	2,300 / 11,500

Northwest Area Committee, *Grays Harbor Geographic Response Plan*, December 2013.

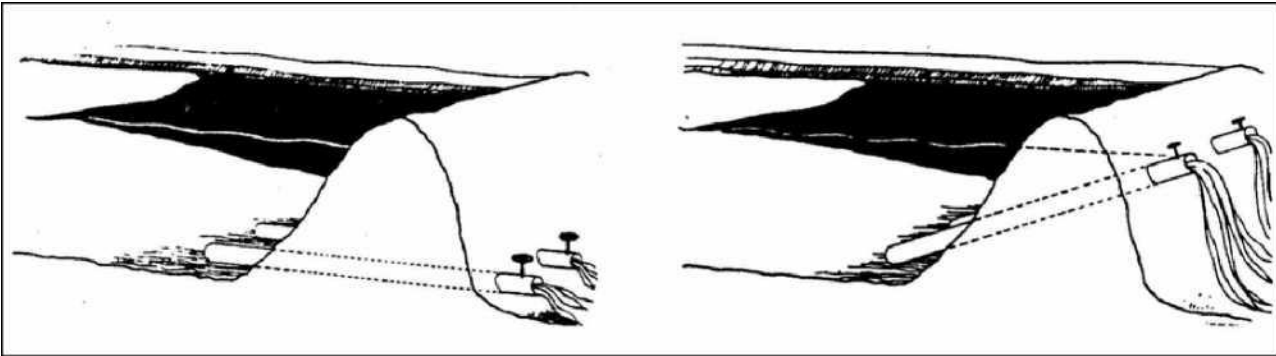
Attempting to moor or anchor a boom in a straight line across a current (90 degrees) is not recommended. The result is a sag in the boom that will trap free floating oil at a point inaccessible to the shore. In swift currents, the resulting forces on moorings or anchoring's can cause large lines of break and present possible safety hazards. The current can be so swift that the boom may dip and become completely or partially submerged. If this happens, the boom's position should be adjusted. The total force on the mooring or anchoring points will be a combination of the forces caused by current, wind, and waves.

Boom positioning is an important point. The first step is to decide where the boom should be located. It is likely that the boom will be placed on an angle to the current; therefore, the prime concern becomes the location of the upstream end. If the selected upstream location is inaccessible, a spot further upstream can be used for access and the boat and boom allowed to drift to the selected mooring or anchoring site. Additionally, boom placement and angle are dependent on where and how the oil can be collected once it has been diverted with boom (e.g. where a skimmer and/or vacuum truck can be placed). The boom can be secured to trees, stakes, anchors, or other solid objects. Do not attach boom to vehicles of any type or size.

### 1.3 Underflow Dams, Culvert Blocks and Weirs

Underflow dams can be built in shallow rivers, culverts, and inlets using hand tools or heavy machinery, as available. Pipes are used to form an underflow dam to allow water passage out while oil stays behind, as seen in first figure below. The inlet of the pipe is cut at an angle to permit a larger entrance area for the water in order to reduce the inlet velocities and the possibility of oil drawdown due to formation of vortices. Caution should be taken to prevent whirlpools from forming and pulling the oil down. Face the cut pipe opening down (or insert a 90-degree angle) to help eliminate this. This technique is effective for water bodies less than two feet deep where flow volume can be accommodated by pipe flow. This method can also be used in deep, narrow culverts. Figures 1-2 and 1-3 show example earthen and sandbag underflow dams.

**Figure 1-2: Earth Underflow Dam (DOWCAR 1997)**



**Figure 1-3: Sandbag Underflow Dam**



OSPR File Photo



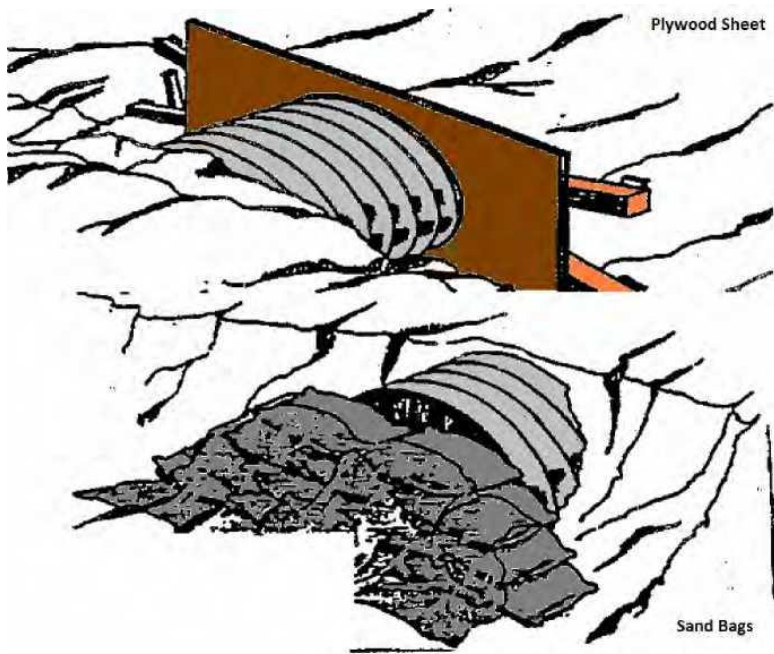
There are commercially available underflow dams that self-inflate with water pressure, see Figure 1-4 below. The dam will unfold and fill as the water infiltrates inside the barrier. Water pressure will completely open the dam and a sewn-in floater on the top allows the dam to stay afloat. Accumulated water pressure stabilizes the dam in place (e.g., <https://www.halenhardy.com/shop/product/instant-underflow-dam/>).

**Figure 1-4: Commercial Underflow Dam**



Culvert blocks prevent oil from entering culverts by blocking with plywood, sandbags, or sediments. Figure 1-5 shows a plywood culvert block and sandbag culvert block.

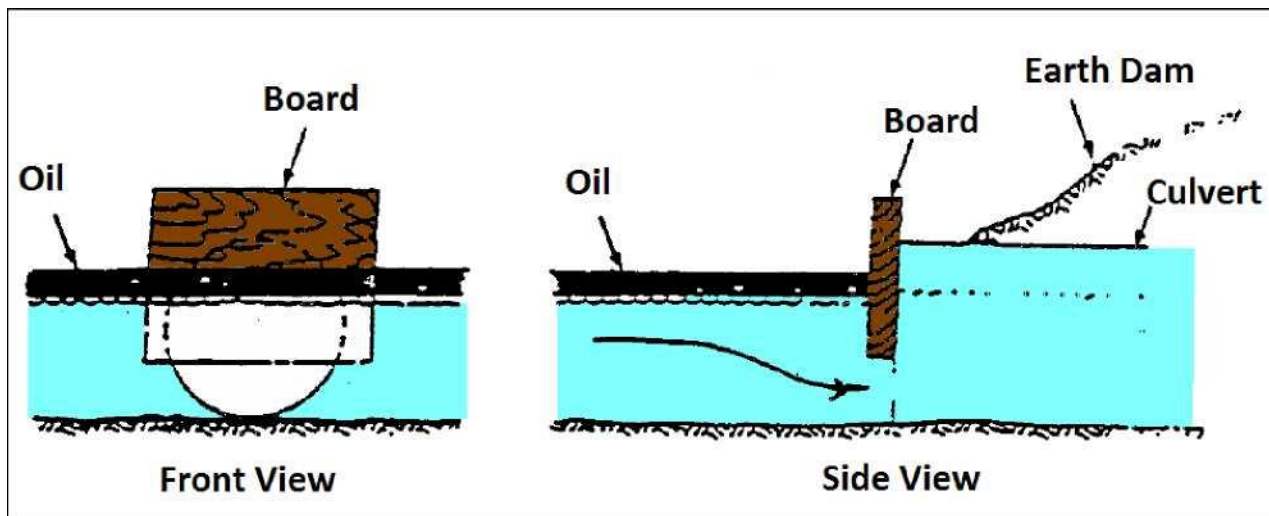
**Figure 1-5: Culvert Block**



Northwest Area Committee, *Grays Harbor Geographic Response Plan*, December 2013.

Weir dams are used to block the flow of oil through a culvert while letting uncontaminated water pass, Figure 1-6. A plywood or similar barrier is fixed to the upstream opening of the culvert. The lower edge of the plywood is below the oil/water interface and above the bottom of the culvert. Adjust size of the opening depending on flow rate.

**Figure 1-6: Culvert Weir/Weir Dam**



Northwest Area Committee, *Grays Harbor Geographic Response Plan*, December 2013.

# Geographic Response Plan Companion Manual

## Section 2 - Shoreline Cleanup Assessment Technique, Shoreline Countermeasures, and Cleanup Endpoints

### 2.0 Introduction

This section serves as a tool for countermeasure contingency planning and implementation for shorelines within the geographic response plan (GRP) area. It contains water body and habitat classification and oil countermeasure matrices for very light oils, light oils, medium oils, and heavy oils. For relative effectiveness of response techniques for non-floating oils, see Section 9 of the Geographic Response Plan Companion Manual (GRP CM). The shoreline type for a specific area can be compared to the matrix for the particular oil spilled to determine (in general) what response cleanup actions are appropriate. This chapter also provides information on Shoreline Cleanup Assessment Technique (SCAT) to document location and shoreline oiling conditions beginning in the early stages of a spill. SCAT surveys continue as cleanup efforts are implemented and to eventually ensure that cleanup endpoints are met.

Do less harm than good. Because implementing spill response options can be potentially damaging to flora and fauna and/or their habitats, responders need to compare the environmental consequences of natural recovery to the relative consequences of other response options in order to select the "best mix" of options that will facilitate ecosystem recovery and benefit the public. This concept is known as a Net Environmental Benefit Analysis (NEBA); and is more recently known as Spill Impact Mitigation Assessment (SIMA). Less intrusive methods or natural recovery are often preferable. The best cleanup strategy is often not the one that removes the most oil but that removes the oil that poses a greater risk of injury than would result from the cleanup.

### 2.1 Shoreline Cleanup Assessment Technique (SCAT)

SCAT is a systematic method for surveying shorelines after an oil spill. The SCAT approach uses standardized terminology to document shoreline oiling conditions and is designed to support decision-making for shoreline cleanup. It is flexible in its scale of surveys and in the detail of datasets collected. SCAT is a regular part of the oil spill response; surveys begin early in the response to assess initial shoreline conditions, and ideally continue to work in advance of operational cleanup. Surveys continue during the response to verify shoreline oiling, recommend appropriate shoreline cleanup countermeasures, assess cleanup effectiveness, and eventually, to develop cleanup endpoints and verify that the approved endpoints have been met.

During a spill response, SCAT is a function that is typically conducted under the Environmental Unit (EU) within the Planning Section of the ICS structure. The SCAT teams are often made up of representatives from state, Office of Spill Prevention and Response (OSPR), and federal, US Coast Guard (USCG) or US Environmental Protection Agency (USEPA), agencies as well as the Responsible Party (RP) and should be trained and knowledgeable in their roles.



SCATalogue is an iOS app for the collection of SCAT data developed by OSPR and is the preferred method for SCAT data collection in California. SCATalogue's digitally captured data can be processed quickly and accurately by GIS staff in the incident command post, and clearly displayed for use by command staff and other responders. SCATalogue also allows for automated georeferencing of data (i.e., track log, SCAT segments, oiling zones, pits/trenches, photos, etc., with associated lat./long. coordinates). The SCATalogue app replaces the use of the NOAA Shoreline Oiling Summary paper forms in the field.

The app is free and available to all, and does not require an internet connection or cell service for use in the field; it was designed for offline usage. Once a survey is completed, the data can be transferred via email, flash drive, iTunes, or via local WiFi as soon as available. The SCATalogue app is available for iOS devices, specifically the iPad Mini's.

Information on SCAT can be found on the National Oceanic and Atmospheric Administration (NOAA) website for oil spill response resources at <http://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/resources/shoreline-cleanup-and-assessment-technique-scat.html>.

## **2.2 Shoreline Countermeasures**

The appropriate shoreline countermeasures will be selected from options based on the chemical and physical properties of the material to be cleaned, the substrate to be cleaned, the weather conditions, safety, and other factors. The EU will consult with the OSPR Applied Response Technology (ART) Technical Specialist regarding use of ART or Oil Spill Cleanup Agent (OSCA) approaches that could benefit shoreline cleanup. The use of OSCAs also requires approval by the Regional Response Team (RRT), which for California is Region IX. Information on ARTs and OSCAs can be found in Section 3 of the GRP CM.

Shoreline countermeasure processes continue to evolve, reflecting increasingly efficient cleanup techniques. Accordingly, the following information may change as new information is developed. The range of shoreline countermeasures extends from passive restoration (no active response measures) to active removal of impacted soil, vegetation, and water. Response organizations and agencies must identify shorelines requiring cleanup, recommend shoreline countermeasures, monitor the effectiveness and impacts of cleanup, and resolve problems as the cleanup progresses.

### **Shoreline Types and Cleanup Measures**

Shoreline types are identified for each of the response strategy locations and can be found on the response strategy detail sheets in Chapter 3 of the GRPs. Table 2-1 below lists the Environmental Sensitivity Index (ESI) shoreline types for three different habitat settings as well as the classification code.

Additional information on standard shoreline type classifications can be found in the Shoreline Assessment Manual (NOAA, 2013) available as a publication on NOAA's website at: [https://response.restoration.noaa.gov/sites/default/files/manual\\_shore\\_assess\\_aug2013.pdf](https://response.restoration.noaa.gov/sites/default/files/manual_shore_assess_aug2013.pdf)

**Table 2-1: ESI Shoreline Types**

ESI NO.	ESTUARINE	LACUSTRINE	RIVERINE
1A	Exposed rocky shores	Exposed rocky shores	Exposed rocky banks
1B	Exposed, solid man-made structures	Exposed, solid man-made structures	Exposed, solid man-made structures
1C	Exposed rocky cliffs with boulder talus base	Exposed rocky cliffs with boulder talus base	Exposed rocky cliffs with boulder talus base
2A	Exposed wave-cut platforms in bedrock, mud, or clay	Shelving bedrock shores	Rocky shoals; bedrock ledges
2B	Exposed scarps and steep slopes in clay		
3A	Fine- to medium-grained sand beaches		
3B	Scarps and steep slopes in sand	Eroding scarps in unconsolidated sediments	Exposed, eroding banks in unconsolidated sediments
3C	Tundra cliffs		
4	Coarse-grained sand beaches	Sand beaches	Sandy bars and gently sloping banks
5	Mixed sand and gravel beaches	Mixed sand and gravel beaches	Mixed sand and gravel bars and gently sloping banks
6A	Gravel beaches (granules and pebbles)	Gravel beaches	Gravel bars and gently sloping banks
6B	Riprap	Riprap	Riprap
7	Exposed tidal flats	Exposed tidal flats	
8A	Sheltered scarps in bedrock, mud, or clay	Sheltered scarps in bedrock, mud, or clay	
8B	Sheltered, solid man-made structures	Sheltered, solid man-made structures	Sheltered, solid man-made structures
8C	Sheltered riprap	Sheltered riprap	Sheltered riprap
8D	Sheltered rocky rubble shores		
8E	Peat shorelines		
8F			Vegetated, steeply-sloping bluffs
9A	Sheltered tidal flats	Sheltered sand/mud flats	
9B	Vegetated low banks	Vegetated low banks	Vegetated low banks
9C	Hypersaline tidal flats		
10A	Salt- and brackish-water marshes		
10B	Freshwater marshes	Freshwater marshes	Freshwater marshes
10C	Swamps	Swamps	Swamps
10D	Scrub-shrub wetlands; Mangroves	Scrub-shrub wetlands	Scrub-shrub wetlands
10E	Inundated low-lying tundra		

Table 2-2 provides a description of the waterbody and habitat types included in Table 2-3, Shoreline Countermeasures Matrix. Where applicable, the comparable ESI shoreline type is included.

**Table 2-2: Waterbody and Habitat Type Descriptions**

Waterbody or Habitat Type	Description	Comparable ESI Shoreline Type (If applicable)
Open Water	Large water body with wind-generated waves and generally weak currents. Suspended sediment loads can be highly variable. Potential thermal stratification in summer and ice cover in winter.	N/A
River	Large linear, flowing water body with typically year-round steady flow, strong currents and deep channels. Suspended sediment load can be high. Include backwater areas and other habitats with extensive vegetation and debris. Water can flow into adjacent floodplains during high water level events. Banks have to be surveyed and operationally treated separately.	See shoreline/bank types below under "Permeable and Impermeable Substrates."
Creek	Smaller linear, flowing water body with shallow water, narrow channels, and highly variable flow. Streams include falls, cascades, riffles, and slides, which can mix oil into the water column. Can be choked with logjams and debris. Mid-channel islands and bars can divide flow into multiple channels. Both banks can be surveyed and cleaned at the same time.	See shoreline/bank types below under "Permeable and Impermeable Substrates."
Wetland	Transitional lands between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. See specific wetland types below.	10B, 10C, 10D
Concrete-lined Channel/Aqueduct	See "Developed Land" below.	1B, 8B
Developed Land	Residential, industrial, and urban, areas with extensive manmade surfaces and modified drainage.	1B, 8B
Forested Wetland	Woody vegetation with standing water or saturated soils at a frequency and duration that supports plants adapted to those conditions. Includes bottomland hardwoods and swamps.	10C
Fresh Emergent Wetland	Areas of emergent vegetation with standing water and saturated soils at a frequency and duration that supports plants adapted to those conditions. Includes marshes, bogs, prairie potholes, wet meadows, and vernal pools.	10B

Waterbody or Habitat Type	Description	Comparable ESI Shoreline Type (If applicable)
Scrub-Shrub Wetland	Areas dominated by semi-permanently flooded, woody vegetation less than 20 feet (6 meters) tall consisting of true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. There may be submersed, rooted, or non-rooted floating aquatics or emergent vegetation associated with these systems which are generally found adjacent and connected to lakes, ponds, or shorelines. *, **	10D
Permeable Substrate	Land surfaces, shorelines, and river/stream bars composed of sand and/or gravel, or riprap structures.	5, 6A, 6B
Impermeable Substrate	Land surfaces, shorelines, and bars composed of bedrock, muddy sediments, solid bulkheads, and pavement.	1A, 1B, 1C, 2A

American Petroleum Institute's, *Options for Minimizing Environmental Impacts of Inland Spill Response* (API Technical Report, October 2016)

\*Vegetation Assessment and Ranking of Fen and Wet Meadow Sites of the Shasta-Trinity National Forest, California. <https://www.cnps.org/wp-content/uploads/2019/01/veg-fen-shasta-trinity-2012.pdf>

\*\*Dieck, J. J., and Robinson, L. R., 2004, *Techniques and Methods Book 2, Collection of Environmental Data*, Section A, Biological Science, Chapter 1, General classification handbook for floodplain vegetation in large river systems: U.S. Geological Survey, Techniques and Methods 2 A-I, 52 p.

Table 2-3 below contains information on oil countermeasures for very light (Group 1) oils, light (Group 2) oils, medium (Group 3) oils, and heavy (Group 4) oils. The matrix provides general guidance on the removal of oil from various waterbody and habitat types as adapted from the American Petroleum Institute's (API) "Options for Minimizing Environmental Impacts of Inland Spill Response" (API Technical Report, October 2016). Where possible, the comparable ESI shoreline type code is included in the table.

The countermeasures listed in Table 2-3 are not comprehensive and not necessarily the best under all circumstances, and any listed technique may need to be used in conjunction with other techniques. Selection of countermeasures is based on the degree of oil contamination, waterbody or habitat type, the presence of sensitive resources, type and volume of material released, the location of the release and of the response actions, river and weather conditions, and the time required to implement the response strategy.

ARTs and OSCAs are addressed in Section 3 of the GRP CM and are subject to state and federal approval prior to use.

**Table 2-3: Shoreline Countermeasures Matrix**

**A = Recommend, B = Consider or Conditional, C = Not Recommended**

Countermeasure & Oil Classification		Waterbody Type					Habitat Type and Comparable ESI Shoreline Type					
		Open Water	River	Creek	Wetland	Concrete-lined Channel/ Aqueduct	Developed Land ESI: 1B, 8B	Impermeable Substrate ESI: 1A, 1B, 1C, 2A	Permeable Substrate ESI: 5, 6A, 6B	Fresh Emergent Wetland ESI: 10B, 9B	Scrub-Shrub Wetland* ESI: 10D	Forested Wetland ESI: 10C
No Action/Natural Recovery	Very Light Oil	A	A	A	A	A	A	A	A	A	A	A
	Light Oil	A	A	B	B	B	B	A	A	B	A	A
	Medium Oil	A	A	B	A/B	B	B	A	A	B	A	A
	Heavy Oil	B	B	B	B	B	B	B	B	B	B	B
Vacuum	Very Light Oil	B	B	B	-	-	-	-	-	-	-	-
	Light Oil	A	A	A	A	A	A	A	-	A	B	B
	Medium Oil	A	A	A	A	A	A	A	A	A	B	B
	Heavy Oil	A	A	A	A	A	A	A	A	A	A	A
Oiled Debris Removal	Very Light Oil	-	-	B	A/B	A	A	A	A	B	A	A
	Light Oil	A	A	A	A	A	A	A	A	A	A	A
	Medium Oil	A	A	A	A	A	A	A	A	A	A	A
	Heavy Oil	A	A	A	A	A	A	A	A	A	A	A
Manual Oil Removal (e.g. Tar Balls)	Very Light Oil	-	-	-	-	-	-	-	-	-	-	-
	Light Oil	-	-	B	B/C	A	A	A	A	C	B	B
	Medium Oil	-	-	B	B	A	A	A	A	B	B	B
	Heavy Oil	A	A	B	B	A	A	A	A	B	B	B
Scraping/Wiping	Very Light Oil	-	-	-	-	-	A	-	-	-	-	-
	Light Oil	-	-	A	-	-	A	-	B	C	-	-
	Medium Oil	-	-	A	-	-	A	-	B	B	-	-
	Heavy Oil	-	-	A	-	-	A	-	B	B	-	-
Oiled Sediment Removal/Excavation	Very Light Oil	-	-	C	C	A	A	-	B	C	C	C
	Light Oil	-	-	B	B/C	A	A	-	B	C	C	A
	Medium Oil	B	B	B	C	A	A	-	B	C	C	C
	Heavy Oil	B	B	B	C	A	A	-	B	C	C	C

Countermeasure & Oil Classification		Waterbody Type					Habitat Type and Comparable ESI Shoreline Type					
		Open Water	River	Creek	Wetland	Concrete-lined Channel/ Aqueduct	Developed Land ESI: 1B, 8B	Impermeable Substrate ESI: 1A, 1B, 1C, 2A	Permeable Substrate ESI: 5, 6A, 6B	Fresh Emergent Wetland ESI: 10B, 9B	Scrub-Shrub Wetland* ESI: 10D	Forested Wetland ESI: 10C
Sediment Removal – Cleaning - Replacement	Very Light Oil	-	-	-	B	-	A	-	B	B	B	B
	Light Oil	-	-	-	B	-	A	-	B	B	B	B
	Medium Oil	-	-	-	B	-	A	-	B	B	B	B
	Heavy Oil	-	-	-	B	-	A	-	B	B	B	B
Cutting Oiled Vegetation/ Vegetation Removal	Very Light Oil	-	-	-	-	-	-	-	-	-	-	-
	Light Oil	B	B	B	C	A	A	-	-	C	C	C
	Medium Oil	B	B	B	C	A	A	-	-	C	B	C
	Heavy Oil	-	B	B	B	A	A	-	-	B	B	B
Ambient/Low Pressure Washing	Very Light Oil	-	-	A	B	-	-	-	-	B	A	B
	Light Oil	-	-	A	A/B	A	A	A	A	A	A	B
	Medium Oil	-	-	A	A/B	A	A	A	A	A	A	B
	Heavy Oil	-	-	B	B	A	A	B	B	B	A	B
Hot Water/High Pressure Washing	Very Light Oil	-	-	-	-	-	-	-	-	-	-	-
	Light Oil	-	-	-	C	-	-	B	B	C	C	C
	Medium Oil	-	-	-	C	A	A	B	B	C	C	C
	Heavy Oil	-	-	-	C	A	A	B	B	C	C	C
Dry Ice Blasting	Very Light Oil	-	-	-	-	-	-	-	-	-	-	-
	Light Oil	-	-	-	-	-	-	A	-	-	-	-
	Medium Oil	-	-	-	-	A	A	A	-	-	-	-
	Heavy Oil	-	-	-	-	A	A	B	-	-	-	-

Adapted from *Options for Minimizing Environmental Impacts of Inland Spill Response*, (API Technical Report, October 2016)

\*Upper Mississippi River Basin Association, *Inland Stranded Oil Habitat Fact Sheet for Response: Floodplain Forest*. <http://www.umrba.org/hazspills/floodplain-forest.pdf>

## 2.3 Cleanup Endpoints

The circumstances of each spill are different and as such, cleanup endpoints must address spill-specific conditions. The goal of a spill response is to select the appropriate treatment methods and cleanup endpoints that minimize overall impacts to, and result in the most rapid recovery of, the environment. The 'how clean is clean' question is complex due to the many variables that need to be considered when developing cleanup endpoints. These include the degree of oiling, group of oil, risk to receptors, cleanup technologies, habitat type (e.g., shoreline type/geomorphology), species present, ecological and cultural resource issues, bioavailability of the oil, safety concerns, logistical issues, waste minimization issues, anticipated rate of natural "cleaning," weather, and sea state (marine)/flow rate (creeks/rivers). Response options and cleanup endpoints must be tailored to address the fate and transport of the specific product that has been released and it necessitates evaluating the environmental trade-offs of each cleanup option.

Cleanup endpoints can be **qualitative** or **quantitative**. Cleanup endpoints are specific criteria assigned to an area that define when sufficient treatment effort has been completed. Part of establishing the cleanup endpoint includes establishing the method to be used for determining whether or not the endpoints have been met. These methods can include using visual observations, physical measurements, and/or analytical measurements. **Qualitative endpoints** describe the presence and character of oil (e.g., does not rub off on contact) or is based on interpretive impact endpoints (e.g., removal to the point when further treatment will result in excessive habitat disturbance) and are more commonly used for oil spill response. **Quantitative endpoints** either utilize SCAT metrics related to percent oil distribution and oil thickness (e.g., no more than 10% stain) or use analytical criteria [e.g., less than 1,000 mg/kg total petroleum hydrocarbons (TPH) in soil]. With input from resource trustees and other stakeholders, the Environmental Unit Leader (EUL) typically recommends cleanup endpoints to the Unified Command (UC) for approval.

# Geographic Response Plan Companion Manual

## Section 3 – Applied Response Technologies and Oil Spill Cleanup Agents

### 3.0 Introduction

Applied Response Technology (ART) includes two categories of response technology: 1) The use of chemical or biologically based Oil Spill Cleanup Agents (OSCAs), which can include sorbents, surface washing agents, bioremediants, dispersants, herding agents, solidifying agents, and de-emulsifiers, and 2) The use of in-situ burning (ISB) of oil on water or land. In California, relatively few ARTs are currently approved for inland use. Responders should engage the Office of Spill Prevention and Response (OSPR) ART Technical Specialist early in the response to assess ART suitability and to coordinate approval for use as described in the following section.

Not all OSCAs are formulated for use in all situations, so product selection is crucial to determining whether a net environmental benefit can be reasonably expected from the use of any particular product. In some situations, oil removal via mechanical means may not remove enough oil in hard-to-reach or sensitive areas, dynamic water environments, natural shorelines, and other hard or manmade surfaces. When appropriate, ARTs are evaluated as response tactics and tailored to the needs posed by the incident.

### 3.1 Federal and State Policies Directing the ART Use and Approval

#### Federal ART Approval

During an oil spill, the Federal On-Scene Coordinator (FOSC) can request the use of an OSCA or ISB by making a formal request of the Regional Response Team (RRT) IX. It is the policy of RRT IX to respond to all such FOSC requests within 2 hours. RRT approvals to use ISB or OSCAs are only issued to the FOSC, although it is expected that the FOSC will want agreement from the Unified Command (UC) members with the ART actions that will be taken.

There are 13 RRTs in the U.S., each representing a particular geographic region. RRTs are composed of representatives from field offices of the federal agencies that make up the National Response Team (NRT), as well as state representatives. The four major responsibilities of RRTs are: Response, Planning, Training, and Coordination. (<https://www.epa.gov/emergency-response/regional-response-teams>).

#### State ART Approval

OSPR is a member of RRT IX. In addition to their voting role on the RRT, the OSPR Administrator has a separate approval authority granted under state law when an OSCA or ISB is considered for use in, on, near, or threatening state waters.



To be considered for use in California, OSCAs must be both:

- 1) Listed on the federal US Environmental Protection Agency (USEPA) National Contingency Plan (NCP) Product Schedule (<https://www.epa.gov/emergency-response/ncp-product-schedule-products-available-use-oil-spills>), and
- 2) Licensed by the California Department of Fish and Wildlife (CDFW), OSPR (<https://wildlife.ca.gov/OSPR>).

Once an OSCA is appropriately listed and licensed, it must still be approved for use by the RRT. If the use is in state waters, approval must also be granted by the OSPR Administrator. Contact the OSPR ART Technical Specialist, or consult the OSPR web site at <https://www.wildlife.ca.gov/OSPR/OSRO/Oil-Spill-Cleanup-Agents>, to access current lists of OSPR licensed and exempt oil spill cleanup agents. The OSPR ART Technical Specialist can also facilitate the RRT and OSPR Administrator approval processes.

## 3.2 ART Category Descriptions

### Sorbents

Sorbent materials may be organic, inorganic, or synthetic and can come in many forms including sheets, pillows, socks, sweeps, clusters (pom-poms), booms, and loose particulates. Several specific properties are considered advantageous for sorbent materials. Sorbents are oleophilic (having or relating to strong affinity for oils) and hydrophobic (tending to repel or fail to mix with water), and should pick-up oil quickly, retain it without significant “re-sheening,” and should sorb a large amount per unit weight of sorbent. Sorbents are generally easy to apply and recover. Most sorbents are not reusable, and the extensive use of sorbents results in the generation of a large amount of oiled waste material for temporary storage and appropriate disposal. For this reason, sorbents tend to be used for oil recovery where the oil covers a relatively small surface area.

The USEPA exempts all sorbent and sorbent-type products from listing procedures. Sorbents are not automatically exempted from the State licensing process – they must first prove they are “inert” according to definitions in State Government Code Section 8670.13.1(b) before a state license exemption will be granted.

### Solidifiers

Solidifiers turn oil into a more cohesive or solid mass to ease recovery. They are usually available in dry granular form for use either in a loose and broadcast application, or as a more easily recoverable self-contained product (e.g., boom, sock, pillow, pad). Unlike sorbents that physically soak-up liquid, the solidifiers bond the liquid into a mass with minimal volume increase. When the product is used in a self-contained form, the oiled mass is easily recovered. The bonded material also eliminates dripping (common with sorbents) and thereby minimizes re-sheening, residue, or cross-contamination of otherwise unoiled areas. Some types of solidifiers can convert the oil to a rubber-like substance. The reaction of these and some other types of solidifiers is not reversible. There is minimal change in the specific gravity of the treated oil when solidified.

Use of solidifiers in self-contained form may provide advantages over the use of conventional sorbent products and, if so, should be more broadly considered and used in marine and inland spill response environments. They are claimed to be more effective than many conventional sorbents, do not allow dripping or re-sheening of oil, can be reused, work in a variety of otherwise sensitive or hard-to-reach environments, and help minimize the considerable amount of sorbents that become part of the oil spill response waste stream.

Although several limitations to the use of loose particulate solidifiers have been identified, there may be certain instances where they could fill specific on-water response functions. Because they react with the first oil they contact, they could potentially be used as a self-creating barrier, although the integrity and recoverability of this solidifier-based barrier has not yet been demonstrated.

### **Surface Washing Agents**

The principal use of surface washing agents (also sometimes referred to as beach cleaners or shoreline cleaning agents) is to lift stranded oil from surfaces (primarily oil stranded in intertidal areas or on constructed surfaces) and to float or refloat the oil where it can be recovered using on-water recovery methods (e.g., skimmers, sorbents, vacuum trucks). These agents should not act to disperse the oil into the water. They can potentially be used for cleanup of sand and gravel, shorelines and other hard surfaces (e.g., sand, cobble, rocky rip rap, pier pilings, ship hulls), as well as in sensitive habitats (e.g., wetlands and marshes) when seeking to release and recover spilled oil without removal of the oiled vegetation. In such cases, a net environmental benefit analysis and consideration of aesthetic and other criteria would typically be employed to consider the relative impact of residual oil remaining in the environment.

### **Herding Agents**

Spilled oil spreads out very quickly to form thin films or slicks several microns to tenths of a millimeter thick. This thinning makes it difficult to contain and collect the oil by mechanical means or to support ISB.

Chemical herding agents work by exerting a spreading pressure on the water surface greater than the oil slick. When used in conjunction with conventional containment and recovery devices, herding agents help prevent oil from spreading. Optimal uses of herding agents include controlling slicks under docks or piers where conventional equipment cannot reach, and in harbors where the equipment can be pre-staged and ready to use early in the spill. Also, herders may be effective in keeping shallow water slicks pushed away from contacting sensitive marshes. Herding agents are not a substitute for booms but may be used for short-term protection and enhanced recovery where deploying booms could cause more damage or be of limited effectiveness.

### **De-Emulsifiers**

One potential approach to extending the window of opportunity for the use of dispersants or ISB is through the application of de-emulsifying agents. The application of these agents would be intended to slow or reduce the formation of water-in-oil emulsion, or break an existing emulsion, allowing for the application of dispersants or other response strategies that are less effective on emulsified oil. Though de-emulsifying agents have been used in oil production for many years, there is little information on their use during on-water oil spill response.

## **Bioremediants/Biodegradation Enhancements**

When oil enters the environment, hydrocarbon degrading bacteria and other microorganisms begin to naturally alter and break down the oil, ultimately converting it to carbon dioxide and water. Although bioremediation occurs naturally starting almost immediately when oil enters the environment, the breakdown of a large mass of oil is a slow process, requiring weeks or months, or perhaps longer depending on the weight and volume of the oil, the degree of weathering, and environmental factors including temperature, oxygen levels (in water), and available nutrients. The addition of bioremediants for spill response does not increase the ultimate extent of hydrocarbon degradation, but only the rate of biodegradation. Once the more easily degraded alkanes and lower-molecular-weight aromatics are removed from the oil through weathering or other degradation processes, the continuing biodegradation of the remaining oil residues slows considerably.

Commercial bioremediants are typically comprised of nutrients intended to stimulate the rate of hydrocarbon biodegradation, and sometimes include bacterial colonies or enzymes to promote enhanced degradation. The use of bioremediants is generally only considered for land-based bioremediation. Bioremediation is generally not considered as a first response tool, but rather for later stages of an oil spill response when continuing active recovery measures may result in higher impacts than allowing residual material to remain in the environment and to naturally break down.

Bioremediation products currently proposed for on-water use were originally designed for terrestrial application. Some of these products include a surfactant, which would move the treated oil into the water column. Other bioremediation products that have been specifically designed for on-water application, contain ingredients such as clay or other material that attach to or encapsulate the oil. This process ensures oleophilic microbes and nutrients maintain contact with the spilled oil but may also sink the oil particles and potentially reduce microbe effectiveness depending on how deep the particle sinks.

The primary use of bioremediation in the rocky and sandy intertidal habitat is generally focused on light to medium oiled areas or as a polishing or finishing step in areas previously cleaned by mechanical means. Bioremediation is not effective in addressing pooled oil, tar balls, mousse, or other heavy concentrations of beached oil. Bioremediation is also less effective in addressing buried oil in dense, fine-grained sediment (e.g., tidal mudflats) where anaerobic conditions exist in the subsurface. However, marshes and mudflats are sensitive environments which are easily impacted by mechanical oil spill cleanup techniques otherwise used on spills in the intertidal region. For this reason, the less intrusive bioremediation process is a potentially important cleanup tool for surficial (not buried) oil spilled in these sensitive areas.

## **Dispersants**

Dispersants are chemicals that are applied directly to spilled oil. Chemical dispersants assist with breaking up the oil into small particles facilitating the mixing of oil and water to prevent floating oil that may migrate to surface features or affect birds and other wildlife at the water surface.

Dispersants could theoretically be approved for use on freshwater lakes and reservoirs, however, there are also no dispersants currently licensed for use in California that are formulated for freshwater use, although if the need arose, a one-time emergency use of a freshwater dispersant that is on the NCP Product Schedule could be approved by the OSPR Administrator and the RRT.

## In-Situ Burn

Another alternative to mechanical recovery or the use of dispersants is ISB. Oil floating on the water surface is collected into slicks and ignited. The oil can be contained in fire-resistant booms, or by natural barriers such as shorelines, levees, roads and ice banks. In some situations (e.g., oiled marshes, or when the spilled oil is highly volatile), supplemental collection to ensure adequate oil thickness for a sustained burn is not required. On land, oil can be burned when it is on a combustible substrate such as vegetation, logs, and other debris. Oil can be burned from non-flammable substrates using a burn promoter. On sedimentary substrates, it may be necessary to dig trenches for oil to accumulate in pools to a thickness that will sustain burning. Heavy oils are difficult to ignite but can sustain a burn. Emulsified oils may not ignite nor sustain a burn when the water content is greater than 30 to 50 percent.

ISB is implemented to eliminate surface oil by converting it into its primary combustion products (gases and soot) released into the atmosphere, with a small percentage of other unburned or residual byproducts. The environmental impacts of on-water spills are lessened but at the cost of increasing the potential threat posed by an airborne smoke and particulate plume. A distinct advantage of ISB is that it permanently removes oil from the water surface, with little or no impacts to potentially sensitive resources outside the burn and smoke plume area. Disadvantages are that successful burns create a very dark and visible soot plume, which will need to be monitored to ensure particulate matter within the plume does not exceed allowed standards and that it is not drifting toward human populated areas or occurring within the minimal distances from shore established by local air districts.

Decision makers and the trustee agencies will evaluate the effects of burning versus not burning the oil and choose the option that provides the greatest overall benefit to the environment without causing undue public health impacts. In-situ burning can in some cases be used in conjunction with other response techniques to increase the rate of surface oil removal. Refer to Sections 4007.06 and 1007.06 of the Region IX Regional Contingency Plan (RCP).

The FOSC currently has the authority (via RRT IX Pre-Authorization or RRT IX Incident-Specific Authorization), to use ISB as an oil spill response tool. Necessary authorizations for ISB will vary for marine versus inland spills. Authorizations for on-shore burning (inland or upland) will vary depending on which agency is providing the FOSC for the response [US Coast Guard (USCG) versus USEPA], whether the burn could affect state waters, whether the burn uses an accelerant (versus simple igniter), and which local Air District might be affected and involved in how the ISB decision is implemented.

The OSPR ART Lead Technical Specialist can work with the FOSC and RRT in providing ISB recommendations and assisting with ISB Plan implementation.

# Geographic Response Plan Companion Manual

## Section 4 – Waste Management and Disposal

### 4.0 Introduction

The oil spill response organization (OSRO) will be responsible for managing all spill-related wastes generated as a result of an oil spill incident. The waste will be managed in an environmentally responsible manner and disposed of in a timely manner so as to reduce opportunities for secondary contamination. Transportation and recycling or disposal will take place following proper segregation, storage and quantification as required. The Environmental Unit (EU) under the Planning Section is responsible for developing a waste disposal plan and the Operations Section is responsible for coordinating the activities of personnel engaged in collecting, storing, transporting, and disposing of waste materials. Depending on the volume, scope and location of the spill, the disposal groups may be further divided into teams or individual resources. Response personnel will recover the maximum feasible amount of oil product spilled during the incident.

### 4.1 Waste Storage, Segregation and Decontamination

Recovered wastes shall be separated by waste stream type and location where the waste was recovered for quantification purposes. Wastes recovered from the incident shall be kept separate from other wastes (i.e., previously collected or daily generated “clean” wastes). All materials will be stored in secure locations and in accordance with all federal, state and local regulations. All materials will be collected, segregated and containerized pending quantification from the State On-Scene Coordinator (SOSC), representatives from the Federal On-Scene Coordinator (FOSC) and Responsible Party (RP), as outlined in the waste management plan. No materials will be removed without the written consent of the Unified Command (UC).

#### 4.1.1 Waste Storage

To expedite removal of spilled oil, refined products, and contaminated material from waters of the state during an emergency response, temporary waste storage sites may be stood up at appropriate locations. The transportation of oil and contaminated material to temporary storage sites during the emergency response is exempt from handling and permitting requirements [Title 22, Sec. 66264.1(g)(8)]. The on-site Department of Toxic Substances Control (DTSC) representative or duty officer should be contacted for approval. If a UC is established, the Office of Spill Prevention and Response (OSPR) will facilitate the contact with DTSC through their liaison function.

#### 4.1.2 Waste Segregation

As oil and oily debris are collected, it will need to be segregated and stored in a secure area; recovery operations need to be simultaneously coordinated with disposal operations. Issues such as interim storage, long-term storage, transportation, and ultimate disposal or re-use must be addressed.

Typically, responders performing planning duties in the EU will develop a waste disposal plan. For large spills, a Disposal Group Supervisor will be designated, and a formal Disposal Group will be established in the Operations Section.

Liquids shall be held in secure tanks for gauging to determine oil content by OSPR and RP representatives prior to disposal. In order to expedite cleanup and disposal, a direct assessment of the contents can be made, or a representative sample may be analyzed by the treatment, storage, and disposal (TSD) facility. Liquids recovered during flushing, steam cleaning and/or decontamination operations should be kept separate from recovered free floating oil and will also be quantified.

Solid wastes will be placed in roll-off bins or over-pack drums with tare weights. Solids shall be segregated as follows: sorbents, oiled debris, soil/sediment, decontamination/personal protective equipment (PPE), and vegetation. Solids recovered from waters of the state or adjacent shorelines shall be stored separate from those recovered elsewhere.

Dead wildlife may be encountered during cleanup activities. Working through the Wildlife Branch under Operations, the Oiled Wildlife Care Network (OWCN) collects and processes nearly all dead wildlife. It is not always feasible, reliable, or practical to attempt to discriminate in the field between spill-related and non-spill-related casualties; thus, all dead animals should be collected. As well, the prompt removal of dead oiled animals from the environment can be critical to minimizing the risk for secondary oiling to occur, externally and/or internally to predators and scavengers. All dead animals should be collected and separated from waste material. If possible, wildlife carcasses should be labeled with the date, time, location [Global Positioning System (GPS) coordinates] collected, and collectors name and phone number, bagged individually, and placed in collection boxes, usually near an OWCN trailer at a staging area. Fish and invertebrate carcasses will be separated from other wildlife and bagged and labeled as described above. It is not necessary to bag each fish or invertebrate separately, thus placing multiple carcasses into one bag is adequate.

Wildlife carcasses will be stored (locked/secure cold storage) by OWCN; OWCN will provide the daily totals to the Wildlife Branch. At the discretion of the Natural Resource Damage Assessment (NRDA) team, fish and invertebrate carcasses may be stored (locked/secure cold storage), by either OWCN or NRDA or disposed of accordingly. The NRDA team will provide totals of the collected fish and invertebrates to the Wildlife Branch when feasible.

Clean wastes (no oil) generated through food service, Incident Command Post (ICP) operations, staging area operations, etc. are to be disposed of through regular city or county waste disposal services.

### **4.1.3 Decontamination**

Decontamination of people and equipment is a large disposal issue, as the process may result in additional waste streams. Under the Recovery and Protection Branch in Operations, the Decontamination Group Supervisor is responsible for decontamination of personnel and response equipment.



## 4.2 Invasive Species

Plants and animals spread through a variety of mechanisms. For plants, seeds, fragments, roots, tubers, rhizomes, and stolons are common materials which facilitate reproductive and migratory strategies. Invertebrates, clams, mussels, snails, and other animals often accompany plants, mud, and other materials. Many animals can attach directly to personnel and equipment. Regardless of mode of transport, unintentional spread of all invasive species, plants and animals, can be managed by removing and isolating them before moving into uninfested areas. Therefore, rigorous inspection and cleaning before leaving a worksite is the best approach, no matter which species are of concern (US Bureau of Reclamation, 2012).

All equipment proposed for use at a spill that has been in an area known to have, or with the potential to have, zebra and/or quagga mussels or New Zealand mudsnail present will be thoroughly inspected prior to being deployed for response. If the spill response area itself has or has the potential to have zebra and/or quagga mussels or New Zealand mudsnail, the equipment used during the response will be thoroughly cleaned and inspected prior to removal from the decontamination/staging location. See the current US Geological Survey (USGS) Nonindigenous Aquatic Species viewer map at <https://nas.er.usgs.gov/viewer/omap.aspx?SpeciesID=1008> which includes New Zealand mudsnail occurrences. See Figure 4-1 below for the 2007-2017 California Department of Fish and Wildlife (CDFW) Quagga and Zebra Mussel Sightings Distribution in California map. Follow the inspection and decontamination protocols in the 2012 US Bureau of Reclamation (USBR) Inspection and Cleaning Manual for Equipment and Vehicles to Prevent the Spread of Invasive Species, <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=48043&inline>. Figure 4-2 below provides a checklist for inspecting and cleaning equipment from the USBR manual. Figures 4-3 through 4-4 provide photos and information on how to identify New Zealand mudsnail and Quagga and Zebra mussels from the 2013 CDFW Aquatic Invasive Species Decontamination Protocol, <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=43333&inline>.

In addition to invasive invertebrates, management of invasive plant species and their spread is vitally important. The inspection and decontamination protocols in the 2012 USBR Inspection and Cleaning Manual for Equipment and Vehicles to Prevent the Spread of Invasive Species includes information on the removal of plants to prevent their spread. Additional information on non-native invasive plant species can be found in the document Best Management Practices for Preventing the Spread of Invasive Species, California Invasive Plant Council, 2012, <https://www.cal-ipc.org/docs/bmps/dd9jwo1ml8vttq9527zjhek99qr/BMPLandManager.pdf>.

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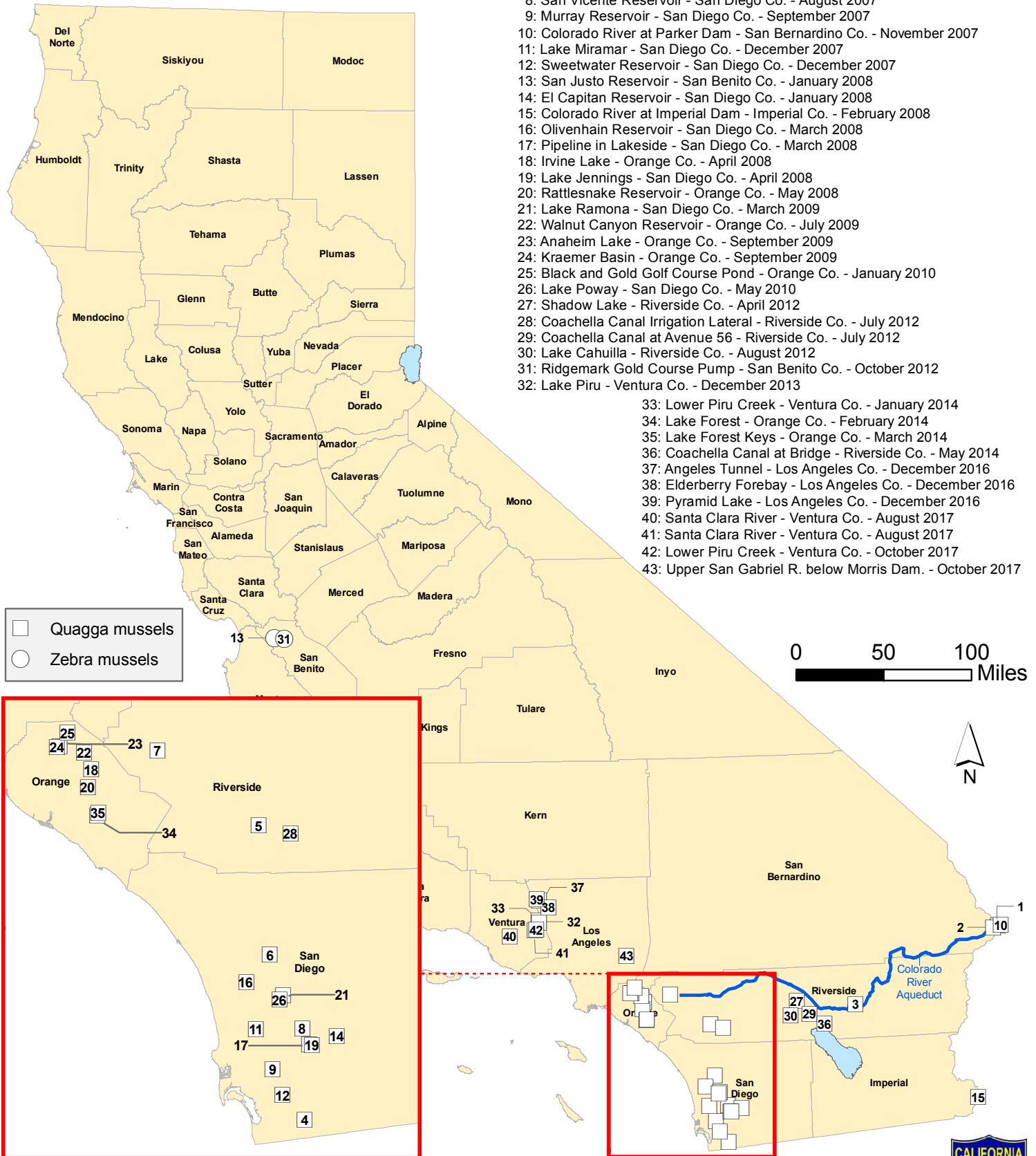


Figure 4-1: CDFW Quagga and Zebra Mussel Sightings Distribution in California Map

# Quagga and Zebra Mussel Sightings Distribution in California, 2007 - 2017

-----LOCATIONS-----

- 1: Lake Havasu - San Bernardino Co. - January 2007
- 2: Copper Basin Reservoir - San Bernardino Co. - March 2007
- 3: Colorado River Aqueduct - Riverside Co. - July 2007
- 4: Lower Otay Lake - San Diego Co. - August 2007
- 5: Skinner Reservoir - Riverside Co. - August 2007
- 6: Dixon Reservoir - San Diego Co. - August 2007
- 7: Lake Mathews - Riverside Co. - August 2007
- 8: San Vicente Reservoir - San Diego Co. - August 2007
- 9: Murray Reservoir - San Diego Co. - September 2007
- 10: Colorado River at Parker Dam - San Bernardino Co. - November 2007
- 11: Lake Miramar - San Diego Co. - December 2007
- 12: Sweetwater Reservoir - San Diego Co. - December 2007
- 13: San Justo Reservoir - San Benito Co. - January 2008
- 14: El Capitan Reservoir - San Diego Co. - January 2008
- 15: Colorado River at Imperial Dam - Imperial Co. - February 2008
- 16: Olivenhain Reservoir - San Diego Co. - March 2008
- 17: Pipeline in Lakeside - San Diego Co. - March 2008
- 18: Irvine Lake - Orange Co. - April 2008
- 19: Lake Jennings - San Diego Co. - April 2008
- 20: Rattlesnake Reservoir - Orange Co. - May 2008
- 21: Lake Ramona - San Diego Co. - March 2009
- 22: Walnut Canyon Reservoir - Orange Co. - July 2009
- 23: Anaheim Lake - Orange Co. - September 2009
- 24: Kraemer Basin - Orange Co. - September 2009
- 25: Black and Gold Golf Course Pond - Orange Co. - January 2010
- 26: Lake Poway - San Diego Co. - May 2010
- 27: Shadow Lake - Riverside Co. - April 2012
- 28: Coachella Canal Irrigation Lateral - Riverside Co. - July 2012
- 29: Coachella Canal at Avenue 56 - Riverside Co. - July 2012
- 30: Lake Cahuilla - Riverside Co. - August 2012
- 31: Ridgemark Gold Course Pump - San Benito Co. - October 2012
- 32: Lake Piru - Ventura Co. - December 2013
- 33: Lower Piru Creek - Ventura Co. - January 2014
- 34: Lake Forest - Orange Co. - February 2014
- 35: Lake Forest Keys - Orange Co. - March 2014
- 36: Coachella Canal at Bridge - Riverside Co. - May 2014
- 37: Angeles Tunnel - Los Angeles Co. - December 2016
- 38: Elderberry Forebay - Los Angeles Co. - December 2016
- 39: Pyramid Lake - Los Angeles Co. - December 2016
- 40: Santa Clara River - Ventura Co. - August 2017
- 41: Santa Clara River - Ventura Co. - August 2017
- 42: Lower Piru Creek - Ventura Co. - October 2017
- 43: Upper San Gabriel R. below Morris Dam. - October 2017



Data Sources: CA Department of Fish and Wildlife, City of San Diego Water Authority, Imperial Irrigation District, Helix Water District, Irvine Ranch Water District, Coachella Valley Water District, National Park Service, CA Department of Water Resources, Los Angeles Department of Water and Power, United Water Conservation District. Map produced by the California Department of Fish and Wildlife, December 15, 2017.



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Figure 4-2: USBR Inspection and Cleaning Checklist for Equipment and Vehicles to Prevent the Spread of Invasive Species

## Inspecting and Cleaning Equipment

- Generally, equipment of all types should be cleaned at the location of last use before being moved to a new location. If this is not possible, arrange for cleaning at a facility that is specifically designed for equipment cleaning.
- If equipment is used at a location known to be infested with an invasive species, the equipment should undergo a preinspection, followed by thorough cleaning, and a final inspection before being moved off the worksite.
- At the new location, the equipment should be inspected again, preferably by someone other than the original inspector before the equipment is placed into service.
- If, on reinspection, contamination is found on the equipment, do not allow the equipment entry on the new worksite; either return the equipment to the location of last use for additional cleaning or arrange for cleaning at a location that is specifically designed for equipment cleaning.

## Clean, Drain, and Dry!

Properly follow these guidelines. While on land, but before leaving a body of water:

### Clean:

- Remove any visible plant or plant fragments, as well as mud or other debris. Plant material, mud, and other debris routinely contain other organisms that may be an aquatic nuisance species. Some plant species are aquatic nuisance species.
- Check trailer, including axel and wheel areas - in and around the boat itself: anchor, props and jet engines, ropes, boat bumpers, paddles.
- Clean and check and dry off all parts and equipment that came in contact with water.
- Using a car wash or home power water sprayer is not adequate to kill and/or remove zebra or quagga mussels.

### Drain:

- Drain every conceivable space or item that can hold water.
- Follow factory guidelines for eliminating water from engines. All engines hold water, but jet drives on personal watercraft and other boats can hold extra water.
- Remove the drain plug from boats and put boat on an incline so that the water drains out.
- Drain live-wells, bilge, ballast tanks, and transom wells.
- Empty water out of kayaks, canoes, rafts, etc.

### Dry:

- Allow everything to completely dry before launching into another body of water.

Source: 2012 USBR Inspection and Cleaning Manual for Equipment and Vehicles to Prevent the Spread of Invasive Species, <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=48043&inline>

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### New Zealand Mudsnail

The threat posed by New Zealand mudsnails (NZMS):

- NZMS reproduce asexually therefore it only takes a single NZMS to colonize a new location.
- NZMS are prolific, and a single NZMS can give rise to 40 million snails in one year.
- Densities of over 750,000 NZMS per square meter have been documented.
- NZMS out-compete and replace native invertebrates that are the preferred foods of many fish species and alter the food web of streams and lakes.

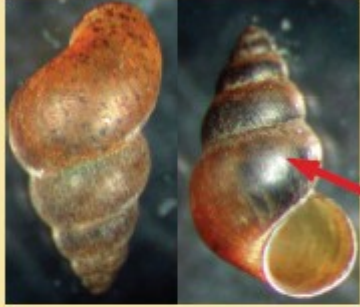
Identifying NZMS:

- NZMS average 1/8 inch in length, but young snails may be as small as a grain of sand. Adults bear live young.
- See the photos, below, for assistance identifying NZMS. Expert identification will be necessary to confirm identification.

**IDENTIFYING THE NEW ZEALAND MUDSNAIL**



**Size:** A mature snail is usually less than 5 mm (.2 in) long. (Photo by Jane and Michael Liu.)




**Shape:** Shell is elongated and dextral (its whorls or spirals lean toward the right). Snail typically has between 5 to 6 whorls on its shell. (Photo by D. L. Gustafson, <http://www.esg.montana.edu/aim/mollusca/nzms>.)

1 whorl



**Color:** Most snails have a light- to dark-brown shell that may appear to be black when wet. (Photo by Jane and Michael Liu.)



**Embryos:** Upon dissection, mature snails will have brooded embryos. (Photo by D. L. Gustafson, <http://www.esg.montana.edu/aim/mollusca/nzms>.)



**Operculum:** The mudsnail operculum (a rounded plate that seals the mouth of the shell when the animal's body is inside) can be seen on live snails but is not easily visible on dead or preserved snails. (Photo by D. L. Gustafson, <http://www.esg.montana.edu/aim/mollusca/nzms>.)

#### NZMS Habitat:

- NZMS can live in most aquatic habitats, including silted river bottoms, clear mountain streams, reservoirs, lakes and estuaries.
- NZMS have a temperature tolerance of 32-77° F.
- NZMS can survive out of water for more than 25 days in cool, moist environments, and have been found over 40 feet from water.

Current known locations of NZMS in California can be found at <http://nas.er.usgs.gov/taxgroup/mollusks/newzealandmudsnaildistribution.aspx>

Source: 2013CDFWAquatic Invasive Species Decontamination Protocol, <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=43333&inline>.

## Quagga and Zebra Mussels

The threat posed by quagga and zebra mussels (Dreissenid mussels):

- Dreissenid mussels multiply quickly and out-compete other species for food and space.
- Their presence can alter food webs and alter environments, negatively affecting native and game fish species.
- Dreissenid mussels attach to hard and soft surfaces, and negatively impact water delivery systems, hydroelectric facilities, agriculture, recreational boating and fishing.
- Adults can survive up to 30 days out of water in cool, humid conditions.
- Produce microscopic larvae that can be unknowingly transported in water, including live-wells, bilges, and motors.

Identifying Dreissenid mussels:

- Typically the same size as a fingernail but can grow up to about 2 inches long.
- Variable, usually dark and light alternating stripes. May also be solid cream, brown, or black.

Dreissenid mussel habitat:

- Variable, including both hard and soft surfaces in freshwater.
- From surface depth to more than 400 feet in depth.



Current known locations of Dreissenid mussels in California can be found <http://nas.er.usgs.gov/taxgroup/mollusks/zebramussel/maps/CaliforniaDreissenaMap.jpg>

Source: 2013CDFWAquatic Invasive Species Decontamination Protocol, <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=43333&inline>.

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# Geographic Response Plan Companion Manual

## Section 5 – Web Links to Information Resources

### **Hazardous Materials Response**

CHEMTREC, Chemical Transportation Emergency Center

<https://www.chemtrec.com/>

Department of Transportation (DOT) Emergency Response Guidebook

<https://www.phmsa.dot.gov/hazmat/erg/emergency-response-guidebook-erg>

Safety Data Sheets (SDS) and Material Safety Data Sheets (MSDS)

<https://chemicalsafety.com/sds-search/>

**US Environmental Protection Agency (USEPA) Incident Management Handbook**

USEPA, Understanding Oil Spills and Oil Spill Response, Understanding Oil Spills In Freshwater Environments

<https://www.epa.gov/sites/production/files/2018-01/documents/ospguide99.pdf>

WISER, Wireless Information System for Emergency Responders

<https://wiser.nlm.nih.gov/>

### **Decontamination Protocols to Prevent the Spread of Invasive Species**

California Invasive Plant Council, Best Management Practices for Preventing the Spread of Invasive Species

<https://www.cal-ipc.org/docs/bmps/dd9jwo1ml8vttq9527zjhek99qr/BMPLandManager.pdf>

**US Bureau of Reclamation (USBR) Inspection and Cleaning Manual for Equipment and Vehicles to Prevent the Spread of Invasive Species**

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### **Flow Data**

Current and historic flow data is available from the California Department of Water Resources (DWR), California Data Exchange Center. Mapper at: <http://cdec.water.ca.gov/cdecstation/>

Current and historical flow data is available online from the US Geological Survey (USGS):

<http://maps.waterdata.usgs.gov/mapper/index.html>

Real-time flow rate is also available online from American Whitewater: <https://www.americanwhitewater.org/content/River/state-summary/state/CA/>

## **CUPA and Cal EPA Resources**

### **CalEPA Site Portal**

The CalEPA Regulated Site Portal provides a modern, intuitive interface allowing users to search for items of environmental interest using both geospatial (map-driven) and tabular (criteria-driven) approaches. Query results can be viewed online, printed as a report, or exported for use in further analytical activities.

<https://siteportal.calepa.ca.gov/nsite/>

**Certified Unified Program Agencies (CUPA)/California Environmental Protection Agency (CalEPA), Unified Program Section** <http://cersapps.calepa.ca.gov/public/directory/>

## **NOAA and USFWS Resources**

**National Oceanic and Atmospheric Administration (NOAA) Fisheries West Coast Critical Habitat Mapper** [http://www.westcoast.fisheries.noaa.gov/maps\\_data/endangered\\_species\\_act\\_critical\\_habitat.html](http://www.westcoast.fisheries.noaa.gov/maps_data/endangered_species_act_critical_habitat.html)

### **NOAA Options for Minimizing Environmental Impacts of Freshwater Spill Response**

[http://response.restoration.noaa.gov/sites/default/files/shoreline\\_countermeasures\\_freshwater.pdf](http://response.restoration.noaa.gov/sites/default/files/shoreline_countermeasures_freshwater.pdf)

### **NOAA Shoreline Assessment Manual, including Shoreline Cleanup Assessment Technique (SCAT)**

<https://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/resources/shoreline-assessment-manual.html>

### **US Fish and Wildlife Service (USFWS) Critical Habitat Mapper**

<https://www.arcgis.com/home/item.html?id=2c2453ee613f47cdae9dbd0ed7939409>

### **USFWS National Wetlands Inventory**

<https://www.fws.gov/wetlands/data/mapper.html>

## **OSPR and OWCN Resources**

### **Disaster Service Worker Volunteer Program (DSWP)**

[DSWP](#)

### **Natural Resource Volunteer Program (NRVD)**

[NRVD](#)

### **Office of Spill Prevention and Response (OSPR) Applied Response Technology (ART) and Oil Spill Cleanup Agents (OSCA)**

<https://www.wildlife.ca.gov/OSPR/OSRO/Oil-Spill-Cleanup-Agents>

### **OSPR Volunteer Program**

[OSPR's Volunteer Program](#)

**OSPR Wildlife Response Plan for Oil Spills in California**

<http://www.wildlife.ca.gov/OSPR/Preparedness/Wildlife-Response>

**Oiled Wildlife Care Network (OWCN)**

<https://owcn.vetmed.ucdavis.edu/>

**OWCN Member Organizations,**

<https://owcn.vetmed.ucdavis.edu/about/member-organizations>

**OWCN Volunteers**

<https://owcn.vetmed.ucdavis.edu/readiness/responders>

# Geographic Response Plan Companion Manual

## Section 6 – Mutual Aid

(Adapted from State of California Emergency Plan, 2017)

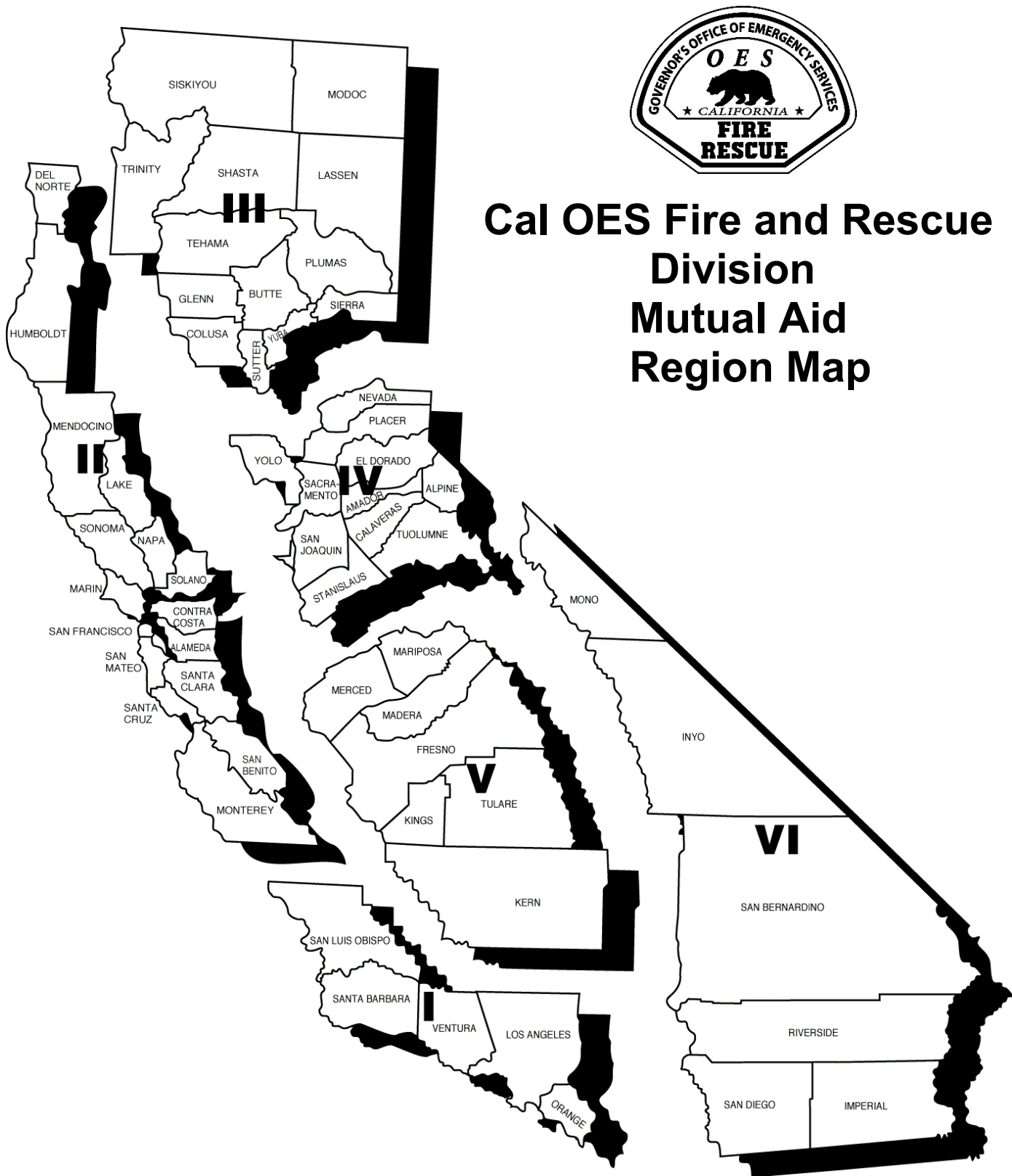
### 6.0 Introduction

California's emergency assistance is based on a statewide mutual aid system designed to ensure additional resources are provided to the state's political subdivisions whenever their own resources are overwhelmed or inadequate. The basis for this system is the Master Mutual Aid Agreement (MMAA), which is entered into by and between the State of California, its various departments and agencies, and the various political subdivisions, municipal corporations, and public agencies to assist each other by providing resources during an emergency. The agreement obligates each signatory entity to provide aid to each other during an emergency without expectation of reimbursement. Under specific conditions, federal and state funding may be appropriated to reimburse public agencies who aid other jurisdictions. If other agreements, memoranda, and contracts are used to provide assistance for consideration, the terms of those documents may affect disaster assistance eligibility and local entities may only be reimbursed if funds are available. This plan promotes the establishment of emergency assistance agreements between public and private sector agencies at all levels.

### 6.1 Mutual Aid Regions

For mutual aid coordination purposes, California has been divided into six mutual aid regions. The purpose of a mutual aid region is to provide for the more effective application and coordination of mutual aid and other emergency related activities. Figure 6-1, Mutual Aid Regions, on the following page illustrates the six mutual aid regions. Each party to the MMAA must ensure adopted and approved emergency plans document how public resources are mobilized to render mutual aid during any type of emergency.

Figure 6-1: Mutual Aid Regions of California



# Geographic Response Plan Companion Manual

## Section 7 – Volunteers

### 7.0 Introduction

Historically, volunteers from the public have not been utilized in oil spills outside the care and processing of oiled wildlife due to the health and safety hazards often present during an oil spill incident. However, recent California oil spill incidents have demonstrated there is a strong public interest in volunteer participation in other aspects of spill response. The San Francisco Bay & Delta Area Committee Volunteer Subcommittee developed the Non-Wildlife Volunteer Plan (NWVP) that sets forth guidance and protocols for the use of volunteers for non-wildlife related work assignments during an oil spill incident. The NWVP has been developed as guidance for the Incident Commander (IC)/Unified Command (UC) to consider the integration of volunteers into oil spill response for missions other than oiled wildlife.

In general, volunteers do not participate in the majority of oil spill responses. In cases when there has been no volunteer interest expressed, the Incident Command System (ICS) structure may not contain any positions specifically dedicated to volunteer management. As the IC or UC becomes aware of individuals or organizations interested in providing volunteer services and/or the need for volunteers arises, the IC/UC should address the volunteer issue and may make assignments for volunteer management within the ICS.

Due to the complexity of volunteer management and its potential to complicate oil spill operations, the NWVP establishes a Volunteer Coordinator (VC) and/ or a Volunteer Unit (VU) in the Planning Section. The NWVP recommends a VC and/or a VU be staffed at the earliest opportunity to conduct stand-by notifications of local government volunteer organizations including Emergency Management Organizations, Non -Governmental Organizations (NGO) and Emergency Volunteer Centers. The VC/VU's task during early activation also includes advising the IC/UC of the possible need for volunteers, possible tasks, and external pressures to use volunteers, and identifies an emergency volunteer management agency that has authority to screen, register, train, and manage volunteers.

### 7.1 Types of Volunteers

The Office of Spill Prevention and Response (OSPR) works with three (3) types of volunteers during an oil spill event; Oiled Wildlife Care Network (OWCN) Pre-trained, Affiliated, and Unaffiliated Volunteers (also known as Community and/or Spontaneous).

- OSPR collaborates with OWCN through the University of California Davis, School of Veterinary Medicine and is legislatively mandated to rescue and rehabilitate oiled wildlife during an oiled wildlife response. OWCN is a statewide collective of pre-trained wildlife care providers, regulatory agencies, academic institutions and wildlife organizations that work to rescue and rehabilitate oiled wildlife in California. OWCN maintains specialized wildlife facilities in a constant state of readiness throughout the State of California. For a list of OWCN member organizations, click on link: [OWCN member organizations](#). During an oiled wildlife response, a limited number of unaffiliated volunteers can be used in the care and processing of oiled wildlife rehabilitation. The use of volunteers for wildlife -related

services falls within the Wildlife Branch which reports to the Operations Section Chief. For additional information, click on link: [Wildlife Response Plan](#).

- **Affiliated Volunteers** – Individuals who come forward following a disaster to assist during the response or recovery phase, without pay or other compensation and have a pre-existing arrangement with either a governmental agency or NGO. They have been trained for a specific role or function prior to a disaster. Affiliated organizations include The California Department of Fish and Wildlife’s Natural Resource Volunteers, Community Emergency Response Teams (CERT) (managed by a city/county) and the California Conservation Corps.
- **Unaffiliated (also known as Community/Spontaneous) Volunteers** – Individuals who come forward following an incident or disaster to assist a governmental agency or NGO with response activities during the response or recovery phase without pay or other consideration. By definition, volunteers are not yet associated with a response or relief agency involved in the incident.

## **7.2 OSPR’s Volunteer Program**

Under California law, the Administrator of OSPR may utilize volunteers to assist with oil spills in waters of the State (Gov. Code § 8670.8.5). These volunteers are deemed employees of the state for the purpose of workers’ compensation under Labor Code section 3363.5. The costs associated with the use of registered volunteers may be initially funded by the state’s Oil Spill Liability Trust Fund (OSLTF) (CA Government Code Section 8670.50) as well as any payments for registered compensation claims. However, the Responsible Party (RP) is ultimately liable for all costs associated with an oil spill, including costs associated with the use of volunteers. For more information, click on link: [OSPR’s Volunteer Program](#).

Registered volunteers will execute a California Department of Fish and Wildlife (CDFW) Volunteer Service Agreement and Loyalty Oath. The CDFW Volunteer Service Agreement and Loyalty Oath grants registered volunteers’ status as unpaid employees of CDFW, and eligibility for coverage under the State Workers’ Compensation Program. Individuals volunteering at the incident site without approval or authorization (i.e. non-registered volunteers) may not be entitled to receive state workers’ compensation benefits.

If the UC decides to utilize volunteers during an oil spill incident, the VU must ensure all of the registered volunteers attend required training and complete the UC approved required paperwork. In the event of a volunteer injury, the designated volunteer supervisor, the VU and/or the Safety Officer (SOFR) is responsible for ensuring the correct actions are taken to ensure the injured volunteer’s compensation benefits and claims are handled according to the procedures and policies outlined by CDFW.

## **7.3 California Disaster Service Worker Volunteer Program (DSWVP)**

The Disaster Service Worker Volunteer Program (DSWVP) is a State funded program that provides workers’ compensation benefits to registered Disaster Service Worker (DSW) volunteers, who are injured while performing authorized disaster service duties. It also provides limited immunity from liability to political subdivisions or political entities as well as the DSW volunteer if a civil suit results from an act of good faith while the DSW was providing disaster-related services. Eligibility for the DSWVP is based on a volunteer’s registration with an Accredited Disaster Council (ADC), California Governor’s Office of Emergency Services (CalOES), or an authorized State Agency and compliance with Program regulations. Most cities and all counties in California have ADCs. Affiliation with an ADC—and written delegated authority from that council are required prior to a jurisdiction administering a disaster service worker volunteer program.

To be eligible for DSWVP benefits, the volunteer must register prior to his or her deployment to participate in disaster-related activities, including pre-approved training. The only exception to the pre-registration requirement is an “impressed volunteer” who is directed/ordered to perform disaster - related duties by an authorized government employee. In addition to the pre-registration requirement, the DSW must be deployed/assigned disaster-related activities by the registering authority. Under no circumstances is a self-deployed volunteer eligible for DSWVP benefits.

The State’s laws and regulations governing the DSWVP specify the need to provide DSWs with adequate training and supervision. The registering authority is responsible for ensuring the disaster training is commensurate with the duties of the DSW classification of the volunteer. The registering authority may require the DSW volunteer to participate in training as a condition of remaining an active DSW volunteer. For more information on these and other rules and regulations governing the DSWVP, click on link: [DSWP](#).

## **7.4 Volunteer Use Considerations**

Volunteers can support response efforts in many ways but the use of volunteers during an oil spill event is not automatic. The decision to utilize volunteers will take into account the benefits that might be gained, against safety and liability realities. The UC, in the early stages of the event, will make the decision whether volunteers will be utilized and the capacities in which they can serve.

Volunteers will not be automatically used for missions such as tar ball removal. Depending on the nature of the incident, volunteers may or may not be used to respond to an incident. Local government decision-makers can provide a wealth of knowledge to the IC/UC when contemplating the initial decision to use volunteers. The benefit of volunteer efforts must be weighed against concerns for volunteer safety. Based on the conditions specific to a particular incident, the IC/UC will determine the suitability of integrating volunteers for oil spill response missions. In all instances, careful consideration will be used to identify specific tasks and where volunteers can be used safely. If, in the judgment of the IC/UC a dangerous condition(s) exists such that volunteers cannot be used safely, volunteers will be restricted from operations in those areas.

When the IC/UC approves the use of volunteers, the IC/UC will activate a VC/VU in the Planning Section. If the IC/UC makes a decision to coordinate with local government in using volunteers (other than oiled wildlife), local government representatives will be notified via the Liaison Officer or the Volunteer Unit Leader (VUL). Local government will advise the UC regarding their ability to assist in the requested volunteer effort. If a particular local government cannot assist in volunteer coordination, the UC or VUL can request a neighboring city or county to facilitate volunteer coordination for the non-assisting local government. After participating local government partners have received, registered, and trained the requisite volunteers, that local agency will continue to coordinate with the VUL in the management of volunteers throughout the event. Volunteers will only be deployed through direct written tasking from the UC during the tactics meeting via the Incident Action Plan (IAP) process. Volunteers will be treated with the same regard as other resources. The UC will supply logistical support to volunteers while operationally deployed (regardless of status condition), engage in logistical support, and continue said relationship with volunteers regarding any issue resulting from volunteerism during a spill.

To learn more about the Natural Resource Volunteer Program, click on the link: [NRVD](#).



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## Section 8 – Natural Resource Damage Assessment Process (Adapted from Sector San Francisco Area Contingency Plan Section 9720.1)

### 8.0 Introduction

The overall goals of the natural resource damage assessment (NRDA) process are to restore the injured natural resources to pre-spill conditions and to obtain compensation for all documented losses. NRDA is a separate process from response. In general, this process may require several phases to complete, including the individual phases of documenting injuries, assessing damages, settling claims, and undertaking restoration programs. This section addresses the NRDA process only during the initial stages while response efforts are underway. This section attempts to describe the NRDA process, identify the principle participants in NRDA activities, and clarify the relationship of NRDA within the framework of the Incident Command System (ICS). NRDA is separate from the response; therefore, it fits in under liaison. This information provided here is to allow a Responsible Party (RP) to understand the NRDA process. Additional information is provided concerning funding for NRDA activities and the requirements for specific federal, state, and local permits necessary to collect information for assessments of natural resource damages.

It is highly desirable for natural resource trustees to coordinate their NRDA activities and to consult with local governments and interest groups from the affected area to produce a single NRDA for all injuries to public trust resources. The trustees are encouraged to coordinate these activities with the efforts of a cooperative RP to the extent that trustee responsibilities are not compromised.

### 8.1 Background and Structure

Significant oil spill incidents initially lead to two primary actions: a response to contain and cleanup the spilled oil, and an assessment of the injuries to natural resources caused by the pollutant. In 1990, Congress enacted the Oil Pollution Act (OPA 90; 33 U.S.C. 2701 et. seq.). OPA 90 authorizes Federal resource trustees [Department of Agriculture, Department of Commerce, Department of Defense, Department of Energy, Department of the Interior (DOI)], State resource trustees (designated by the governor of each state), federally-recognized Indian tribes, and foreign trustees to seek compensation for injuries to natural resources caused by the discharge of oil. For purposes of this section, these groups are referred to as either “trustees” or “trustee agencies”. In California, the Governor has designated the Secretary of the Resources Agency and the Secretary of the California Environmental Protection Agency as the State Trustees for natural resources within their purview. The Lead State Trustee generally is selected based upon the types of natural resources affected by the spill.

Damage assessments for natural resources shall be coordinated by representatives from each of the trustee agencies with affected resources. These trustee agencies typically work as a team to develop a single approach to the assessment process. The “NRDA Team” consults with members of government and interest groups from the affected area to address local concerns. Cooperative RP(s) may be invited to participate with the NRDA Team activities to develop one unified NRDA plan for public trust resources. A cooperative damage assessment could reduce costs by eliminating parallel assessments by the trustees and the RP. However, due

to the statutory responsibilities, the trustees must maintain management and oversight of any cooperative damage assessment.

## **8.2 Assessment Procedures**

The assessment procedures set forth in the DOI rules are not mandatory. However, they must be used by trustees to obtain a rebuttable presumption that a specific assessment of damages is correct. The DOI rules set out two types of assessment procedures. The “Type A” procedures uses a computer model to calculate damages and is a simplified assessment process. The “Type B” procedures involve more comprehensive assessment activities but, may be tailored for individual cases. Five steps are described in the DOI rules for determining and quantifying injury to resources and assessing monetary damages. The steps include: (1) conducting an initial preassessment; (2) conducting a preassessment screen; (3) preparing an assessment plan; (4) conducting the assessment following either the “Type A” or “Type B” rule; and, (5) preparing a post-assessment report. Although the regulations provide the option for the trustees to use either “Type A” or “Type B” procedures in a given case, both may be employed in practice as long as there is no double recovery of damages. The speed and simplicity of the “Type A” procedures may prove useful for certain spills or types of injury, whereas the “Type B” procedures may be used if a full assessment is warranted. The National Oceanic and Atmospheric Administration (NOAA) has identified three phases to a damage assessment: (1) Preassessment; (2) Restoration Planning; and, (3) Restoration Implementation. If injuries to natural resources or the services provided by natural resources are expected to continue following response actions, and feasible restoration alternatives exist to address those injuries, then trustees may proceed beyond the Preassessment phase to Restoration Planning and Implementation.

## **8.3 Injuries and Lost Services**

Initial steps in the NRDA process require documentation of a pathway for the spilled oil, demonstration of oil exposure (direct and indirect) with specific resources along the pathway, and quantification of the injuries caused by the spilled oil. Natural resources and/or the services provided by such resources may be injured or disrupted through direct or indirect exposure to released substances.

The methods used to assess the injuries arise largely from scientific practices and best professional judgement. The DOI rules and NOAA rule provide guidance on specific types of biological injuries (e.g., death, physiological malfunctions such as decreased reproductive capacity) that may be used to claim damages. The scope of possible injuries extends beyond impacts to single organisms and may include effects on populations, habitats, and ecosystems.

“Services” include physical and biological functions provided by the natural resources to the ecosystem as well as other functions related to human use of the resources. Production of food, protection from predators, maintenance of community diversity, and provision of habitats are examples of some services provided to the ecosystem or its constituents. Examples of services provided to humans by natural resources include recreational opportunities such as fishing, wildlife viewing and beach activities. Other services provided by resources to humans are often less visible and can relate to the knowledge that a resource exists and is healthy or will continue to exist for the benefit of future generations.

## **8.4 Preliminary Damage Estimates**

Expected damages should be estimated as soon as possible to determine the potential scope of the case and the prudence of undertaking certain types of studies. Preliminary damage estimates should include: (1) the reasonable costs of injury assessment, (2) the cost of restoring, rehabilitating, replacing or acquiring the equivalent of the injured resources; and, (3) the value of interim losses including both direct use (e.g., recreational) and passive use (e.g., existence value) of resources pending restoration or natural recovery.

## 8.5 NRDA Process

Successful pursuit of NRDA actions, either by the trustees alone or in cooperation with the RP(s), is a complex process comprising numerous tasks that generally involve the interaction of scientists, economists, lawyers, and administrators. The DOI rules and NOAA rule reduce some of the complexity by establishing an assessment process and providing a mechanism for determining the merits of going forth with the assessment and claim. The process provides a record of the trustees' decisions.

Other advantages to following the federal regulatory assessment processes may warrant use of the procedures. Results obtained by following the DOI and NOAA rules are presumed correct. The rebuttable presumption shifts the burden of proof to the party challenging the correctness of those results. Additionally, these rules provide national standards on injury measurement, describe methods for quantifying natural resource injuries into monetary values, and assist trustees in planning restoration of impacted resources.

## 8.6 NRDA and the ICS

The ICS is an organizational framework designed to efficiently and effectively manage personnel and resources during emergency incidents. The system is designed to be adaptable to any size event and can be changed in structure to conform to the needs of the response. One objective of the ICS is to reduce or eliminate the duplication of efforts by the numerous response agencies while attempting to control or contain the spill and mitigate possible impacts of the spilled oil. A small group consisting of the Federal On-Scene Coordinator (FOSC), the State On-Scene Coordinator (SOSC) and a representative of the RP form the Unified command (UC), coordinates and directs the actions of the response.

Concerns of the affected local governments related to spill response or cleanup are generally presented to the UC through a Multi-Agency Coordination (MAC) group representative. The local government claims for spill damages associated with services provided by natural resources should be coordinated with the Trustee NRDA Team to avoid overlap within assessments. For additional details on the ICS see section 1000.

Assessment of injuries and damages resulting from spilled oil need to begin as soon as possible following the initial release of the pollutant. This necessitates that NRDA activities be conducted simultaneously with response efforts and coordinated through the UC. Portions of the NRDA process should be integrated into the ICS to improve communication, expedite both response and NRDA activities, and make efficient use of personnel and equipment. To avoid potential conflicts in duties, it is recommended that members of the NRDA Team not have responsibilities for the spill cleanup or general response activities.

The primary role of the NRDA Team is to document a pathway for the spilled oil, measure levels of injuries resulting from the spill, and determine damages. The UC, in contrast to the NRDA Team, focuses primarily on response, cleanup, and minimizing impacts of the oil spill. Although the UC and NRDA Team often have different responsibilities and needs, some of their activities overlap and require coordination. Examples of activities to be coordinated immediately following a spill include collecting samples (e.g., access to restricted sites, sampling prior to cleanup), gathering information pertinent to measuring actual or potential adverse changes to natural resources, using equipment (boats, helicopters, etc.), communications, surveying spill sites, identification of protective measures and potential need for emergency restoration.

Uninterrupted communication between the UC and the NRDA Team is essential to ensure that needs and efforts of the NRDA Team are not in conflict with response strategies and activities selected by the UC. Information concerning, for example, the spill trajectory forecasts, cleanup strategies, and beach and port closures should be made available to the NRDA Team to assist sample and data collection in a timely fashion. Conversely, information concerning potential injuries to natural resources caused by oiling or response techniques should be made available to the Planning Section before implementation of clean up responses by the Operations Section.

**It is important to note that the RP is part of the UC but may not necessarily be part of the trustees 'coordinated NRDA activities. For this reason, the NRDA Team must remain separate from the ICS to ensure that statutory responsibilities of the trustees are not compromised.** The trustees retain the option of inviting the RP to participate in all or part of the damage assessment process. Some NRDA activities, however, are best coordinated through the UC. **The NRDA Team will provide a Representative(s) to the Liaison Officer of the ICS to present the needs of the NRDA Team and other response information to the incident command.** The NRDA Representative(s) will also act as historian or recorder of information critical for an accurate assessment of spill damages and will attend appropriate incident command meetings to secure knowledge of the up-to-date response activities.

## **8.7 Notification Procedure for Initiating NRDA**

In the event of a spill, each trustee is responsible for notifying its own members of the NRDA Team. Individual federal, state, and local agencies may be notified through various channels depending on the size and location of the spill. In all incidents that might require NRDA action, the Office of Spill Prevention and Response (OSPR) will attempt to notify representatives from each of the trustee agencies expected to participate in the NRDA process.

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## Section 9 – Procedures for Managing the Discovery of Human Remains and Cultural and Historic Resources

Inadvertent Discovery of Human Skeletal Remains: Any human remains, burial sites, or burial-related materials that are discovered during a spill response must be treated in a culturally appropriate and professionally proper manner at all times. The following procedures, as detailed within State (California Health and Safety Code § 7050.5) and Federal [Native American Graves Protection and Repatriation Act (NAGPRA, if relevant)] law, shall be followed:

- All work must be stopped immediately, and the on-site operations manager must notify the Incident commander (IC)/Unified Command (UC) and Cultural Resource Specialist, under the Environmental Unit (EU), of the discovery. The discovery shall be protected with a buffer of 100-feet and remain attended at all times. No further disturbance shall occur within the 100-foot buffer. The IC/UC shall immediately contact the property owner/land manager and the respective county sheriff's coroner.
- The Coroner shall make his/her assessment of the discovery and, should the find be non-Native American, the find shall be turned over to the appropriate law enforcement agency. If the find is determined to be of Native American origin, the Coroner will take 1 of 2 actions, dependent on the jurisdiction of the property upon which the find is located:

Inadvertent Discovery of Cultural Resources: Any cultural materials that are discovered during a spill response must be treated in a culturally appropriate and professionally proper manner at all times, and the following procedures shall be followed:

- Cultural Resources:  
(May include but not be limited to any of the following items)
  - Lithic debitage (stone chips and other tool-making byproducts)
  - Flaked or ground stone tools
  - Exotic rock, minerals or quarries
  - Concentrations of organically stained sediments, charcoal, or ash
  - Fire-modified rock
  - Rock alignments or rock structures
  - Bone (burned, modified, or in association with other bone, artifacts, or features)
  - Shell or shell fragments
  - Petroglyphs and pictographs
  - Fish weirs and traps
  - Culturally modified trees
  - Physical locations or features (traditional cultural properties)

- Historic Resources:  
(May include any of the following items over 50 years old)
  - Bottles, or other glass
  - Cans
  - Ceramics
  - Milled wood, brick, concrete, metal, or other building material
  - Trash dumps
  - Homesteads, building remains
  - Logging, mining, or railroad features
  - Piers, wharves, docks, bridges, dams
  
- All work must be stopped immediately, and the on-site operations manager shall notify the IC/UC and Cultural Resource Specialist of the discovery. The discovery shall be protected with a buffer of up to 100-feet and no further disturbance shall occur within the buffer. The find shall not be removed from the discovery location.
  
- Preservation in place shall be the preferred treatment of any cultural materials inadvertently discovered during an incident. However, should the resource not be a candidate for avoidance or preservation in place, a resource-specific mitigation plan shall be developed by the Cultural Resource Specialist, reviewed by the IC/UC, and implemented. Should the mitigation plan include archaeological data recovery, a research design shall be developed that exhausts the research potential of the resource in accordance with current professional archaeology standards. Any mitigation plan that results in the removal of cultural resources (artifacts, ecofacts, features, etc.) from their original provenience shall also include a comprehensive discussion of resource processing, analysis, curation, and reporting protocols and obligations.

Refer to [Section 1680 of the Sector L.A./Long Beach Area Contingency Plan](#) and [section 1002.02.3\(a\) Protection of Historic Properties in the Federal Region 9 Regional Contingency Plan](#) during an emergency response as well as information on resources in California to assist with the protection of these sensitive resources.

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