

**CALIFORNIA PROFESSIONAL
DIVERS ASSOCIATION...BMP COMMITTEE**



**DIVERS HULL CLEANING
BEST MANAGEMENT PRACTICES
CERTIFICATION MANUAL**

**BOATING POLLUTION
ECONOMICS AND IMPACTS**

I. BOATING POLLUTION AND URBAN RUN-OFF

- a. Non-point source pollution
- b. BMPs for boaters and marina managers
- c. BMPs for all dockside workers
- d. Functions: educate marine industry on types of pollution, who is responsible, and the impacts caused to the environment

II. TYPES OF POLLUTION

- a. Detergents: soaps and other cleaning supplies
- b. Solvents: acetone, thinners, etc.
- c. Anti-freeze
- d. Oil/fuel/diesel
- e. Acids and alkaline substances
- f. Metals:
 1. **COPPER**: anti-fouling bottom paints
 2. **TRIBUTYL TIN (TBT)** used as an anti-fouling agent (illegal in CA)
 3. **ZINC**: used as a sacrificial anode to combat marine corrosion and eliminate the effects of electrolysis.
 4. **OTHERS**: brake dust and other miscellaneous ground pollutants introduced into bays and oceans from run-off, including nitrates, metal shavings, paint chips.
- g. **IN WATER HULL CLEANING** ... recognized as a major source of copper loading in the bay, listed as NPS pollution and recognized by the USEPA as toxic pollutant. (Discussed in detail under BMP'S)
- h. Other major types of pollution
 1. **DUSTS** and Sediments accumulate in bay sediment. If agitated they are released into the water column. This lowers water quality and reduces oxygen levels in bay.
 2. **NUTRIENTS** occur naturally in marine environment, but run-off and sewage discharge effects normal balance, this increases algae growth and decreases light that in turn decreases oxygen levels in water.
 3. **MARINE DEBRIS** plastics, wood, garbage generally pose more of a problem for fish and marine mammals, but also can be detrimental to a boaters running gear and water intakes.

URBAN RUNOFF OBJECTIVES

1. Where are Detergents, Solvents, and Anti-freeze found?
2. How do Detergents harm the environment?
3. What different kinds of metals are in the bay?
4. What are the harmful effects of Marine debris?

URBAN RUNOFF

Boating Pollution and Urban Runoff (both non-point source pollution) is a problem that carries significant economic impacts in most coastal areas. You may be asking what does urban runoff have to do with all this boating stuff? Well, all drainage pipes lead to the ocean and they carry many different forms of pollutants that destroy these ecosystems. A lot of these pollutants are common to the boating industry, and we will be discussing them and their harmful affects on the marine environment.

Just because we do not see the pollutants anymore doesn't mean they're gone. Pollutants are usually on the bottom - out of site - and in the sediment. This is where the problem starts to compound. So, while working directly on and around the water, we have to do our part to help minimize the pollution.

Lets take a look at pollution and the impact it has on our bay.

DETERGENTS, SOLVENTS, AND ANTI-FREEZE

Detergents are found in most cleaning agents and soaps. They are a source of pollution because they accumulate in the sediments and are toxic to marine plants and animals. Toxic means - no plants – no animals. When performing boat washing it is best to use biodegradable soap products.

Solvents are found in paint, paint remover varnish, lacquer, epoxy, resin compounds, and degreasing agents. They are toxic because they do not dissolve in the water and sink to the sediment below.

Anti-freeze is used as an engine coolant, and consists of Ethylene glycol. It is deadly to marine organisms, and also to humans and pets. Pets often ingest ethylene glycol because it tastes sweet. Ethylene glycol is green in color. A preferred anti-freeze alternative for boaters is called Propylene glycol, its color is orange/pink and is less toxic.

ACIDS AND ALKALIS

Acids and Alkalis are found in batteries and in some cleaning products. Besides these chemicals being toxic they can increase the toxicity of other toxic products.

METALS

A variety of metals are introduced into the bay from various sources: paint products, engine wear, brake pads, and other consumer products. Metals are persistent in the environment, and accumulate in the animals, marine plants, and sediment. The toxicity can change the food web in the marine environment by eliminating certain species. Two metals used in the marine environment are copper in the bottom paints and zinc used to fight off electrolysis.

MARINE DEBRIS

Plastics, wood, garbage all can be hazardous to the marine mammals and fish. Not to mention boaters running gear, and water intake. Do your part to help keep your waterways clean.

All these items we have talked about are also major sources of Urban Runoff.

BOATING AND URBAN POLLUTION QUESTIONS

1. Where are detergents found?
2. What kind of soap is best to use when washing a boat?
3. Where are solvents found?
4. Why are solvents toxic?
5. What are the two colors of anti-freeze
6. What color anti-freeze is preferred for boating and is less toxic.
7. The majority of all bay pollution is caused by urban Runoff.
True or False
8. What types of metals get into the bay via urban runoff?
9. What types of metals are common to the marine industry?
10. What type of heavy metal is the most commonly found?
11. Floating debris such as wood, plastics, nylon lines, and garbage is generally harmless to a boats running gear.
True or False

BOATING POLLUTION AND ECONOMIC IMPACT OBJECTIVES

Be able to discuss:

1. The Clean Vessel Act and give the year it was enacted
2. The different uses of Marine Sanitation Devices (MSD)
3. The chemicals that are involved with MSD
4. The vessel sewage discharge law
5. What does BOD mean
6. Local Sewage Pump-out Facilities in your area.
7. What is a Diver's role in the elimination of Boating Pollution?

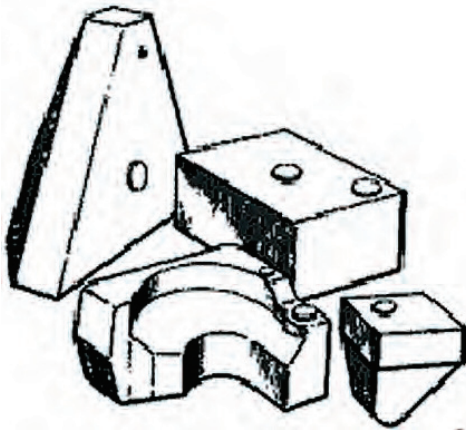
BOATING POLLUTION AND ECONOMIC IMPACTS OBJECTIVES

1. What year did the clean vessel act identify boats as potential polluters?
2. What does MSD stand for?
3. What is the most common MSD used?
4. What is another name for MSD?

In 1992 The Clean Vessel Act identified vessel sewage discharge as a “substantial contributor to localized degradation of water quality in the United States.”

Because of this, Marine Sanitation Devices (MSD's) are being used on all marine vessels today. There are 3 Types of marine sanitation devices. The most common is Type III, which we will be discussing for this lesson. The Type III sewage system used on boats is commonly referred to as a holding tank system.

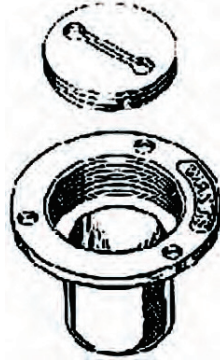
The type III MSD consists of a holding tank with a hose on the bottom of the tank that goes up to the deck and a deck fitting where the sewage can be pumped out. The deck fitting usually says WASTE around it or is color-coded with a black cap to ID it as such. The sewage can be pumped overboard while out to sea through a Y Valve. While you are in port the Y valve is to be locked or wire shut in the closed position. A hose from the toilet to the top of the tank allows the sewage to drop into the tank, and a vent on the tank allows air in and flows through the tank so it can be pumped out.



COMMON HOLDING TANK DESIGNS

DECK FITTINGS

The federal standard for a deck fitting for pump-out is 1 1/2" inside diameter pipe thread. Most pump-out stations have adapters that will fit boats not so equipped. The top surface of the deck fitting should be clearly and permanently labeled "Waste." Check to be certain that all of the boat's other deck fittings are labeled "Water" and "Gas" or "Diesel" as appropriate. You can ruin your whole day if you accidentally fill the waste tank with fuel or siphon out the fuel tank at the pump-out station.



COMMON DECK FITTING

VENT FITTINGS

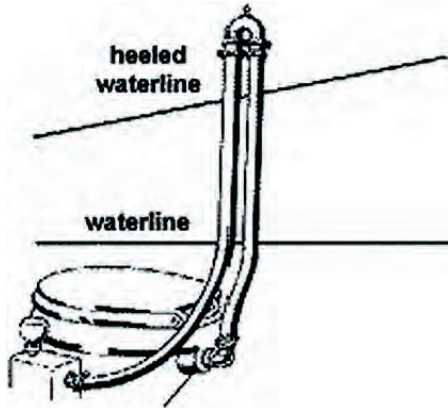
These fittings are made of chrome plated zinc, brass, bronze, stainless steel, or plastic. Over filling the holding tank can force sewage into the tank vent line. A clogged vent line will be ineffective and can make it difficult, if not impossible, to pump out the tank at the pump-out station. Clogged vents can also lead to over pressurizing the tank causing leakage or rupture.



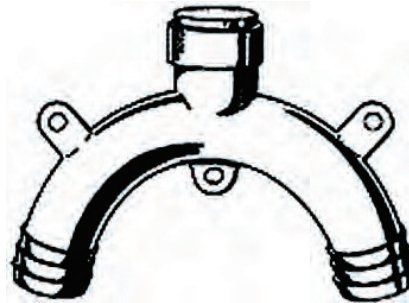
COMMON SEWAGE VENT

SIPHON BREAKS (VENTED LOOPS)

Most toilets on boats are installed below the waterline. Any leakage past the toilet's suction or discharge valves can siphon water into the toilet, possibly sinking the boat if not discovered in time. It is, therefore, essential that a siphon break be installed on both the intake and discharge lines. Looping the line above the water level and installing a valve at the highest point so that air can be drawn into the line form a siphon break. As an additional safeguard, the toilet intake through-hull valve should be left in the closed position whenever the toilet is not in use.



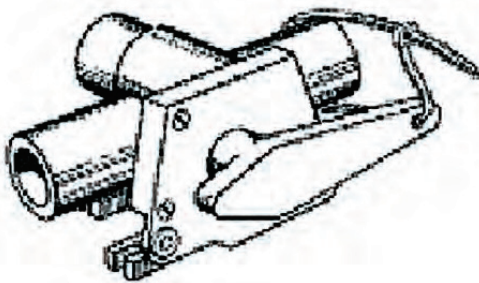
TYPICAL SIPHON LOOP



SIPHON LOOP DEVICE

“Y” VALVES

“Y” valves are used to direct waste overboard, into the holding tank or to a deck pump-out fitting. Most “Y” valves used in sewage systems are made of plastic, however, bronze may also be used. Key attributes of a good “Y” valve include corrosion resistance, fully operating ports for minimal resistance to flow, ease of disassembly for maintenance, and a sturdy handle for positive stops. Make sure you can readily identify the closed position.



SANITARY Y-VALVE DEVICE

MACERATOR PUMPS

Are used to breakup and pump wastes from many holding tanks. They may be installed inside, on top of the tank, or mounted separately. A macerator pump is not a Type I or II MSD; it does not treat sewage to reduce bacteria content.

ADVANTAGES:

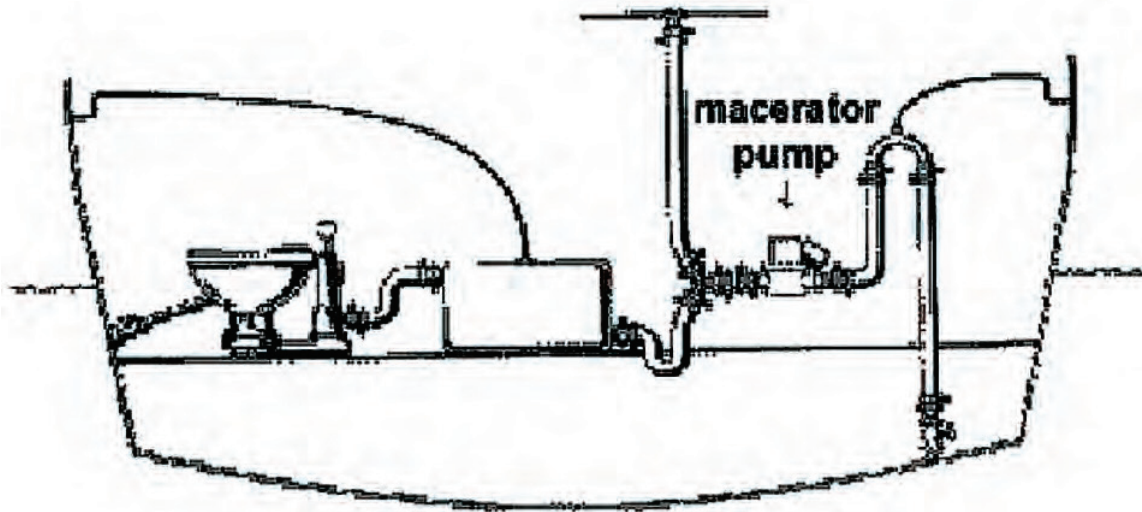
Break up solid wastes, thereby minimizing the likelihood of clogged piping downstream.

When installed at the toilet, typically requires less water for flushing than a manual pump, a plus when the holding tank is being used.

DISADVANTAGES:

Requires electrical power for operation.

Motor, shaft seal and/or impeller may burn up if pump is run dry.



TYPICAL HOLDING TANK INSTALLATION

OVERBOARD DISCHARGE OPTION BEFORE THE HOLDING TANK

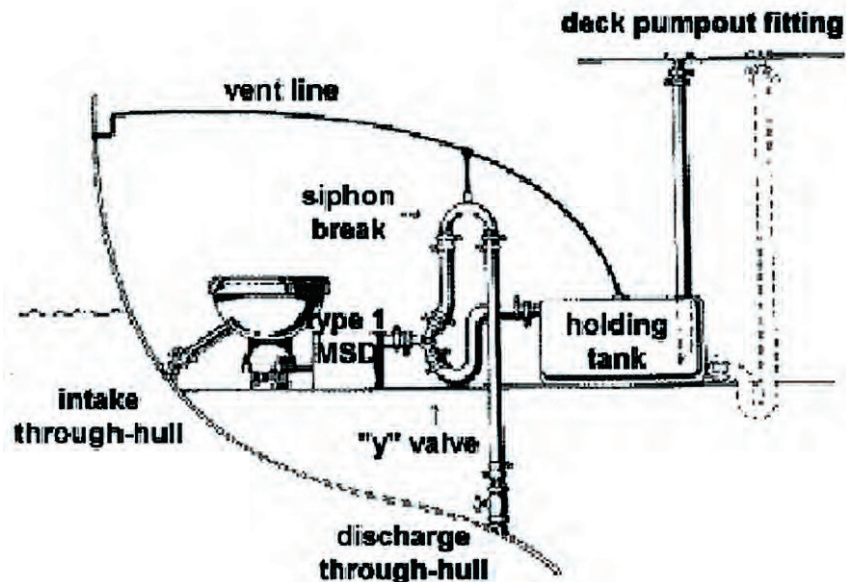
This system is good for those who spend extended periods offshore. This system may be the easiest to retrofit by adding a holding tank to an existing system. When using a Type I or II holding system, you should install a holding tank for use when boating in environmentally sensitive areas or when moored or dockside. A "Y" valve, is installed in line between the treatment system and holding tank.

ADVANTAGE:

If a Type I or II treatment system is installed between the toilet and the "Y" valve, treated sewage can be pumped directly overboard, unless the boat is in "No Discharge" waters.

DISADVANTAGES:

"Y" valve must be secured to prevent accidental illegal discharge. External pump is required to empty holding tank.



HOLDING TANK INSTALLATION WITH OVERBOARD FROM HEAD OPTION

- How many fittings are usually on a holding tank?
- What is the color designation for a deck fitting waste cap?
- What does a Y valve allow you to do?
- When should the Y valve be in the close position?

CHEMICAL ADDITIVES

OBJECTIVES

- What 2 chemicals should be avoided in holding tanks?
- What is the preferred chemical to use in a holding tank?

Chemicals that are added to holding tanks should avoid having chlorine or formaldehyde in them because this is harmful to sea life.

FOR EXAMPLE:

A chemical called ODØRLØS helps prevent smell, breaks down the contents, and is not harmful to sea life.

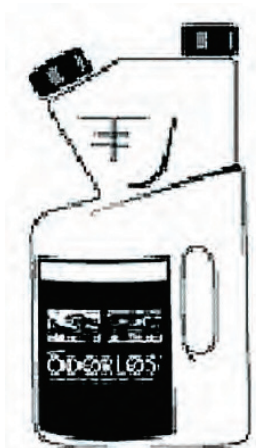
ODØRLØS is an industrial strength, environmental award winner so effective that it eliminates all holding tank odors without masking perfumes or staining dyes.

- Eliminates Holding Tank Odors Completely
- Breaks Down Waste & Tissue
- Lubricates Valves
- Prevents Clogging
- Safe for any Septic Tank System
- Safe for Chemically Sensitive People
- Clear Non Staining
- Contains No Formaldehyde
- 100% Biodegradable

SCENT SENSITIVE USERS:ODØRLØS contains no perfumes.

CONTENT: A nutrient for the naturally occurring bacteria in the waste, consisting mainly of: nitrate, magnesium and potassium.

Norsk Hydro was awarded in 1996 the prestigious Her Majesty the Queen's Award (United Kingdom) for Environmental Excellence in the development of the technology behind ODØRLØS.



The contents of this document do not necessarily reflect the views and policies of the USEPA or the SWRCB, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

After Avalon Harbor launched a boater education and clean water program, the sewage count dropped from 16,000 parts per 100mi to 23 parts per 100mi. It will work if we work it.

THE LAW CLEARLY STATES THE FOLLOWING:

Discharge of untreated sewage is prohibited within navigational waters, and all boats with installed toilets must have a coast guard approved MSD. Fines up to \$2000 can be imposed for illegal discharges.

OBJECTIVE:

Be able to name 3 things that the law clearly states about sewage

When sewage is discharged into the water it takes oxygen to decompose the sewage in the water thus depleting the amount of oxygen in the water for sea life. This amount of dissolved oxygen in the water required to decompose sewage matter is measured in terms of BOD or BIOLOGICAL OXYGEN DEMAND. Sewage from a boat, although small in quantity, is very concentrated and up to thirty-five times more concentrated than that from a treated municipal sewage.

OBJECTIVES:

- a. Understand what does it take to decompose sewage in the water.
- b. How does sewage effect sea life and divers?
- c. What does BOD mean?

THINGS YOU CAN DO TO HELP:

Avoid chlorine or formaldehyde chemicals in your holding tank. Pump out often. Use rapid dissolving toilet paper, and know where the pump out facilities are located. They are:

In Santa Barbara:

The fuels docks at Santa Barbara Fuel Dock

The following marinas: Marina One (Two on the east end and one on the west end)

OBJECTIVES:

- a. Name 2 things you can do to help prevent inadvertent sewage discharge
- b. Name the pumpout sites in Santa Barbara

<p>Alameda Ballena Isle Marina Alameda Fortman Marina Alameda Grand Marina Alameda Marina Village Yacht Harbor Alameda Park St. Landing Antioch Antioch Marina Antioch Lauritzen Yacht Harbor Avalon City Of Avalon Harbor Benicia Benicia Marina Berkeley Berkeley Marina Berkeley Berkeley Marine Center Bethel Island Anchor Marina Bethel Island Bentleys Marina & Rv Park Bodega Bay Spud Point Marina Bradley Lake San Antonio Resort Brentwood Holland Riverside Marina Brisbane Brisbane Marina Byron Discovery Bay Yacht Harbor Chula Vista California Yacht Marina Chula Vista Chula Vista Launching Ramp Chula Vista Chula Vista Marina Corona Del Mar Bahia Corinthian Yacht Club Corona Del Mar Bayside Marina Corona Del Mar Orange Co. Sheriff's Harbor Coronado Glorietta Bay Marina Coronado Lowes Coronado Bay Resort Dana Point Dana Point Fuel Dock Dana Point Dana Point Harbormaster Dana Point Dana Point-West Marina Emeryville Emery Cove Yacht Harbor Emeryville Emeryville Marina-City Of Emeryville Eureka Woodley Island Marina Folsom Folsom Lake Marina Fort Bragg Noyo Harbor Half Moon Bay Pillar Point Harbor Holt Whiskey Slough Harbor Homewood Obexer's Boat Company Huntington Beach Huntington Harbor Yacht Club</p>	<p>Huntington Beach Peter's Landing Marina Huntington Beach Sunset Aquatic Marina Isleton Ox Bow Marina Isleton Willow Berm Marina Locke The Boathouse Marina Lodi Tower Park Marina/Westrec Marinas Long Beach Alamitos Bay Marina Long Beach Downtown Marina/Shoreline Long Beach M.P. Boat Slips Marina Del Rey Burton Chase Park Marina del Rey Marina del Rey public launch ramp Marina Del Rey Marina Fuels Martinez Martinez Marina Monterey Monterey Marina Morro Bay Morro Bay City Harbor Morro Bay Morro Bay Marina Moss Landing Moss Landing Harbor Napa Lake Berryessa Marina Resort Napa Lake Berryessa-Steel Park Resort Newport Beach American Legion Yacht Club Newport Beach Balboa Bay Club Newport Beach Balboa Fun Zone Marina Newport Beach Balboa Yacht Basin Newport Beach Deanza Bayside Marina Newport Beach Harbor Club Marina Newport Beach Lido Marina Village Newport Beach Lido Sail Club Newport Beach Newport Dunes Marina Oakland Port Of Oakland Oceanside Oceanside - Coast Guard Dock Oceanside Oceanside Small Craft Harbor Oroville Oroville Lake-Bidwell Canyon Marina Oxnard Channel Island Marina Oxnard County Guest Dock Oxnard East Bank Guest Dock Oxnard Harbor Masters Dock</p>
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<p>Oxnard Peninsula Park Guest Dock Paradise Oroville Lake-Lime Saddle Marina Petaluma Port Sonoma Marina Redondo Beach King Harbor Marine Patrol Redwood City Port Of Redwood City Yacht Harbor Sacramento Cliffs Marina Sacramento Metro Marina Sacramento Riverbank Marina Sacramento Riverview Marina Sacramento Sacramento Marina San Diego Cortez Fuel Dock San Diego Harbor Island West Marina San Diego Islandia Hotel Marina San Diego Marina Village Marina San Diego National City Launching Ramp San Diego Pearsons Marine Serv. San Diego San Diego Harbor Police San Diego Sea World Marina San Diego Sheraton East Hotel Marina San Diego Sunroad Resort Marina San Francisco Gashouse Cove San Francisco Pier 39 Marina San Francisco San Francisco Marina-West Harbor San Francisco South Beach Harbor San Leandro San Leandro Marina San Mateo Coyote Point Marina San Rafael Loch Lomond Marina Santa Barbara Santa Barbara Harbor Dept. Santa Cruz Santa Cruz Harbor Sausalito Clipper Yacht Harbor Sausalito Kappas Yacht Harbor Sausalito Marina Plaza Harbor Sausalito Schoonmaker Point Marina Snelling Lake McClure-McClure Point Marina South Lake Tahoe Ski Run Marina</p>	<p>South Richmond Richmond Bay Marina South San Francisco Oyster Cove Marina South San Francisco Oyster Point Marina Stockton Herman & Helen's Marina Stockton King Island Resort Stockton Paradise Point Marina Stockton Tiki Lagoon Resort Stockton Village West Marina Stockton Waterfront Yacht Harbor Suisun City Suisun City Marina Thorton New Hope Landing Vallejo Glen Cove Marina Vallejo Vallejo Municipal Marina Ventura Ventura Harbor Launch Ramp Ventura Ventura Isle Marina Ventura Ventura West Marina Walnut Grove Dagmar's Landing Walnut Grove Walnut Grove Marina Winters Lake Berryessa-Markley Cove Marina <i>*LIST COUTESY OF THE DEPARTMENT OF BOATING AND WATERWAYS</i></p>
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OIL POLLUTION OBJECTIVES

What are the 3 most important laws with regards to oil pollution?

What are divers responsibilities in regards to these laws?

What are the Maximum fines for oil pollution?

What are the damaging effects from oil pollution?

What can you do to help and prevent spills?

OIL POLLUTION

In regards to oil pollution there are 3 important laws to be familiar with:

OIL POLLUTION, NOTIFICATION AND THE USE OF DISPERSANTS.

OIL POLLUTION:

Any person or facility that discharges oil or hazardous substances into or upon the navigable waters of the US, adjoining shorelines, or into or upon the contiguous zone, or which may affect natural resources belonging to or under the exclusive management authority of the US is in violation.

If any fuel or oil creates sheen, you are in violation and subject to up to a \$25,000 fine. This is in addition to the cost of cleaning up the spill. It doesn't pay to spill. It costs.

NOTIFICATION:

Any person in charge of a vessel or facility: Shall as soon as they have knowledge of a discharge of oil or hazardous material substance shall immediately notify the United States Coast Guard.

DISPERSANTS:

The use of chemical agents (soaps, detergents, surfactants, or emulsifying agents) shall be in accordance with the provisions of Subpart H of the national Contingency Plan and with the prior approval of the federal on scene coordinator, in and around California waters.

In other words the use of chemical agents to disperse oil is more harmful to the marine environment than if the oil had been left alone. The fuel or oil that would have been restricted to the surface layers can now enter the entire water column, poison fish, and threaten the lives of everything on the seabed.

OBJECTIVES:

- a. What 3 laws should we be concerned with, in regards to oil pollution?
- b. What is the maximum fine per incident?

One pint of oil can cover 1 acre of water surface, and 1 gallon of oil dumped in 1 million gallons of water will kill half of all exposed Dungeness crab larvae. Oil that gets on birds and mammals destroys their ability to stay warm. When it gets on fish, it affects their ability to breath.

OBJECTIVES:

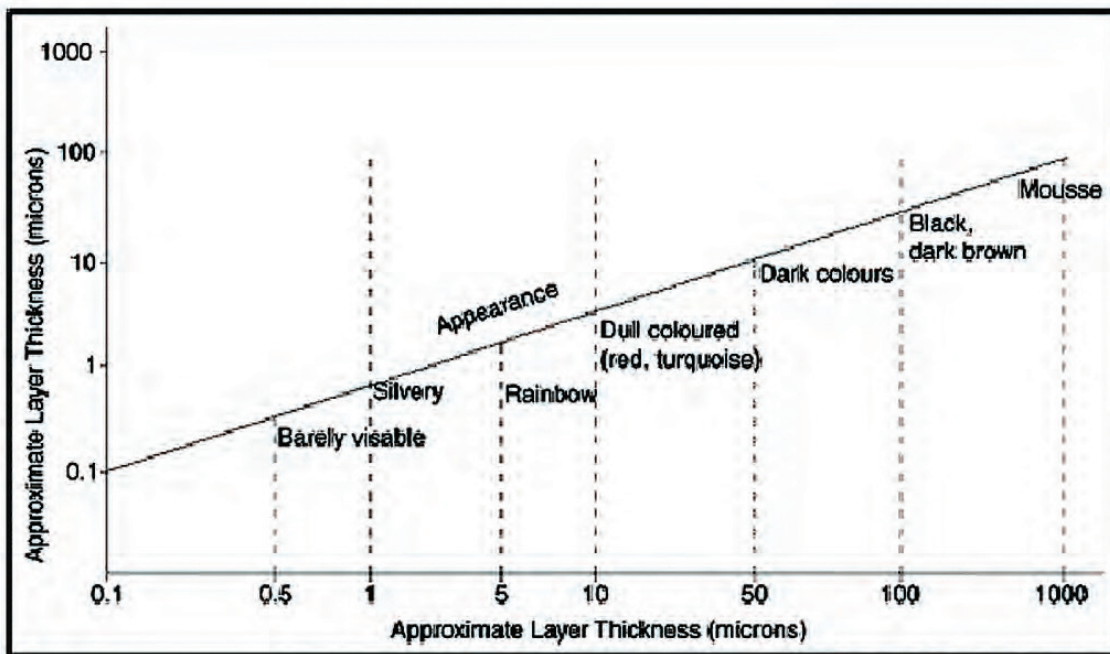
- How much water surface will one pint of oil cover?
- Name one-way oil can affect birds or fish?

THINGS YOU CAN DO TO HELP:

Don't overfill your fuel tank. Use absorbent pads or rags to catch fuel drips from the nozzle or vent. Keep your bilges clean. Recycle used oil, batteries, and paint. Never use soap to disperse oil or fuel.

OBJECTIVES:

- Be able to name 2 things you can do to prevent inadvertent oil discharge



(Courtesy CONCAWE, A Field Guide to the application of dispersants to oil spills)

VISUAL CUES FOR OIL IN WATER CHART BASED ON QUANTITY

GENERAL GLOSSARY OF TERMS USED IN OIL SPILL OBSERVATIONS

Spill characteristics appear differently under low light conditions and under strong winds conditions.

Light Sheen

A light, almost transparent, layer of oil. Sometimes confused with windrows and natural sheen resulting from biological processes. (e.g. coral spawning or algal bloom).

Silver Sheen

A slightly thicker layer of oil that appears silvery or shimmering.

Rainbow Sheen

Sheen that reflects multiple colors.

Brown Oil

Typically a 0.1 mm - 1.0 mm thick layer of water-in-oil emulsion. (Thickness can vary widely depending on wind and current conditions). May be referred as heavy or dull colored sheens.

Mousse

Water-in-oil emulsion often formed as oil weathers: colors can range from orange or tan to dark brown.

Black Oil

Area of black colored oil sometimes appearing with a latex texture. Often confused with kelp beds and other natural phenomenon.

Windrows

Oil or sheen oriented in lines or streaks. Brown oil and mousse can be easily confused with algae scum collecting in convergence lines, algae patches, or mats of kelp or fucoids. Sometimes called streaks, stringers or fingers.

Tar-balls

Weathered oil that has formed a pliable ball. Size may vary from pinhead to about 30 cm. Sheen may or may not be present.

Tar Mats

Non-floating mats of oily debris (usually sediment and/or plant matter) that are found on beach or just offshore.

Pancakes

Isolated patches of oil shaped in a mostly circular fashion. Pancakes can range in size from a few meters across to hundreds of meters in diameter. Sheen may or may not be present.

OIL POLLUTION QUESTIONS

1. The majority of all bay pollution is caused by urban runoff.
 - a. True or False

2. What does MSD stand for and which type is the most common?

3. What does a Y-Valve allow you to do?

4. What chemicals should you avoid using in a holding tank system?

5. Name and explain the 3 laws in regards to oil pollution.

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14. System Design, Sport Fish & Wildlife Restoration, Federal Aid Project. Available online at <http://www.dbw.ca.gov/design.htm> (NOT FOR CITATION) Sea Grant Extension Program, Cooperative Extension University of California, The United States Department, and the United States Department of Commerce Cooperating, July 7, 2000, Copyright University of California, Encouraging Superior Alternative Antifouling Strategies for Recreational Boats, Jeremy C. Haas & Leigh T. Johnson, July 2000 Review Draft *(For comment only, please do not circulate or cite.)