

The Determination of Oil Persistence: A Historical Perspective

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per•sist (pr-sst, -zst)

1. To be obstinately
repetitious, insistent, or
tenacious
- 2 To hold firmly and
steadfastly
3. To continue in existence; last

The Clean Water Act, OPA Amendment

Preparedness requirement: to establish procedures, methods, and equipment to contain discharges of oil from vessels and facilities

- **EPA:** Non-transportation-related onshore facilities and some offshore facilities
- **Coast Guard:** Marine transportation-related facilities, deep water ports, and vessels

U.S. EPA:

Facility Response Plan Rule

(40 CFR 112.20 and 112.21)



U.S. Coast Guard:

Response Plans for Marine Transportation-
Related Facilities (33 CFR 154)

Oil or Hazardous Material Pollution
Prevention Regulations for Vessels (33 CFR
155)



Non-Persistent Oil

EPA and U.S. Coast Guard Definition

A petroleum based oil that consists of hydrocarbon fractions:

- At least 50% of which by volume, distill at a temperature of 340°C (645°F); and
- At least 95% of which by volume, distill at a temperature of 370°C (700°F).

Also known as Group 1 Oils

Persistent Oil

EPA and U.S. Coast Guard Definition

A petroleum-based oil that does not meet the distillation criteria for non-persistent oils.

Persistent oils are further classified based on specific gravity as follows:

- Group 2 - specific gravity less than 0.85;
- Group 3 - specific gravity equal to or greater than 0.85 and less than 0.95;
- Group 4 - specific gravity equal to or greater than 0.95 and less than 1.0; or
- Group 5 - specific gravity equal to or greater than 1.0.

Significance in EPA and Coast Guard FRP Regulatory Requirements

- **Calculating Planning Distances**
 - Persistent oils: 15 miles from the facility
 - Non-persistent oils: 5 miles from the facility
- **Response Plan Development Criteria**
 - Response time and minimum quantity of boom required depend on oil persistency group
- **Determination of On-Water Recovery and Shoreline Cleanup Capacity and Worst Case Planning Volumes**
 - Removal capacity planning and shoreline cleanup volume
 - Adjusted according to emulsification factors

Limitations to Defining Specific Oils According to Persistence Type

- Different batches of a particular oil type can have different characteristics
- Weathering (persistence can vary at different times throughout spill recovery)
- Environmental conditions (water salinity, microorganisms, air and water temperatures affect persistence)

National Oceanic and Atmospheric Administration (NOAA)

- **Type 1: Very Light Oils**
 - Jet Fuels, Gasoline
- **Type 2: Light Oils**
 - Diesel, No. 2 Fuel Oil, Light Crudes
- **Type 3: Medium Oils**
 - Most Crude Oils
- **Type 4: Heavy Oils**
 - Heavy Crude Oils, No. 6 Fuel Oil, Bunker C

National Research Council for the National Academy of Sciences

Petroleum Persistence for Oil Spills

Oil Type	Persistence
Gasoline	days
Light Distillates	days
Crudes	months
Heavy Distillates	years

Washington Dept. of Ecology

Oil Spill Damage Compensation Schedule

Relative Ranking Scores for Classified Oils

Oil Class	Acute Toxicity	Mechanical Injury	Persistence
Prudhoe Bay Crude Oil	0.9	3.6	5
Bunker C	2.3	5	5
No. 2 Fuel Oil	2.3	3.2	2
Gasoline	5	1	1
Kerosene	1.4	2.4	1
Kerosene-type Jet Fuel	1.4	2.4	1

Ranks are based on scale of 0 to 5, where 0 represents the least harmful effect and 5 represents the most harmful effect.

Environment Canada

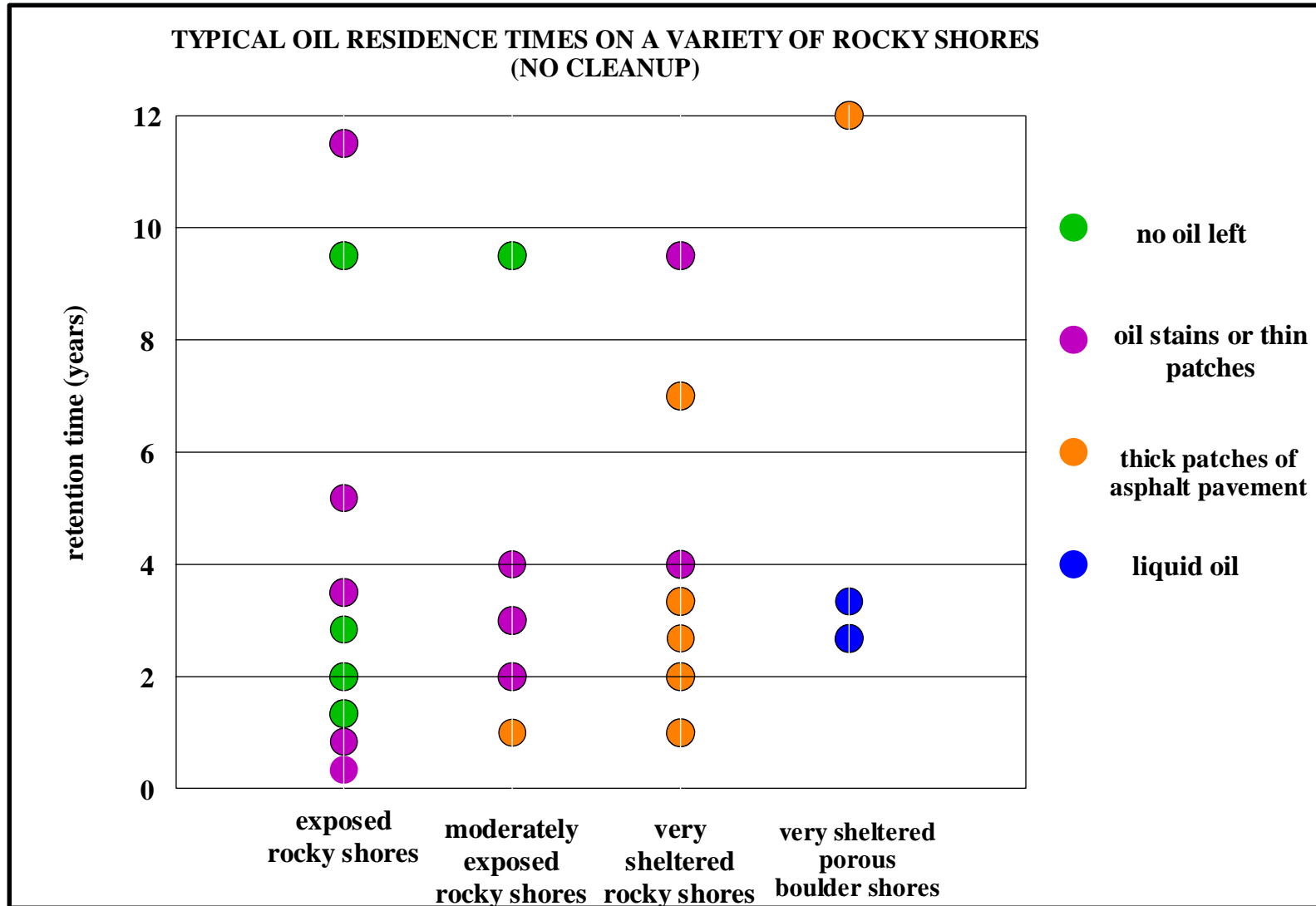
Oil Properties

- **Viscosity**
- **Density**
- **Flash Point**
- **Solubility in Water**
- **Pour Point**
- **API Gravity**
- **Interfacial Tension**
- **Distillation Fraction**

Oil Types

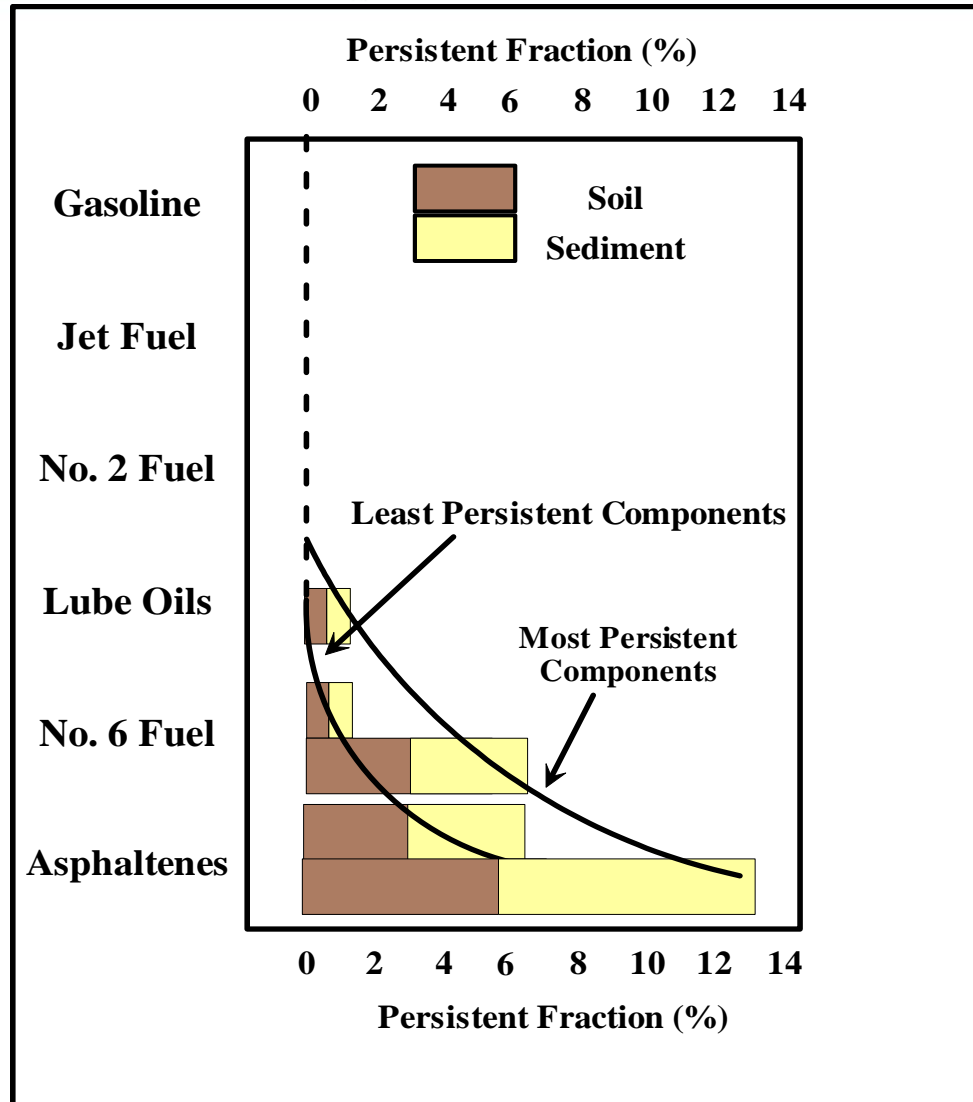
- **Gasoline**
- **Diesel**
- **Light Crude**
- **Heavy Crude**
- **Intermediate Fuel Oil**
- **Bunker C**
- **Crude Oil Emulsion**

International Petroleum Industry Environmental Conservation Association



American Petroleum Institute

Persistent Fraction of Petroleum Products in Aquatic Environments



American Petroleum Institute

Numerical Scale for Relative Persistence of Oil and Oil Products in the Aquatic Environment

Oil/Oil Product	Relative Persistence Ranking ¹	Persistence Classification
Gasoline	1	“relatively nonpersistent”
Jet Fuel	2	
No. 2 Fuel Oil	8	
Lube Oils	55	“slightly persistent”
Light Crude Oil	320	“highly persistent”
No. 6 Fuel Oil	400	
Medium Crude Oil	450	
Heavy Crude Oil	590	
Residual Asphaltenes	1,600	

Relative ranking with “1” being least persistent to “1,600” being extremely persistent.

International Maritime Organization (IMO)

IMO Definition

- **Non-persistent oil**
 - Same as EPA/Coast Guard Definition
 - Adds: “...when tested by the American Society for Testing and Materials Method D 86/78 or any subsequent revision thereof.”
- **Persistent oil.**
 - All oils which are not within the category of “non-persistent oil” as defined shall be regarded as “persistent oil.”

Summary and Conclusions

- Consistent definitions among three major organizations
- Limitations to labeling oils by persistence types
- Other approaches for addressing persistence
- Q & A