

# HISTORICAL OVERVIEW OF OIL SPILLS FROM ALL SOURCES (1960–1998)

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**ABSTRACT:** *This poster session gives an overview of oil spill statistics on oil spills of at least 10,000 gallons (34 tonnes) that have occurred worldwide over the last twenty years. Included are: the annual amount of oil spilled from different source types as well as in total, and the number and amount of oil spilled by size range. The data indicate that in any one year, the total amount of oil spilled depends largely on the incidence of catastrophic spills. While the frequency of smaller spills under 100,000 gallons (340 tonnes) greatly exceeds those of spills of over 1 million gallons (3,400 tonnes), the total volume of these smaller spills represents only a fraction of one catastrophic spill. While tanker spills have often gotten more media coverage,*

*the amount of oil spilled from these vessels is often less than that spilled from pipelines, storage tanks, and other facilities.*

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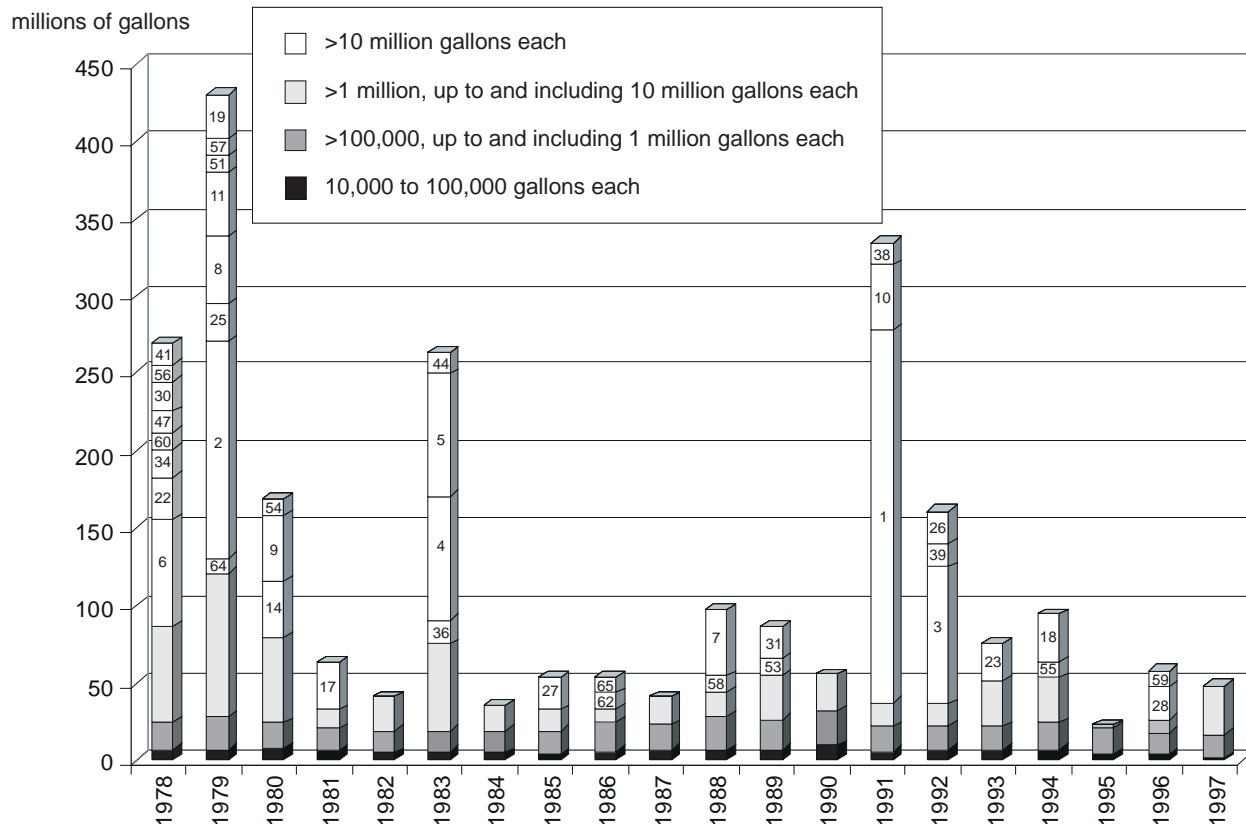
## **Detecting trends**

As we have indicated in past summaries, data indicating reduced oil spillage, both in terms of volume and number of incidents, are probably equivocal in terms of indicating any general downward trend in oil spillage, as shown in both Figures 1 and 2.

**Amount Spilled Annually According to Size Range**  
(corresponds to Figures 1 and 2)

Year	10,000-100,000 Gallons Each		>100,000 - 1 Million Gallons Each		>1 Million - 10 Million Gallons Each		>10 Million Gallons Each		Total	
	Spills	Gallons (Tonnes)	Spills	Gallons (Tonnes)	Spills	Gallons (Tonnes)	Spills	Gallons (Tonnes)	Spills <sup>1</sup>	Gallons (Tonnes)
1978	181	6,888,400 (23,430)	66	18,413,000 (62,629)	19	61,366,000 (208,728)	8	183,362,000 (623,680)	302	270,029,400 (918,467)
1979	194	7,369,200 (25,065)	78	21,207,000 (72,133)	23	92,562,000 (314,837)	8	308,967,000 (1,050,908)	346	430,105,200 (1,462,943)
1980	232	8,183,600 (27,835)	62	16,735,000 (56,922)	19	55,053,000 (187,255)	3	89,560,000 (304,626)	382	169,531,600 (576,638)
1981	193	6,471,000 (22,010)	55	14,122,000 (48,034)	3	12,286,000 (41,789)	1	31,165,000 (106,003)	288	64,044,000 (217,837)
1982	176	14,147,000 (48,119)	52	14,147,000 (48,119)	6	21,729,000 (73,908)	0	0	284	41,134,000 (139,912)
1983	176	5,561,000 (18,915)	46	13,787,000 (46,895)	15	55,888,000 (190,095)	4	188,300,000 (640,476)	270	263,536,000 (896,381)
1984	181	5,128,000 (17,442)	59	14,206,000 (48,320)	7	17,177,000 (58,425)	0	0	257	36,511,000 (124,187)
1985	155	4,550,000 (15,478)	53	15,375,000 (52,296)	4	12,941,000 (44,017)	1	21,352,000 (72,626)	218	54,218,500 (184,417)
1986	194	5,696,800 (19,377)	56	19,941,000 (67,827)	5	8,028,000 (27,306)	2	20,454,000 (27,306)	316	54,119,800 (184,081)
1987	230	6,933,300 (23,583)	52	16,175,000 (55,017)	8	17,728,000 (60,299)	0	0	318	40,836,300 (138,899)
1988	198	6,544,900 (22,262)	76	22,001,000 (74,833)	7	15,702,000 (53,408)	2	53,702,000 (182,660)	289	97,949,900 (333,163)
1989	229	6,866,400 (23,355)	62	19,503,800 (66,339)	10	29,370,000 (99,898)	2	31,000,000 (105,442)	306	86,740,200 (295,035)
1990	307	9,417,900 (32,034)	75	22,624,700 (76,955)	9	24,067,480 (81,862)	0	0	395	56,110,080 (190,851)
1991	230	6,300,500 (21,430)	53	15,407,200 (52,405)	7	15,854,000 (53,925)	3	297,000,000 (1,010,204)	306	334,561,700 (1,137,965)
1992	244	6,900,600 (23,471)	61	15,386,800 (52,336)	5	14,363,200 (48,854)	3	124,900,000 (424,830)	321	161,550,600 (549,492)
1993	242	7,031,500 (23,917)	49	14,632,400 (49,770)	10	29,279,000 (99,588)	1	25,000,000 (85,034)	308	75,942,900 (258,309)
1994	228	7,122,600 (24,227)	60	17,235,000 (58,622)	8	28,785,000 (97,908)	2	41,600,000 (141,497)	308	94,742,600 (322,254)
1995	164	5,015,500 (17,060)	50	15,571,200 (52,967)	2	2,573,100 (8,752)	0	0	220	23,160,800 (78,778)
1996	118	4,261,700 (14,496)	50	13,703,000 (46,609)	3	8,660,000 (29,456)	2	31,834,000 (108,279)	202	58,458,700 (198,839)
1997	61	2,018,000 (6,864)	49	15,238,000 (51,830)	9	31,408,000 (106,830)	0	0	136	48,664,000 (165,524)

<sup>1</sup>Includes major incidents where no amount was provided or confirmed.



- 1: 26 January 1991; terminals, tankers; 8 sources total Sea Island installations; Kuwait; off coast in Persian Gulf and in Saudi Arabia - 240 million gallons (816,300 tonnes)
- 2: 03 June 1979; exploratory well Ixtoc I well; Mexico; Gulf of Mexico, Bahia Del Campeche, - 140 million gallons (476,190 tonnes)
- 3: 02 March 1992; oil well; Uzbekistan; Fergana Valley (88.0)
- 4: 04 February 1983; platform No. 3 well (Nowruz); Iran; Persian Gulf, Nowruz Field - 80 million gallons (272,109 tonnes)
- 5: 06 August 1983; tanker Castillo de Bellver; South Africa; 64km off Table Bay - 78.5 million gallons (267,007 tonnes)
- 6: 16 March 1978; tanker Amoco Cadiz; France; Atlantic Ocean, off Portsall, Brittany - 68.7 million gallons (233,670 tonnes)
- 7: 10 November 1988; tanker Odyssey; Canada; 1,175 km NE of Saint John's, Newfoundland - 43.1 million gallons (146,600 tonnes)
- 8: 19 July 1979; tanker Atlantic Empress; Trinidad/Tobago; Caribbean Sea - 42.7 million gallons (145,238 tonnes)
- 9: 01 August 1980; production well D-103 concession well; 800 km southeast of Tripoli, Libya - 42 million gallons (142,860 tonnes)
- 10: 11 April 1991; tanker Haven; Italy; Mediterranean Sea, port of Genoa - 42 million gallons (142,860 tonnes)
- 11: 02 August 1979; tanker Atlantic Empress; 450 km east of Barbados - 41.5 million gallons (141,160 tonnes)
- 12: 18 March 1967; tanker Torrey Canyon; United Kingdom; Lands End - 38.2 million gallons (129,930 tonnes)\*
- 13: 19 December 1972; tanker Sea Star; Oman; Gulf of Oman - 37.9 million gallons (128,910 tonnes)\*
- 14: 23 February 1980; tanker Irenes Serenade; Greece; Mediterranean Sea, Navarino Bay - 36.6 million gallons (124,490 tonnes)
- 15: 07 December 1971; tanker Texaco Denmark; Belgium; North Sea - 31.5 million gallons (107,140 tonnes)\*
- 16: 23 February 1977; tanker Hawaiian Patriot; USA; Pacific Ocean 593 km W of Kauai, Hawaii - 31.2 million gallons (106,120 tonnes)\*
- 17: 20 August 1981; storage tanks; Kuwait; Shuaybah - 31.2 million gallons (106,120 tonnes)
- 18: 25 October 1994; pipeline Kharyaga-Usinsk Pipeline; Russia; Usinsk - 30.7 million gallons (104,420 tonnes)
- 19: 15 November 1979; tanker Independentza; Turkey, Bosphorus Strait, Hydarpaşa port - 28.9 million gallons (98,300 tonnes)
- 20: 11 February 1969; tanker Julius Schindler; Portugal; Ponta Delgada, Azores Islands - 28.4 million gallons (96,600 tonnes)\*
- 21: 12 May 1976; tanker Urquiola; Spain; La Coruña Harbor port -28.1 million gallons (95,580 tonnes)\*
- 22: 25 May 1978; pipeline No. 126 well and pipeline; Iran; Ahvazin - 28 million gallons (95,240 tonnes)
- 23: 05 January 1993; tanker Braer; United Kingdom; Garth Ness, Shetland Islands - 25 million gallons (85,035 tonnes)
- 24: 29 January 1975; tanker Jakob Maersk; Portugal; Porto de Leisoes, Oporto - 24.3 million gallons (82,650 tonnes)\*
- 25: 06 July 1979; storage tank Tank #6; Nigeria; Forcados - 23.9 million gallons (81,290 tonnes)
- 26: 03 December 1992; double-bottom tanker Aegean Sea; Spain; La Coruña harbor port - 21.9 million gallons (74,490 tonnes)
- 27: 06 December 1985; tanker Nova; Iran; Persian Gulf, 140 km south of Kharg Island - 21.4 million gallons (72,800 tonnes)

- 28: 15 February 1996; tanker Sea Empress; United Kingdom; Mill Bay; Milford Haven Harbor port - 21.3 million gallons (72,450 tonnes)
- 29: 27 February 1971; tanker Wafra; South Africa; Atlantic Ocean - 20.2 million gallons (68,700 tonnes)\*
- 30: 11 December 1978; fuel storage depot; Zimbabwe (then Rhodesia); Salisbury - 20.0 million gallons (68,030 tonnes)
- 31: 19 December 1989; tanker Khark 5; Morocco; Atlantic Ocean, 185 km from Moroccan coast - 20 million gallons (68,030 tonnes)
- 32: 20 March 1970; freighter Othello; Sweden; Tralhavet Bay east of Vaxholm - 18 million gallons (61,220 tonnes)\*
- 33: 13 May 1975; tanker Epic Colocotronis; USA; Caribbean Sea, 111 km NW of Puerto Rico - 18 million gallons (61,220 tonnes)\*
- 34: 12 June 1978; storage tanks; Japan; Sendai (offshore Miyagi prefecture) - 17.7 million gallons (60,200 tonnes)
- 35: 06 December 1960; tanker Sinclair Petrolore; Brazil - 17.6 million gallons (59,860 tonnes)\*
- 36: 07 January 1983; tanker Assimi; Oman; Gulf of Oman, Ras al Hadd, 93 km from Muscat - 15.8 million gallons (53,740 tonnes)
- 37: 09 November 1974; tanker Yuyo Maru No. 10; Japan; Tokyo Bay, Honshu Island - 15.8 million gallons (53,740 tonnes)\*
- 38: 28 May 1991; tanker ABT Summer; Angola; open water 1,287 km off coast in the Atlantic Ocean - 15 million gallons (51,020 tonnes)
- 39: 26 April 1992; tanker Katina P.; South Africa; Indian Ocean, 180 km east of Durban - 15 million gallons (51,020 tonnes)
- 40: 22 May 1965; tanker Heimvard; Japan; Pacific Ocean, Hokkaido Island - 14.7 million gallons (50,000 tonnes)\*
- 41: 31 December 1978; tanker Andros Patria; Spain; Bay of Biscay off Cape Villano, Spain - 14.6 million gallons (49,660 tonnes)
- 42: 13 June 1968; tanker World Glory; South Africa; Indian Ocean, 105 km east Durban - 14.2 million gallons (48,300 tonnes)\*
- 43: 13 January 1975; tanker British Ambassador; Japan; 333 km west of Iwo Jima Island - 14.2 million gallons (48,300 tonnes)\*
- 44: 09 December 1983; tanker Pericles GC; Qatar; Persian Gulf, 30 km east-northeast of Doha - 14 million gallons (47,620 tonnes)
- 45: 09 August 1974; tanker Metula; Chile; Straits of Magellan, Satellite Bank port - 13.9 million gallons (47,280 tonnes)\*
- 46: 01 June 1970; tanker Ennerdale; Seychelles; Indian Ocean - 13.8 million gallons (46,940 tonnes)\*
- 47: 07 December 1978; tanker Tadotsu; Indonesia; Strait of Malacca, near Dumai - 13.2 million gallons (44,900 tonnes)
- 48: 29 February 1968; tanker Mandoil; USA; Pacific Ocean, near Warrenton, Oregon - 12.6 million gallons (42,860 tonnes)\*
- 49: 18 December 1974; refinery tank Mizushima Refinery; Japan; Kurashiki, Okayama - 11.6 million gallons (39,460 tonnes)\*
- 50: 10 June 1973; tanker Napier; Chile; Southeast Pacific Ocean off west coast of Chile - 11.3 million gallons (38,440 tonnes)\*
- 51: 26 August 1979; bulk carrier Patianna; United Arab Emirates; Persian Gulf, off Dubai - 11.2 million gallons (38,100 tonnes)
- 52: 11 June 1972; tanker Trader; Greece; Mediterranean Sea off east coast Greece - 11 million gallons (37,400 tonnes)\*
- 53: 24 March 1989; tanker Exxon Valdez; USA; Prince William Sound, Valdez, Alaska - 11 million gallons (37,400 tonnes)\*
- 54: 29 December 1980; tanker Juan Antonio Lavalleja; Algeria; Arzew Harbor - 11 million gallons (37,400 tonnes)\*
- 55: 21 October 1994; tanker Thanassis A.; Hong Kong; South China Sea, 700 km off coast - 10.9 million gallons (37,075 tonnes)
- 56: 19 October 1978; pipeline; Turkey; Mardin - 10.7 million gallons (36,400 tonnes)
- 57: 01 November 1979; tanker Burmah Agate; USA; Gulf of Mexico, 6.4 km off Galveston Bay, Texas - 10.7 million gallons (36,400 tonnes)
- 58: 22 April 1988; tanker Athenian Venture; Canada; 644 km SE of Cape Race, Newfoundland - 10.6 million gallons (36,050 tonnes)
- 59: 07 March 1996; tanker unknown; Mexico; Bay of Campeche, Tuxpan, Veracruz - 10.6 million gallons (36,050 tonnes)
- 60: 14 December 1978; storage tank; USA; Benuelan, Puerto Rico - 10.5 million gallons (35,710 tonnes)
- 61: 07 February 1977; tanker Borag; Taiwan; East China Sea, 3 km north of Chilung - 10.4 million gallons (35,370 tonnes)\*
- 62: 23 October 1986; Well Abkatun 91; Mexico; Bay of Campeche, 64 km NW of Ciudad del Carmen - 10.4 million gallons (35,370 tonnes)
- 63: 06 February 1976; tanker Saint Peter; Colombia; Pacific Ocean, 56 km W of Punta Manglares - 10.3 million gallons (35,030 tonnes)\*
- 64: 28 April 1979; bulk carrier Gino; France; Atlantic Ocean, 64 km off Brittany - 10.1 million gallons (34,350 tonnes)
- 65: 27 April 1986; storage tank Refineria Las Minas; Panama; Colón, Las Minas Bay - 10.1 million gallons (33,350 tonnes)

Notes:

<sup>1</sup>On 19 July 1979, the Atlantic Empress spilled 42.7 million gallons after colliding with the Aegean Captain. On 2 August 1979, while under tow from the original spill site, the Atlantic Empress spilled an additional 41.5 million gallons.

<sup>2</sup>In this incident, the vessel sank with some of its cargo still on board after spilling an undetermined amount of oil. The spill size reported reflects the total amount of oil spilled and oil left on board the sinking vessel.

<sup>3</sup>The records of the 20 March 1970 Othello spill have been the subject of controversy. The International Tanker Owners Pollution Federation (ITOPF) claims that the spill size could be no larger than 25,000 gallons and that the vessel recorded as the tanker Othello is probably the freighter Otello (DWT 4,376) listed in the 1970-1971 Lloyd's List. A vessel of this size would have a maximum oil-carrying capacity of 1.35 million gallons. A number of other sources, however, report the spill size to be as large as 30.7 million gallons. Several reports indicate that the oil formed huge blobs that sank below the water, leaving only about 10 cm of the oil exposed on the surface. The bay was covered with 60-cm-deep ice except in the shipping channel. Since a large part of the oil disappeared below the ice and the surface of the water, it's difficult to estimate the total spill volume.

<sup>4</sup>This vessel was "scuttled" — deliberately sunk — with some of its cargo still on board after salvage efforts failed.

<sup>5</sup>ITOPF gives the spill amount as 76.44 million gallons, which includes all oil left onboard the tanker when it sank. It is unclear how much oil burned, spilled into the water, or sank.

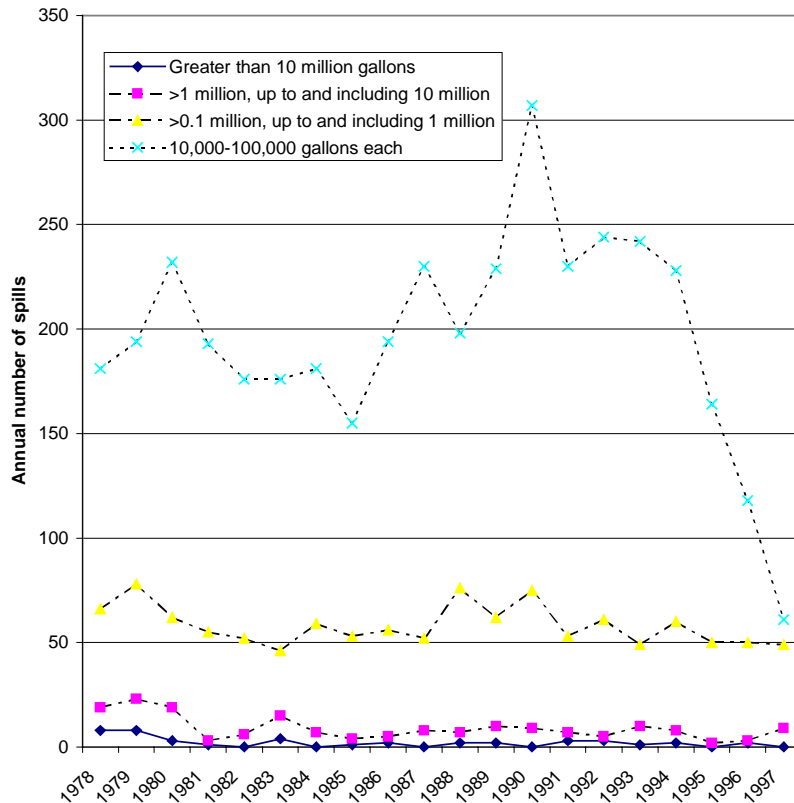


Figure 1 and Table 1 illustrate each year's total volume broken down into segments representing the annual contribution of each spill size category. Policymakers and the oil transport industry would like to speculate that the apparent downward trend in oil spillage, particularly since a peak in 1991 (due mainly to the catastrophic incidents in the Persian Gulf that year) is indicative of the success of spill prevention efforts. While recognizing that such efforts may have had a positive effect in reducing the number and size of oil spills, we should view the data with some caution.

The number of spills have fluctuated widely every year since 1978 and even going back as far as 1960. Viewed over a longer time frame it appears that the current downward trend may be part of a temporary downward fluctuation that is part of erratic cycling over the long term. However, with a few more years of data to examine, a truly significant downward trend might become apparent in retrospect. The amount of oil spilled has fluctuated even more widely due to the fact that any one or two catastrophic incidents greatly increase the total amount of spillage for that particular year.

### Influence of very large spills

In any one year, one or more very large spills (over 10 million gallons or over 34,000 tonnes) can dramatically skew the data, while the actual *number* of incidents often does not change significantly. Every year since 1991 there

has been at least one catastrophic incident of these proportions with the exception of 1995 and 1997.

The volume (and tonnage) figures are, of course, important to consider when viewing the data from the perspective of the amount of oil that entered the environment, causing damage to natural resources and requiring cleanup and removal. Small fluctuations in the number of these very large spills can have a highly significant impact on the amount of oil spilled in a single year.

Although the annual volume of all the spills in the smallest range of spill size depicted in Figure 2 -- 10,000-100,000 gallons (34-340 tonnes) each -- appears insignificant when stacked against the volume contributions from the larger categories, the *incidence* of spills in this group is consistently the highest out of the four categories shown.

As is typical of frequency distributions and as Figure 2 suggests, the annual number of spills in a given size range increases in the smaller categories, since these events are more likely to occur. A 1991 study by the US Coast Guard (USCG) and the National Oceanic and Atmospheric Administration (NOAA) of oil spills in US coastal waters indicated that oil spills of over 10,000 gallons (34 tonnes) represented only 1.1% of the total *number* of spills, but represented 87.5% of the *volume* of spillage.

Applying this model worldwide to the data currently in the *International Oil Spill Database* for 1997, one could estimate the total spillage amount for 1997 as 55.7 million gallons (189,000 tonnes) in 13,545 incidents. Likewise,

according to this model, since 1960, an estimated 4.2 billion gallons (14,127,000 tonnes) of oil has spilled from all sources in an estimated 732,000 incidents. The additional spillage from these smaller events in 1997 is less than the amount in the largest spill during that year -- the 8.4 million gallons (28,570 tonnes) that spilled from the tanker *Evoikos* after a collision in the Singapore strait in October 1997.

The amount spilled annually will continually to be dependent on the number of very large spills. While the frequency of spills of over 10 million gallons (34,000 tonnes) continues at a seemingly regular rate, fluctuating from zero, as in 1995 and 1997, to eight, as in 1978, a year-to-year change from zero or one spill in this category to three or four, or even eight spills of over 10 million gallons (34,000 tonnes), will have a dramatic effect on the annual spillage volume and tonnage.

### Number of incidents

From the perspective of evaluating spill prevention efforts and response readiness, the total number of incidents in different size categories, may be more significant than the total volume spilled.

Examining the total number of incidents occurring in a particular region or worldwide is integral to the evaluation of spill prevention efforts. But such an evaluation should

also include an analysis of the number of incidents occurring in different size categories. Spill prevention efforts might successfully reduce the number of incidents by reducing the probability that a spill will occur or that a particular situation, such as a grounding, collision, or poor weather, will result in oil spillage. It is important to recognize that these spill prevention efforts, while not always averting accidental spillage, might reduce the amount spilled in a particular incident.

Analysis of the frequency of incidents in different size categories might also provide spill response organizations with valuable insight into the numbers and types of spills that may require response in the future, or the extent to which current response structures handled the number of incidents of different magnitudes that required response in the past. Spill responders are well aware that larger spill incidents require more elaborate response equipment, increased manpower, and more complex strategies.

### Different sources

From the perspective of spill response and prevention, spills from different sources—e.g., vessels, pipelines, storage tanks, and trucks—are totally different events. Figure 3 illustrates the amounts of oil spilled by source type. During 1997 spillage from all sources was well below average amounts for each source type.

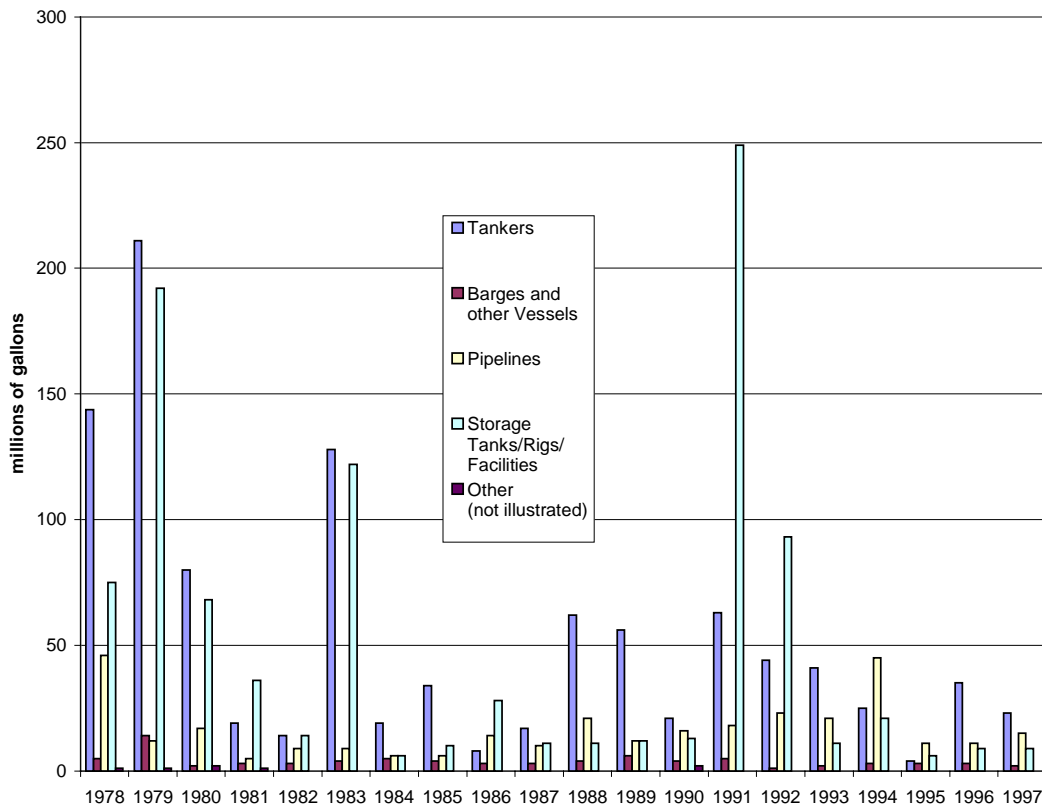
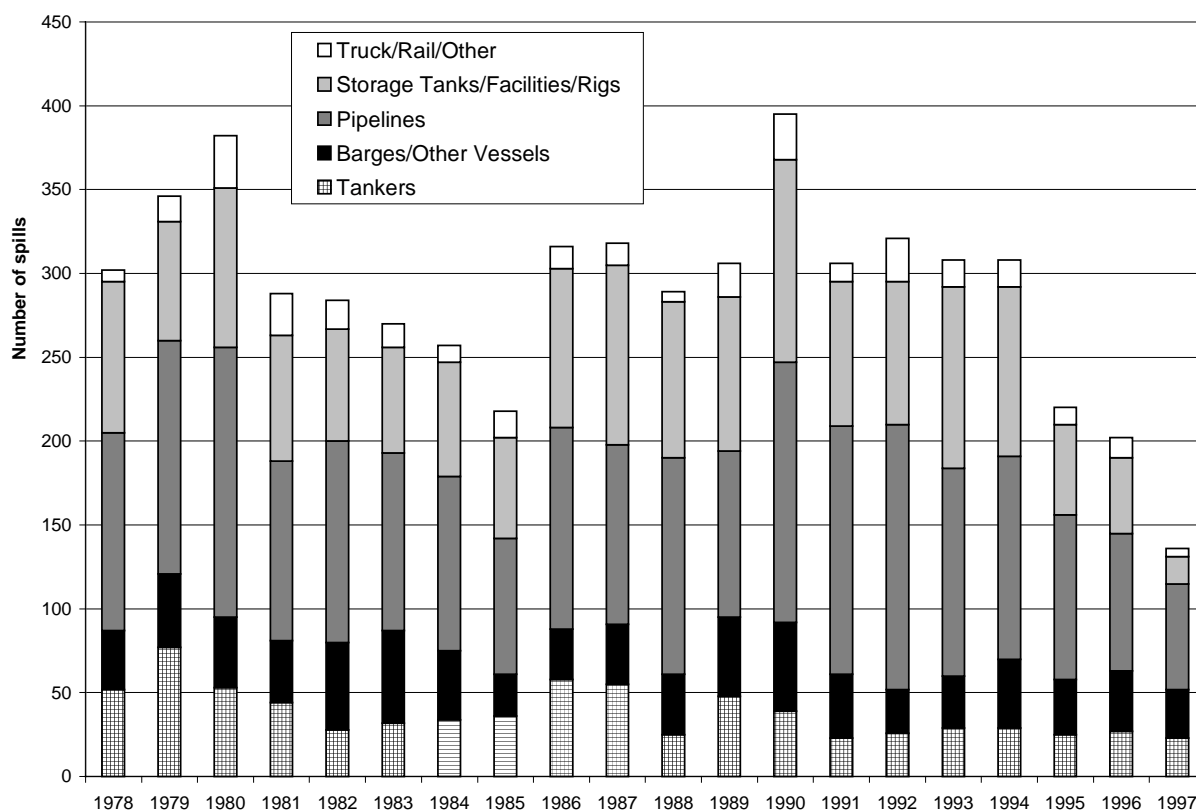


Figure 4 illustrates the annual number of incidents by source type. The darker rectangles toward the bottom of the chart represent vessels (tankers, barges, freighters, container vessels, fishing vessels, and others) and the

lighter upper areas represent nonvessel sources (pipelines, storage tanks, rigs, facilities, and land-based transportation modes such as truck or rail).



Land-based transfer modes are not illustrated in Figure 3, since given the scale of the chart the totals they represent are not visible.

During 1997, as in the past, spills from pipelines and storage tanks outnumber vessel spills, though the latter got more press coverage. In 1997, spills from pipelines represented more than twice the number of spills from tankers. Historical records show that nearly half of pipeline spills have been caused by structural problems, most commonly corrosion. Aging pipelines in many countries are suffering from corrosion problems which can lead to slow leaks or catastrophic bursting. Many pipelines that spilled in the last several years were installed at least 30 or 40 years ago, some as many as 60 or 70 years ago. Prevention efforts must focus on the structural soundness of these aging pipeline systems.

Although pipelines and other nonvessel sources consistently spill oil more frequently than vessels, nonvessel spills often involve lower volumes. In 1997, pipelines spilled 14.6 million gallons (49,660 tonnes) in 63 incidents, while the combined totals of 12 major spills from storage tanks and other facilities resulted in the release of nearly 9.1 million gallons (30,952 tonnes) of oil into the environment. Exploration and production activities resulted in only four significant spills, totalling 224,000 gallons (762 tonnes), according to preliminary figures.

The combined total of nonvessel spills came to nearly 24 million gallons (81,633 tonnes), about half of that spilled from all sources combined. With the addition of belated

reports of more pipeline and facility spill data, this proportion will most likely increase.

The effects of spills from nonvessel sources, particularly pipelines, have more recently begun to attract more publicity, in some cases leading to legislative action. But data on pipeline spills is still relatively inaccessible from sources outside the US and Europe. In part, this is due to the fact that pipeline spills are more likely to go undetected. The nature of vessel transport makes it more difficult for oil spills from vessels to go unnoticed. Vessels require personnel, so in most cases no oil spill from a vessel is unattended. Insurance industry scrutiny and local laws and regulations often help to ensure that oil spills from vessels are reported and recorded within a relatively short time period.

But similar safeguards do not necessarily apply to oil distribution by pipeline. Buried underground or submerged, leaks from pipelines and storage tanks can remain unnoticed for years. Pipelines are also subject to fewer regulations and inspections than vessels, even in the US.

In developing nations and nations where the oil industry is nationalized, governments often have little incentive to publicize major spills, as it would add to the burden of agencies working with already limited means. In contrast to the international tanker trade, the more local nature of pipeline distribution means that the burden of cleanup costs and other spill-related damages is not usually shared by the beneficiaries along the route. Unlike funding mechanisms and conventions set up for the benefit of vessel owners and

operators (e.g., the International Oil Pollution Convention Fund), no similar institutions exist that address the damages caused by spills from pipelines and storage tanks.

### **Biography**

Dagmar Schmidt Etkin (B.A. Biology, U. Rochester; A.M., Ph.D. Biology, Harvard U.) is Senior Research Analyst/Consultant for *Oil Spill Intelligence Report* and Cutter Consortium, and a member of the UN/IMO Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection Working Group on Oil Discharges into the Marine Environment. She maintains the International Oil Spill Database and consults on oil spill issues and Y2000 problems for the oil transportation, production, and spill response industries.