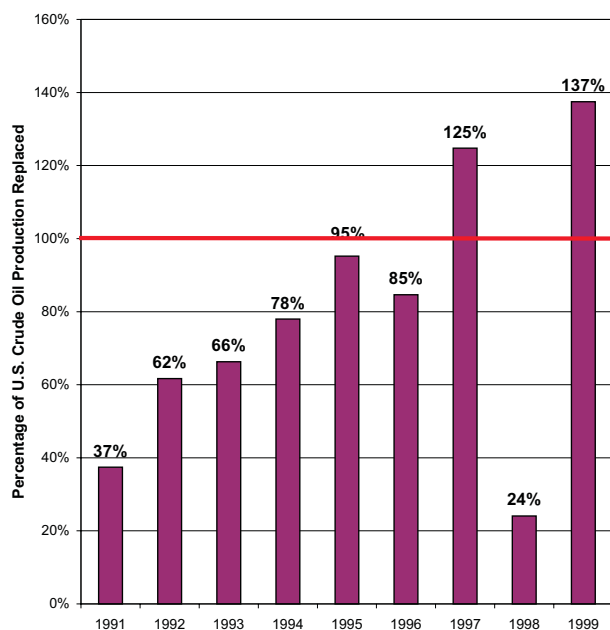


## 3. Crude Oil Statistics

The United States had 21,765 million barrels of crude oil proved reserves as of December 31, 1999. This is 3.5 percent (731 million barrels) more than in 1998, and is the largest percentage increase in oil reserves in the 23-year EIA reserves program.

**Figure 15. Reserve Additions Replace 137 Percent of U.S. Oil Production in 1999**



Source: Energy Information Administration, Office of Oil and Gas.

Operators replaced 137 percent of 1999 oil production with proved reserves additions (Figure 15). This was not a result of increased drilling, more successful exploratory drilling, or dramatically improved technology. Crude oil prices began slowly increasing from the inflation-adjusted 53-year low of December 1998 and then accelerated during the year, reaching \$22.55 per barrel in December 1999. Price was the most significant factor in the largest positive net revisions to proved reserves in over a decade.

Over the past decade, U.S. crude oil proved reserves had been declining (Figure 1) an average of 2 percent per year. The decline was much more severe in 1998. In 1999, oil reserve levels appear to have recovered from the 1998 decline.

### Proved Reserves

Table 6 presents the U.S. proved reserves of crude oil as of December 31, 1999, by selected States and State subdivisions.

Figure 16 maps 1999 crude oil proved reserves by area. The following four areas account for 79 percent of U.S. crude oil proved reserves:

Area	Percent of U.S. Oil Reserves
Texas	25
Alaska	23
California	18
Gulf of Mexico Federal Offshore	13
<b>Area Total</b>	<b>79</b>

Of these four areas, Texas and California increased their reserves in 1999, while Alaska and the Gulf of Mexico had decreases in crude oil proved reserves.

### Discussion of Reserves Changes

Figure 17 maps the change in crude oil proved reserves from 1997 to 1998 by area. Here's how the top four areas fared compared to the total United States:

Area	Change in U.S. Oil Reserves (million barrels)
Texas	+412
Alaska	-152
California	+91
Gulf of Mexico Federal Offshore	-49
<b>Area Total</b>	<b>+302</b>
<b>U.S. Total</b>	<b>+731</b>

Figure 2 in Chapter 2 shows the components of the changes in crude oil proved reserves for 1999 and the preceding 10 years.

### Total Discoveries

Total discoveries are those new reserves attributable to extensions of existing fields, new field discoveries, and new reservoir discoveries in old fields. They result from the drilling of exploratory wells.

**Table 6. Crude Oil Proved Reserves, Reserves Changes, and Production, 1999**  
(Million Barrels of 42 U.S. Gallons)

State and Subdivision	Published Proved Reserves 12/31/98	Changes in Reserves During 1999						Estimated Production (-)	Proved Reserves 12/31/99
		Adjustments (+,-)	Revision Increases (+)	Revision Decreases (-)	Extensions (+)	New Field Discoveries (+)	New Reservoir Discoveries in Old Fields (+)		
Alaska	5,052	1	2,351	2,201	6	79	0	388	4,900
<b>Lower 48 States</b>	<b>15,982</b>	<b>138</b>	<b>3,933</b>	<b>2,264</b>	<b>253</b>	<b>242</b>	<b>145</b>	<b>1,564</b>	<b>16,865</b>
Alabama	39	-1	29	13	0	0	0	5	49
Arkansas	47	-7	23	10	0	0	0	5	48
California	3,843	72	575	337	60	0	0	279	3,934
Coastal Region Onshore	354	2	150	31	33	0	0	17	491
Los Angeles Basin Onshore	207	40	98	42	13	0	0	19	297
San Joaquin Basin Onshore	3,127	19	275	264	14	0	0	222	2,949
State Offshore	155	11	52	0	0	0	0	21	197
Colorado	212	-9	25	9	0	0	0	16	203
Florida	71	1	18	0	0	0	0	5	85
Illinois	81	5	24	1	0	0	0	9	100
Indiana	13	-4	3	1	0	0	0	1	10
Kansas	246	-97	60	17	4	0	2	23	175
Kentucky	23	0	3	0	0	0	0	2	24 <sup>b</sup>
Louisiana	551	10	184	90	20	2	10	87	600
North	101	-6	33	15	12	0	0	17	108
South Onshore	353	3	126	63	8	2	8	53	384
State Offshore	97	13	25	12	0	0	2	17	108
Michigan	44	3	26	14	0	0	0	7	52
Mississippi	141	-16	62	12	2	0	1	15	163
Montana	167	-5	136	94	15	0	0	12	207
Nebraska	18	-3	7	3	0	0	0	2	17
New Mexico	620	54	149	55	11	0	0	61	718
East	610	51	147	54	11	0	0	60	705
West	10	3	2	1	0	0	0	1	13
North Dakota	245	21	55	31	3	0	0	31	262
Ohio	40	-21	28	2	0	0	10	4 <sup>b</sup>	51
Oklahoma	599	5	148	81	6	0	0	56	621
Pennsylvania	15	0	3	2	1	0	0	1	16
Texas	4,927	127	1,239	601	59	1	3	416	5,339
RRC District 1	61	-17	31	1	0	0	0	8	66
RRC District 2 Onshore	45	8	15	6	0	0	0	9	53
RRC District 3 Onshore	211	15	62	44	10	0	0	33	221
RRC District 4 Onshore	40	-1	14	7	2	0	0	6	42
RRC District 5	40	-2	6	2	1	0	0	6	37
RRC District 6	308	6	126	167	3	0	0	31	245
RRC District 7B	115	20	9	7	0	0	0	14	123
RRC District 7C	173	21	60	31	3	0	1	18	209
RRC District 8	1,865	31	406	123	18	0	2	132	2,067
RRC District 8A	1,895	22	444	159	21	1	0	135	2,089
RRC District 9	111	16	52	41	1	0	0	16	123
RRC District 10	62	4	11	9	0	0	0	7	61
State Offshore	1	4	3	4	0	0	0	1	3
Utah	201	4	112	35	0	0	0	14	268
West Virginia	17	5	2	2	0	0	0	1	21
Wyoming	547	-6	141	45	4	1	0	52	590
Federal Offshore	3,261	1	876	808	68	238	119	458	3,297
Pacific (California)	468	-1	147	26	2	0	0	37	553
Gulf of Mexico (Louisiana)	2,483	2	693	730	55	238	77	376	2,442
Gulf of Mexico (Texas)	310	0	36	52	11	0	42	45	302
Miscellaneous <sup>a</sup>	14	-1	5	1	0	0	0	2	15
<b>U.S. Total</b>	<b>21,034</b>	<b>139</b>	<b>6,284</b>	<b>4,465</b>	<b>259</b>	<b>321</b>	<b>145</b>	<b>1,952</b>	<b>21,765</b>

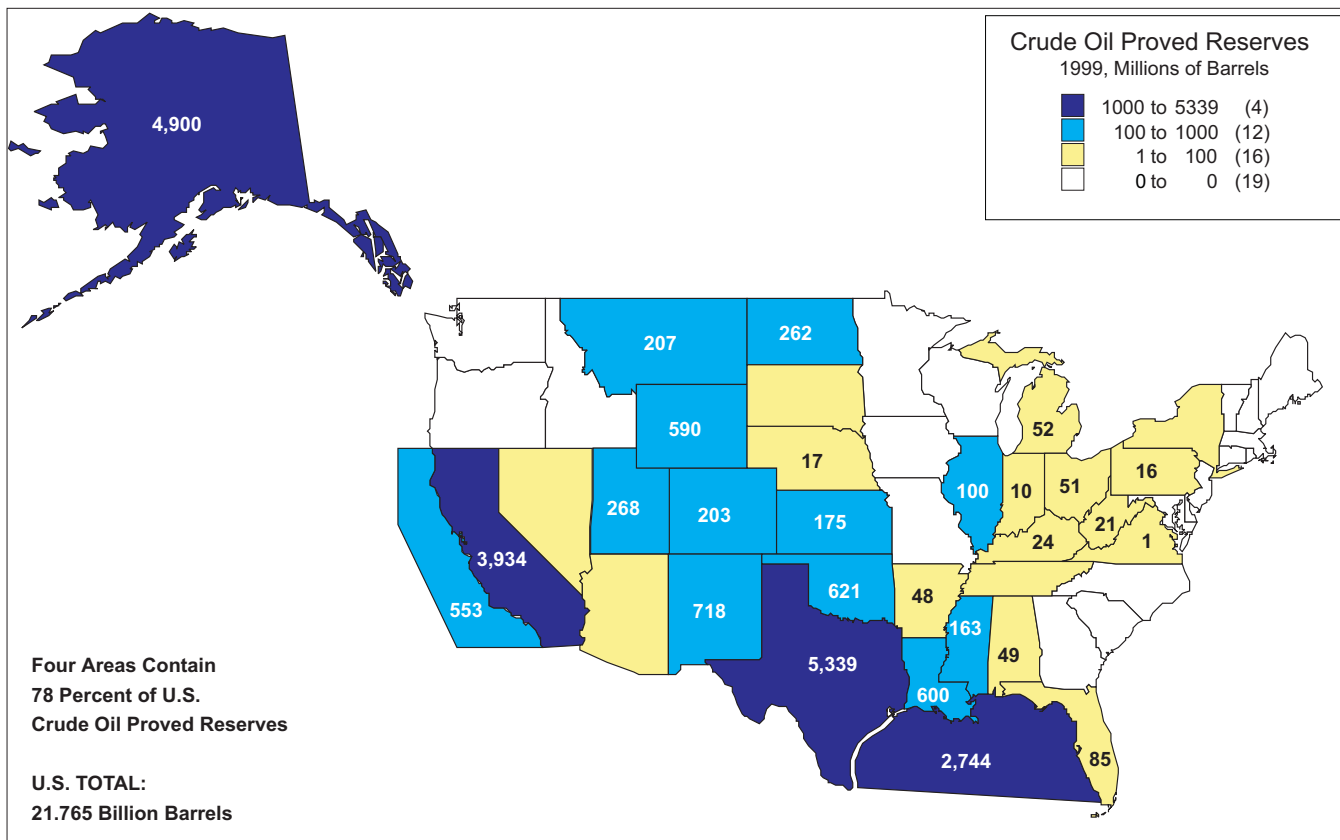
<sup>a</sup>Includes Arizona, Missouri, Nevada, New York, South Dakota, Tennessee, and Virginia.

<sup>b</sup>Indicates the estimate is associated with a sampling error (95 percent confidence interval) that exceeds 20 percent of the estimated value.

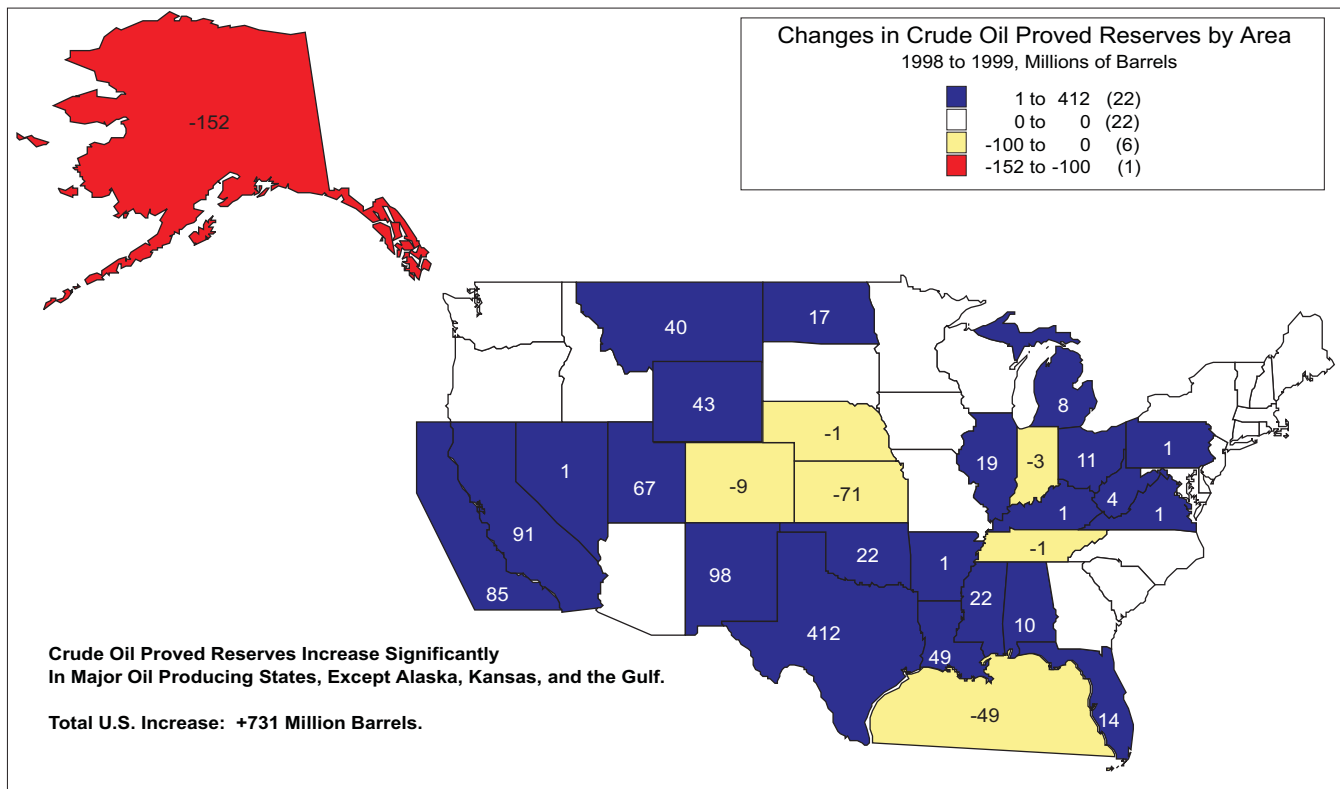
Note: The production estimates in this table are based on data reported on Form EIA-23, "Annual Survey of Domestic Oil and Gas Reserves." They may differ from the official Energy Information Administration production data for crude oil for 1999 contained in the *Petroleum Supply Annual 1999*, DOE/EIA-0340(99).

Source: Energy Information Administration, Office of Oil and Gas.

**Figure 16. 1999 Crude Oil Proved Reserves by Area**



**Figure 17. Changes in Crude Oil Proved Reserves by Area, 1998 to 1999**



Source: Energy Information Administration, Office of Oil and Gas.

*Total discoveries* of crude oil were 725 million barrels in 1999, 21 percent more than those of 1998. Only five areas had *total discoveries* exceeding 30 million barrels:

- The Gulf of Mexico Federal Offshore had 423 million barrels of *total discoveries*, 58 percent of the National total.
- Alaska had 85 million barrels of *total discoveries*, 12 percent of the National total.
- Texas had 63 million barrels of *total discoveries*, 9 percent of the National total.
- California had 60 million barrels of *total discoveries*, 8 percent of the National total.
- Louisiana had 32 million barrels of *total discoveries*, 4 percent of the National total.

The United States discovered an average of 752 million barrels of new crude oil proved reserves per year in the prior 10 years (1989 through 1998). *Total discoveries* in 1999 were 4 percent less than that average.

## Extensions

Operators reported 259 million barrels of *extensions* in 1999. The highest volume of *extensions* was reported in the Gulf of Mexico Federal Offshore (66 million barrels of *extensions*.) Operators in California reported 60 million barrels of *extensions*. Texas was third with 59 million barrels, followed by Louisiana with 20 million barrels.

In the prior 10 years, U.S. operators reported an average of 433 million barrels of *extensions* per year. The 1999 *extensions* were 40 percent less than that average.

## New Field Discoveries

There were 321 million barrels of *new field discoveries* reported in 1998. Only five areas in the United States reported any *new field discoveries*, and only two contributed more than 1 percent to the total:

- Gulf of Mexico Federal Offshore (74 percent; 238 million barrels)
- Alaska (25 percent; 79 million barrels).

In the prior 10 years, U.S. operators reported an average of 184 million barrels of reserves from *new field discoveries* per year. Reserves from *new field discoveries* in 1999 were 74 percent more than that average volume.

## New Reservoir Discoveries in Old Fields

Operators in the United States reported 145 million barrels of crude oil reserves from *new reservoir discoveries in old fields* in 1999. As with *new field discoveries*, the most significant portion of the *new reservoir discoveries in old fields* came from the Gulf of Mexico Federal Offshore—119 million barrels or 82 percent of the total. Louisiana and Ohio each had 10 million barrels (7 percent each). In the prior 10 years, U.S. operators reported an average of 135 million barrels of reserves from *new reservoir discoveries in old fields* per year. Reserves from *new reservoir discoveries in old fields* in 1999 were 7 percent more than that average.

## Revisions and Adjustments

Thousands of positive and negative *revisions* to proved reserves occur each year as infill wells are drilled, well performance is analyzed, new technology is applied, or economic conditions change. *Adjustments* are the annual changes in the published reserve estimates that cannot be directly attributed to the estimates for other reserve change categories because of the survey and statistical estimation methods employed.

There were 1,958 million barrels of net *revisions and adjustments* for crude oil in 1999. This is the largest contribution in the 23-year history of the EIA reserves program. Average *revisions and adjustments* for the prior 10 years were 986 million barrels.

## Production

U.S. *production* of crude oil in 1999 was 1,952 million barrels. This was 2 percent lower than 1998's production of 1,991 million barrels. U.S. crude oil *production* has declined eight years in a row. The Gulf of Mexico Federal Offshore leapt from third place to the largest producing area in the United States in 1999 with 22 percent of the National total of oil production. Texas and Alaska are now second and third with 21 percent and 20 percent of the total, respectively. California is fourth with 14 percent.

In 1999, the Form EIA-23 National production estimates were within two tenths of 1 percent of the comparable *Petroleum Supply Annual (PSA) 1999* volumes for crude oil and lease condensate production combined (2,147 million barrels).

## Areas of Note: Large Discoveries and Reserves Additions

The following State and area discussions summarize notable activities during 1999 concerning expected new field reserves, development plans, and possible production rates as reported in various trade publications. The citations do not necessarily reflect EIA's concurrence, but are considered important enough to be brought to the reader's attention.

The following areas are the major success stories for crude oil reserves and production for 1999.

### Texas

Texas, the state with the largest proved reserves of crude oil, also reported the largest increase in proved reserves in 1999. Texas proved oil reserves increased by 412 million barrels in 1999. The largest increase component was revisions and adjustments in the Permian Basin area (Texas Subdivisions 8 and 8A). These 2 state subdivisions accounted for 396 million barrels of the crude oil proved reserves increase.

### New Mexico

New Mexico had the second highest net increase in crude oil proved reserves in 1999, an increase of 98 million barrels. Operators in New Mexico, as they did in Texas, revised their crude oil proved reserves upward in 1999. New Mexico had a 16 percent increase in proved crude oil reserves, and a production increase of 3 percent from 1998 (59 million barrels production) to 1999.

### Gulf of Mexico Federal Offshore

Despite the net loss of reserves in 1999, the Gulf of Mexico still holds much promise for future development and reserves additions, especially in deep water. In 1999, this area had the most *total discoveries* of crude oil proved reserves – 423 million barrels of *total discoveries*, which is 58 percent of the National total.

- **The British (Petroleum) Invasion:** BP Amoco announced four major discoveries in the deepwater Gulf in 1999. These include Crazy Horse, Mad Dog, Atlantis, and Holstein. All four of these fields are operated by BP Amoco. Crazy Horse, the largest deepwater discovery to date, is anticipated to have reserves of at least one

billion barrels of oil equivalent. It is owned 75% by the BP Amoco group, and 25% by Exxon Mobil. Mad Dog is 63.56% group-owned by BP Amoco, with partners Unocal and BHP. Atlantis is owned 56% by the BP Amoco group and 44% by BHP, and Holstein is an equal partnership between BP Amoco and Shell. The latter three discoveries are anticipated to add another 600 million barrels of oil equivalent in net additional reserves.{34}

- **Brutus:** Shell Exploration and Production Company announced in April 1999 its plans to develop Brutus using a tension leg platform to be installed on Green Canyon Block 158 in 2,985 feet of water. Estimated ultimate gross recovery from the development is greater than 200 million barrels of oil equivalent, with a 70:30 oil/gas ratio. The Brutus TLP facilities are designed to accommodate 100,000 barrels of oil and 300 million cubic feet of gas per day. The TLP will be utilized as a hub for surrounding developments.{35}
- **Oregano:** On April 22, 1999, Shell Exploration and Production Company announced its third oil and gas discovery in the deepwater Auger basin of the Gulf of Mexico. The Oregano prospect, located at Garden Banks Block 559 in a water depth of 3,393 feet, was drilled to a measured depth of 19,500 feet and encountered commercial quantities of hydrocarbons.{36}
- **Hoover and Diana:** In 1999, Exxon Mobil Corporation installed the largest deep draft caisson vessel in the Gulf of Mexico to develop the Hoover and Diana fields, located in the Gulf of Mexico 320 kilometers (200 miles) from Houston. These fields hold the equivalent of 400 million barrels of oil. ExxonMobil is also the primary leaseholder on several good prospects and discoveries nearby, such as the Marshall and Madison fields, which will be tied into the Hoover hub in 2002. Exxon Mobil set another record while developing these fields – the deepest water-depth for horizontal wells and gravel packs: 760 meters (2,500 feet) of horizontal section in 1,425 meters (4,700 feet) of water, Diana field, Gulf of Mexico.{37}

### California

California's crude oil proved reserves increased 2 percent (91 million barrels) in 1999. Operators in

California revised their 1998 reserves upward, plus added reserves through extensions.

### Other Gain Areas

**Pacific Federal Offshore:** Proved oil reserves in the Pacific Federal Offshore increased by 18 percent (85 million barrels) in 1999. The increase was from upward revisions of reserves.

**Utah:** Utah's proved oil reserves increased by 33 percent (67 million barrels) in 1999 compared to 1998. The increase was from upward revisions of reserves.

## Areas of Note: Large Reserves Declines

The following areas had large declines in crude oil proved reserves due to downward revisions or unreplaced production.

### Alaska

Alaska's crude oil proved reserves declined 152 million barrels in 1999, 39 percent more than the decline reported in 1998 (109 million barrels). Alaska had the second highest volume of *new field discoveries* (79 million barrels) of any area in 1999, but this did not offset Alaska's oil production—an estimated 388 million barrels in 1999. Alaska's production declined 11 percent from its 1998 level (437 million barrels production).

### Kansas

Kansas' crude oil proved reserves declined 29 percent (71 million barrels) in 1999. Operators also reported a production decline of 32 percent (11 million barrels) from 1998 (34 million barrels production) to 1999.

### Gulf of Mexico Federal Offshore

There was a net decline of 49 million barrels of crude oil proved reserves in the Gulf of Mexico Federal Offshore in 1999. It is expected that development and exploration in the Gulf of Mexico Federal Offshore will continue to add future reserves.

The Gulf of Mexico produced about 421 million barrels of crude oil in 1999, an increase of 13 percent over

1998's production (372 million barrels). However, there were only 372 million barrels of total reserves additions (which includes adjustments, net revisions, and total discoveries) in this area, which replaced just 88 percent of production from this area.

### Other Decline Areas

In the following areas of the United States, development of existing or new oil fields was outpaced by crude oil production.

**Colorado:** Proved oil reserves decreased by 4 percent (9 million barrels).

**Indiana:** Proved oil reserves decreased by 23 percent (3 million barrels).

## Reserves in Nonproducing Reservoirs

Not all proved reserves of crude oil were contained in reservoirs that were producing. Operators reported 4,206 million barrels of proved reserves in nonproducing reservoirs, 1 percent more than reported in 1998 (4,147 million barrels).

Nonproducing reserves are those waiting for well workovers, drilling additional development or replacement wells, installing production or pipeline facilities, and awaiting depletion of other zones or reservoirs before recompletion in reservoirs not currently open to production.

## Indicated Additional Reserves

In addition to proved reserves of crude oil, Category I and Category II operators estimate the quantities of crude oil, other than proved reserves, that may become economically recoverable from known reservoirs through the application of improved recovery techniques using currently available technology. The 1999 volume, 2,865 million barrels, is about 9 percent less than what was reported in 1998 (3,160 million barrels).

**Table 7** lists the indicated additional reserves by selected States and State subdivisions. The presence of large indicated additional reserves in Alaska, California, south Louisiana and west Texas implies that significant upward revisions to proved crude oil reserves could occur in the future.

**Table 7. Reported Indicated Additional Crude Oil Reserves,<sup>a</sup> 1999**  
(Million Barrels of 42 U.S. Gallons)

State and Subdivision	Indicated Additional Reserves	State and Subdivision	Indicated Additional Reserves
Alaska . . . . .	464	North Dakota . . . . .	1
Lower 48 States . . . . .	2,400	Ohio . . . . .	0
Alabama . . . . .	0	Oklahoma . . . . .	58
Arkansas . . . . .	0	Pennsylvania . . . . .	0
California . . . . .	1,400	Texas . . . . .	426
Coastal Region Onshore . . . . .	30	RRC District 1 . . . . .	0
Los Angeles Basin Onshore . . . . .	0	RRC District 2 Onshore . . . . .	0
San Joaquin Basin Onshore . . . . .	1,330	RRC District 3 Onshore . . . . .	25
State Offshore . . . . .	30	RRC District 4 Onshore . . . . .	0
Colorado . . . . .	21	RRC District 5 . . . . .	0
Florida . . . . .	0	RRC District 6 . . . . .	4
Illinois . . . . .	0	RRC District 7B . . . . .	0
Indiana . . . . .	0	RRC District 7C . . . . .	3
Kansas . . . . .	0	RRC District 8 . . . . .	279
Kentucky . . . . .	0	RRC District 8A . . . . .	115
Louisiana . . . . .	278	RRC District 9 . . . . .	0
North . . . . .	0	RRC District 10 . . . . .	0
South Onshore . . . . .	278	State Offshore . . . . .	0
State Offshore . . . . .	0	Utah . . . . .	42
Michigan . . . . .	0	West Virginia . . . . .	0
Mississippi . . . . .	0	Wyoming . . . . .	5
Montana . . . . .	0	Federal Offshore . . . . .	5
Nebraska . . . . .	0	Pacific (California) . . . . .	0
New Mexico . . . . .	165	Gulf of Mexico (Louisiana) . . . . .	5
East . . . . .	165	Gulf of Mexico (Texas) . . . . .	0
West . . . . .	0	Miscellaneous <sup>b</sup> . . . . .	0
		<b>U.S. Total . . . . .</b>	<b>2,865</b>

<sup>a</sup>Includes only those operators who produced 400,000 barrels of crude oil or 2 billion cubic feet of natural gas, or both, during the report year (Category I or Category II operators).

<sup>b</sup>Includes Arizona, Missouri, Nevada, New York, South Dakota, Tennessee, and Virginia.

Source: Form EIA-23, "Annual Survey of Domestic Oil and Gas Reserves," 1999.