GJO-100(80)

STATISTICAL DATA OF THE URANIUM INDUSTRY

JANUARY 1, 1980

U.S. DEPARTMENT OF ENERGY
Assistant Secretary for Resource Applications
Grand Junction Office, Colorado

Available From: Technical Library
Bendix Field Engineering Corporation
P. O. Box 1569
Grand Junction, CO 81502

Telephone: 303/242-8621, ext. 278

Price: *$3.50*

DISCLAIMER

GJO-100(80)

STATISTICAL DATA OF THE URANIUM INDUSTRY

JANUARY 1, 1980

U.S. DEPARTMENT OF ENERGY

Assistant Secretary for Resource Applications
Grand Junction Office, Colorado

STATISTICAL DATA OF THE URANIUM INDUSTRY January 1, 1980

CONTENTS

IX. LAND HOLDINGS FOR URANIUM EXPLORATION AND MINING

X. EMPLOYMENT

XI. COMMERCIAL U_3O_8 SALES AND REQUIREMENTS

XII. PROCESSING MILLS

APPENDIX A

APPENDIX B

FOREWORD

The "Statistical Data of the Uranium Industry" is a compilation of historical facts and figures through 1979. These statistics are based primarily on information provided voluntarily by the uranium exploration, mining, and milling companies. This publication is compiled and updated annually by the Grand Junction Office (GJO). Most of the numbers reported herein have been rounded. The production, reserves, drilling, and production capability information has been reported in a manner which avoids disclosure of proprietary information.

Due to production cost increases, only a few companies own $15 per pound U_3O_8 reserves. Consequently, the distribution statistics for $15 reserves have been deleted to avoid disclosure of proprietary information. Totals for the $15 reserves, however, are reported on page 13. Because of increased interest in higher cost resources for long-range planning purposes, a section covering the distribution of $100 per pound reserves statistics has been newly included, pages 57 to 62. A table of mill recovery ranges for the January 1, 1980 reserves has also been added to this year's edition, page 12. The section on domestic uranium production capability has been deleted this year but will be included in next year's report.

The January 1, 1980 potential resource estimates are unchanged from the January 1, 1979 estimates. GJO has concentrated its efforts on producing a comprehensive and up-to-date report of total U.S. resources in a report which will be released in October 1980.

SECTION I
URANIUM RESERVES, PRODUCTION, AND INVENTORIES

SECTION I
URANIUM RESERVES, PRODUCTION, AND INVENTORIES

Reserve Estimates

Uranium reserve estimates are derived from drill hole and other data made available to the Grand Junction Office by the uranium companies. Separate evaluations are made of the quantities of uranium in cost categories of $30, $50, and $100 per pound U_3O_8 to cover the range of current economic interest. The costs used to assign the uranium reserves to these cost categories are "forward costs" comprising operating and capital costs, in present dollars, that will be incurred in production of the uranium. These include costs of labor, materials, electricity, royalties, payroll and production taxes, insurance, and applicable general and administrative costs. All previous expenditures (before the time of the estimate) for such items as property acquisition, exploration, mine development, mill construction, etc., are excluded in determining the appropriate cost category. Also excluded are income taxes, profit, and the cost of money. *The various cost categories are independent of the market price at which the uranium would be sold.*

Uranium reserves are the estimated quantities of uranium which occur in known deposits of such grade, quantity, configuration, and depth that they can be recovered at, or less than, a specified cost with state-of-the-art mining and processing technologies. Reserves are based on direct radiometric and chemical measurements of drill holes and other types of sampling of the deposits. Reserves are calculated individually for properties throughout the United States using company-provided data. Mineral grades and thicknesses, spatial relationships, depths below the surface, mining extraction methods, distances to milling facilities, and amenability of ores to processing are all considered in the evaluation. The amounts of uranium in ore that could be exploited at the forward-cost levels are calculated according to conventional engineering practices utilizing all available engineering, geologic, and economic data. DOE reserves have been adjusted for mining dilution and recovery but have not been adjusted for mill recovery. Thus, DOE reserves in the $30, $50, and $100 cost categories represent the amount of U_3O_8 in ore that is estimated to be recoverable at or less than those costs in the mining process. Losses associated with milling processes have not been deducted but an average milling recovery factor is given for the total reserves in each cost category on page 12.

Estimation Procedures

Reserves are estimated for each individual property, based on sample results and interpretation of gamma-ray drill-hole logs. The amount of uranium in ore that could be produced from a deposit at maximum forward costs of $30, $50, and $100 per pound U_3O_8 is calculated by the general procedure outlined below.

1. Determination of the "cutoff" to define the lowest grade (in percent U_3O_8) of material that can be mined from a deposit at a minimum thickness where the total operating cost per pound of recoverable U_3O_8 in such material is equal to the chosen cost ($30, $50, or $100) per pound. The cutoff grade is determined by the following formula.

$$\text{Cutoff Grade} = \frac{\text{Cost of Mining, Hauling, Royalty \& Milling/Ton of Ore}}{\text{Chosen Cost/lb } U_3O_8 \times \text{Mill Recovery} \times 20}$$

2. Estimation of the quantity of mineralized material in the deposit that meets or exceeds the cutoff grade and thickness criteria, expressed in tons of material and average grade adjusted for mining recovery and dilution.

3. Application of all forward operating and capital costs not yet incurred to the mineralized material derived in Step 2.

4. If the cost per pound U_3O_8 derived in Step 3 is less than the chosen cost per pound, the estimated material is assigned to the appropriate cost category.

The above procedure applies to reserves suitable for conventional mining. The quantities of U_3O_8 estimated to be recoverable from solution (in-situ) mining operations are included in reserve totals, but are estimated by another method. This type of reserve is calculated for those properties for which companies have initiated or indicated their intent to do solution mining. The uranium content of material above 0.01 percent U_3O_8 is calculated for each property, and the reserves are estimated by multiplying this amount of U_3O_8 by an appropriate recovery factor.

Summary of 1/1/80 Reserve Estimates

The January 1, 1980, $30 reserves estimate is 645,000 tons compared with 690,000 tons reported for January 1, 1979. This 45,000-ton reduction does not indicate a decrease in the amount of uranium present in the ground, but it does indicate that, due to rising production costs, less uranium is available at a forward cost of $30 per pound or less. A tabular explanation of the changes during 1979 is listed on page 14. About 40,000 tons of U_3O_8 were added to the $30 reserves in 1979 for new properties and for reevaluation of properties, but 66,000 tons were removed, primarily due to cost increases. About 19,000 tons of $30 reserves were mined in 1979.

The January 1, 1980, $50 reserves estimate is 936,000 tons of U_3O_8 compared with 920,000 tons reported for January 1, 1979. This net 16,000-ton addition includes 64,000 tons from new properties and 29,000 from additional exploration and development of properties with established reserves. About 57,000 tons of U_3O_8 were removed from the $50 category because of cost increases, and 20,000 tons of $50 reserves were mined in 1979. Most of the $50 additions were in central Wyoming, as a result of intensive exploration activity over the past several years.

Historical uranium reserves estimates are listed on page 13. The newly included estimate of January 1, 1980 $100 reserves is 1,122,000 tons of U_3O_8.

Milling Recovery Factors

Processing plant recoveries for the January 1, 1980 uranium reserves listed in this report are summarized in the following table.

Reserves Category	$15/lb	$30/lb	$50/lb	$100/lb
Average Grade, % U_3O_8	0.20	0.10	0.07	0.06
Recovery Range, %	90–97	87–96	84–95	82–95

HISTORICAL ESTIMATES OF URANIUM RESERVES

As Of	$15/lb Tons U_3O_8	$30/lb Tons U_3O_8	$50/lb Tons U_3O_8	$100/lb Tons U_3O_8
1/1/65	-	-	-	-
1/1/66	-	-	-	-
1/1/67	-	-	-	-
1/1/68	248,000	-	-	-
1/1/69	265,000	-	-	-
1/1/70	317,000	-	-	-
1/1/71	391,000	-	-	-
1/1/72	520,000	-	-	-
1/1/73	520,000	-	-	-
1/1/74	520,000	634,000	-	-
1/1/75	420,000	600,000	-	-
1/1/76	430,000	640,000	-	-
1/1/77	410,000	680,000	840,000	-
1/1/78	370,000	690,000	890,000	-
1/1/79	290,000	690,000	920,000	-
1/1/80	225,000	645,000	936,000	1,122,000

Note: Reserves reported at $30, $50, and $100 include reserves in all lower cost categories. This table does not include byproduct uranium.

CHANGES IN URANIUM RESERVES
During 1979

	$15/lb U_3O_8	$30/lb U_3O_8	$50/lb U_3O_8
January 1, 1979 Reserves	290,000	690,000	920,000
New Properties	1,000	20,000	64,000
Reevaluation-Additions	0	20,000	29,000
Reevaluation-Subtractions	(52,000)	(66,000)	(57,000)
Depletion-Production*	(14,000)	(19,000)	(20,000)
January 1, 1980 Reserves	225,000	645,000	936,000

*Includes erosion, i.e., the amount of uranium-bearing material not recoverable in the future as a result of the mining of lower cost reserves in 1979.

CHANGES IN RESERVES BY COST CATEGORIES DURING 1979

Quantities in Thousands of Tons

	$30 Reserves			$50 Reserves			$100 Reserves		
	Ore	% U_3O_8	U_3O_8	Ore	% U_3O_8	U_3O_8	Ore	% U_3O_8	U_3O_8
1145 Properties Total $30 Reserves	658,000	0.10	645	1,192,000	0.07	864	1,667,000	0.06	1,005
604 Properties are added @ $50/lb				79,000	0.09	72	277,000	0.05	112
1749 Properties Total $50 Reserves				1,271,000	0.07	936			
72 Properties are added @ $100/lb							14,000	0.03	5
1821 Properties Total $100 Reserves							1,958,000	0.06	1,122

PROPERTIES CONTAINING 150 OR MORE TONS U_3O_8 IN EACH COST CATEGORY 1/1/80

	$30	$50	$100
Number of Properties	309	368	382
Tons U_3O_8 (Thousands)	630	916	1,101
Percentage of Total Tons U_3O_8	98	98	98
Percentage of Properties	27	21	21

Uranium Inventory

The uranium inventory is a compilation of inventories for individual uranium properties, derived mainly from company drilling data. The inventory includes all material equal to or exceeding minimum mining thicknesses and equal to or greater than a grade of 0.01 percent U_3O_8; economic availability is not considered. Grades below 0.01 percent are excluded because the validity of lower grades interpreted from gamma-ray logs is highly questionable, due to such factors as uranium disequilibrium and the limitations of the gamma-ray logging equipment presently in use. The inventory includes, in addition to reserves, material that meets minimum mining thickness criteria but not the other criteria for reserves. Such material would be available at higher costs than current reserves. Pages 16 to 20 show the preproduction and postproduction uranium mineral inventories, by 0.01 percent U_3O_8 grade increments, as of January 1, 1980, for the United States and individually for New Mexico, Wyoming, and Texas. The preproduction inventories of U_3O_8 are cumulative tonnage-grade distributions of individual properties prior to production (i.e., the uranium originally present). The postproduction inventories reflect in-place distributions of U_3O_8 after subtracting all production prior to January 1, 1980.

The estimate of the postproduction inventory increased over 200,000 tons U_3O_8 in 1979 from 1,381,000 to 1,602,000 tons U_3O_8. A substantial amount of this inventory is estimated to be producible at costs of $100 per pound of U_3O_8 or less. In addition to these resources, there are known higher cost resources such as the Chattanooga Shale, which contains several million tons of U_3O_8 at an average grade of less than 0.007 percent U_3O_8.

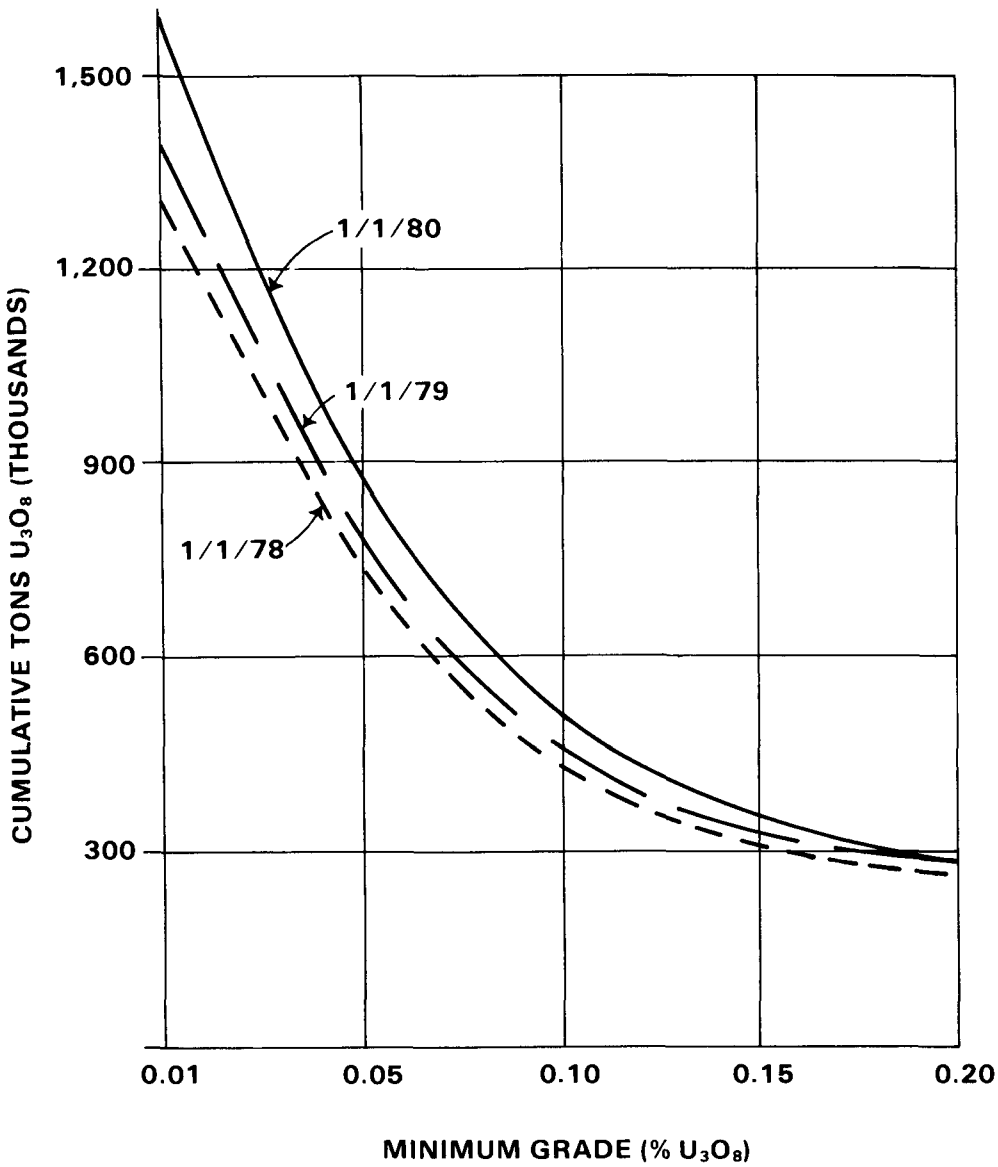
Byproduct Uranium

In addition to the reserves, it is estimated that approximately 120,000 tons of U_3O_8 will be available through the year 2000, with 100,000 tons U_3O_8 contained in wet-process phosphoric acid and 20,000 tons U_3O_8 contained in copper dump leach liquor.

Reliability of Reserve Estimates

To indicate reliability, the January 1, 1980 reserve estimates are expressed in terms of confidence levels. Properties are stratified (grouped) into subsets based on geological similarity and geographic proximity, and the properties in each subset are judged to have a correlation coefficient of 1. The 0.95 and 0.05 confidence limits for the key variables are then convoluted (combined) into a probability function for each property. Key variables include grade, thickness, area of deposit, disequilibrium, quality of data, tonnage factor, cost, and recovery. Results for properties in each subset are then convoluted by computer into a probability function for each subset. This procedure compensates for the lack of statistical independence between elements of each subset. Subsets are then convoluted into an aggregated probability distribution for the domestic reserves by assuming a correlation coefficient between subsets to be equal to 0, i.e., they are mutually or statistically independent. This resulted in a $\pm$ 13 percent range for the $30 reserves, $\pm$ 14 percent for the $50 reserves, and a $\pm$ 15 percent for the $100 reserves at the 90 percent confidence level. Pages 32 and 33 show probability distribution curves for the January 1, 1980, $50 and $100 reserves.

U.S. POSTPRODUCTION URANIUM INVENTORY 1/1/78, 1/1/79, and 1/1/80



UNITED STATES
PREPRODUCTION URANIUM INVENTORY, 1/1/80

Minimum Grade (% U_3O_8)	Cumulative Tons of Ore (Millions)	Avg. Grade (% U_3O_8) of Cumulative Tons	Cumulative Tons U_3O_8 (Thousands)
0.01	4,154	0.05	1,954
0.02	2,574	0.07	1,730
0.03	1,737	0.09	1,538
0.04	1,252	0.11	1,365
0.05	964	0.13	1,238
0.06	768	0.15	1,132
0.07	629	0.17	1,044
0.08	525	0.18	966
0.09	445	0.20	901
0.10	382	0.22	841
0.11	331	0.24	789
0.12	290	0.26	741
0.13	256	0.27	697
0.14	227	0.29	659
0.15	202	0.31	624
0.16	182	0.33	592
0.17	164	0.34	562
0.18	149	0.36	536
0.19	136	0.38	513
0.20	124	0.40	490

Note: These figures do not represent reserves, since the economics of exploitation and minability are not taken into account.

UNITED STATES
POSTPRODUCTION URANIUM INVENTORY, 1/1/80

Minimum Grade (% U_3O_8)	Cumulative Tons of Ore (Millions)	Avg. Grade (% U_3O_8) of Cumulative Tons	Cumulative Tons U_3O_8 (Thousands)
0.01	3,975	0.05	1,602
0.02	2,395	0.06	1,378
0.03	1,558	0.08	1,186
0.04	1,073	0.09	1,013
0.05	785	0.11	886
0.06	589	0.13	780
0.07	450	0.15	692
0.08	346	0.18	614
0.09	266	0.21	549
0.10	228	0.22	514
0.11	199	0.24	479
0.12	173	0.26	452
0.13	156	0.27	426
0.14	136	0.29	422
0.15	121	0.31	381
0.16	109	0.33	360
0.17	94	0.34	344
0.18	90	0.36	328
0.19	81	0.38	312
0.20	74	0.40	300

Note: These figures do not represent reserves, since the economics of exploitation and minability are not taken into account.

NEW MEXICO
PREPRODUCTION URANIUM INVENTORY, 1/1/80

Minimum Grade (% U_3O_8)	Cumulative Tons of Ore (Millions)	Avg. Grade (% U_3O_8) of Cumulative Tons	Cumulative Tons U_3O_8 (Thousands)
0.01	1,317	0.06	792
0.02	979	0.08	744
0.03	715	0.10	683
0.04	546	0.12	626
0.05	432	0.13	577
0.06	352	0.15	534
0.07	293	0.17	497
0.08	247	0.19	464
0.09	212	0.21	435
0.10	183	0.22	408
0.11	160	0.24	384
0.12	140	0.26	362
0.13	124	0.27	341
0.14	111	0.29	323
0.15	99	0.31	306
0.16	89	0.33	291
0.17	80	0.34	276
0.18	73	0.36	263
0.19	67	0.38	252
0.20	61	0.40	241

Note: These figures do not represent reserves, since the economics of exploitation and minability are not taken into account.

NEW MEXICO
POSTPRODUCTION URANIUM INVENTORY, 1/1/80

Minimum Grade (% U_3O_8)	Cumulative Tons of Ore (Millions)	Avg. Grade (% U_3O_8) of Cumulative Tons	Cumulative Tons U_3O_8 (Thousands)
0.01	1,124	0.06	648
0.02	906	0.08	600
0.03	642	0.10	539
0.04	473	0.12	482
0.05	360	0.13	433
0.06	280	0.15	390
0.07	220	0.17	353
0.08	175	0.19	320
0.09	150	0.21	300
0.10	130	0.22	281
0.11	113	0.24	265
0.12	99	0.26	250
0.13	88	0.27	235
0.14	78	0.29	222
0.15	70	0.31	211
0.16	63	0.33	201
0.17	57	0.34	191
0.18	51	0.36	182
0.19	47	0.38	174
0.20	43	0.40	166

Note: These figures do not represent reserves, since the economics of exploitation and minability are not taken into account.

TEXAS
PREPRODUCTION URANIUM INVENTORY, 1/1/80

Minimum Grade (% U_3O_8)	Cumulative Tons of Ore (Millions)	Avg. Grade (% U_3O_8) of Cumulative Tons	Cumulative Tons U_3O_8 (Thousands)
0.01	235	0.05	105
0.02	145	0.06	92
0.03	98	0.08	79
0.04	67	0.10	69
0.05	50	0.12	61
0.06	38	0.14	54
0.07	30	0.16	48
0.08	24	0.18	43
0.09	19	0.20	40
0.10	16	0.23	36
0.11	14	0.25	34
0.12	12	0.27	32
0.13	10	0.29	30
0.14	9	0.31	28
0.15	8	0.33	26
0.16	7	0.35	25
0.17	7	0.37	24
0.18	6	0.38	23
0.19	6	0.40	22
0.20	5	0.42	22

Note: These figures do not represent reserves, since the economics of exploitation and minability are not taken into account.

TEXAS
POSTPRODUCTION URANIUM INVENTORY, 1/1/80

Minimum Grade (% U_3O_8)	Cumulative Tons of Ore (Millions)	Avg. Grade (% U_3O_8) of Cumulative Tons	Cumulative Tons U_3O_8 (Thousands)
0.01	219	0.05	90
0.02	129	0.06	77
0.03	81	0.08	64
0.04	56	0.10	56
0.05	42	0.12	49
0.06	32	0.14	44
0.07	25	0.16	39
0.08	20	0.18	35
0.09	16	0.20	32
0.10	14	0.23	30
0.11	11	0.25	28
0.12	10	0.27	26
0.13	9	0.29	24
0.14	8	0.31	23
0.15	7	0.33	21
0.16	6	0.35	21
0.17	6	0.37	20
0.18	5	0.38	19
0.19	5	0.40	18
0.20	4	0.42	18

Note: These figures do not represent reserves, since the economics of exploitation and minability are not taken into account.

WYOMING
PREPRODUCTION URANIUM INVENTORY, 1/1/80

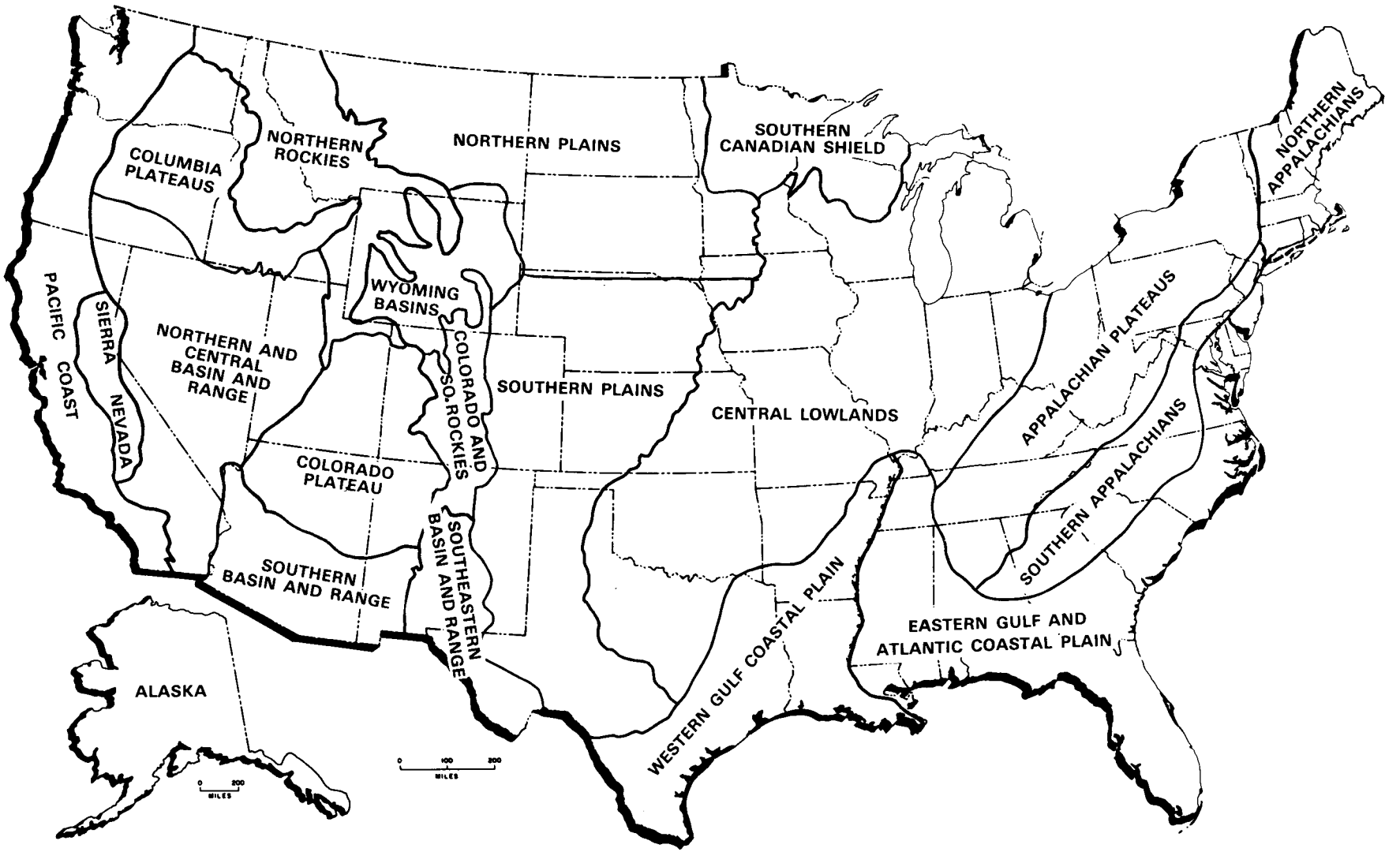
Minimum Grade (% U_3O_8)	Cumulative Tons of Ore (Millions)	Avg. Grade (% U_3O_8) of Cumulative Tons	Cumulative Tons U_3O_8 (Thousands)
0.01	1,731	0.04	659
0.02	919	0.06	547
0.03	578	0.08	472
0.04	399	0.10	402
0.05	295	0.12	356
0.06	227	0.14	319
0.07	181	0.16	289
0.08	148	0.18	264
0.09	124	0.20	244
0.10	104	0.22	224
0.11	88	0.23	208
0.12	77	0.25	194
0.13	67	0.27	181
0.14	59	0.29	171
0.15	53	0.31	161
0.16	47	0.32	152
0.17	42	0.34	144
0.18	38	0.36	137
0.19	34	0.38	130
0.20	31	0.40	124

Note: These figures do not represent reserves, since the economics of exploitation and minability are not taken into account.

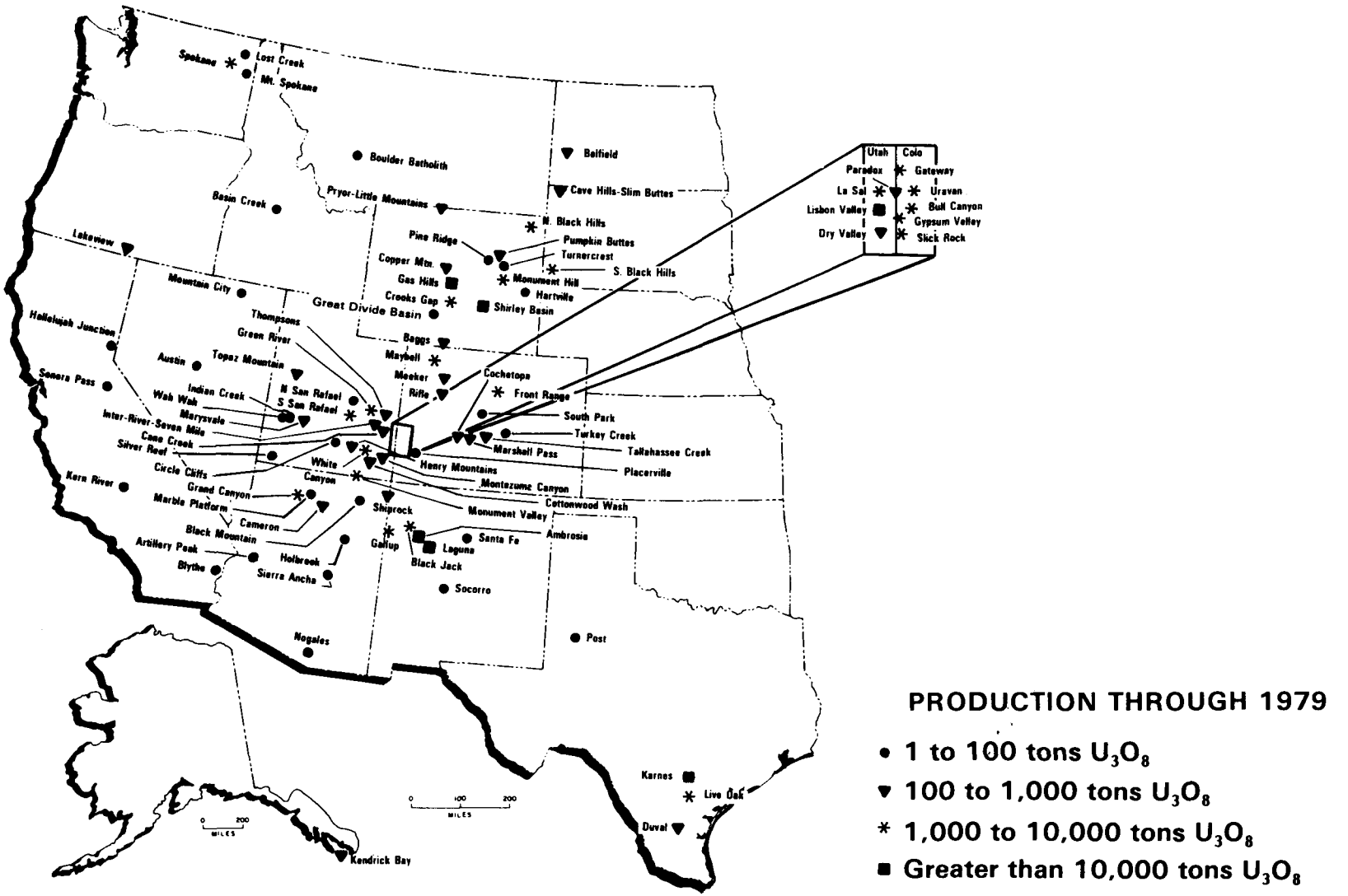
WYOMING
POSTPRODUCTION URANIUM INVENTORY, 1/1/80

Minimum Grade (% U_3O_8)	Cumulative Tons of Ore (Millions)	Avg. Grade (% U_3O_8) of Cumulative Tons	Cumulative Tons U_3O_8 (Thousands)
0.01	1,685	0.04	579
0.02	873	0.06	467
0.03	533	0.08	392
0.04	353	0.10	322
0.05	249	0.12	276
0.06	181	0.14	239
0.07	135	0.16	209
0.08	111	0.18	191
0.09	92	0.20	176
0.10	78	0.22	162
0.11	66	0.23	150
0.12	57	0.25	140
0.13	50	0.27	131
0.14	44	0.29	123
0.15	39	0.31	116
0.16	35	0.32	110
0.17	31	0.34	104
0.18	28	0.36	99
0.19	26	0.38	94
0.20	23	0.40	90

Note: These figures do not represent reserves, since the economics of exploitation and minability are not taken into account.



URANIUM RESOURCE REGIONS OF THE UNITED STATES



PRODUCTION THROUGH 1979

- • 1 to 100 tons U_3O_8
- ▼ 100 to 1,000 tons U_3O_8
- * 1,000 to 10,000 tons U_3O_8
- ■ Greater than 10,000 tons U_3O_8

Note: Uranium produced as a byproduct from the processing of phosphates, copper ores, etc., is not included.

AREAS OF URANIUM PRODUCTION IN THE UNITED STATES

URANIUM ORE SHIPMENTS TO MILLS AND BUYING STATIONS BY STATE 1948 Through 1979

State	Tons of Ore	% U_3O_8	Contained Tons U_3O_8*
New Mexico	72,992,000	0.20	144,400
Wyoming	45,001,000	0.18	81,000
Others**	61,886,000	0.21	128,600
Total	179,879,000	0.20	354,000

*Includes miscellaneous non-ore sources.

**Includes Alaska, Arizona, California, Colorado, Florida, Idaho, Montana, Nevada, New Jersey, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, and Washington.

URANIUM ORE RECEIPTS AT MILLS AND BUYING STATIONS*

Calendar Year	Total Receipts		Receipts From Open Pit Production		Receipts From Underground Production	
	Tons Ore	Tons U_3O_8	Tons Ore	Tons U_3O_8	Tons Ore	Tons U_3O_8
1948	38,000	100	<1,000	<100	38,000	100
1949	173,000	500	1,000	<100	172,000	500
1950	251,000	800	23,000	100	228,000	700
1951	347,000	1,100	28,000	200	319,000	900
1952	435,000	1,300	65,000	300	370,000	1,000
1953	734,000	2,300	179,000	600	555,000	1,700
1954	1,106,000	3,500	266,000	900	840,000	2,600
1955	1,524,000	4,400	374,000	800	1,150,000	3,600
1956	3,005,000	8,400	1,247,000	3,200	1,758,000	5,200
1957	3,695,000	9,800	1,613,000	3,400	2,082,000	6,400
1958	5,178,000	14,000	2,358,000	5,400	2,820,000	8,600
1959	6,935,000	17,400	2,206,000	4,400	4,729,000	13,000
1960	7,970,000	18,800	2,393,000	5,300	5,577,000	13,500
1961	8,041,000	18,500	2,482,000	5,300	5,559,000	13,200
1962	7,053,000	17,100	1,782,000	4,300	5,271,000	12,800
1963	5,948,000	14,700	1,879,000	4,400	4,069,000	10,300
1964	5,297,000	13,900	1,537,000	3,400	3,760,000	10,500
1965	4,376,000	10,400	1,243,000	3,000	3,133,000	7,400
1966	4,329,000	9,900	1,333,000	3,100	2,996,000	6,800
1967	5,272,000	10,700	1,593,000	3,200	3,679,000	7,500
1968	6,448,000	12,600	2,366,000	4,600	4,082,000	8,000
1969	5,904,000	12,300	2,173,000	5,200	3,731,000	7,100
1970	6,324,000	12,800	2,801,000	5,900	3,523,000	6,900
1971	6,279,000	12,900	3,284,000	7,000	2,995,000	5,900
1972	6,418,000	13,700	3,887,000	8,100	2,531,000	5,600
1973	6,537,000	13,600	4,544,000	8,600	1,993,000	5,000
1974	7,027,000	12,400	4,216,000	7,300	2,811,000	5,100
1975	7,057,000	12,000	4,247,000	6,700	2,810,000	5,300
1976	8,608,000	13,500	4,673,000	6,800	3,935,000	6,700
1977	10,325,000	15,900	5,578,000	7,600	4,747,000	8,300
1978	14,342,000	18,800	8,237,000	9,600	6,105,000	9,200
1979	15,011,000	15,700**	9,655,000	9,400	5,356,000	6,300

*Mined ore—does not include miscellaneous sources.

**Does not include 5,000 tons of U_3O_8 in mine water, in-situ leach liquor, heap leach solutions, byproducts, and miscellaneous low-grade ore from old mine dumps.

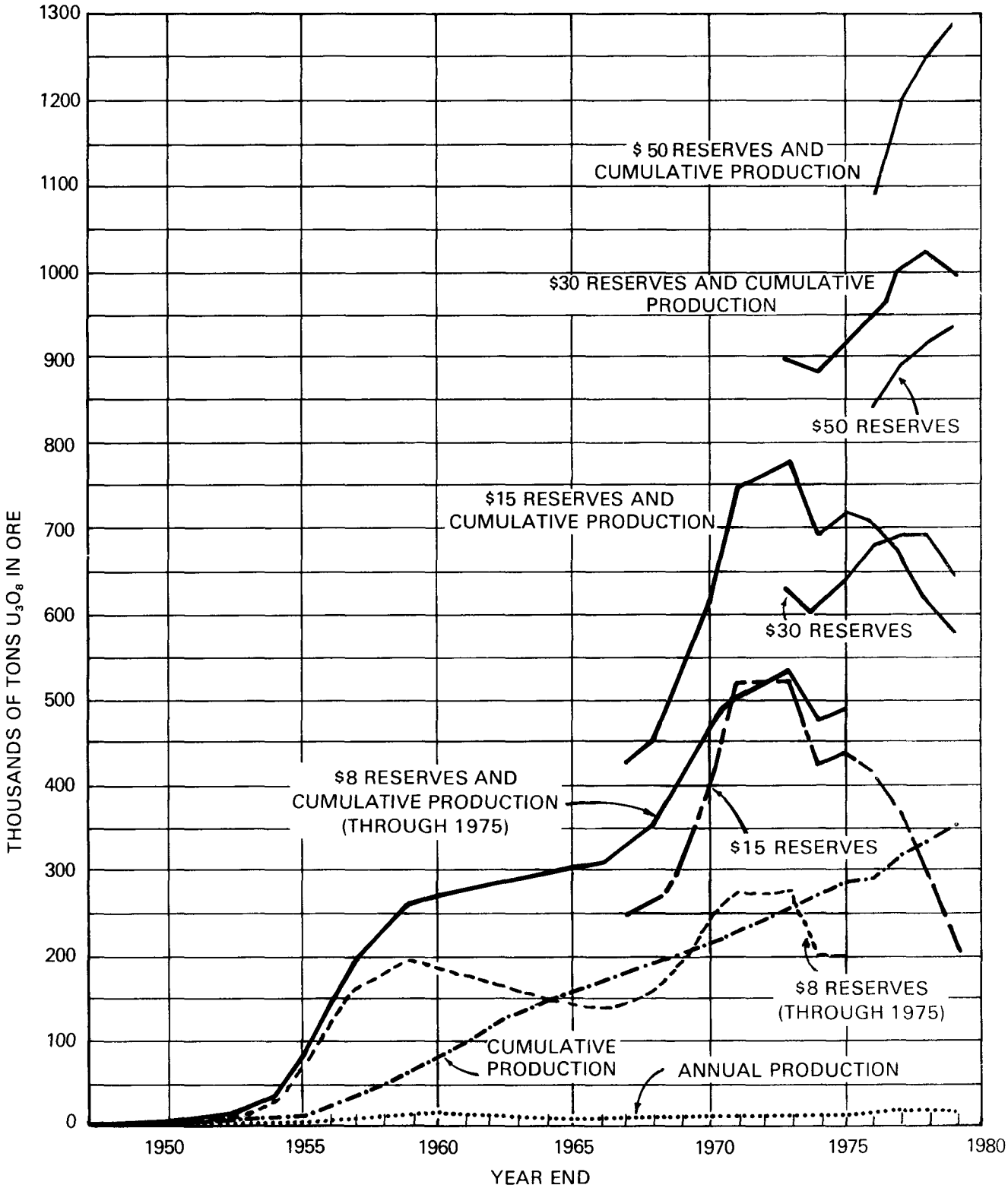
URANIUM RESERVES AND PRODUCTION
1947 Through 1979

Year End	Shipment To Mills*	Cum Prod.	Tons U_3O_8 In Ore							
			Reserve Estimates**				Summary of Reserves and Cumulative Production			
			($15)	($30)	($50)	($100)	($15)	($30)	($50)	($100)
1947	-	-	-	-	-	-	-	-	-	-
1948	100	100	-	-	-	-	-	-	-	-
1949	500	600	-	-	-	-	-	-	-	-
1950	800	1,400	-	-	-	-	-	-	-	-
1951	1,100	2,500	-	-	-	-	-	-	-	-
1952	1,300	3,800	-	-	-	-	-	-	-	-
1953	2,300	6,100	-	-	-	-	-	-	-	-
1954	3,500	9,600	-	-	-	-	-	-	-	-
1955	4,400	14,000	-	-	-	-	-	-	-	-
1956	8,400	22,400	-	-	-	-	-	-	-	-
1957	9,800	32,200	-	-	-	-	-	-	-	-
1958	14,000	46,200	-	-	-	-	-	-	-	-
1959	17,400	63,600	-	-	-	-	-	-	-	-
1960	18,800	82,400	-	-	-	-	-	-	-	-
1961	18,500	100,900	-	-	-	-	-	-	-	-
1962	17,100	118,000	-	-	-	-	-	-	-	-
1963	14,700	132,700	-	-	-	-	-	-	-	-
1964	13,900	146,600	-	-	-	-	-	-	-	-
1965	10,600	157,200	-	-	-	-	-	-	-	-
1966	10,100	167,300	-	-	-	-	-	-	-	-
1967	10,900	178,200	-	-	-	-	-	-	-	-
1968	12,800	191,000	265,000	-	-	-	456,000	-	-	-
1969	12,600	203,600	317,000	-	-	-	520,600	-	-	-
1970	13,100	216,700	391,000	-	-	-	607,700	-	-	-
1971	13,100	229,800	520,000	-	-	-	749,800	-	-	-
1972	13,900	243,700	520,000	-	-	-	763,700	-	-	-
1973	13,800	257,500	520,000	634,000	-	-	777,500	900,500	-	-
1974	12,600	270,100	420,000	600,000	-	-	690,100	870,100	-	-
1975	12,300	282,400	430,000	640,000	-	-	712,400	922,400	-	-
1976	14,000	296,400	410,000	680,000	-	-	706,400	976,400	-	-
1977	16,700	313,100	370,000	690,000	890,000	-	683,100	1,003,100	1,203,100	-
1978	20,200	333,300	290,000	690,000	920,000	-	623,300	1,023,300	1,253,300	-
1979	20,700	354,000	225,000	645,000	936,000	1,122,000	579,000	999,000	1,290,000	1,476,000

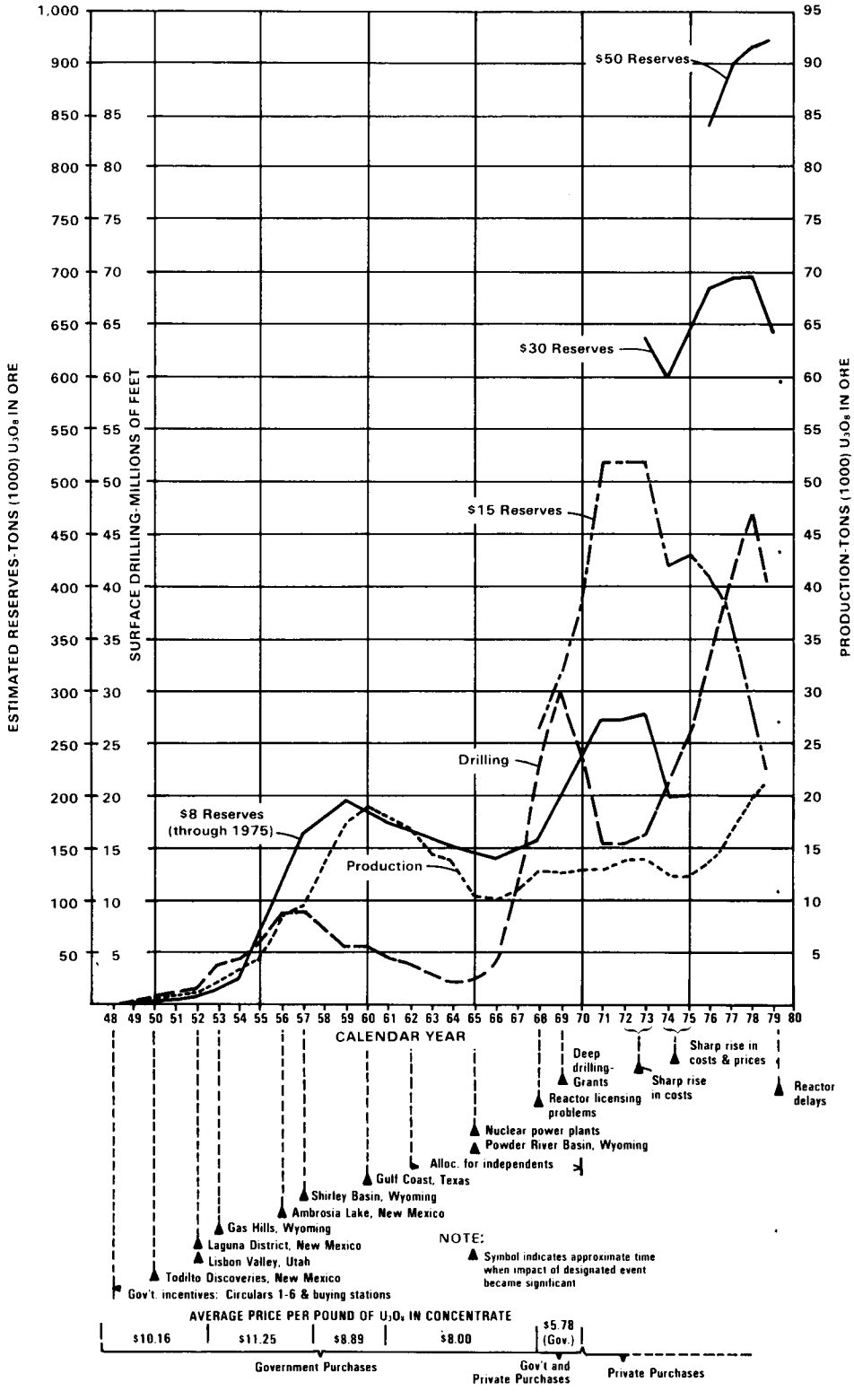
*Includes miscellaneous U_3O_8 receipts from mine waters, heap leach, solution mining, and refining residues.

**The reserve estimates since 1961 are based on a chosen cost per pound of U_3O_8. Estimates for the period 1952 to 1961, inclusive, are based on the AEC Domestic Uranium Program Circular 5 (Revised). For the period prior to 1952, the basis is arbitrary thickness and grade cutoffs.

RELATIONSHIP OF U.S. $15, $30, AND $50 /lb RESERVES TO U_3O_8 PRODUCTION



DRILLING, RESERVES, AND PRODUCTION IN ORE COMPARED TO VARIOUS HISTORICAL FACTORS



URANIUM ORE PRODUCTION BY STATE--1963 THROUGH 1979

DISTRIBUTION OF 1979 U_3O_8 PRODUCTION IN ORE BY STATE
(Ore Weighed and Sampled by Mills and Buying Stations)

State	Tons of Ore	Tons U_3O_8	% of Total
New Mexico	6,880,000	8,200	40
Wyoming	5,029,000	5,600	27
Others: Arizona, California, Colorado, Florida, Texas, Utah, & Washington	7,244,000	6,900	33
Total	19,153,000	20,700	100

Note: Includes miscellaneous receipts.

DISTRIBUTION OF 1979 U_3O_8 PRODUCTION IN ORE BY RESOURCE REGION

Resource Region	Tons U_3O_8	% of Total
Colorado Plateau	10,200	49
Wyoming Basins	5,700	28
Others: Northern Rockies, Northern & Central Basin Range, Southern Basin and Range, E. Gulf & Atlantic Coastal Plain, W. Gulf Coastal Plain, Colorado, & Southern Rockies	4,800	23
Total	20,700	100

Note: Includes miscellaneous receipts.

DISTRIBUTION OF 1979 U_3O_8 PRODUCTION IN ORE BY MINING METHOD

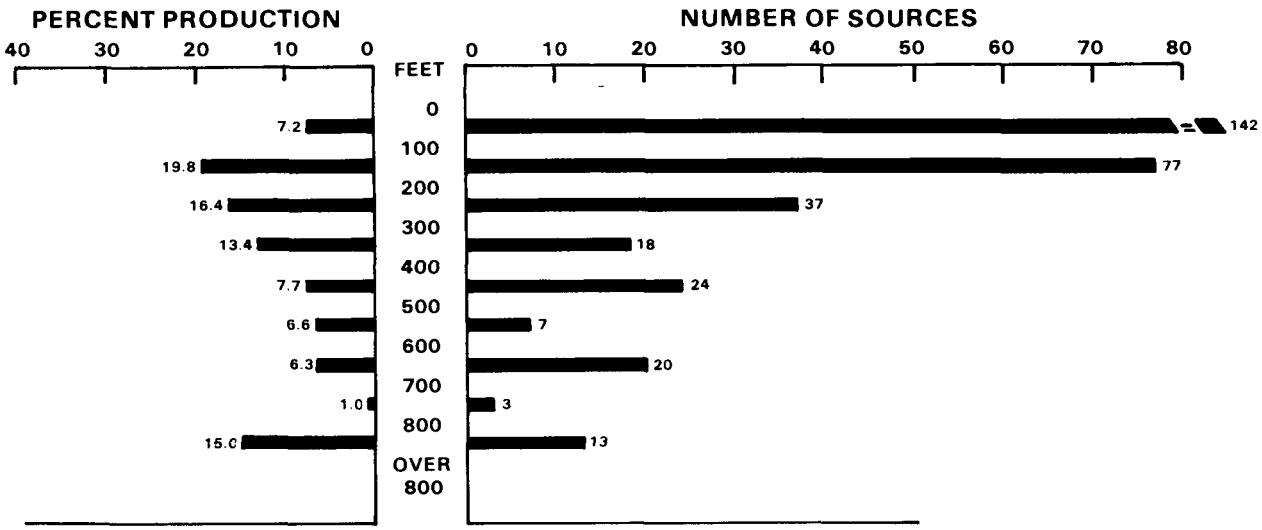
Source	Tons U_3O_8	% of Total
Underground Mines	6,300	30
Open Pit Mines	9,400	45
Others: Heap Leach, Mine Water, Solution Mining, & Low-Grade Stockpiles	5,000	25
Total	20,700	100

DISTRIBUTION OF 1979 U_3O_8 PRODUCTION IN ORE BY GEOLOGIC AGE

Era	Period	Production %	No. of Sources*
Cenozoic	Tertiary	42	66
Mesozoic	Jurassic	46	252
	Triassic	4	43
Paleozoic and Precambrian		8	71
Total		100	432

*Includes shipments from 362 operating mines and 70 miscellaneous sources.

DISTRIBUTION OF 1979 U_3O_8 PRODUCTION BY DEPTH OF ORE



Feet	Tons U_3O_8	% of Total	No. of Sources
0–100	1,500	7	142
100–200	4,100	20	77
200–300	3,400	16	37
300–400	2,800	13	18
400–500	1,600	8	24
500–600	1,300	7	7
600–700	1,300	6	20
700–800	200	1	3
800–or more	3,100	15	13
Others*	1,400	7	91
Total	20,700	100	432

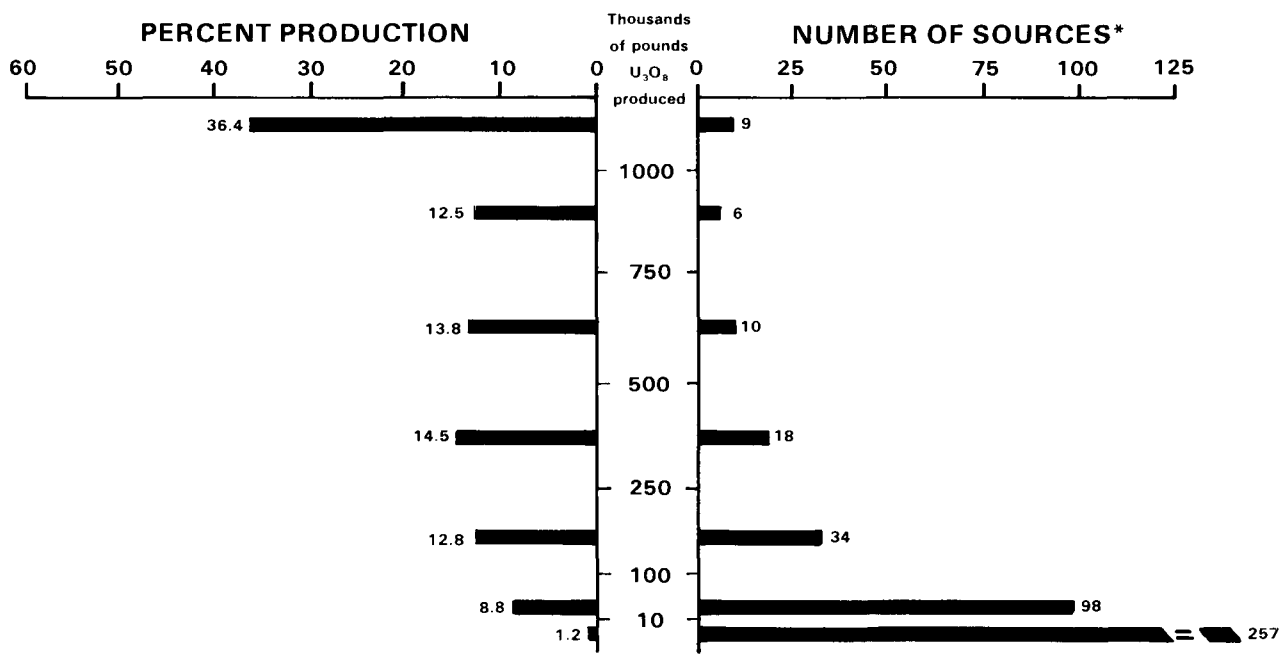
*Not included in graph.

DISTRIBUTION OF 1979 U_3O_8 PRODUCTION SOURCES BY MINING METHOD

Source	No. Sources*	% of Total
Underground Mines	300	69
Open Pit Mines	62	14
Others: Heap Leach, Mine Water, Solution Mining, & Low-Grade Stockpiles	70	17
Total	432	100

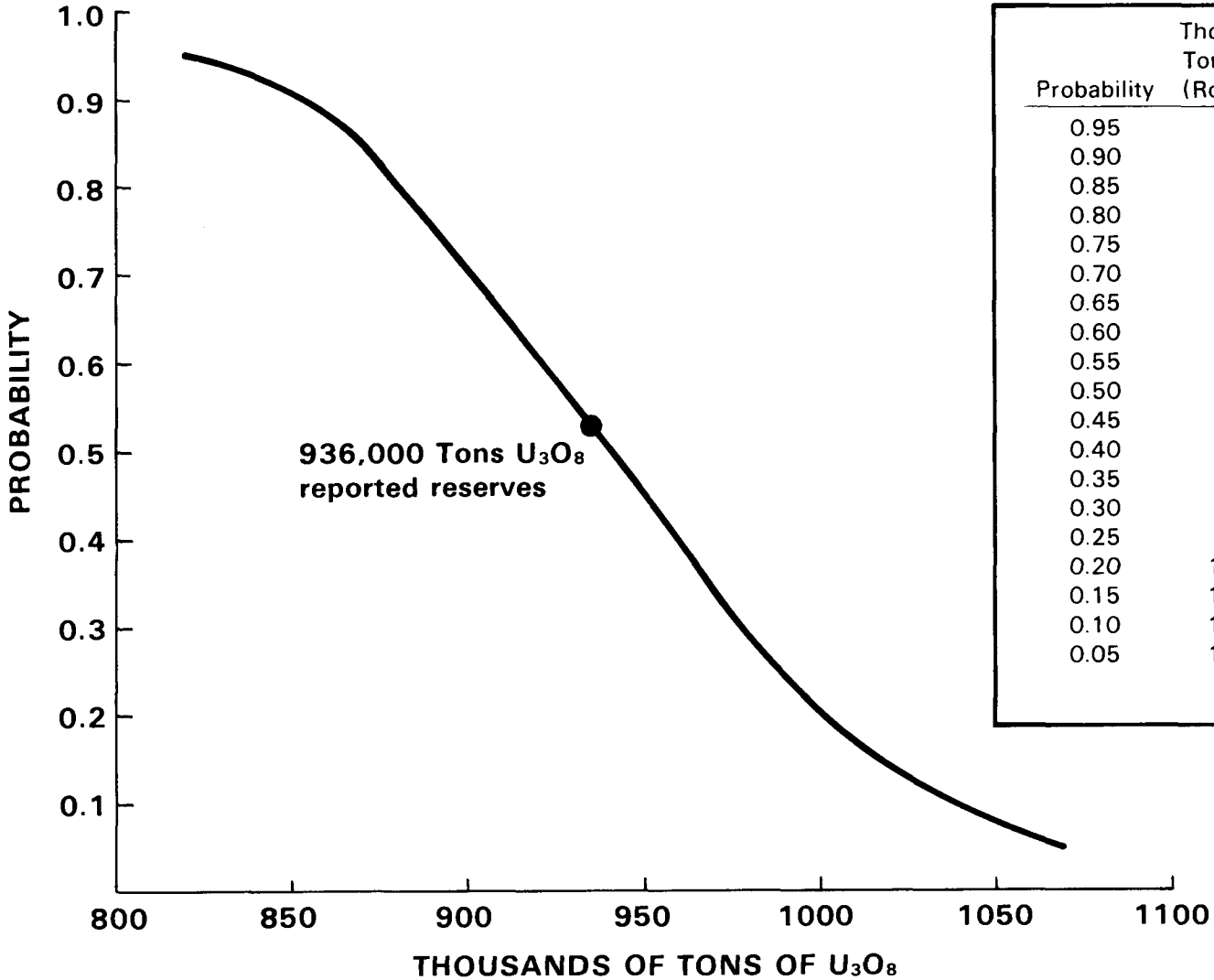
*Includes shipments from 362 operating mines and 70 miscellaneous sources.

DISTRIBUTION OF 1979 U_3O_8 PRODUCTION SOURCES BY ANNUAL PRODUCTION RATE



*Includes shipments from 362 operating mines and 70 miscellaneous sources.

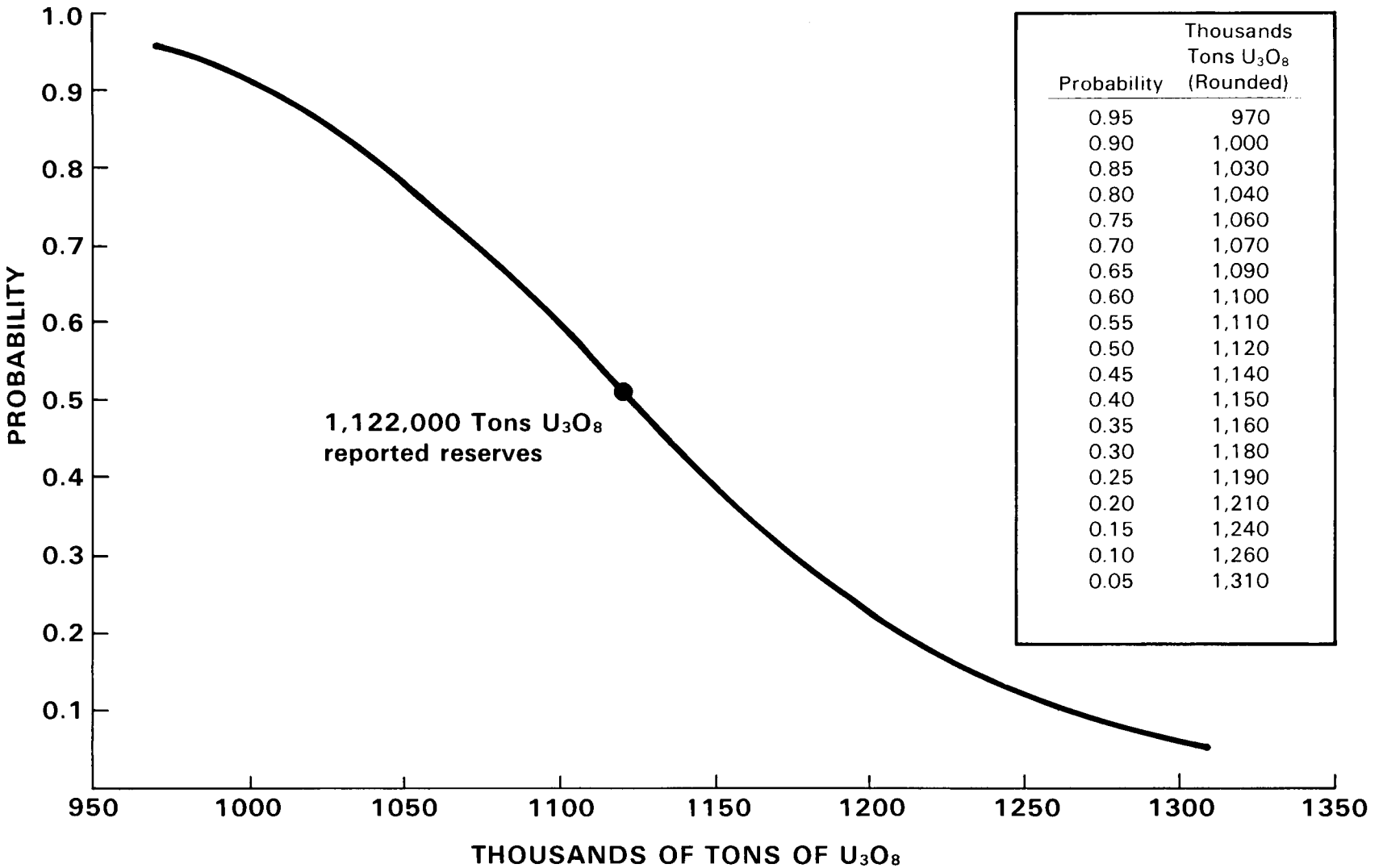
CUMULATIVE PROBABILITY* DISTRIBUTION CURVE FOR 1-1-80 $50 RESERVES



Probability	Thousands Tons U_3O_8 (Rounded)
0.95	820
0.90	850
0.85	870
0.80	880
0.75	890
0.70	900
0.65	910
0.60	920
0.55	930
0.50	940
0.45	950
0.40	960
0.35	970
0.30	980
0.25	990
0.20	1,000
0.15	1,020
0.10	1,040
0.05	1,070

*Probability of reserves exceeding given tonnage of U_3O_8.

CUMULATIVE PROBABILITY* DISTRIBUTION CURVE FOR 1-1-80 $100 RESERVES



Probability	Thousands Tons U_3O_8 (Rounded)
0.95	970
0.90	1,000
0.85	1,030
0.80	1,040
0.75	1,060
0.70	1,070
0.65	1,090
0.60	1,100
0.55	1,110
0.50	1,120
0.45	1,140
0.40	1,150
0.35	1,160
0.30	1,180
0.25	1,190
0.20	1,210
0.15	1,240
0.10	1,260
0.05	1,310

*Probability of reserves exceeding given tonnage of U_3O_8.

SECTION II
POTENTIAL RESOURCE ESTIMATES

SECTION II
POTENTIAL RESOURCE ESTIMATES

The estimates of potential resources for January 1, 1980, included in this report, remain unchanged from those reported for January 1, 1979. One of the major goals of the NURE program is to complete and publish, by October 1980, a comprehensive assessment of uranium resources in the United States. To meet this goal, much of the past year was spent in collecting and evaluating NURE and other data for use in updating estimates of potential resources. The new estimates derived for October 1980, will be reported in detail in a NURE report to be published at that time.

Potential resource estimates of uranium have been published in GJO-100 since 1969 and were reviewed in *Potential Resources of Uranium in the Western United States, GJO-104(73).* These potential estimates were assigned to geologic formations in the western United States, largely in established mining districts. The potential resource estimates published annually during the period 1966-1974 are shown in the following table.

POTENTIAL RESOURCE ESTIMATES, 1966-1974
Tons U_3O_8

Year	$8/lb	$10/lb	$15/lb	$30/lb
1/1/66	-	325,000	525,000	665,000
1/1/68	245,000	350,000	570,000	1,000,000
1/1/70	385,000	600,000	960,000	1,600,000
1/1/71	490,000	680,000	1,040,000	1,600,000
1/1/72	460,000	650,000	1,000,000	1,600,000
1/1/73	450,000	700,000	1,000,000	1,600,000
1/1/74	450,000	700,000	1,000,000	1,600,000

Note: No estimates were made for January 1, 1967 and January 1, 1969. Potential resources reported at $10, $15, and $30 per pound U_3O_8 include resources in all lower cost categories.

In 1974, DOE's National Uranium Resource Evaluation (NURE) program was started to assess the potential resources in all favorable geologic environments throughout the United States. For the NURE program, the single class of potential uranium resources was expanded to three classes (probable, possible, and speculative) to accommodate potential estimates in a variety of geologic environments with varying degrees of reliability. This classification is patterned after that used by the Potential Gas Committee. The three NURE potential classes are defined as follows:

"Probable" potential resources are those estimated to occur in known productive uranium areas (where "productive" means that past production plus known reserves exceeds 10 tons U_3O_8):

1. in extensions of known deposits, or
2. in undiscovered deposits within known geologic trends or areas of mineralization.

"Possible" potential resources are those estimated to occur in undiscovered or partly defined deposits in formations or geologic settings productive elsewhere within the same geologic province or subprovince.

"Speculative" potential resources are those estimated to occur in undiscovered or partly defined deposits:

1. in formations or geologic settings not previously productive within a productive geologic province or subprovince, or
2. within a geologic province or subprovince not previously productive.

The January 1, 1975, potential estimates were the first to be adapted to this classification. The potential estimates as of January 1, 1976, were published in *National Uranium Resource Evaluation, Preliminary Report, GJO-111(76).* Potential estimates for January 1, 1977, were published in *Statistical Data of the Uranium Industry, GJO-100(77).* During calendar years 1976, 1977, and 1978, some of the potential estimates were revised as new information became available from geologic studies and industry exploration and mining activities. These revisions resulted in changes within all three classes of potential. The principal reasons for the changes were (1) new information on the geologic favorability of potential uranium host rocks, (2) development by industry of reserves and the consequent shifting by DOE of potential into the reserve category, and (3) changes in economics, largely cost increases. A report on the January 1, 1979, resources is, The *National Uranium Resource Evaluation, Interim Report,* GJO-111(79). The following tables summarize the potential uranium resources at the beginning of each year from 1975 through 1980.

POTENTIAL RESOURCE ESTIMATES, 1975-1980
Thousands Tons U_3O_8

	1/1/75	1/1/76	1/1/77	1/1/78	1/1/79 & 1/1/80
$10/lb					
Probable	460	440	275	-	-
Possible	390	420	115	-	-
Speculative	110	145	100	-	-
$15/lb					
Probable	680	655	585	540	415
Possible	640	675	490	490	210
Speculative	210	290	190	165	75
$30/lb					
Probable	1,140	1,060	1,090	1,015	1,005
Possible	1,340	1,270	1,120	1,135	675
Speculative	410	590	480	415	300
$50/lb					
Probable	-	-	1,370	1,395	1,505
Possible	-	-	1,420	1,515	1,170
Speculative	-	-	540	565	550

Each cost category includes all lower cost potential resources.

DISTRIBUTION OF 1/1/80 $15 POTENTIAL RESOURCES BY RESOURCE REGION

Resource Region	Tons U_3O_8		
	Probable	Possible	Speculative
Colorado Plateau	217,000	138,000	1,000
Wyoming Basins	93,000	10,000	14,000
W. Gulf Coastal Plain	62,000	22,000	1,000
Others: Rocky Mountains, Basin & Range, Great Plains, and Sierra Nevada	43,000	40,000	59,000
Total	415,000	210,000	75,000

DISTRIBUTION OF 1/1/80 $30 POTENTIAL RESOURCES BY RESOURCE REGION

Resource Region	Tons U_3O_8		
	Probable	Possible	Speculative
Colorado Plateau	557,000	428,000	16,000
Wyoming Basins	243,000	22,000	22,000
W. Gulf Coastal Plain	119,000	60,000	22,000
Others: Rocky Mountains, Basin & Range, Great Plains, Pacific Coast, Sierra Nevada, Columbia Plateaus, Central Lowlands, Appalachians, and Alaska	86,000	165,000	240,000
Total	1,005,000	675,000	300,000

Note: This cost category includes the $15 potential resources.

DISTRIBUTION OF 1/1/80 $50 POTENTIAL RESOURCES BY RESOURCE REGION

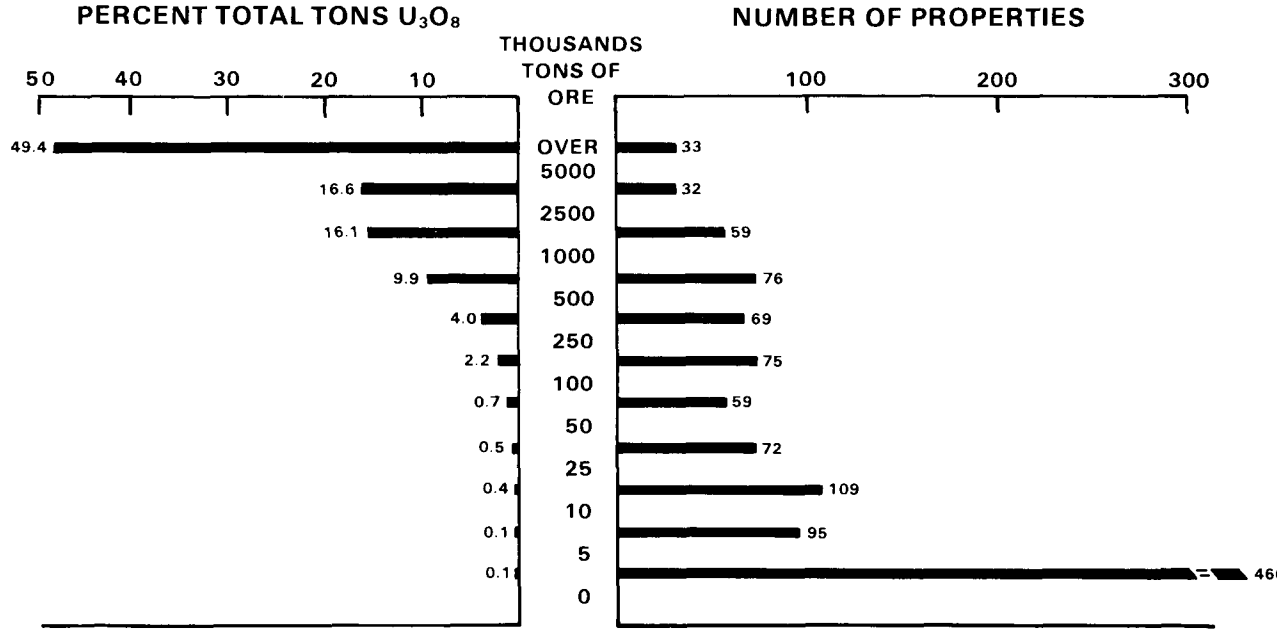
Resource Region	Tons U_3O_8		
	Probable	Possible	Speculative
Colorado Plateau	767,000	696,000	30,000
Wyoming Basins	364,000	73,000	32,000
W. Gulf Coastal Plain	190,000	93,000	35,000
Others: Rocky Mountains, Basin & Range, Great Plains, Pacific Coast, Sierra Nevada, Columbia Plateaus, Central Lowlands, Appalachians, and Alaska	184,000	308,000	453,000
Total	1,505,000	1,170,000	550,000

Note: This cost category includes the $15 and $30 potential resources.

SECTION III
DISTRIBUTION OF $30 RESERVES

Distribution of 1/1/80 $30 Reserves:

DISTRIBUTION OF 1/1/80 RESERVES BY SIZE OF PROPERTY
$30 RESERVES



Tons Range	Tons Ore	% U_3O_8	Tons U_3O_8	% Total Tons U_3O_8	No. Properties
<1,000	100,000	0.13	100		211
1,000- 5,000	600,000	0.12	800	1	255
5,000- 10,000	700,000	0.13	900		95
10,000- 25,000	1,800,000	0.14	2,400		109
25,000- 50,000	2,700,000	0.12	3,200	1	72
50,000- 100,000	4,400,000	0.11	4,700		59
100,000- 250,000	13,100,000	0.11	14,100	2	75
250,000- 500,000	25,200,000	0.10	25,700	4	69
500,000-1,000,000	58,000,000	0.11	63,700	10	76
1,000,000-2,500,000	96,400,000	0.11	103,700	16	59
2,500,000-5,000,000	120,200,000	0.09	106,900	17	32
5,000,000 or more	334,800,000	0.10	318,800	49	33
Total	658,000,000	0.10	645,000	100	1,145

DISTRIBUTION OF 1/1/80 RESERVES BY GEOLOGIC AGE
$30 RESERVES

Geologic Age	Tons Ore	% U_3O_8	Tons U_3O_8	% Total Tons U_3O_8	No. Properties
Late Tertiary	89,600,000	0.06	58,000	9	105
Early Tertiary	213,200,000	0.08	180,000	28	303
Cretaceous	21,300,000	0.05	11,400	2	81
Jurassic	311,700,000	0.12	375,000	58	534
Triassic	2,900,000	0.11	3,300	<1	60
Paleozoic	2,200,000	0.24	5,400	1	25
Precambrian	17,100,000	0.07	11,900	2	37
Total	658,000,000	0.10	645,000	100	1,145

DISTRIBUTION OF 1/1/80 RESERVES BY TYPE OF HOST ROCK
$30 RESERVES

Host Type	Tons Ore	% U_3O_8	Tons U_3O_8	% Total Tons U_3O_8	No. Properties
Coarse Clastics	617,000,000	0.10	612,300	97	953
Fine Clastics	19,600,000	0.07	13,100		38
Lignitic Materials	1,000,000	0.18	1,800		55
Limestone	700,000	0.11	700	3	30
Igneous & Metamorphic	19,700,000	0.09	17,100		69
Total	658,000,000	0.10	645,000	100	1,145

DISTRIBUTION OF 1/1/80 RESERVES BY RESOURCE REGION
$30 RESERVES

Resource Region	Tons Ore	% U_3O_8	Tons U_3O_8	% Total Tons U_3O_8	No. Properties
Colorado Plateau	269,700,000	0.13	355,500	55	585
Wyoming Basins	230,500,000	0.08	180,900	28	208
W. Gulf Coastal Plain	75,300,000	0.06	43,300	7	109
Northern Plains	7,500,000	0.08	5,900	1	105
Others*	75,000,000	0.08	59,400	9	138
Total	658,000,000	0.10	645,000	100	1,145

*Includes Coastal U.S., Colorado and Southern Rockies, Northern Rockies, Northern and Central Basin and Range, Southern Plains, and Sierra Nevada.

DISTRIBUTION OF 1/1/80 RESERVES BY STATE
$30 RESERVES

State	Tons Ore	% U_3O_8	Tons U_3O_8	% Total Tons U_3O_8	No. Properties
New Mexico	255,700,000	0.13	338,500	52	140
Wyoming	243,300,000	0.08	188,000	29	217
Texas	75,300,000	0.06	43,300	7	117
Arizona, Colorado, & Utah	61,000,000	0.09	57,000	9	535
Others*	22,700,000	0.08	18,200	3	136
Total	658,000,000	0.10	645,000	100	1,145

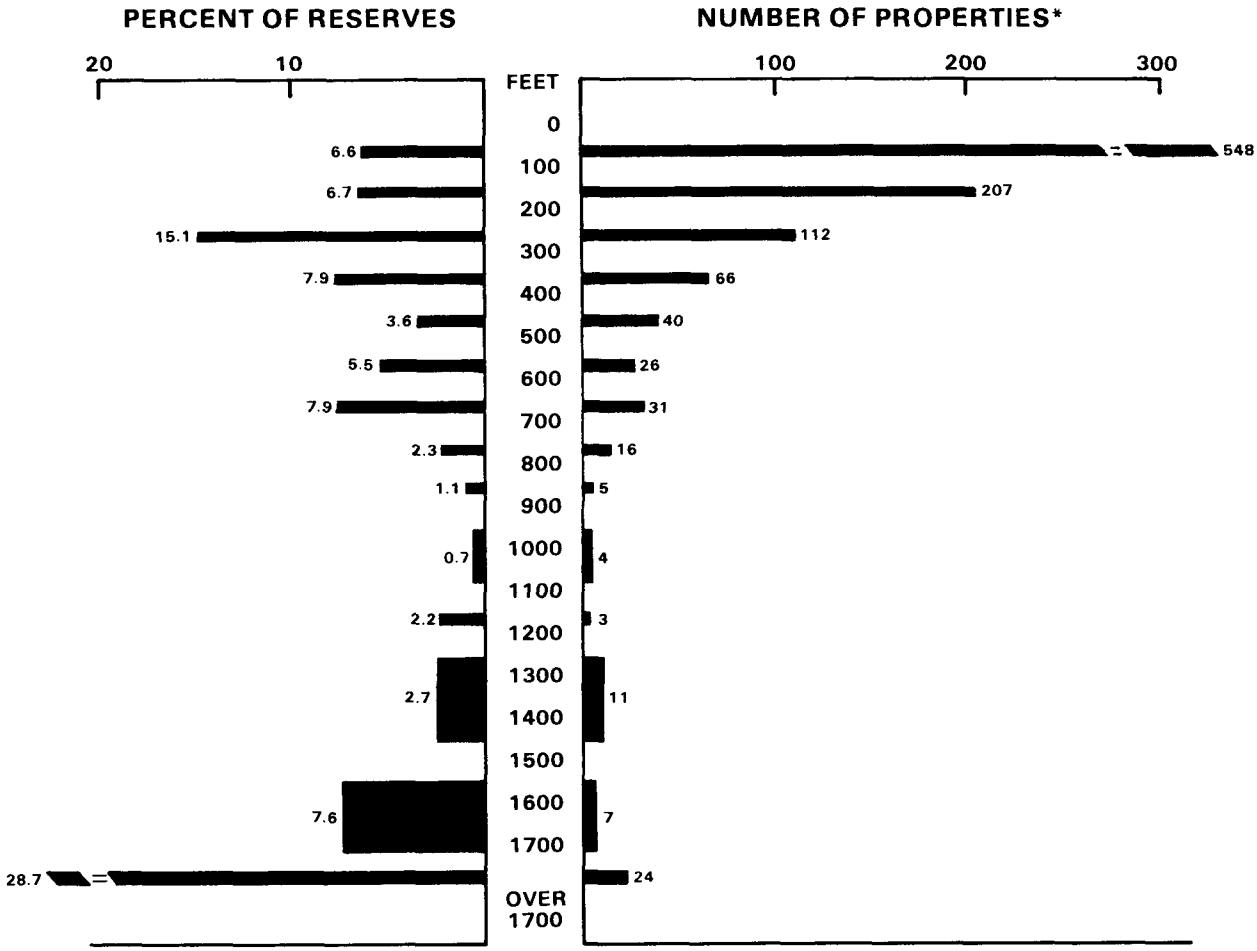
*Includes Alaska, California, Idaho, Montana, Nevada, North Dakota, Oregon, South Dakota, and Washington.

DISTRIBUTION OF 1/1/80 RESERVES BY MINING METHOD
$30 RESERVES

Mining Method	Tons Ore	% U_3O_8	Tons U_3O_8	% Total Tons U_3O_8	No. Properties
Open Pit	214,500,000	0.08	177,800	28	348
Underground	330,800,000	0.13	417,400	65	712
Others*	112,700,000	0.04	49,800	7	85
Total	658,000,000	0.10	645,000	100	1,145

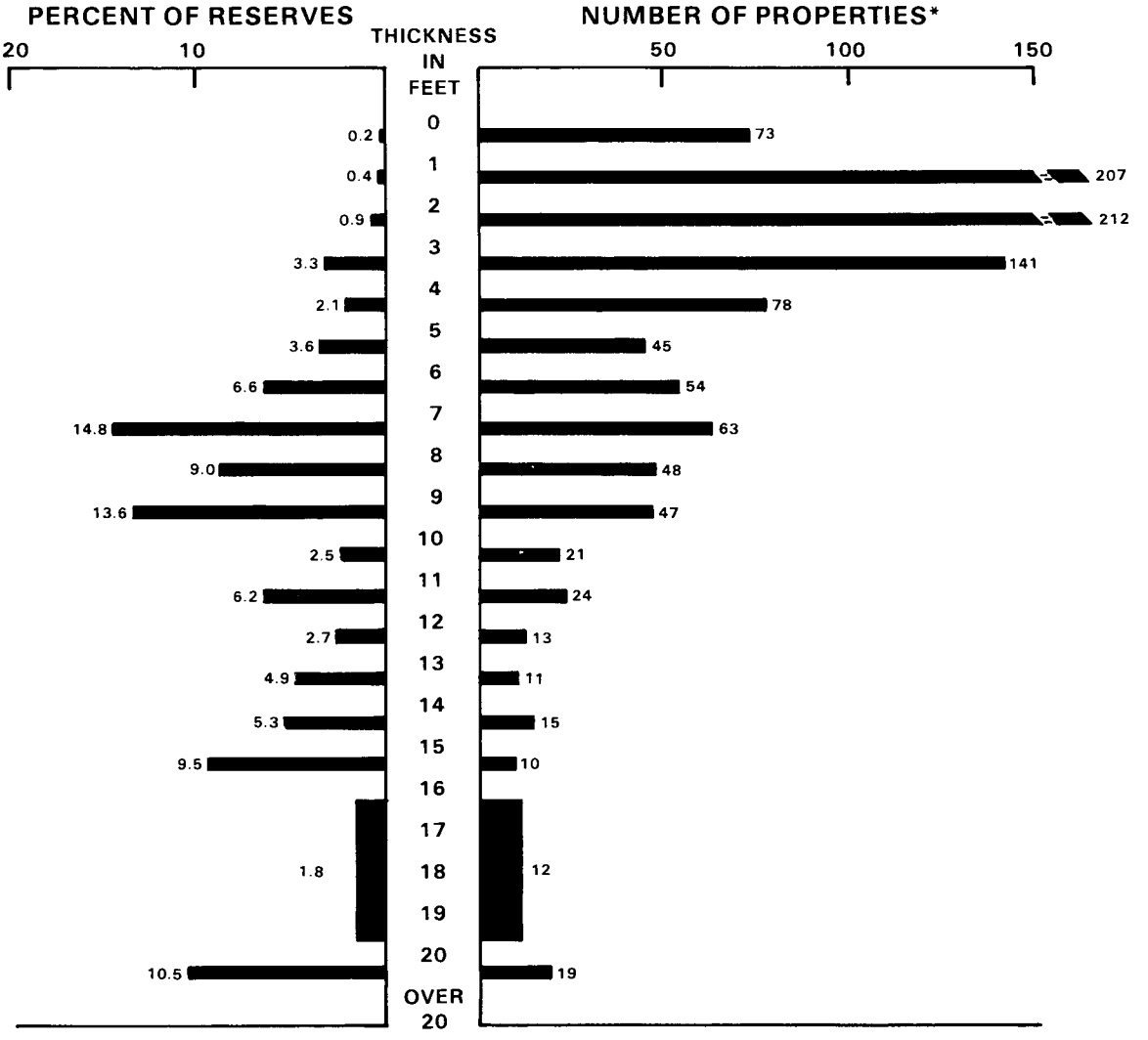
*Includes 94,000,000 tons of material at 0.04% U_3O_8 classified as solution mining reserves.

DISTRIBUTION OF 1/1/80 RESERVES BY DEPTH
$30 RESERVES



*Does not include stockpiles, dumps, etc.

DISTRIBUTION OF 1/1/80 RESERVES BY THICKNESS
$30 RESERVES

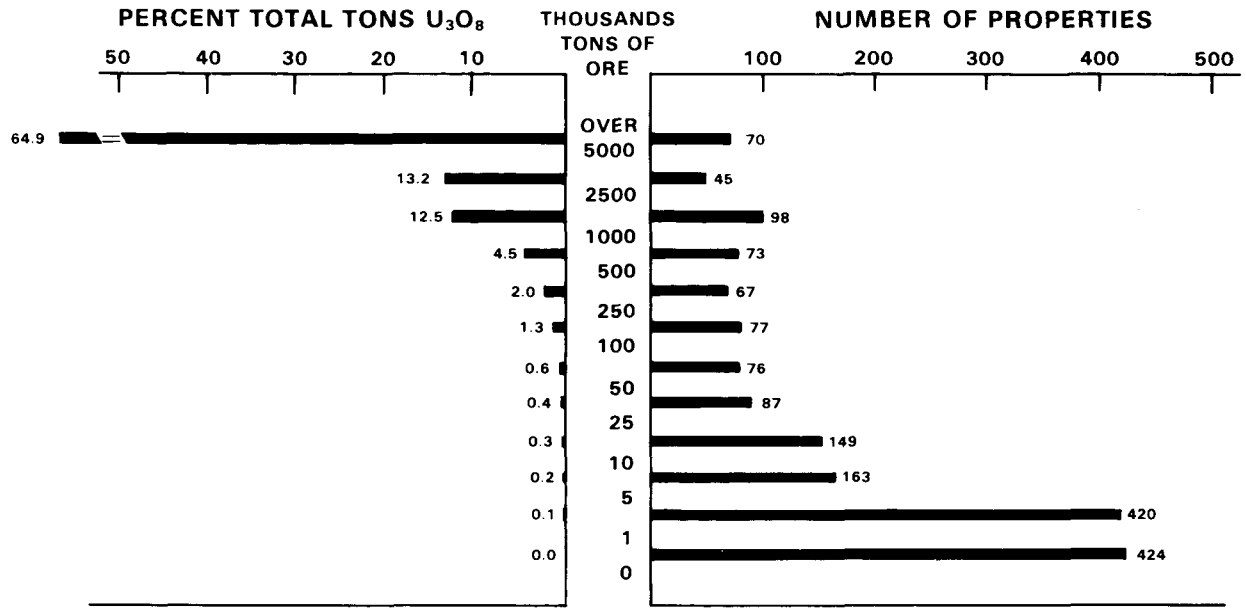


*Does not include stockpiles, dumps, etc.

SECTION IV
DISTRIBUTION OF $50 RESERVES

Distribution of 1/1/80 $50 Reserves:

DISTRIBUTION OF 1/1/80 RESERVES BY SIZE OF PROPERTY
$50 RESERVES



Tons Range	Tons Ore	% U_3O_8	Tons U_3O_8	% Total Tons U_3O_8	No. Properties
<1,000	200,000	0.14	300		424
1,000- 5,000	1,100,000	0.12	1,300	1	420
5,000- 10,000	1,300,000	0.12	1,400		163
10,000- 25,000	2,400,000	0.12	2,900		149
25,000- 50,000	3,200,000	0.11	3,400	1	87
50,000- 100,000	5,700,000	0.09	5,300		76
100,000- 250,000	12,800,000	0.09	11,900	1	77
250,000- 500,000	24,200,000	0.08	18,700	2	67
500,000-1,000,000	54,900,000	0.08	41,900	4	73
1,000,000-2,500,000	152,200,000	0.08	117,400	13	98
2,500,000-5,000,000	166,900,000	0.07	123,800	13	45
5,000,000 or more	846,100,000	0.07	607,700	65	70
Total	1,271,000,000	0.07	936,000	100	1,749

DISTRIBUTION OF 1/1/80 RESERVES BY GEOLOGIC AGE
$50 RESERVES

Geologic Age	Tons Ore	% U_3O_8	Tons U_3O_8	% Total Tons U_3O_8	No. Properties
Late Tertiary	158,900,000	0.05	84,900	9	152
Early Tertiary	468,700,000	0.07	305,600	33	424
Cretaceous	35,700,000	0.05	17,000	2	123
Jurassic	558,300,000	0.09	490,900	52	777
Triassic	6,200,000	0.15	9,100	1	177
Paleozoic	4,200,000	0.17	7,000	1	42
Precambrian	39,000,000	0.06	21,500	2	54
Total	1,271,000,000	0.07	936,000	100	1,749

DISTRIBUTION OF 1/1/80 RESERVES BY TYPE OF HOST ROCK
$50 RESERVES

Host Type	Tons Ore	% U_3O_8	Tons U_3O_8	% Total Tons U_3O_8	No. Properties
Coarse Clastics	1,192,400,000	0.07	885,300		1,423
Fine Clastics	29,800,000	0.06	17,400	97	52
Lignitic Materials	2,100,000	0.15	3,100		96
Limestone	1,400,000	0.09	1,200	3	50
Igneous & Metamorphic	45,300,000	0.06	29,000		128
Total	1,271,000,000	0.07	936,000	100	1,749

DISTRIBUTION OF 1/1/80 RESERVES BY RESOURCE REGION
$50 RESERVES

Resource Region	Tons Ore	% U_3O_8	Tons U_3O_8	% Total Tons U_3O_8	No. Properties
Colorado Plateau	505,800,000	0.09	475,600	51	950
Wyoming Basins	489,700,000	0.06	305,800	33	274
W. Gulf Coastal Plain	104,300,000	0.05	54,700	6	125
Northern Plains	12,600,000	0.08	9,700	1	160
Others*	158,600,000	0.06	90,200	9	240
Total	1,271,000,000	0.07	936,000	100	1,749

*Includes Colorado and Southern Rockies, Northern Rockies, Northern and Central Basin and Range, Southern Plains, and Sierra Nevada, Pacific Coast, Southern Basin & Range, Southeastern Basin & Range, Columbia Plateaus, and Alaska.

DISTRIBUTION OF 1/1/80 RESERVES BY STATE
$50 RESERVES

State	Tons Ore	% U_3O_8	Tons U_3O_8	% Total Tons U_3O_8	No. Properties
New Mexico	482,400,000	0.09	448,700	48	181
Wyoming	510,900,000	0.06	314,700	34	283
Texas	104,400,000	0.05	55,800	6	135
Arizona, Colorado, & Utah	132,300,000	0.06	88,000	9	909
Others*	41,000,000	0.06	28,800	3	241
Total	1,271,000,000	0.07	936,000	100	1,749

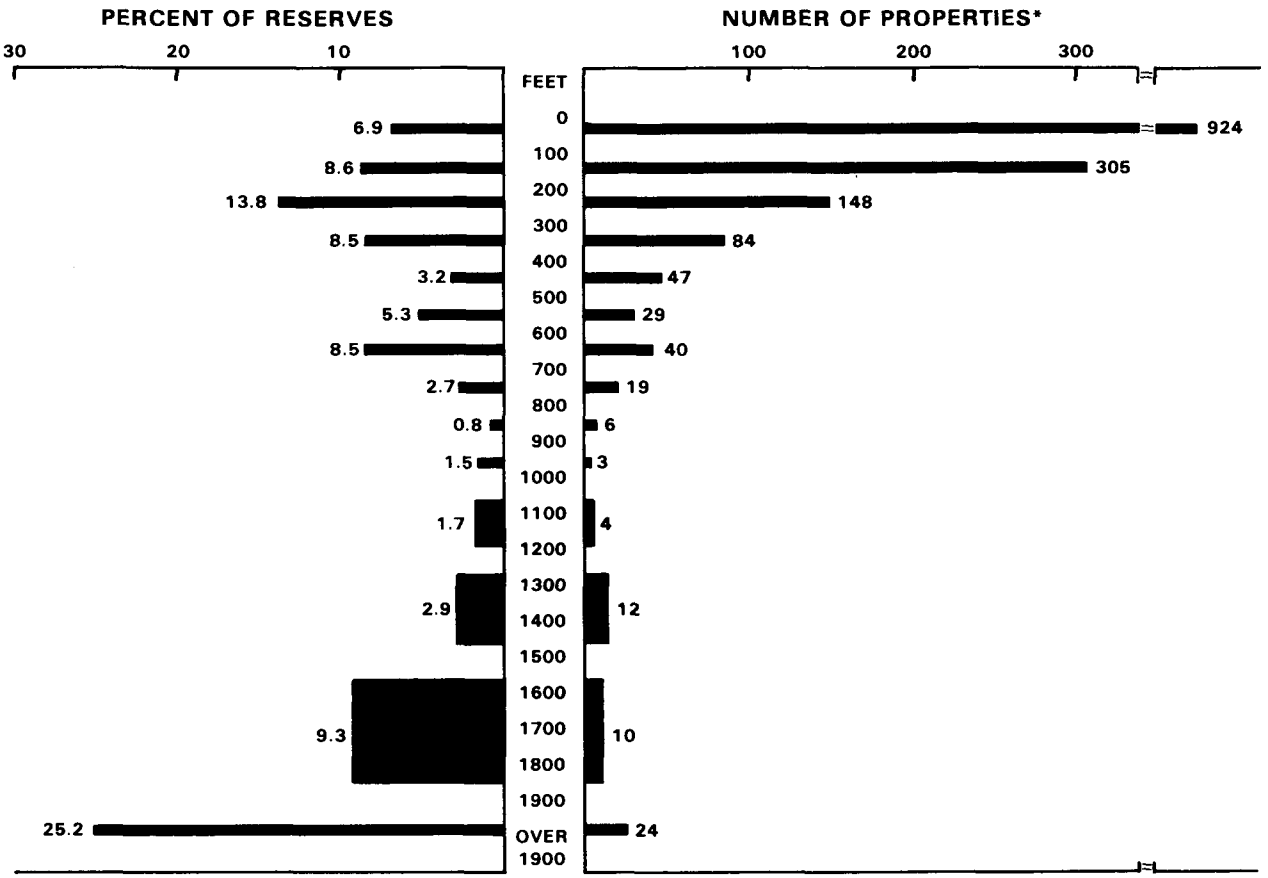
*Includes Alaska, California, Idaho, Montana, Nevada, North Dakota, Oregon, South Dakota, and Washington.

DISTRIBUTION OF 1/1/80 RESERVES BY MINING METHOD
$50 RESERVES

Mining Method	Tons Ore	% U_3O_8	Tons U_3O_8	% Total Tons U_3O_8	No. Properties
Open Pit	484,500,000	0.06	282,000	30	556
Underground	667,000,000	0.09	602,100	64	1,099
Others*	119,500,000	0.04	51,900	6	94
Total	1,271,000,000	0.07	936,000	100	1,749

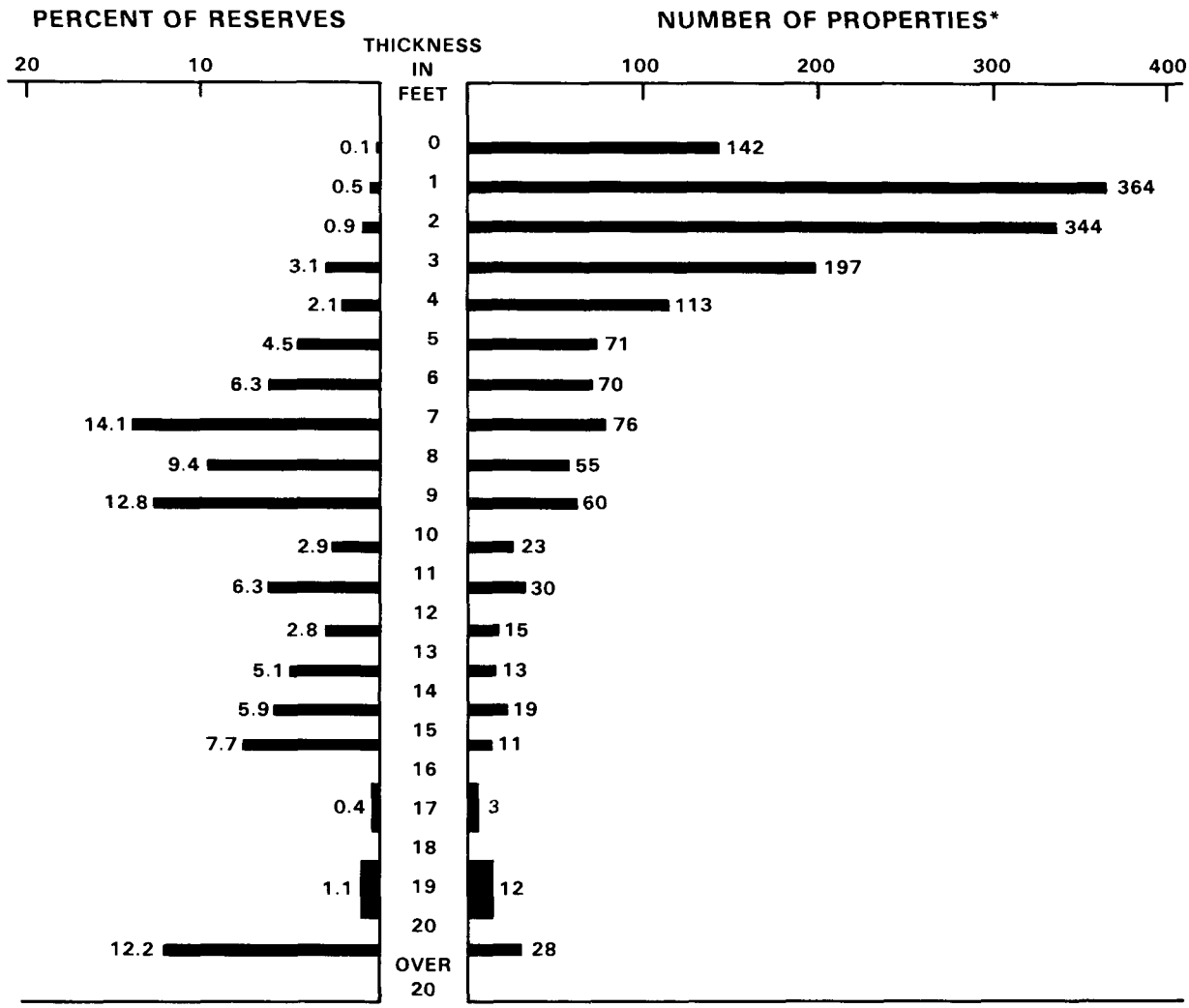
*Includes 98,300,000 tons of material at 0.04% U_3O_8 classified as solution mining reserves.

DISTRIBUTION OF 1/1/80 RESERVES BY DEPTH
$50 RESERVES



*Does not include stockpiles, dumps, etc.

DISTRIBUTION OF 1/1/80 RESERVES BY THICKNESS
$50 RESERVES

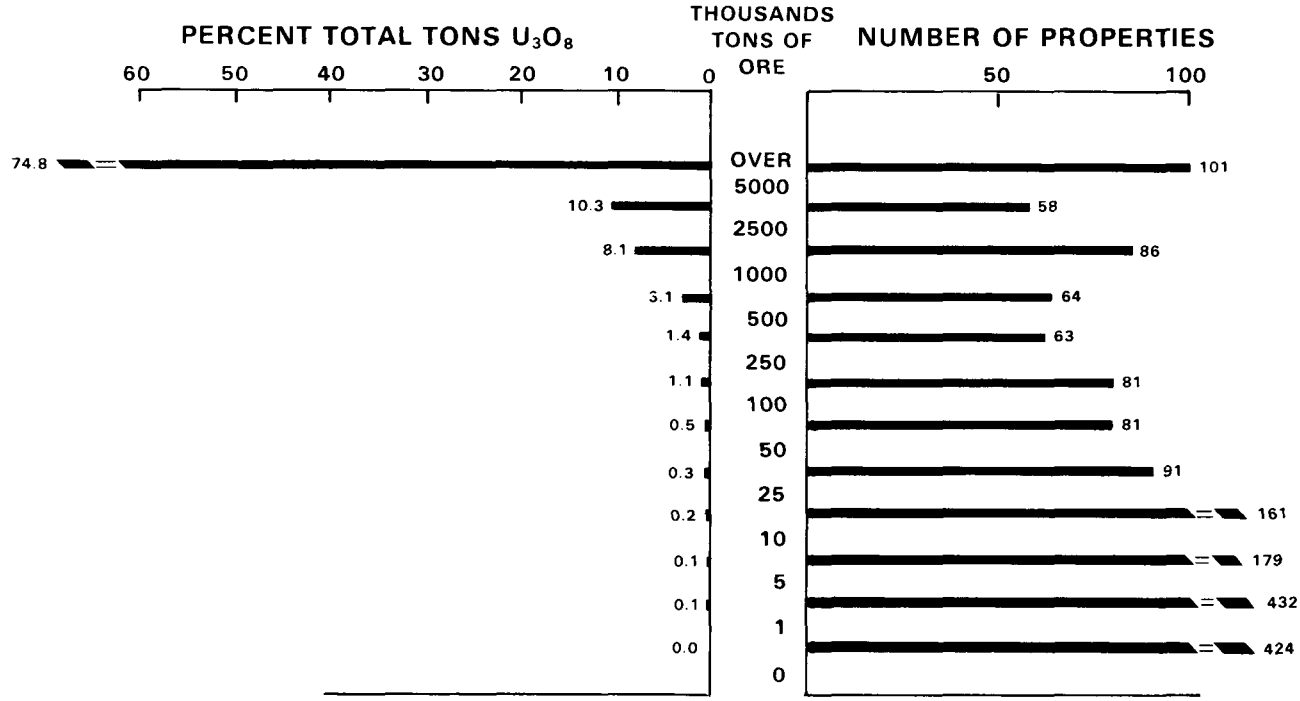


*Does not include stockpiles, dumps, etc.

SECTION V
DISTRIBUTION OF $100 RESERVES

Distribution of 1/1/80 $100 Reserves:

DISTRIBUTION OF 1/1/80 RESERVES BY SIZE OF PROPERTY
$100 RESERVES



Tons Range	Tons Ore	% U_3O_8	Tons U_3O_8	% Total Tons U_3O_8	No. Properties
<1,000	200,000	0.12	200		424
1,000– 5,000	1,100,000	0.11	1,300		432
5,000– 10,000	1,300,000	0.11	1,500	1	179
10,000– 25,000	2,600,000	0.11	2,800		161
25,000– 50,000	3,300,000	0.11	3,500		91
50,000– 100,000	6,000,000	0.09	5,500	1	81
100,000– 250,000	13,700,000	0.09	11,800	1	81
250,000– 500,000	23,200,000	0.07	15,200	1	63
500,000–1,000,000	48,600,000	0.07	34,500	3	64
1,000,000–2,500,000	136,100,000	0.07	90,900	8	86
2,500,000–5,000,000	211,900,000	0.05	115,000	10	58
5,000,000 or more	1,510,000,000	0.06	839,800	75	101
Total	1,958,000,000	0.06	1,122,000	100	1,821

DISTRIBUTION OF 1/1/80 RESERVES BY GEOLOGIC AGE
$100 RESERVES

Geologic Age	Tons Ore	% U_3O_8	Tons U_3O_8	% Total Tons U_3O_8	No. Properties
Late Tertiary	241,200,000	0.04	102,200	9	160
Early Tertiary	824,600,000	0.05	400,000	35	434
Cretaceous	50,200,000	0.04	21,200	2	127
Jurassic	768,400,000	0.07	555,300	50	800
Triassic	7,400,000	0.14	10,100	1	189
Paleozoic	7,800,000	0.10	8,400	1	48
Precambrian	58,400,000	0.04	24,800	2	63
Total	1,958,000,000	0.06	1,122,000	100	1,821

DISTRIBUTION OF 1/1/80 RESERVES BY TYPE OF HOST ROCK
$100 RESERVES

Host Type	Tons Ore	% U_3O_8	Tons U_3O_8	% Total Tons U_3O_8	No. Properties
Coarse Clastics	1,844,400,000	0.06	1,062,900	97	1,476
Fine Clastics	36,800,000	0.05	19,200		59
Lignitic Materials	2,400,000	0.14	3,300		96
Limestone	1,700,000	0.08	1,400	3	50
Igneous & Metamorphic	72,700,000	0.05	35,200		140
Total	1,958,000,000	0.06	1,122,000	100	1,821

DISTRIBUTION OF 1/1/80 RESERVES BY RESOURCE REGION
$100 RESERVES

Resource Region	Tons Ore	% U_3O_8	Tons U_3O_8	% Total Tons U_3O_8	No. Properties
Colorado Plateau	699,600,000	0.08	542,300	48	985
Wyoming Basins	912,300,000	0.05	407,800	36	283
W. Gulf Coastal Plain	131,900,000	0.05	61,000	5	127
Northern Plains	26,400,000	0.05	13,600	1	163
Others*	187,800,000	0.05	97,300	10	263
Total	1,958,000,000	0.06	1,122,000	100	1,821

*Includes Colorado and Southern Rockies, Northern Rockies, Northern and Central Basin and Range, Sierra Nevada, Pacific Coast, Southern Basin & Range, Southeastern Basin & Range, Columbia Plateaus, Southern Plains, and Alaska.

DISTRIBUTION OF 1/1/80 RESERVES BY STATE
$100 RESERVES

State	Tons Ore	% U_3O_8	Tons U_3O_8	% Total Tons U_3O_8	No. Properties
New Mexico	670,500,000	0.08	512,300	46	183
Wyoming	944,700,000	0.04	419,900	37	293
Texas	131,900,000	0.05	61,000	5	137
Arizona, Colorado, & Utah	149,700,000	0.06	93,700	8	958
Others*	61,200,000	0.06	35,100	4	250
Total	1,958,000,000	0.06	1,122,000	100	1,821

*Includes Alaska, California, Idaho, Montana, Nevada, North Dakota, Oregon, South Dakota, and Washington.

DISTRIBUTION OF 1/1/80 RESERVES BY MINING METHOD
$100 RESERVES

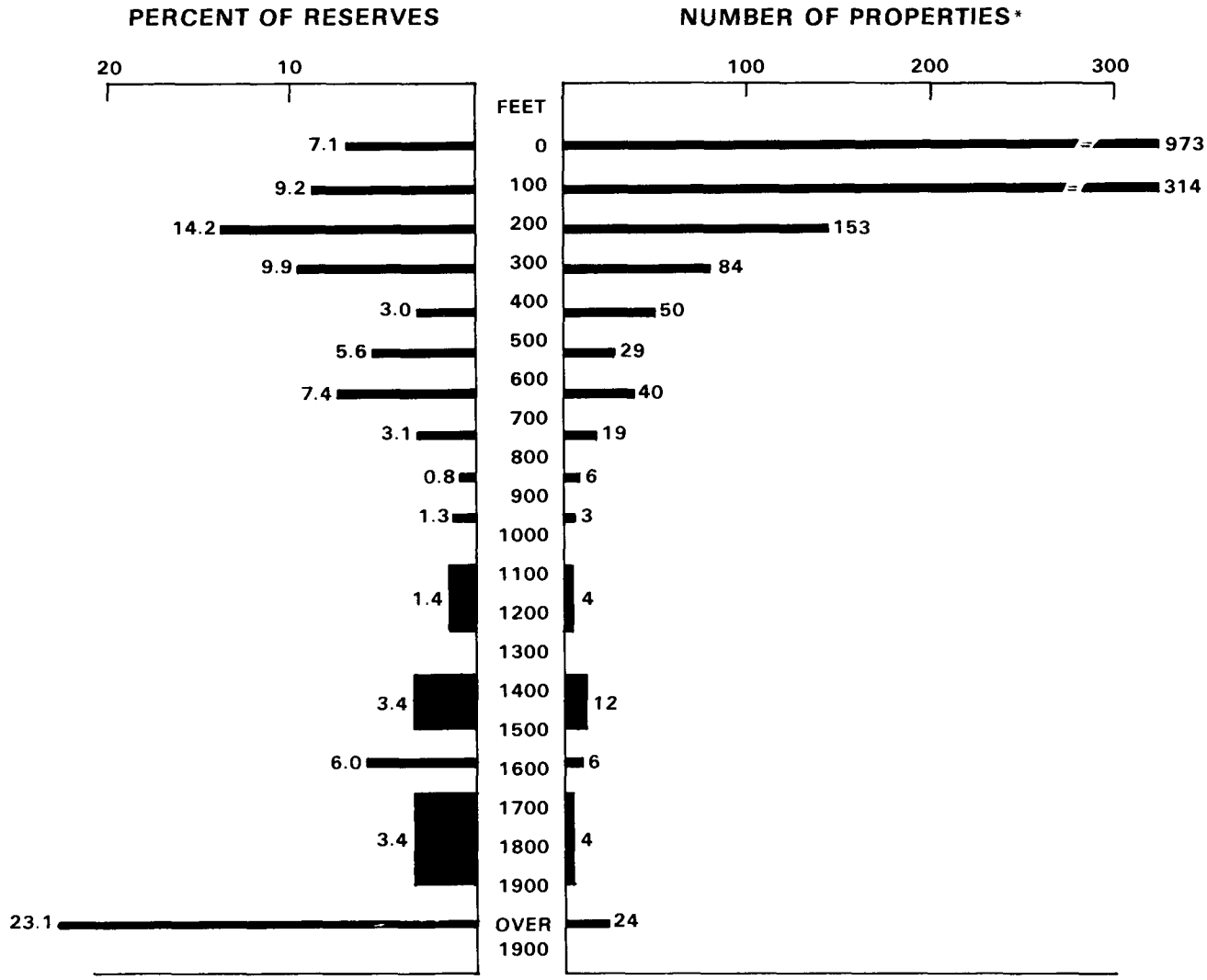
Mining Method	Tons Ore	% U_3O_8	Tons U_3O_8	% Total Tons U_3O_8	No. Properties
Open Pit	884,500,000	0.04	373,500	33	581
Underground	952,400,000	0.07	695,900	62	1,145
Others*	121,100,000	0.04	52,600	5	95
Total	1,958,000,000	0.06	1,122,000	100	1,821

*Includes 99,300,000 tons of material at 0.04% U_3O_8 classified as solution mining reserves.

DISTRIBUTION OF 1/1/80 $100 RESERVES BY MINING METHOD IN PRODUCING AND NON-PRODUCING PROPERTIES

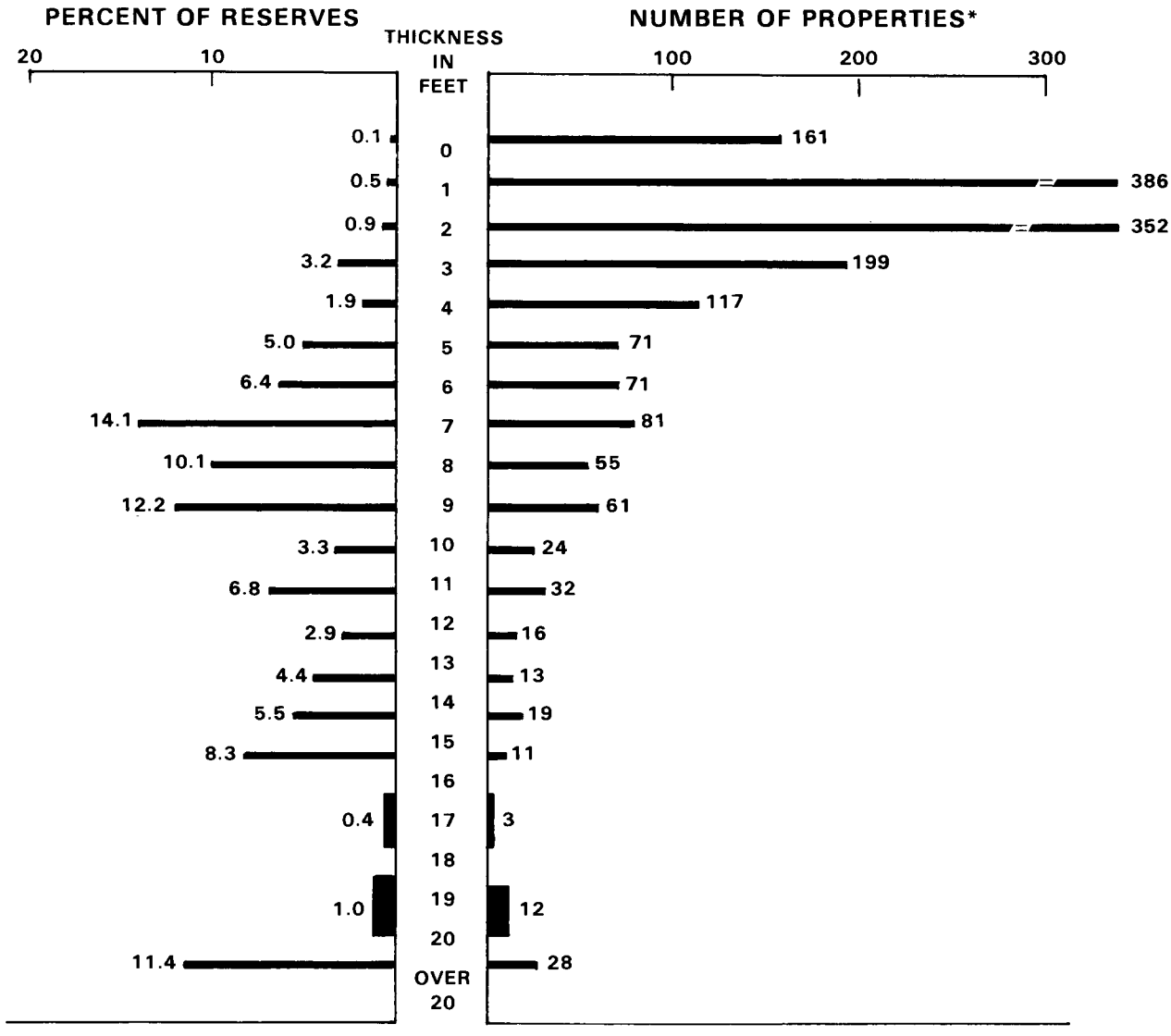
		Tons Ore	% U_3O_8	Tons U_3O_8	No. Properties
Producing properties	Open Pit	519,400,000	0.04	216,200	335
	Underground	306,000,000	0.07	212,000	923
	Others	32,200,000	0.05	15,700	27
	Total	857,600,000	0.05	443,900	1,285
Non-producing properties	Open Pit	365,100,000	0.04	157,300	246
	Underground	646,400,000	0.08	483,900	222
	Others	88,900,000	0.04	36,900	68
	Total	1,100,400,000	0.06	678,100	536

DISTRIBUTION OF 1/1/80 RESERVES BY DEPTH
$100 RESERVES



*Does not include stockpiles, dumps, etc.

DISTRIBUTION OF 1/1/80 RESERVES BY THICKNESS
$100 RESERVES



*Does not include stockpiles, dumps, etc.

SECTION VI
DISTRIBUTION OF $100 RESERVES AND OF $100 RESERVES PLUS PRODUCTION

SECTION VI
DISTRIBUTION OF $100 RESERVES AND OF $100 RESERVES PLUS PRODUCTION

The three charts on page 58 present the distribution of $100 reserves in individual properties for the United States, Wyoming, and New Mexico by tons and average grades. The three charts on page 60 are similar except that production has been added to the $100 reserves to approximate the original in-place or preproduction reserve.

The size-depth-thickness chart on page 59 presents statistics on the number of properties referenced to range of size (tons), depth, and thickness for the U.S. $100 reserves. The size-depth-thickness chart on page 61 presents similar statistics for the U.S. $100 reserves plus production.

In comparing the preproduction and postproduction charts, it is apparent that production has a marked influence on the size distributions. This is shown by the larger number of properties in the lower tonnage and grade portions of the postproduction matrices than in the preproduction matrices. This is the result of the depletion of higher grade material by production, which results in the transfer of many production properties to the smaller size and lower grade portions of the postproduction matrices.

The chart "U.S. Distribution of $100 Reserves Plus Production by Grade Increment as of 1/1/80," on page 62 shows the distribution of the average grade of $100 reserves and/or production of 4,258 properties by grade increments of 0.01 percent U_3O_8. The asterisks (each representing about 5 properties) graphically show the distribution. The properties in the two or three lowest grade increments are nearly all properties that have produced but have no remaining reserves.

UNITED STATES 1/1/80 $100 RESERVES NUMBER OF PROPERTIES WITHIN SELECTED RANGES OF GRADE AND TONNAGE

Tons Ore (Thousands)	Average Grade (% U_3O_8)				
	0-0.05	0.05-0.10	0.10-0.20	0.20-0.40	>0.40
>8,000	30	30	3	2	0
4,000-8,000	36	17	3	0	0
2,000-4,000	31	19	5	0	0
1,000-2,000	27	31	9	2	0
500-1,000	31	25	5	3	0
0- 500	158	759	480	99	16

WYOMING 1/1/80 $100 RESERVES NUMBER OF PROPERTIES WITHIN SELECTED RANGES OF GRADE AND TONNAGE

Tons Ore (Thousands)	Average Grade (% U_3O_8)				
	0-0.05	0.05-0.10	0.10-0.20	0.20-0.40	>0.40
>8,000	20	11	0	0	0
4,000-8,000	25	7	0	0	0
2,000-4,000	19	6	0	0	0
1,000-2,000	16	14	0	0	0
500-1,000	10	7	3	0	0
0- 500	28	84	32	9	2

NEW MEXICO 1/1/80 $100 RESERVES NUMBER OF PROPERTIES WITHIN SELECTED RANGES OF GRADE AND TONNAGE

Tons Ore (Thousands)	Average Grade (% U_3O_8)				
	0-0.05	0.05-0.10	0.10-0.20	0.20-0.40	>0.40
>8,000	5	17	4	0	0
4,000-8,000	4	8	4	0	0
2,000-4,000	3	9	0	0	0
1,000-2,000	3	9	7	2	0
500-1,000	2	7	0	2	0
0- 500	6	73	16	2	0

U.S. 1/1/80 $100 RESERVES BY SIZE-DEPTH-THICKNESS

Size Range Tons Ore (Thousands)	No. Prop.	Total Tons	Depth (Feet)	No. Prop.	Total Tons	Avg % U_3O_8	Thickness (Feet)	No. Prop.	Total Tons	Avg % U_3O_8
0-100	1,359	13,709,412	0-100	681	4,015,381	0.03	0-4	558	2,883,341	0.03
							4-8	98	969,518	0.03
							>8	25	162,522	0.05
			100-250	498	5,685,460	0.04	0-4	321	2,475,094	0.03
							4-8	153	2,339,764	0.07
							>8	24	870,602	0.07
			250-500	139	2,646,908	0.08	0-4	68	776,332	0.15
							4-8	56	1,252,376	0.08
							>8	15	618,200	0.15
			>500	41	1,361,663	0.10	0-4	14	266,369	0.05
							4-8	17	821,094	0.15
							>8	10	274,200	0.07
100-1,000	213	82,575,293	0-100	39	14,153,702	0.07	0-4	21	8,097,093	0.09
							4-8	10	3,218,200	0.06
							>8	8	2,838,409	0.04
			100-250	95	36,042,835	0.07	0-4	13	3,723,464	0.08
							4-8	41	13,388,959	0.07
							>8	41	18,930,412	0.06
			250-500	53	19,174,029	0.08	0-8	20	8,778,456	0.09
							>8	33	10,395,573	0.07
			>500	26	13,204,727	0.11	0-8	13	5,530,491	0.13
							>8	13	7,674,236	0.07
>1,000	249	1,862,099,361	0-250	74	392,808,857	0.05	0-8	33	154,804,822	0.05
							>8	41	238,004,035	0.04
			250-500	66	591,822,769	0.05	0-8	12	107,729,378	0.05
							>8	54	484,093,391	0.05
			>500	109	877,467,735	0.07	0-8	18	81,838,604	0.08
							>8	91	795,629,131	0.07

UNITED STATES 1/1/80 $100 RESERVES PLUS PRODUCTION NUMBER OF PROPERTIES WITHIN SELECTED RANGES OF GRADE AND TONNAGE

Tons Ore (Thousands)	Average Grade (% U_3O_8)				
	0-0.05	0.05-0.10	0.10-0.20	0.20-0.40	>0.40
>8,000	25	37	7	2	0
4,000-8,000	32	18	7	0	0
2,000-4,000	29	20	7	2	0
1,000-2,000	26	34	15	4	0
500-1,000	23	24	11	8	0
0- 500	69	330	700	364	27

WYOMING 1/1/80 $100 RESERVES PLUS PRODUCTION NUMBER OF PROPERTIES WITHIN SELECTED RANGES OF GRADE AND TONNAGE

Tons Ore (Thousands)	Average Grade (% U_3O_8)				
	0-0.05	0.05-0.10	0.10-0.20	0.20-0.40	>0.40
>8,000	17	12	2	0	0
4,000-8,000	23	10	0	0	0
2,000-4,000	17	8	3	0	0
1,000-2,000	15	13	2	0	0
500-1,000	8	7	4	0	0
0- 500	16	63	52	21	0

NEW MEXICO 1/1/80 $100 RESERVES PLUS PRODUCTION NUMBER OF PROPERTIES WITHIN SELECTED RANGES OF GRADE AND TONNAGE

Tons Ore (Thousands)	Average Grade (% U_3O_8)				
	0-0.05	0.05-0.10	0.10-0.20	0.20-0.40	>0.40
>8,000	2	22	7	0	0
4,000-8,000	3	5	5	0	0
2,000-4,000	2	9	3	0	0
1,000-2,000	2	10	9	3	0
500-1,000	0	4	2	2	0
0- 500	0	29	52	52	0

U.S. 1/1/80 $100 RESERVES PLUS PRODUCTION BY SIZE-DEPTH-THICKNESS

Size Range Tons Ore (Thousands)	No. Prop.	Total Tons	Depth (Feet)	No. Prop.	Total Tons	Avg % U_3O_8	Thickness (Feet)	No. Prop.	Total Tons	Avg % U_3O_8
0-100	1,289	18,828,347	0-100	675	6,104,635	0.07	0-4	554	4,282,593	0.07
							4-8	96	1,588,127	0.08
							>8	25	233,915	0.07
			100-250	470	8,477,611	0.12	0-4	317	4,730,753	0.12
							4-8	134	2,919,919	0.13
							>8	19	826,939	0.09
			250-500	120	3,370,052	0.14	0-4	65	1,498,642	0.13
							4-8	46	1,418,643	0.14
							>8	9	452,767	0.14
			>500	24	876,049	0.14	0-4	13	340,268	0.11
							4-8	8	388,505	0.20
							>8	3	147,276	0.10
100-1,000	265	96,315,703	0-100	41	15,075,074	0.09	0-4	24	9,457,598	0.11
							4-8	10	2,854,986	0.09
							>8	7	2,762,490	0.04
			100-250	118	43,441,544	0.10	0-4	17	4,531,846	0.11
							4-8	59	18,798,926	0.11
							>8	42	20,110,772	0.07
			250-500	70	24,713,211	0.14	0-4	5	1,273,530	0.19
							4-8	27	10,019,774	0.14
							>8	38	13,419,907	0.13
			>500	36	13,085,874	0.16	0-4	2	1,072,954	0.17
							4-8	18	5,299,564	0.17
							>8	16	6,713,356	0.16
>1,000	267	2,000,423,889	0-250	83	438,338,525	0.06	0-8	37	185,076,720	0.06
							>8	46	253,261,805	0.05
			250-500	68	629,503,468	0.06	0-8	13	112,236,763	0.07
							>8	55	517,266,705	0.06
			>500	116	932,581,904	0.09	0-8	21	89,247,552	0.09
							>8	95	843,334,352	0.08

U.S. DISTRIBUTION OF $100 RESERVES PLUS PRODUCTION BY GRADE INCREMENT AS OF 1/1/80*

Grade Class	No. Class Properties	Cumulative No. Of Properties	Cumulative Tons Of Ore (Thousands)	Avg. Grade (% U_3O_8)	Cumulative Lbs U_3O_8 (Thousands)	Cumulative % Of Tons Of Ore	Cumulative % Of Lbs Of U_3O_8
0-0.01	14	4,258	2,137,091	0.07	2,944,657	100.000	100.000
0.01-0.02	33	4,244	2,135,591	0.07	2,944,357	99.930	99.990
0.02-0.03	89	4,211	2,009,816	0.07	2,885,102	94.044	97.978
0.03-0.04	111	4,122	1,660,845	0.08	2,672,286	77.715	90.750
0.04-0.05	165	4,011	1,420,068	0.09	2,476,319	66.449	84.095
0.05-0.06	149	3,846	1,156,626	0.10	2,211,085	54.122	75.088
0.06-0.07	133	3,697	883,451	0.11	1,879,289	41.339	63.820
0.07-0.08	168	3,564	570,036	0.13	1,436,220	26.673	48.774
0.08-0.09	164	3,396	473,170	0.14	1,282,028	22.141	43.537
0.09-0.10	210	3,232	340,094	0.15	1,042,226	15.914	35.394
0.10-0.11	166	3,022	270,463	0.17	902,183	12.656	30.835
0.11-0.12	165	2,556	227,889	0.18	806,824	10.664	27.466
0.12-0.13	197	2,691	187,738	0.19	712,588	8.785	24.199
0.13-0.14	174	2,494	130,413	0.21	559,606	6.102	19.004
0.14-0.15	174	2,320	102,609	0.23	481,804	4.801	10.362
0.15-0.16	162	2,146	92,364	0.24	451,322	4.322	15.327
0.16-0.17	146	1,984	84,749	0.25	426,763	3.966	14.493
0.17-0.18	152	1,838	79,968	0.26	410,492	3.742	13.940
0.18-0.19	136	1,686	75,939	0.26	395,840	3.553	13.443
0.19-0.20	137	1,550	66,379	0.27	359,174	3.106	12.198
0.20-0.21	119	1,413	64,363	0.27	351,078	3.012	11.923
0.21-0.22	109	1,294	61,593	0.28	339,391	2.882	11.526
0.22-0.23	109	1,185	60,036	0.28	332,554	2.809	11.293
0.23-0.24	100	1,076	49,984	0.29	286,349	2.339	9.724
0.24-0.25	88	976	27,454	0.32	178,219	1.285	6.052
0.25-0.26	85	888	20,892	0.35	145,364	0.978	4.937
0.26-0.27	48	803	19,256	0.36	136,825	0.901	4.647
0.27-0.28	76	755	13,215	0.36	131,202	0.852	4.456
0.28-0.29	57	679	16,699	0.37	122,771	0.781	4.169
0.29-0.30	45	622	15,589	0.37	116,289	0.729	2.949
0.30-0.31	42	577	11,515	0.40	91,740	0.539	3.115
0.31-0.32	42	535	11,103	0.40	89,177	0.520	3.028
0.32-0.33	34	493	10,654	0.41	86,303	0.499	2.931
0.33-0.34	32	459	9,350	0.42	77,814	0.438	2.643
0.34-0.35	28	427	5,317	0.48	50,530	0.249	1.716
0.35-0.36	26	399	5,167	0.48	49,484	0.242	1.660
0.36-0.37	22	373	3,569	0.53	38,082	0.167	1.293
0.37-0.38	24	351	2,573	0.60	30,638	0.120	1.040
0.38-0.39	20	327	2,547	0.60	30,441	0.119	1.034
0.39-0.40	22	307	2,461	0.60	29,764	0.115	1.011
0.40-0.41	17	285	2,371	0.61	29,049	0.111	0.987
0.41-0.42	13	268	2,321	0.62	28,644	0.109	0.973
0.42-0.43	8	255	2,269	0.62	28,201	0.106	0.958
0.43-0.44	14	247	2,267	0.62	28,188	0.106	0.957
0.44-0.45	18	233	2,161	0.63	22,255	0.101	0.926
0.45-0.46	14	215	2,149	0.63	27,149	0.101	0.922
0.46-0.47	6	201	2,104	0.64	26,732	0.098	0.908
0.47-0.48	10	195	2,101	0.64	26,710	0.098	0.907
0.48-0.49	5	185	1,769	0.66	23,526	0.083	0.799
0.49-0.50	5	180	1,768	0.66	23,522	0.083	0.799
0.50-0.51	7	175	1,768	0.66	23,521	0.083	0.799
0.51-0.52	2	168	1,763	0.67	23,465	0.083	0.797
0.52-0.53	8	166	1,763	0.67	23,464	0.082	0.797
0.53-0.54	6	158	1,762	0.67	23,463	0.082	0.797
0.54-0.55	9	152	1,478	0.69	20,393	0.069	0.693
0.55-0.56	3	143	1,135	0.73	16,620	0.053	0.564
0.56-0.57	1	140	1,128	0.73	16,548	0.053	0.562
0.57-0.58	6	139	1,128	0.73	16,540	0.053	0.562
0.58-0.59	6	133	1,125	0.73	16,510	0.053	0.561
0.59-OVER	127	127	1,125	0.73	16,507	0.053	0.561

*For explanation of chart see p. 57.

SECTION VII
DRILLING STATISTICS

SECTION VII
DRILLING STATISTICS

Surface Drilling Reported During 1979

Drilling information for this section is acquired on a monthly basis[1], chiefly at the field level, from the numerous companies, partnerships, and individuals engaged in drilling programs. These figures are detailed by project name, location, number of holes, and total footage of exploration and development drilling. The statistics thus obtained are used as a measure of exploration activity during the year and form the basis for the analyses of drilling shown in this section.

The total footage reported in 1979 was 40.8 million feet which was about 13 percent lower than the 47 million feet reported in 1978. The uranium industry has completed 421 million feet of surface drilling since 1948.

The surface drilling figures for 1979 are:

SURFACE DRILLING
(Millions of Feet)

Quarter	Exploration	Development	Total Surface
First	4.3	2.5	6.8
Second	6.8	3.6	10.4
Third	6.8	3.8	10.6
Fourth	9.0	4.0	13.0
Total	26.9	13.9	40.8

Of the 40.8 million feet reported monthly in 1979, about 12 million feet, or 29 percent, were drilled in areas more than 50 miles from existing uranium production centers, compared with 28 percent in 1978. Exploration drilling in search for new ore deposits or extensions of known deposits was 66 percent of the total. Developmental drilling, which defines the shape, size, and grade of deposits and provides information needed for mine planning accounted for the remaining 34 percent compared with 31 percent in 1978. These drilling figures do not include underground or open-pit drilling done for the control of uranium mining operations or drilling for solution mining.

[1]The drilling statistics compiled in Section VIII, Uranium Exploration Expenditures (pages 69 to 75), presents a compilation of drilling footage taken from an annual survey. The two sets of data for total drilling footage have been obtained for different purposes at different times and in different manners; therefore, they do not agree in detail.

Exploration in 1979 was influenced by a soft market and rising costs. With the exception of Texas and Utah, drilling decreased in most areas. In Texas, the search for deeper targets, applicable to solution mining technology, expanded. Drilling in Utah remained the same as in 1978 as companies continued their search for deposits in both new and established areas. Exploration in "frontier areas" such as Alaska, California, Nevada, Oregon, and Washington increased slightly.

DISTRIBUTION OF 1979 DRILLING BY STATE
(Millions of Feet)

State	Exploration	Development	Total Surface	% of Total
Wyoming	7.2	7.6	14.8	36.2
New Mexico	3.0	3.3	6.3	15.4
Texas	7.6	0.6	8.2	20.0
Utah	3.5	1.4	4.9	11.9
Colorado	3.0	0.8	3.8	9.3
Others*	2.5	0.3	2.8	7.2
Total	26.8	14.0	40.8	100.0

*In 1979, "Others" included Alabama, Alaska, Arizona, California, Georgia, Idaho, Michigan, Minnesota, Montana, Nebraska, Nevada, New Jersey, New York, North Dakota, Oklahoma, Oregon, Pennsylvania, South Dakota, and Washington.

SUMMARY OF 1979 DRILLING BY RESOURCE REGION
(Millions of Feet)

Resource Region	Exploration	Development	Total Surface	% of Total
Alaska, Sierra Nevada, Pacific Coast, Central Lowlands, Appalachians, Southern Canadian Shield and E. Gulf Coastal Plain	0.62	0.04	0.66	1.64
Colorado Plateau				
San Juan Basin	2.56	3.27	5.83	14.29
Paradox Basin	3.83	1.38	5.21	12.78
Other Areas	1.64	0.70	2.34	5.75
Wyoming Basins				
Powder River Basin	3.61	3.49	7.10	17.43
Central Wyoming	1.29	2.31	3.60	8.82
Great Divide Basin	1.70	0.19	1.89	4.64
Other Areas	0.32	1.58	1.90	4.66
W. Gulf Coastal Plain	7.58	0.53	8.11	19.89
Northern Plains	1.21	0.40	1.61	3.96
Basin and Range	1.03	0.01	1.04	2.51
Southern Plains	0.66	-	0.66	1.62
Colorado: Southern Rockies	0.53	-	0.53	1.29
Northern Rockies	0.26	0.03	0.29	0.72
Total	26.84	13.93	40.77	100.00

Historical Drilling Data

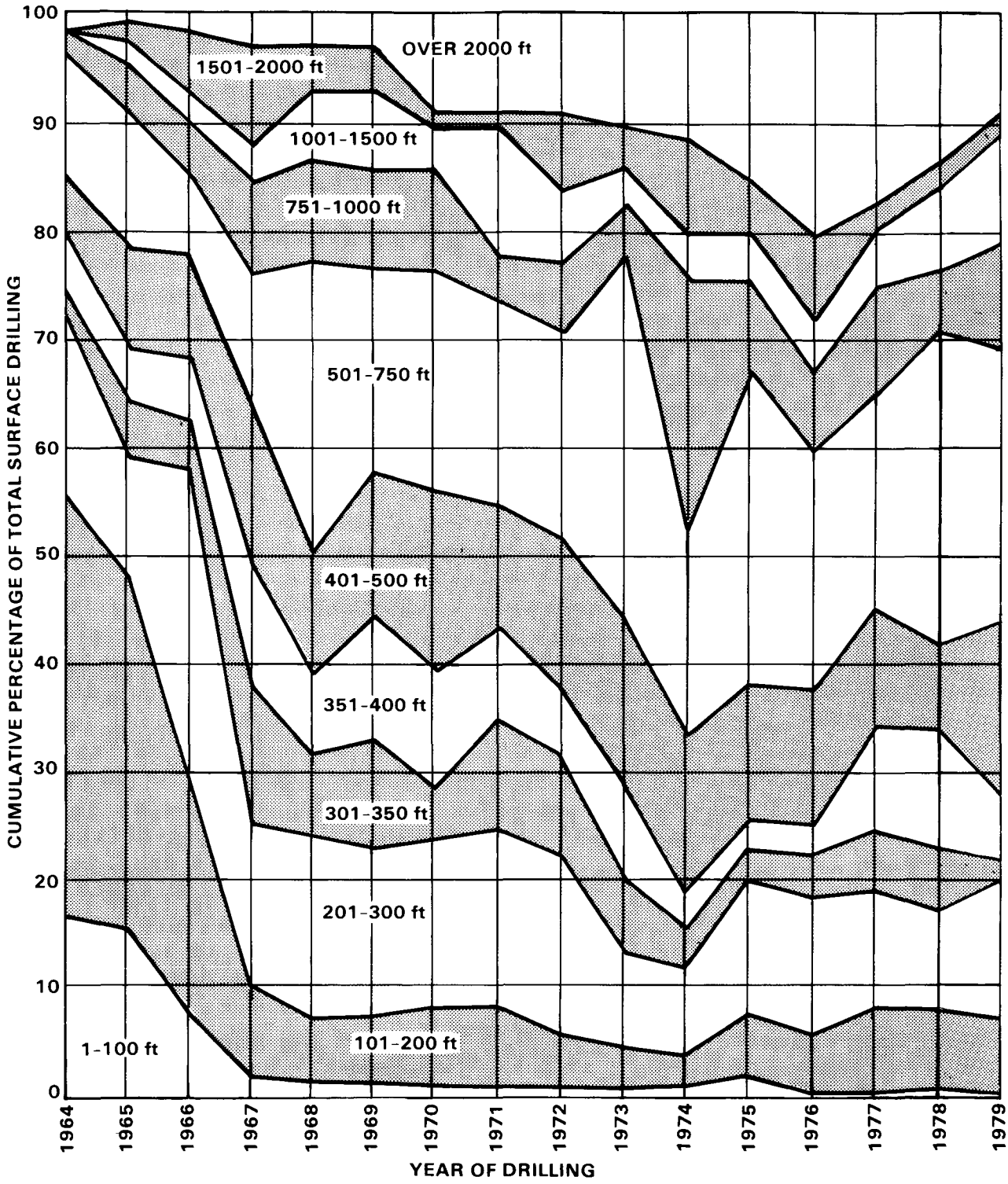
Surface drilling in 1948 was 210,000 feet and increased steadily to a peak in 1957 when 9.2 million feet were reported. Thereafter, the drilling effort diminished to approximately 2 million feet per year in the mid-1960s. From 1966 through 1968 the annual drilling rate more than doubled each year, reaching nearly 30 million feet in 1969. Drilling diminished to about 15.5 million feet per year in the early 1970s. In 1974, the drilling effort resumed its upward climb, and in 1978 attained an all-time yearly high of 47 million feet, as compared to approximately 41 million feet in 1979.

An estimated 370 drill rigs were used by the uranium industry during 1979 compared to about 375 in 1978. An estimated 380 logging units were utilized in 1979, of which 250 were available through commercial service companies, compared to 220 in 1978.

DRILLING STATISTICS FOR THE UNITED STATES

Year	Surface Drilling—Millions of Feet						Surface Drilling					
	Exploration		Development		Total Surface Drilling		Number of Holes			Average Depth—Feet		
	Annual	Cumulative	Annual	Cumulative	Annual	Cumulative	Exploration	Development	Total Surface	Exploration	Development	Total Surface
1948	0.170	0.170	0.040	0.040	0.210	0.210	-	-	-	-	-	-
1949	0.360	0.530	0.053	0.093	0.413	0.623	-	-	-	-	-	-
1950	0.570	1.100	0.208	0.301	0.778	1.401	-	-	-	-	-	-
1951	1.080	2.180	0.348	0.649	1.428	2.829	-	-	-	-	-	-
1952	1.362	3.542	0.300	0.949	1.662	4.491	-	-	-	-	-	-
1953	3.648	7.190	0.367	1.316	4.015	8.506	-	-	-	-	-	-
1954	4.057	11.247	0.553	1.869	4.610	13.116	-	-	-	-	-	-
1955	5.267	16.514	0.762	2.631	6.029	19.145	-	-	-	-	-	-
1956	7.287	23.801	1.503	4.134	8.790	27.935	-	-	-	-	-	-
1957	7.352	31.153	1.848	5.982	9.200	37.135	-	-	-	-	-	-
1958	3.759	34.912	3.494	9.476	7.253	44.388	25,321	22,932	48,253	148	152	150
1959	2.368	37.280	3.282	12.758	5.650	50.038	16,253	19,585	35,838	146	168	158
1960	1.399	38.679	4.211	16.969	5.610	55.648	7,335	24,395	31,730	191	173	177
1961	1.319	39.998	3.190	20.159	4.509	60.157	8,256	19,314	27,570	160	165	164
1962	1.483	41.481	2.431	22.590	3.914	64.071	6,439	12,870	19,309	230	189	203
1963	0.880	42.361	1.977	24.567	2.857	66.928	8,472	13,534	22,006	104	146	130
1964	0.967	43.328	1.245	25.812	2.212	69.140	5,972	9,909	15,881	162	126	139
1965	1.164	44.492	0.949	26.761	2.113	71.253	6,231	7,331	13,562	187	129	156
1966	1.800	46.292	2.400	29.161	4.200	75.453	5,751	13,179	18,930	313	182	222
1967	5.435	51.727	5.329	34.490	10.764	86.217	12,788	16,947	29,735	425	314	362
1968	16.277	67.954	7.527	42.017	23.754	109.971	38,470	19,531	58,001	422	385	410
1969	20.470	88.424	9.385	51.402	29.855	139.826	47,850	28,012	75,862	428	335	394
1970	17.981	106.405	5.547	56.949	23.528	163.354	43,980	14,874	58,854	409	373	400
1971	11.400	117.805	4.052	61.001	15.542	178.806	28,416	10,440	38,856	401	388	398
1972	11.815	129.620	3.609	64.610	15.424	194.230	26,909	9,706	36,615	439	371	421
1973	10.831	140.451	5.590	70.200	16.421	210.651	22,557	11,704	34,261	480	478	480
1974	16.000	156.451	6.000	76.200	22.000	232.651	27,400	12,300	39,700	580	490	550
1975	16.538	172.989	9.004	85.204	25.542	258.193	34,285	12,601	55,886	482	417	457
1976	19.527	192.516	14.704	99.908	34.231	292.424	40,409	27,231	67,640	483	540	506
1977	25.924	218.440	14.626	114.534	40.550	332.974	62,597	30,855	93,452	414	475	434
1978	32.203	250.643	14.800	129.334	47.003	379.977	75,068	29,285	104,353	429	505	450
1979	26.842	277.485	13.926	143.260	40.768	420.745	60,457	30,191	90,648	444	461	450

PERCENTAGE OF SURFACE DRILLING BY SELECTED DEPTH RANGES 1964-1979



SECTION VIII
URANIUM EXPLORATION EXPENDITURES

SECTION VIII
URANIUM EXPLORATION EXPENDITURES

This section summarizes land, surface drilling, and cost data provided in a report entitled, *Uranium Exploration Expenditures in 1979 and Plans for 1980-1981,* GJO-103(80), issued May 1980. The report is a compilation of data from 164 companies active in uranium exploration in the United States in 1979. The expenditure survey is conducted annually.

The preceding section is a compilation of drilling footages obtained on a monthly basis mainly at the field level. The two sets of data are obtained for different purposes, at different times, and in different manners; therefore, they do not agree in detail.

Total surface drilling, as reported on questionnaires, was 41.1 million feet in 1979. This footage is 15 percent lower than the record high of 48.1 million feet reported for 1978. The total exploration expenditures for 1979 were $315.9 million, which included $44.5 million for land acquisition, $163.0 million for surface drilling, and $108.4 million for other related exploration activities. The total expenditures for 1979 are slightly higher than the previous record of $314.3 million reported for 1978. The following table summarizes the results for 1979 as compared with data for 1966-78.

SUMMARY OF EXPLORATION ACTIVITIES

Land (Millions)	1979	1966-78
Acquired	4.21 acres	-
Held 12/31/79	17.15 acres	-
Surface Drilling (Millions)		
Exploration*	28.07 feet	199.54 feet
Development**	13.01 feet	96.06 feet
Expl. & Dev. Reported Together	-	12.57 feet†
Total	41.08 feet	308.17 feet
Expenditures (Millions)		
Land Acquisition	$ 44.5	$ 177.2
Surface Drilling		
Exploration	$119.6	$ 494.7
Development	$ 43.4	$ 208.7
Expl. & Dev. Reported Together	-	$ 13.7
Other Expenditures‡	$108.4	$ 384.2
Total	$315.9	$1,278.5

*Drilling done in search for new ore deposits or extensions to known deposits, and drilling at the location of a discovery up to the time that the company decides that sufficient ore reserves are present to justify commercial exploitation.

**Includes all drilling of a uranium deposit to more precisely determine size, grade, and configuration subsequent to the time that determination is made that the deposit can be commercially exploited.

†Includes 2,074,000 million feet of exploration drilling and 530,000 feet of development drilling for which no costs were reported (1966-1971).

‡Includes all other costs (exclusive of land acquisition and drilling programs) directly associated with a company's uranium exploration effort. Included are items such as geological and geophysical investigations and costs incurred by field personnel in the course of exploration effort, expenditures for geological research, and overhead and administrative charges directly associated with supervising and supporting field and exploration activities. The overhead and administrative charges reported do not include internal corporate charges, such as director's salaries, that are not directly associated with a company's exploration effort.

Solution Mining Production Drilling

Although solution mining is not an exploration activity, and is not included in the data provided elsewhere in this section, it has been included in the survey for the past 4 years to obtain complete data on uranium surface drilling activities. Solution mining drilling is exclusively for solution mining production, and is subsequent to the initial development drilling which identified the size, grade, and configuration of a solution mining deposit. Pattern development and monitor wells are included.

SOLUTION MINING PRODUCTION DRILLING

Year	No. of Companies	Millions of Feet of Drilling	Drilling Cost (Millions)	Drilling Cost Per Foot
1976	10	0.350	$ 1.83	$5.20
1977	7	0.625	$ 3.17	$5.07
1978	14	2.035	$11.36	$5.58
1979	16	2.305	$14.32	$6.21

Aerial Radiometric Exploration

In 1977 an item was added to the survey to obtain an estimate of the aerial radiometric effort of private companies for the 5-year period 1972–1976. This activity has been continued on an annual basis. In 1979, as in previous years, the western United States was the most heavily flown area, although some activity was reported for Alaska and the midwestern and eastern parts of the United States. Aerial radiometric exploration activities are summarized in the following table.

AERIAL RADIOMETRIC EXPLORATION

	Year			
	1972-76	1977	1978	1979
Number of companies reporting	30	29	44	25
Total line miles flown	910,000	435,000	570,000	130,000
Percentage gamma spectrometry	57	68	58	72
Percentage gross gamma ray	43	32	42	28
Flight-line spacing range (miles)	0.25-1.0	0.1-2.6	0.1-2.0	0.2-3.0
Weighted average of flight-line spacing (miles)	0.67	0.78	0.39	0.35

ESTIMATES OF PLANNED DOMESTIC EXPLORATION EXPENDITURES

Year	Millions of Feet of Drilling			Millions of Dollars
	Exploration	Development	Total	Total Explor. Costs
1980 (Planned)	27.9	11.5	39.4	277
1981 (Planned)	24.7	10.8	35.5	271

Comparison of Planned Versus Actual Activities

The following table shows a comparison of actual uranium exploration activities with footages and costs based on surveys during the past 3 years.

PLANNED VERSUS ACTUAL ACTIVITIES

	Planned for 1978 (1978 Survey)	Reported for 1978 (1979 Survey)	Planned for 1979 (1979 Survey)	Reported for 1979 (1980 Survey)
Millions of feet of Drilling	52.5	48.1	53.0	41.1
Total cost, Millions of Dollars	289	314.4	339	315.9

Domestic Exploration for Non-Sandstone Deposits and in Non-Established Areas

The following table is a summary of reported activities and plans for exploration efforts in non-sandstone geologic environments and/or in geographic areas outside the Colorado Plateau, Wyoming Basins, and Texas Gulf Coast Regions.

PERCENTAGE OF TOTAL EXPLORATION COSTS FOR NON-SANDSTONE DEPOSITS AND IN NON-ESTABLISHED AREAS

Year	Percentage of Non-Sandstone Exploration	No. of Companies	Percentage of Exploration in Non-Established Areas	No. of Companies
1974	16.3	39	19.1	45
1975	11.1	39	19.2	45
1976	16.7	51	23.2	53
1977	13.1	72	22.0	78
1978	19.7	90	27.5	93
1979	18.8	87	28.7	94
1980 (Planned)	19.1	79	28.7	80
1981 (Planned)	20.6	59	30.8	63

Foreign Participation in Domestic Exploration

Twenty-eight companies reported that foreign interests provided full or partial funding of their 1979 exploration activities. The total foreign participation amounted to $34.1 million, or about 11 percent of the $315.9 million total domestic exploration expenditures reported for 1979. Foreign participation in 1979, in terms of costs, was about 13 percent less than that reported for 1978.

Foreign Uranium Exploration by U.S. Companies

Twenty-four U.S. companies reported that they expended $43.24 million in foreign countries in 1979. This is a 20 percent increase over the $35.89 million reported for 1978. Total foreign expenditures of $115.92 million were reported for 1966-78.

The following is a summary of reported activities and plans for the uranium exploration expenditures of U.S. companies in foreign countries.

FOREIGN URANIUM EXPLORATION EXPENDITURES
(Expenditures and plans in millions of dollars)

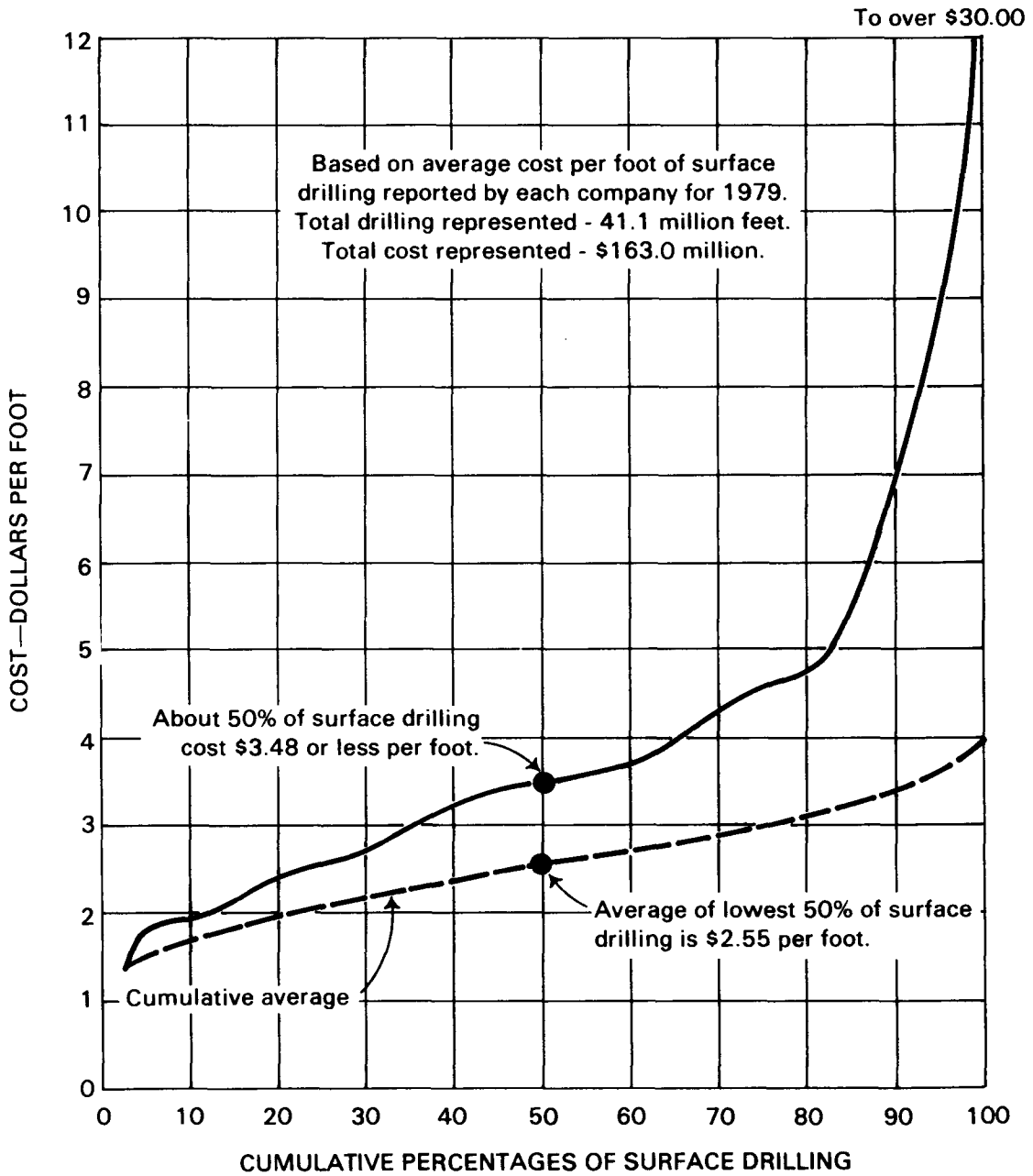
Year	Africa	Canada	Australia	Others*	Total
1975	2.66	1.00	1.34	0.10	5.10
1976	4.36	2.60	1.97	9.87	18.80
1977	7.50	3.60	4.70	15.36	31.16
1978	6.98	3.47	3.56	21.88	35.89
1979	7.05	8.75	6.22	21.22	43.24
1980 (Planned)	4.59	12.50	6.98	18.09	42.16
1981 (Planned)	3.42	15.47	8.99	18.53	46.41

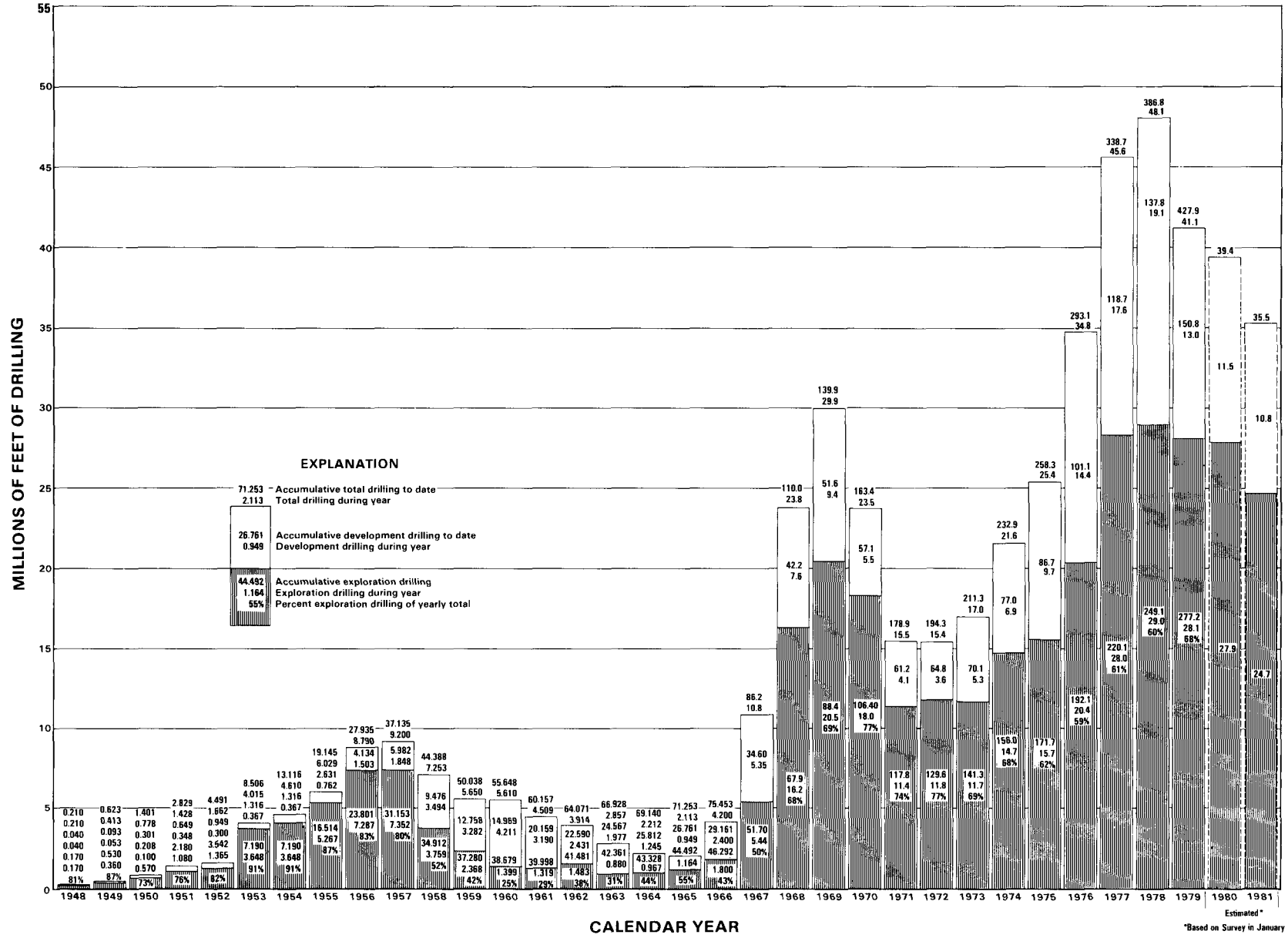
*Includes expenditures for which countries were not specified in the survey responses.

Surface Drilling Costs

Surface drilling costs include drilling, drill roads, site preparation, geological and other technical support, sampling, and drill hole logging. These costs ranged from less than $1.25 to more than $30 per foot. The average cost was $3.97 per foot. This represents a 12 percent increase over the 1978 average of $3.53 per foot.The following table shows the cumulative percentage of total surface drilling in terms of cost per foot of drilling.

1979 SURFACE DRILLING COSTS





HISTORY AND FORECAST OF U.S. URANIUM EXPLORATION

SECTION IX
LAND HOLDINGS FOR URANIUM EXPLORATION AND MINING

SECTION IX
LAND HOLDINGS FOR URANIUM EXPLORATION AND MINING

Explanation of Land Tables and Graph

The figures shown in these tables and in the accompanying graph were obtained from the public records. They comprise the total acreage of mining claims and State, Federally Acquired, Indian, and Fee lands held for uranium exploration as of January 1, 1980. They also include lands held for production and auxiliary purposes as well as leases and claims held by individuals and/or companies in anticipation of exploration interest. Note that these data include lands which may have been relinquished although control is still indicated in the public records.

This explanation is included to clarify possible differences between the land holdings reported in this section and those reported in Section VIII and in the exploration survey reports (GJO-103) which reflect mainly the land holdings of the companies directly involved in exploration and development drilling activities.

LAND HELD FOR URANIUM EXPLORATION AND MINING

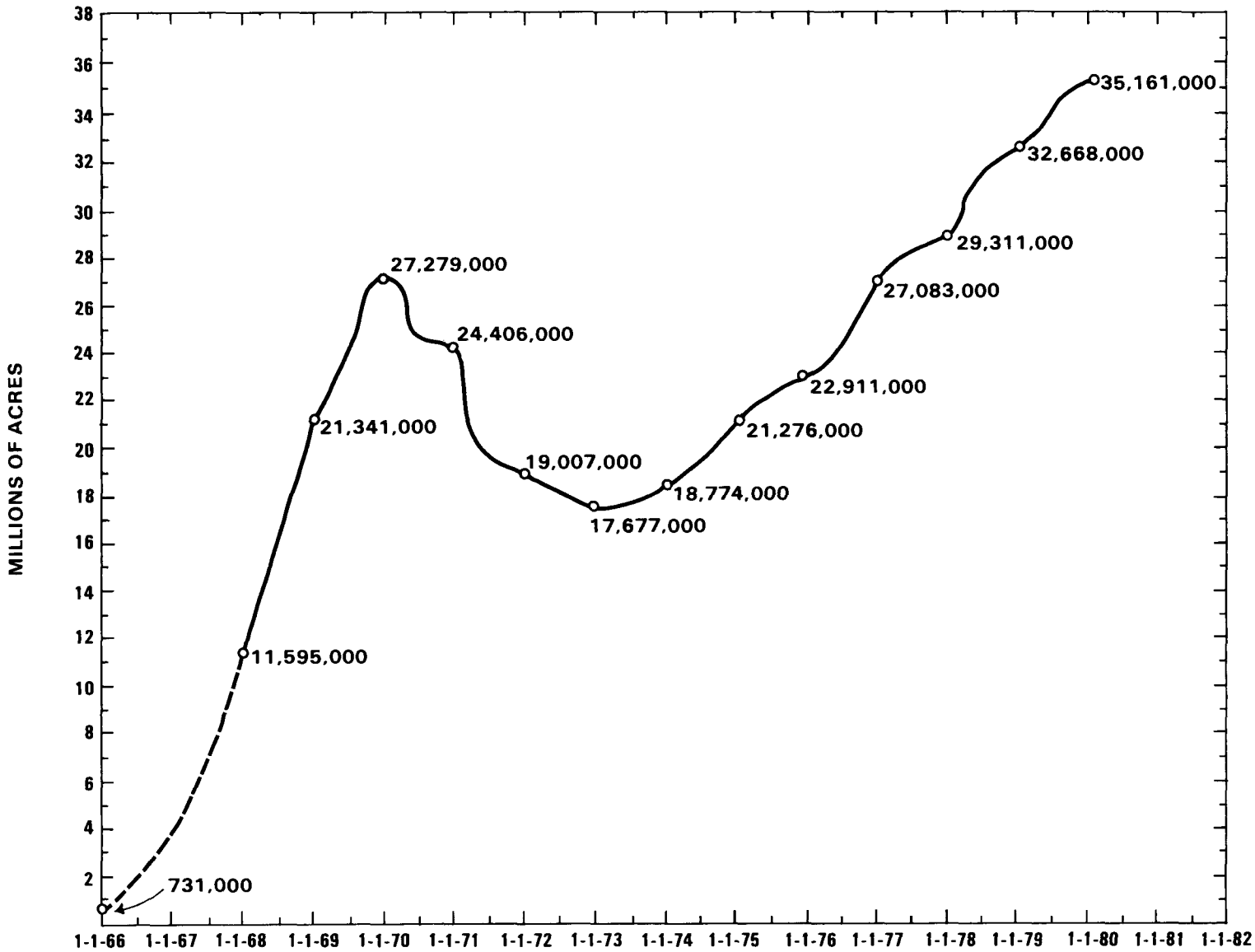
(Thousands of acres)

Distribution By Land Category

	1/1/76	1/1/77	1/1/78	1/1/79	1/1/80
State	3,385	4,635	5,048	5,175	4,641
Claim	12,605	15,067	16,594	19,495	21,843
Acquired	277	293	271	271	243
Indian	627	815	785	785	793
Fee	6,017	6,273	6,613	6,942	7,641
Total	22,911	27,083	29,311	32,668	35,161

Distribution By State

	1/1/76	1/1/77	1/1/78	1/1/79	1/1/80
Arizona	942	1,021	1,212	1,282	1,662
California	619	631	631	631	713
Colorado	1,623	1,852	2,431	3,349	3,901
Idaho	81	108	138	222	265
Montana	418	420	488	527	641
Nevada	321	376	478	478	941
New Mexico	3,663	3,885	3,855	4,279	4,652
North Dakota	100	128	256	386	386
Oregon	31	31	31	81	140
South Dakota	87	810	882	904	425
Texas	622	676	798	1,027	1,539
Utah	4,185	5,498	5,829	6,748	7,038
Washington	129	401	414	425	442
Wyoming	10,090	11,246	11,868	12,329	12,416
Total	22,911	27,083	29,311	32,668	35,161



LAND HELD BY URANIUM INDUSTRY

SECTION X
EMPLOYMENT

EMPLOYMENT IN THE URANIUM EXPLORATION INDUSTRY (1979)

Exploration Area	Geologists & Engineers	Drilling Services	Logging Services	Aerial Services	Others: Landmen, Surveyors, Draftsmen	Total
Colorado and Eastern Utah	413	160	72	7	362	1,014
Wyoming, N. Dakota, S. Dakota, and E. Montana	345	310	86	3	294	1,038
New Mexico and Arizona	218	396	85	6	189	894
Texas, Oklahoma, Arkansas, and Louisiana	170	278	65	3	198	714
Far West, Northwest, and Alaska	191	16	10	19	85	321
Other States	47	1	3	6	28	85
Total	1,384	1,161	321	44	1,156	4,066

Note: This table was prepared from information obtained from companies and individuals engaged in uranium exploration. The numbers are man-years expended during calendar year 1979.

EMPLOYMENT IN THE URANIUM MINING AND MILLING INDUSTRIES (1979)

MINING*

State	Underground		Open Pit		Technical	Other	Supervisory	Total
	Miners	Serv. & Support	Miners	Serv. & Support				
Colorado & Utah	891	471	90	6	124	273	213	2,068
New Mexico	1,843	1,836	338	237	496	361	555	5,666
Wyoming	278	310	1,424	1,012	381	289	353	4,047
Other States	52	25	459	216	69	61	92	974
Total	3,064	2,642	2,311	1,471	1,070	984	1,213	12,755

MILLING

State	Operations	Maintenance	Technical	Other	Supervisory	Total
Colorado & Utah	289	246	117	41	103	796
New Mexico	449	342	103	81	185	1,160
Wyoming	288	238	117	113	142	898
Other States	139	125	31	36	51	382
Total	1,165	951	368	271	481	3,236

*The figures include 323 truckers and 430 employees involved in shaft sinking. Not included are 1,464 employees working in recovery of uranium from byproducts and solution mining, and 240 employees working on construction of uranium recovery facilities.

Note: This table was prepared from information obtained from companies and individuals engaged in mining and milling uranium. The numbers are the average employment levels for calendar year 1979.

SECTION XI
COMMERCIAL U_3O_8 SALES AND REQUIREMENTS

NOTE: Unless otherwise indicated, all materials in this section were obtained from "The U.S. Uranium Market: 1978-1979," George F. Combs, Jr., in *Uranium Industry Seminar Proceedings*, GJO-108(79), October 16-17, 1979, p. 31-46, U.S. Department of Energy, Grand Junction, Colorado.

SECTION XI
COMMERCIAL U_3O_8 SALES AND REQUIREMENTS

COMMERCIAL U_3O_8 DELIVERY COMMITMENTS

A survey of the industry as of July 1, 1979, indicated that U.S. uranium producers had made commercial sales commitments of domestic-origin uranium to domestic buyers for delivery on the following schedule for the years 1979 to 2000. Data on actual delivery for earlier years were derived from surveys done prior to July 1, 1979.

Year of Delivery	Tons U_3O_8	Tons U_3O_8 Cumulative
1966-1971	-	31,900
1972	11,600	43,500
1973	12,100	55,600
1974	11,900	67,500
1975	12,500	80,000
1976	13,800	93,800
1977	13,900	107,700
1978	15,800	123,500
1979	19,600	143,100
1980	20,700	163,800
1981	19,400	183,200
1982	19,100	202,300
1983	17,900	220,200
1984	14,500	234,700
1985	13,000	247,700
1986	11,000	258,700
1987	10,900	269,600
1988	10,000	279,600
1989	9,100	288,700
1990	6,400	295,100
1991-2000 Total	34,600	329,700

REPORTED HISTORICAL AND FUTURE AVERAGE PRICES FOR U_3O_8 DELIVERY COMMITMENTS MADE BETWEEN 1/1/67 and 7/1/79

The following average U_3O_8 prices for the years 1973–1978 are the result of surveys conducted from January 1, 1973, to January 1, 1979, and represent averages of actual prices paid in those years. The 1979–1989 average U_3O_8 prices come from a survey as of July 1, 1979, and represent prices to be paid in contracts as of that date.

Year	Price Per Pound of U_3O_8 (Year-of-Delivery Dollars)
1973	7.10
1974	7.90
1975	10.50
1976	16.10
1977	19.75*
1978	21.60*
1979	21.60*
1980	22.65*
1981	30.10*
1982	29.15*
1983	30.15
1984	30.85
1985	33.65
1986	35.70
1987	37.65
1988	42.75
1989	46.10

*Includes market price settlements of market price contracts.

U_3O_8 SALES TO FOREIGN BUYERS

As of January 1, 1979, sales of domestic-origin U_3O_8 to foreign countries were scheduled as follows:

Year of Delivery	Tons U_3O_8	Tons U_3O_8 Cumulative
1966	400	400
1967	700	1,100
1968	800	1,900
1969	500	2,400
1970	2,100	4,500
1971	200	4,700
1972	100	4,800
1973	600	5,400
1974	1,500	6,900
1975	500	7,400
1976	600	8,000
1977	2,000	10,000
1978	3,400	13,400
1979	2,600	16,000
1980	1,600	17,600
1981	800	18,400
1982	500	18,900
1983	500	19,400
1984	400	19,800
1985	400	20,200
1986-1988	250/year	20,950

DOMESTIC U_3O_8 PROCUREMENT FROM FOREIGN SOURCES

Uranium delivery commitments, imports for domestic end use. As of January 1, 1979, U.S. companies have made purchase commitments for foreign U_3O_8 as follows. Some of this material may be reexported to foreign countries.

Year of Delivery	Tons U_3O_8	Tons U_3O_8 Cumulative
1975	700	700
1976	1,800	2,500
1977	2,800	5,300
1978	2,600	7,900
1979	1,700	9,600
1980	1,700	11,300
1981	4,000	15,300
1982	3,600	18,900
1983	3,300	22,200
1984	3,300	25,500
1985	3,400	28,900
1986-1988	1,750/year	34,150
1989-1990	1,750/year	37,650

Note: The above figures include 1,500 tons of optional purchases.

CAPITAL INVESTMENT FOR DOMESTIC URANIUM PRODUCTION*
(Millions of Dollars)

	Actual					Planned	
	1975	1976	1977	1978	1979	1980	1981
Mine							
Companies Reporting	22	29	31	25	26	24	22
Expenditures	124	200	325	271	282	350	317
Mill							
Companies Reporting	18	24	26	19	26	24	24
Expenditures	22	55	167	156	203	249	242
Total Expenditures	146	255	492	427	485	599	559

*Based upon surveys conducted from January 1, 1976 to January 1, 1980.

FORECASTS OF DOMESTIC URANIUM REQUIREMENTS
DOE Energy Information Administration
Thousand Tons U_3O_8

Year	Low	Mid	High
1980	14.5	15.0	15.1
1981	14.8	15.6	18.5
1982	15.4	18.3	20.8
1983	18.1	20.5	22.0
1984	19.9	22.2	23.0
1985	21.8	23.0	23.3
1986	22.3	22.9	25.4
1987	21.8	24.3	26.6
1988	23.2	25.5	26.8
1989	23.9	25.8	27.6
1990	25.2	25.8	28.2
1991	25.2	27.0	28.1
1992	24.4	28.2	29.1
1993	25.6	28.4	30.7
1994	26.3	29.0	31.7
1995	26.9	30.5	33.2
1996	27.8	31.3	34.4
1997	28.3	32.0	35.5
1998	29.7	33.6	38.1
1999	31.7	35.7	41.5
2000	33.5	37.6	44.3
2005	40.1	44.9	57.1
2010	46.9	52.5	70.7
2015	53.8	58.3	81.3
2020	56.6	61.9	91.1

Source: Domestic nuclear power forecasts presented in Energy Information Administration's *Annual Report to Congress, 1979,* Volume III, published July 1980. Forecasted installed capacities for selected years are shown below.

NUCLEAR CAPACITY (GWe)

Year	Low	Mid	High
1985	86	98	109
1990	121	128	139
1995	137	151	160
2000	160	180	200
2010	235	265	345
2020	290	320	460

HISTORICAL ANNUAL NUCLEAR PLANT ORDERING*

Year Ordered	Number of Plants**	MWe***
Thru 1965	19	8,493.0
1966	20	16,561.0
1967	30	25,632.8
1968	14	12,903.0
1969	7	7,203.0
1970	13	13,683.0
1971	14	13,799.8
1972	23	25,984.0
1973	29	33,575.8
1974	13	15,741.0
1976	3	3,804.0
1977	2	2,500.0
1978	2	2,240.0
	189	182,120.4

*As of January 1, 1980.
**Does not include units ordered and cancelled prior to January 1, 1980.
***Does not include eight units totaling 301.3 MWe permanently shut down.
Source: *U.S. Central Station Nuclear Electric Generating Units: Significant Milestones,* DOE/NE-0030/1(80).

SECTION XII
PROCESSING MILLS

URANIUM MILLING OPERATIONS IN 1979

Number of Mills in Operation*	39
Total Millfeed Tonnage Per Operating Day	46,000

	Thousands of Tons	% U_3O_8	Tons U_3O_8
Ore Receipts (Crushed and Sampled)**	16,300	0.11	18,450
Ore Stockpiles 1/1/79	700	0.14	1,000
Ore Stockpiles 1/1/80	900	0.14	1,290
Ore Fed to Process	16,100	0.11	18,160
In Process 1/1/79	–	–	490
In Process 1/1/80	–	–	520
Possible Production	–	–	18,130
Concentrate Production	–	–	16,480
Mill Tailing	–	–	1,650
Recovery (from Ore)—90.9%	–	–	–
Other Concentrate Production†	–	–	2,250
Total Concentrate Production	–	–	18,730
Concentrate Inventory 1/1/79	–	–	2,620
Concentrate Inventory 1/1/80	–	–	2,810
Concentrate Shipments	–	–	18,540

*Twenty-one conventional mills plus 18 additional processing plants.

**Includes ore at five buying stations but does not include ore (equivalent) attributed to solution mining, mine water, or heap leaching activities that produced U_3O_8 in concentrate.

†Saleable U_3O_8 in concentrate obtained by solution mining, heap leaching, or as a byproduct of another activity.

U.S. URANIUM PRODUCTION MILLS
Operating as of 1/1/80

Conventional Mills	Plant Location	Nominal Capacity (Tons Ore/Day)	Nominal Capacity (Tons U_3O_8/Year)
ANACONDA Copper Company	Grants, New Mexico	6,000	
Atlas Minerals Corporation	Moab, Utah	1,400	
Bear Creek Uranium Company	Powder River Basin, Wyoming	2,000	
Chevron Resources Company	Hobson, Texas	2,500	
Conoco-Pioneer Nuclear	Falls City, Texas	3,400	
Cotter Corporation	Canon City, Colorado	1,200	
Dawn Mining Company	Ford, Washington	450	
Exxon Minerals Company, USA	Powder River Basin, Wyoming	3,200	
Federal-American Partners	Gas Hills, Wyoming	950	
Kerr-McGee Nuclear Corporation	Grants, New Mexico	7,000	
Pathfinder Mines Corporation	Gas Hills, Wyoming	2,500	
Pathfinder Mines Corporation	Shirley Basin, Wyoming	1,800	
Petrotomics Company	Shirley Basin, Wyoming	1,500	
Rio Algom Corporation	La Sal, Utah	750	
Sohio-Reserve	Cebolleta, New Mexico	1,600	
Union Carbide Corporation	Uravan, Colorado	1,300	
Union Carbide Corporation	Natrona County, Wyoming	1,400	
United Nuclear Corporation	Church Rock, New Mexico	3,000	
United Nuclear—Homestake Partners	Grants, New Mexico	3,400	
Western Nuclear, Inc.	Jeffrey City, Wyoming	1,700	
Western Nuclear, Inc.	Wellpinit, Washington	2,000	
	Total	49,050	19,000-21,000
Solution Mining Operations	**Plant Location**		
Everest Mineral Corporation	Hobson, Texas		
IEC Corporation	Three Rivers, Texas		
Mobil Oil Corporation	Bruni, Texas		
Union Carbide Corporation	Palangana, Texas		
United States Steel Corporation	George West, Texas		
U.S. Steel-Niagara Mohawk	George West, Texas		
Uranium Resources, Inc.	Bruni, Texas		
Wyoming Mineral Corporation	Bruni, Texas		
Wyoming Mineral Corporation	Three Rivers, Texas		
Wyoming Mineral Corporation	Irigaray, Wyoming		
	Total		1,200-1,600
Phosphoric Acid Byproduct	**Plant Location**		
Freeport Uranium Recovery Corporation	Uncle Sam, Louisiana		
Gardinier, Inc.	Tampa, Florida		
Uranium Recovery Corporation	Mulberry, Florida		
Wyoming Mineral Corporation	Pierce, Florida		
	Total		500-700
Heap Leaching:			
Dumps, Tailings, or Copper Dumps	**Plant Location**		
Durita Development Corporation	Naturita, Colorado		
Solution Engineering, Inc.	Falls City, Texas		
Union Carbide Corporation	Maybell, Colorado		
Wyoming Mineral Corporation	Bingham Canyon, Utah		
	Total		100-300
	Grand Total	49,050	20,800-23,600

URANIUM MILLS IN THE UNITED STATES OPERATING AS OF 1/1/80

URANIUM CONCENTRATE PRODUCTION BY STATE
In Tons of U_3O_8

Calendar Year	Colorado	New Mexico	Utah	Wyoming	Others**	Total	Cum. Total
1947–1965*	29,652	54,301	28,924	18,449	8,380	139,706	139,706
1966	1,423	5,076	**	2,248	1,842	10,589	150,295
1967	1,340	5,933	**	2,667	1,313	11,253	161,548
1968	1,614	6,192	**	2,873	1,689	12,368	173,916
1969	1,678	5,943	**	3,063	925	11,609	185,525
1970	**	5,771	**	3,654	3,480	12,905	198,430
1971	**	5,305	**	3,487	3,481	12,273	210,703
1972	**	5,464	**	4,216	3,220	12,900	223,603
1973	**	4,634	**	5,159	3,442	13,235	236,838
1974	**	4,951	**	3,767	2,810	11,528	248,366
1975	**	5,191	**	3,447	2,962	11,600	259,966
1976	**	6,059	**	4,046	2,642	12,747	272,713
1977	**	6,780	**	4,990	3,170	14,940	287,653
1978	**	8,560	**	5,330	4,600	18,490	306,143
1979	**	7,420	**	5,450	5,860	18,730	324,873

*AEC concentrate purchases, by state, prior to 1966 are reported on page A-3.

**Data included in "Others" category when state production is from less than three companies. States included in this category for 1 or more years are: Arizona, Colorado, Florida, Louisiana, South Dakota, Texas, Utah, and Washington.

Uranium Ore Processing

The following graphs show the trends in uranium ore processing from 1966 through 1979 for mills in the United States.

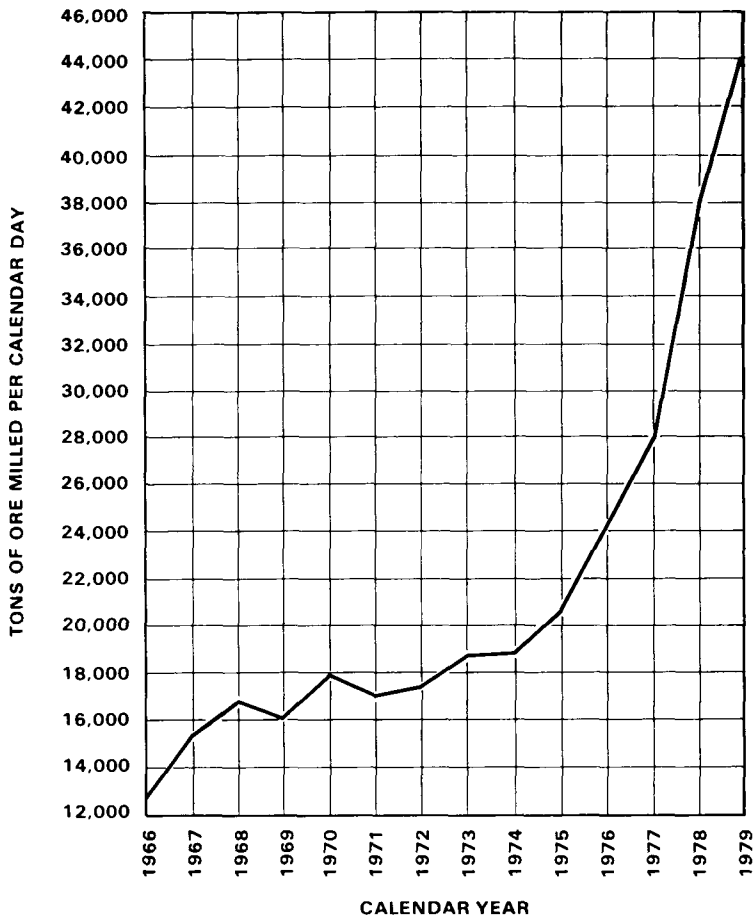
In 1979, domestic uranium mills processed 17 percent more ore than had been processed in 1978 and more than in any other previous year. The grade of ore processed, however, was 16 percent lower in 1979 than in 1978. Production of U_3O_8 in concentrate from ore, due to the opposing effect of these factors as well as several operating difficulties, was 340 tons less than in 1978. U_3O_8 recovered by solution mining, heap leaching, and as byproducts of other processing activities increased by 580 tons over the 1978 production by these nonconventional methods. Production for the United States was, therefore, 240 tons more than in 1978, for a total of 18,730 tons of U_3O_8.

By the end of 1979, the number of operating conventional mills had increased from the prior year by 1 to a total of 21. One company replaced its mill with one of greater capacity and different circuitry, and two other mills increased capacity by the installation of additional equipment. Another mill, scheduled for start up in 1979, was unable to do so because its tailings storage plan was not acceptable to the state's regulatory agency. Three months' production was lost by one operation as the result of a tailings dam rupture and the subsequent investigation as to the cause. Construction of two new mills was started during the year and they will be operational in 1980. The average operating rate per mill in December 1979 was 2,308 tons of ore per calendar day. The average mill-head grade was 0.11 percent U_3O_8 in 1979, the lowest industry average ever recorded. Recovery of U_3O_8 from ore was 90.9 percent, a 0.3 percent increase from 1979, even though the average mill-head grade decreased by 0.02 percent U_3O_8.

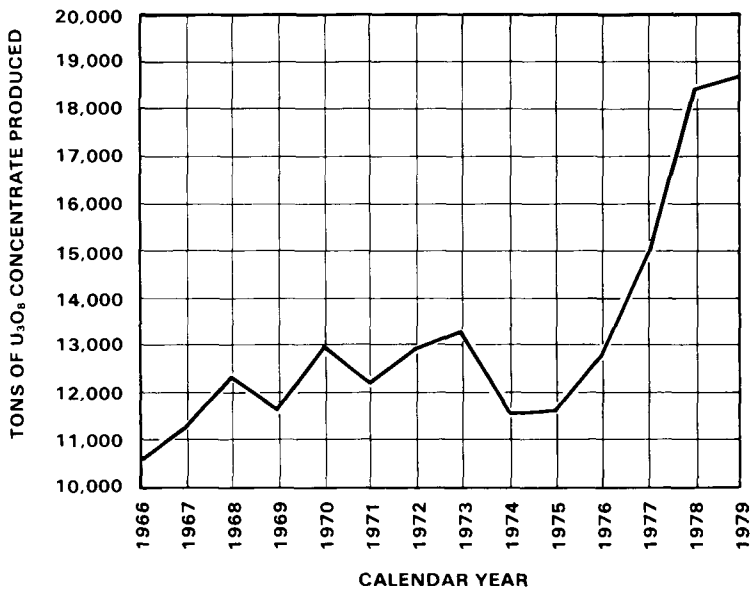
In addition to the conventional mills, eight solution mining operations, three phosphoric acid byproduct plants, and four other operations reported the production of saleable U_3O_8 in concentrate during 1979. Two more solution mining operations and one phosphoric acid byproduct plant were on stream the last month of the year but did not report any production.

In addition to uranium concentrate production facilities, there were five ore-buying stations located in Colorado and Utah stockpiling ore for processing at a later date.

URANIUM ORE PROCESSING RATES



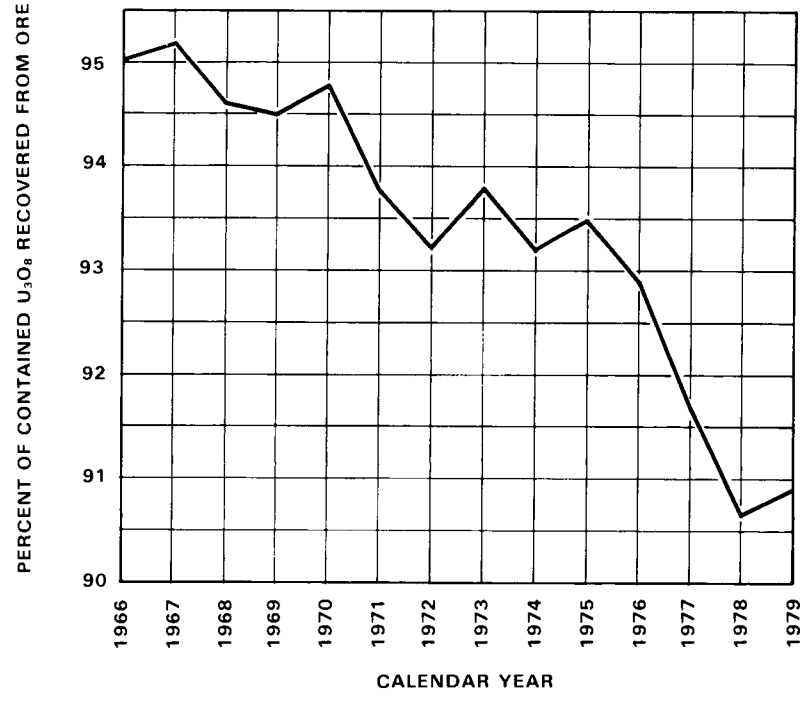
URANIUM CONCENTRATE PRODUCTION*



* Includes production from millfeed other than ore.

GRADE OF URANIUM ORE PROCESSED

RECOVERY FROM ORE PROCESSED



APPENDIX A

URANIUM ORE PURCHASES BY AEC
Fiscal Years 1949-1962

FY	At Buying Stations		Under Special Arrangements		Total	
	Tons of Ore	Pounds of U_3O_8	Tons of Ore	Pounds of U_3O_8	Tons of Ore	Pounds of U_3O_8
1949	28,742	126,302	-	-	28,742	126,302
1950	65,602	351,152	-	-	65,602	351,152
1951	55,904	263,663	-	-	55,904	263,663
1952	87,191	445,725	1,300	4,713	88,491	450,438
1953	121,015	707,581	48,960	232,191	169,975	939,772
1954	267,510	1,601,241	110,515	698,248	378,025	2,299,489
1955	480,232	2,922,826	126,853	962,490	607,085	3,885,316
1956	753,595	4,347,465	52,303	280,677	805,898	4,628,142
1957	587,495	3,778,372	17,016	97,921	604,511	3,876,293
1958	220,649	1,163,049	1,507	5,934	222,156	1,168,983
1959	138,596	1,531,374	734	3,806	139,330	1,535,180
1960	113,345	1,099,928	31,634	148,236	144,979	1,248,164
1961	41,465	453,773	179,966	922,201	221,431	1,375,974
1962	30,408	265,601	60,351	332,210	90,759	597,811
Total	2,991,749	19,058,052	631,139	3,688,627	3,622,888	22,746,679

Note: The first and second columns represent ore purchased at 11 different ore-buying stations operated for varying lengths of time in the west by AEC between 1948 and 1962. The third and fourth columns show ore bought under special arrangements with mills and the AEC ore-buying agent to purchase ore in certain areas for a limited time and usually while mills were under construction. All of the 3,622,888 tons of ore bought during this period gradually was sold to the mills, and at the end of December 1966, the AEC had no ore stockpiles. The 11 AEC ore-buying stations were at Marysvale, White Canyon, Moab, and Monticello, Utah; Shiprock and Grants, New Mexico; Globe and Tuba City, Arizona; Edgemont, South Dakota; Riverton and Crooks Gap, Wyoming. The last AEC station, at Monticello, Utah, was closed on March 31, 1962, with the termination of the Domestic Uranium Program Circular 5, Revised.

AEC DOMESTIC URANIUM CONCENTRATE PURCHASES*
Fiscal Years 1948-1971

Fiscal Year	Tons U_3O_8	Cost to AEC (Thousands of Dollars)	Average Price Per lb U_3O_8 (Dollars)
1948	116	$ 1,656	$ 7.14
1949	115	1,967	8.53
1950	323	5,887	9.11
1951	639	12,907	10.10
1952	824	18,579	11.18
1953	968	23,904	12.35
1954	1,435	35,233	12.27
1955	2,125	52,082	12.25
1956	4,179	96,170	11.51
1957	7,505	157,375	10.49
1958	10,078	190,480	9.45
1959	15,029	274,111	9.12
1960	16,394	286,980	8.75
1961	17,646	299,838	8.50
1962	17,244	280,980	8.15
1963	15,752	246,247	7.82
1964	12,607	201,743	8.00
1965	11,240	179,835	8.00
1966**	10,178	162,828	8.00
1967**	8,902	142,434	8.00
1968**	7,937	126,993	8.00
1969**	7,124	99,579	6.99
1970**	4,010	46,046	5.74
FY 1971 thru Dec. 1970**	1,295	14,341	5.54
Total	173,665	$2,958,195	$ 8.52

*Purchases are shown for the year in which the concentrate was received in accordance with contract provisions. Uranium recorded as a byproduct from the processing of phosphates, euxenites, etc., is not included.

**Production, tons U_3O_8 in concentrates, FY 1966—10,310; FY 1967—10,743; FY 1968—12,062; FY 1969—11,795; FY 1970—12,490; First half FY 1971—6,347.

AEC CONCENTRATE PURCHASES BY STATE
In Tons of U_3O_8

Calendar Year	Colorado	New Mexico	Utah	Wyoming	Others*	Total	Cum. Total
1947	67	-	-	-	-	67	67
1948	102	-	-	-	-	102	169
1949	175	-	-	-	2	177	346
1950	452	-	-	-	7	459	805
1951	620	-	146	-	-	766	1,571
1952	743	-	131	-	-	874	2,445
1953	940	-	214	-	9	1,163	3,608
1954	1,239	-	280	-	181	1,700	5,308
1955	1,483	847	454	-	-	2,784	8,092
1956	1,726	2,891	1,222	-	119	5,958	14,050
1957	1,966	2,534	3,291	-	691	8,482	22,532
1958	2,917	3,604	3,822	1,247	847	12,437	34,969
1959	3,278	6,772	3,535	1,675	979	16,239	51,208
1960	3,117	7,760	3,034	2,770	956	17,637	68,845
1961	2,951	7,750	2,954	2,823	870	17,348	86,193
1962	2,652	7,293	3,188	3,055	820	17,008	103,201
1963	2,134	5,512	3,080	2,566	925	14,217	117,418
1964	1,800	4,747	2,063	2,216	1,020	11,846	129,264
1965	1,290	4,591	1,510	2,097	954	10,442	139,706
1966	1,258	4,393	-	1,944	1,893	9,488	149,194
1967	840	4,698	-	1,705	1,182	8,425	157,619
1968	782	4,300	-	1,567	688	7,337	164,956
1969	-	4,104	-	1,115	965	6,184	171,140
1970	-	833	-	628	1,059	2,520	173,660

*Data included in "Others" category when only one company was operating in a state for sales to AEC.

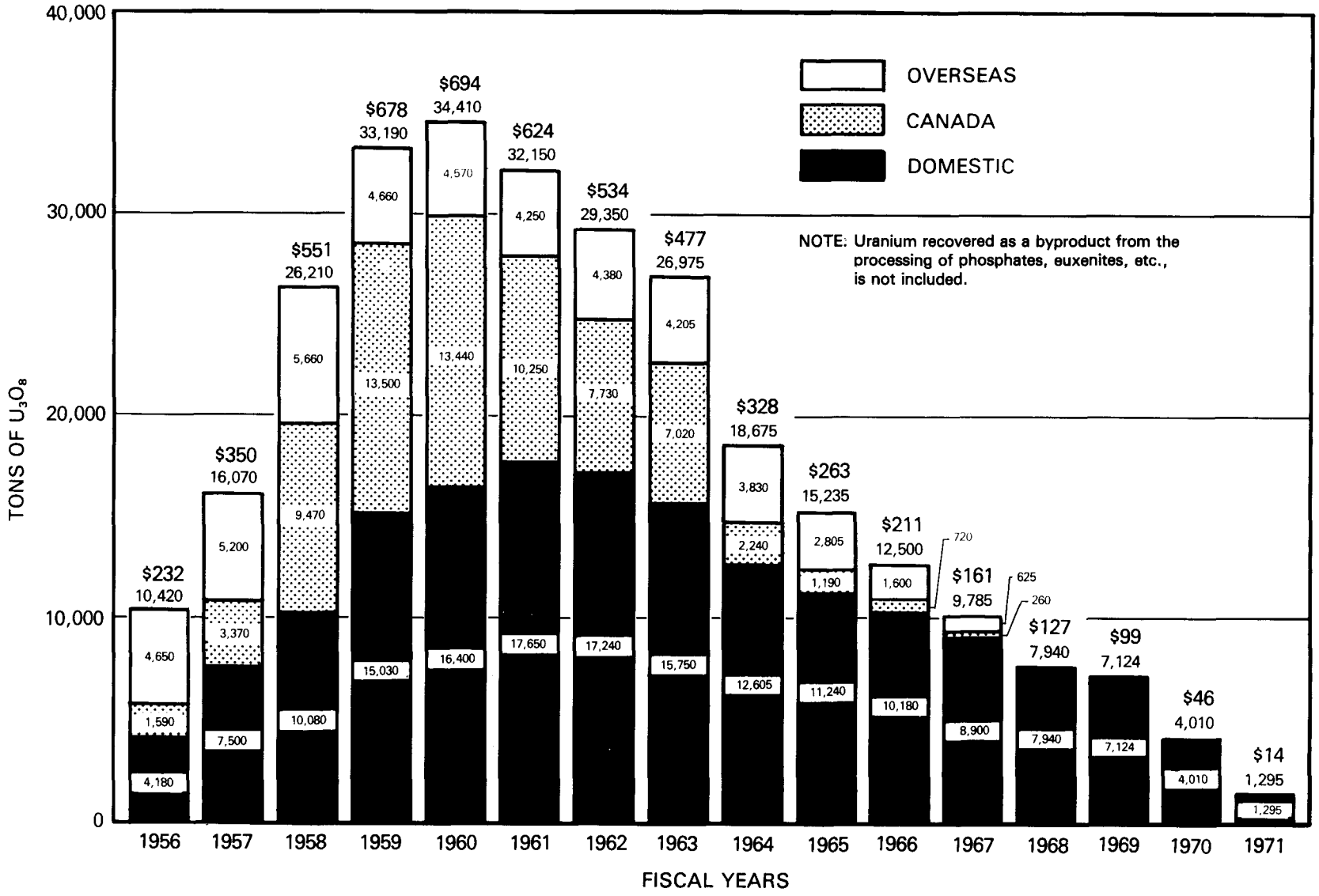
Note: Uranium recovered as a byproduct from the processing of phosphates, euxenites, etc., is not included.

AEC CONCENTRATE PURCHASES BY STATE
In Thousands of Dollars

Calendar Year	Colorado	New Mexico	Utah	Wyoming	Others*	Total	Cum. Total
1947	966	-	-	-	-	966	966
1948	1,531	-	-	-	-	1,531	2,497
1949	3,063	-	-	-	43	3,106	5,603
1950	7,992	-	-	-	1,890	9,882	15,485
1951	13,513	-	2,275	-	-	15,788	31,273
1952	17,163	-	3,556	-	-	20,219	51,492
1953	22,149	-	6,139	-	271	28,559	80,051
1954	29,404	-	7,331	-	5,536	42,271	122,322
1955	34,341	19,978	12,166	-	-	66,485	188,807
1956	40,969	64,633	23,698	-	2,994	132,294	321,101
1957	45,105	50,920	57,980	-	12,501	166,506	487,607
1958	58,514	66,462	67,374	23,764	17,491	233,605	721,212
1959	62,572	112,770	63,853	28,587	19,981	287,763	1,008,975
1960	61,257	125,146	54,641	44,799	18,874	304,717	1,313,692
1961	52,245	123,794	51,376	45,361	17,001	289,777	1,603,469
1962	43,058	110,373	52,174	48,942	13,458	268,005	1,871,474
1963	34,126	85,892	49,348	41,045	14,810	225,221	2,096,695
1964	28,803	75,975	33,007	35,461	16,317	189,563	2,286,258
1965	20,631	73,464	24,164	33,551	15,259	167,069	2,453,327
1966	20,118	70,285	-	31,094	30,276	151,773	2,605,100
1967	13,442	75,147	-	27,275	18,921	134,785	2,739,885
1968	12,514	68,801	-	24,990	11,012	117,317	2,857,202
1969	-	47,150	-	12,531	12,777	72,458	2,929,660
1970	-	7,875	-	6,346	13,814	28,035	2,957,695

*Data included in "Others" category when only one company was operating in a state for sales to AEC.

Note: Uranium recovered as a byproduct from the processing of phosphates, euxenites, etc., is not included.



AEC URANIUM PURCHASES—TONS U_3O_8—MILLIONS OF DOLLARS

APPENDIX B

APPENDIX B

Foreign Production Capability

Producer nations have reviewed current and planned uranium production at the request of the Nuclear Energy Agency and the International Atomic Energy Agency, as shown on page B-2. In the early 1980s, production is expected to increase markedly as Australian production in the Alligator Rivers area comes on stream and as deposits under development in Canada and in Niger begin production. Also, South Africa expects to expand byproduct uranium recovery from gold mining. Foreign production was expected to reach about 33,000 tons U_3O_8 in 1979 (up from 25,000 tons in 1978). By 1985, production will possibly increase to over 80,000 tons U_3O_8. By 1990, most of the major deposits now known could be in production at an annual rate exceeding 90,000 tons U_3O_8, assuming adequate markets.

Foreign Uranium Resources

Foreign uranium resources at $30 and $50 per pound U_3O_8 are shown on page B-3. According to the International Atomic Energy Agency's definitions, "Reasonably Assured resources" refers to uranium that occurs in known mineral deposits of such size, grade, and configuration that they could be recovered within given cost ranges using current mining and milling technology. This corresponds, more or less, to DOE's Reserve category. "Estimated Additional resources" refers to uranium expected to occur in extensions of explored, little explored, and undiscovered deposits along well-defined geologic trends with known deposits. This category corresponds, more or less, to DOE's Probable Potential resources category.

FOREIGN URANIUM PRODUCTION CAPABILITY
(Excludes People's Republic of China, USSR, and Associated Countries)

Thousand Tons U_3O_8

Year	Australia	Canada	France	Gabon	Namibia	Niger	South Africa	Other	Totals
1979	0.8	9.0	3.8	1.3	4.8	4.3	6.8	1.5	32.3
1980	0.8	9.4	4.5	1.3	5.3	5.2	8.5	2.7	37.7
1981	3.0	11.7	4.7	1.3	5.7	5.2	9.5	3.5	44.6
1982	4.9	12.9	5.0	2.0	5.9	5.2	11.2	5.7	52.8
1983	6.5	14.3	5.2	2.0	6.5	5.2	12.9	6.8	59.4
1984	8.5	17.6	5.2	2.0	6.5	5.9	13.5	7.1	66.3
1985	15.6	18.7	5.2	2.0	6.5	7.8	13.8	7.8	77.4
1986	17.7	18.9	5.9	2.0	6.5	10.4	13.9	7.8	83.1
1987	19.8	18.9	5.9	2.0	6.5	10.4	13.9	7.9	85.3
1988	21.8	19.1	5.9	2.0	6.5	10.4	13.8	8.0	87.5
1989	23.9	20.0	5.9	2.0	6.5	10.4	13.8	8.1	90.6
1990	26.0	20.2	5.9	2.0	6.5	10.4	13.5	8.2	92.7

Source: "Uranium Resources, Production and Demand," OECD Nuclear Energy Agency and the International Atomic Energy Agency, December 1979.

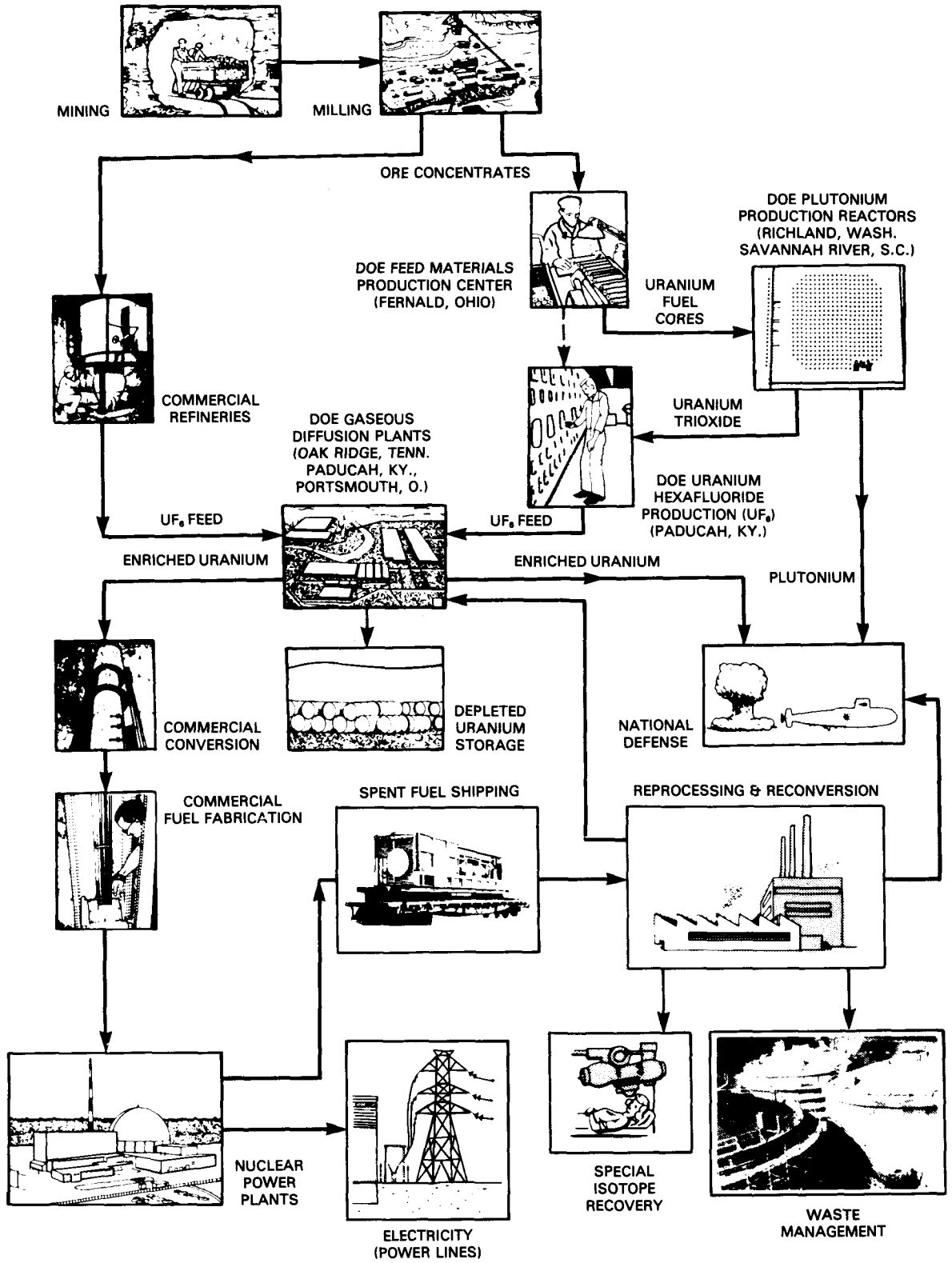
FOREIGN URANIUM RESOURCES BY CONTINENT
Thousand Tons U_3O_8

	Reasonably Assured		Estimated Additional	
	$30/lb U_3O_8	$50/lb U_3O_8*	$30/lb U_3O_8	$50/lb U_3O_8*
North America	**290**	**350**	**520**	**1,010**
Canada	280	305	480	945
Mexico	9	9	44	44
Greenland	0	35	0	21
Africa	**790**	**1,000**	**180**	**340**
South Africa	320	508	70	180
Niger	210	210	69	69
Namibia	152	173	39	69
Algeria	36	36	0	7
Gabon	48	48	0	0
C.A.E.	23	23	0	0
Zaire	2	2	2	2
Somalia	0	6	0	3
Egypt	0	0	0	7
Madagascar	0	0	0	3
Botswana	0	0.5	0	0
Australia	**380**	**390**	**60**	**70**
Europe	**90**	**510**	**60**	**130**
France	51	72	34	60
Spain	13	13	11	11
Portugal	9	10	3	3
Yugoslavia	6	8	7	27
United Kingdom	0	0	0	10
Germany	5	5	9	10
Italy	0	2	0	3
Austria	2	2	0	0
Sweden	1	390	0	4
Finland	0	4	0	0
Asia	**50**	**60**	**0**	**30**
India	39	39	1	31
Japan	10	10	0	0
Turkey	3	5	0	0
Korea	0	6	0	0
Philippines	0.4	0.4	0	0
South America	**130**	**130**	**130**	**140**
Brazil	96	96	117	117
Argentina	30	36	5	12
Chile	0	0	7	7
Bolivia	0	0	0	0.9
Total (rounded)	**1,700**	**2,400**	**1,000**	**1,700**

*Includes resources at $30/lb U_3O_8.

Source: "Uranium Resources, Production and Demand," OECD Nuclear Energy Agency and the International Atomic Energy Agency, December 1979.

Note: This table excludes People's Republic of China, USSR, and associated countries.



PRODUCTION OF FISSIONABLE MATERIALS FOR ELECTRICAL POWER PRODUCTION AND NATIONAL DEFENSE

SELECTED REFERENCES

GJO-103(80) — *Uranium Exploration Expenditures in 1979 and Plans for 1980 and 1981,* U.S. Department of Energy, Grand Junction Office, May 1980, 12 p.

GJO-108(79) — *Uranium Industry Seminar Proceedings, October 16-17, 1979,* U.S. Department of Energy, Grand Junction Office, October 1979, 281 p.

GJO-111(79)* — *National Uranium Resource Evaluation, Interim Report, 1979,* U.S. Department of Energy, Grand Junction Office, April 1979, 184 p.

GJBX-11(80) — *NURE 1979 Annual Activity Report,* Bendix Field Engineering Corporation, March 1980, 108 p.

GJBX-82(80) — *Survey of Lands Held for Uranium Exploration, Development, and Production in Fourteen Western States, in the Six-month Period Ending December 31, 1979,* Bendix Field Engineering Corporation, April 1980, 24 p.

Procurement information for the above publications is available from:

Technical Library
Bendix Field Engineering Corporation
P.O. Box 1569
Grand Junction, Colorado 81502
Telephone (303) 242-8621, Ext. 278

*GJO-111(80)—A comprehensive and up-to-date report of U.S. Uranium Resources will be released in October 1980.